NOVA SCHOOL OF
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DRIVERS AND FACETS OF CORPORATE STRATEGIC CHANGE IN RESPONSE TO PERFORMANCE FEEDBACK

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ABSTRACT

The present Work Project investigates the heterogeneous performance feedback – strategic response relationship of organizations as well as the moderating effects of profitability and CEO temporal- and regulatory foci on this main relationship, providing a nuanced understanding of how, where, and why organizations engage in strategic change. Overall, this study suggests that firms adapt their strategy as a response to performance feedback according to the psychological process of risk perception explained in the "Prospect Theory" and according to the influence of various moderators, each one selectively affecting specific aspects of a firm's strategy in different situations.

Keywords: Performance Feedback, Behavioral Theory of the Firm, Business Aspirations, Behavioral Strategy, Upper Echelons Theory, Prospect Theory

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INTRODUCTION

Decades' worth of empirical strategy research has studied why and how organizations change and adapt over time (Argote and Greve 2007; Cyert and March 1963; Greve 1996). As an outgrow of the "Behavioral Theory of the Firm" (BTF) (Cyert and March 1963), the "Performance Feedback Theory" (PFT) is a central approach to study this organizational adaptiveness. It describes the ability of companies to learn from their experience (past performance) and to react according to the divergence between their actual- and their aspired performance level. This performance relative to aspiration level is called "performance feedback" (Greve 1996; Verver et al. 2019; Sengul and Obloj 2017; Greve 2003b).

Throughout empirical studies, firms have been found to react inconsistently to both performances above aspiration (positive performance feedback) and below aspiration (negative performance feedback). Several scholars argued and found that when performance is lower than the aspiration level, organizations engage in "problemistic search" (Choi, Rhee, and Kim 2019; Eun and Kang 2015). Consequently, some adapt their organizational strategy while others prefer inertia (Eun and Kang 2015; Greve 1996; Mount and Baer 2021; Alessandri and Pattit 2014; Audia and Greve 2006). Furthermore, among the companies adapting their strategy, some decrease their expenditures, since this decrease implies a short-term performance improvement at the expense of long-term competitiveness. In contrast, others increase their expenditures to ensure better competitive positioning of the company in the long-term at the expense of short-term results (Yu, Minniti, and Nason 2019). When performance exceeds an organization's aspiration level, some companies tend to become complacent and, consequently, the willingness to introduce and implement strategic changes with uncertain outcomes diminishes. Other organizations increase their resources for experimentation instead, even if a strategic change, in this case, increases the likelihood of an overall performance reduction of the organization (Greve 1996). This Work

Project aims to reduce this empirical ambiguity surrounding the “Performance Feedback Theory” (Greve 1996; Audia and Greve 2006). First, it examines which specific aspects of their strategy companies tend to change as a response to performance feedback. Second, we analyze if firms adapt their strategy as a response to performance feedback according to the psychological process of risk perception explained in the “Prospect Theory”. Finally, we evaluate if a firm’s profitability situation, as well as the CEOs’ personality traits (temporal- and regulatory foci), have a significant moderating effect on this performance feedback - strategic change relationship.

THEORETICAL BACKGROUND

By drawing upon prior research, in this chapter we clarify the conceptual relations and our expectations regarding the outcomes of this quantitative research project.

The “Performance Feedback Theory” (PFT) is a central approach to study organizational adaptiveness and argues that an organization's past performances have a direct influence on future decisions and strategic actions (Greve 1996; Verver et al. 2019; Sengul and Obloj 2017; Greve 2003b). Extant research has already established this relationship such as in the case of M&As (Iyer and Miller 2008), new market entries (Ref and Shapira 2017), and R&D resource allocations (Chen and Miller 2007; Greve 2003a; Lucas, Knoben, and Meeus 2018; Verver 2022). A central aspect is that decision-makers look at “performance feedback”, which is the divergence between their actual- and their aspired performance level (Greve 1996; Verver et al. 2019; Sengul and Obloj 2017; Greve 2003b), where the aspired performance is defined as the “the smallest outcome that would be deemed satisfactory by the decision-maker” (Schneider 1992, 1053). According to the PFT, organizations compare their achieved financial and non-financial key performance indicators (KPI) with their historical aspiration level, based upon their own past performance, and their social aspiration level, based upon the performance of direct competitors (Alessandri and Pattit 2014; Greve 1996; Cyert and March 1963; Verver et al. 2019). If one or more aspiration levels are not attained, firms are expected to counteract this performance shortfall by adjusting established practices or choosing strategic alternatives that are expected to bring performance back above aspiration (Cyert and March 1963). If all aspiration levels are attained, companies see themselves as successful, and no additional actions are required (Cyert and March 1963; Theresa K. Lant, Milliken, and Batra 1992; Theresa K. Lant and Montgomery 1987).

While it is still widely discussed in the academic community which metrics (financial- and non-financial KPIs; historical- and social aspiration levels) are the most suitable to determine the performance feedback (Venkatraman and Ramanujam 1986), most studies use financial KPIs in their modeling due to their standardization and more straightforward comparability across companies, industries, and time. Nevertheless, financial KPIs neither indicate the specific problems that companies face nor the magnitude or type of the required responses (Greve 2003b). Non-financial KPIs, such as the number of patents (Lungeanu, Stern, and Zajac 2016) and new product introductions (Tyler and Caner 2016), are harder to analyze and to compare instead, but provide more guidance regarding the organization's responsiveness and are better suited to explain why and where organizations perform above or below aspiration (Greve 2003b). Similarly, most studies use the historical aspiration level instead of the social aspiration level, because competitor information is often harder to get and ambiguous to evaluate (J.-Y. Kim, Finkelstein, and Haleblian 2015; Mount and Baer 2021). This is mainly the case when a company differs significantly from its competitors in the same industry (Greve 2003a) and they, therefore, compare themselves to industry-subgroups with a similar size, strategy, or technology (Ref and Shapira 2017; Greve 2003b; Washburn and Bromiley 2012).

Research performed various analyzes about this performance feedback – strategic responsiveness relationship. Among others, Short and Palmer (2003) found that performance feedback in connection with historical aspiration results in higher responsiveness if compared to social aspiration (Short and Palmer 2003; Verver et al. 2019). Furthermore, organizations tend to be more responsive to financial KPIs, when their performance is above their historical aspiration and below the social aspiration level. At the same time, they also tend to be more responsive to non-financial KPIs, when their performance is above social aspiration (Verver et al. 2019). Chatterjee and Hambrick (2011) proposed, that managers use performance feedbacks as a validation for their managerial competence and, since a positive (negative) performance feedback

increases (decreases) the confidence of managers in their managerial abilities, it also encourages (discourages) them to perform bold strategic investments (Buyl and Boone 2014; Chatterjee and Hambrick 2011; 2007).

Throughout empirical studies, firms have been found to react inconsistently to both performances above aspiration (positive performance feedback) and below aspiration (negative performance feedback). For example, research found that negative performance feedback results in decreased R&D intensity (Xu, Zhou, and Du 2018) and that R&D intensity rises as performance increases above aspiration (Chen and Miller 2007), while Greve (2003) found opposite effects (Greve 2003a). Therefore, this Work Project aims to reduce the current empirical ambiguity in the PFT literature (Greve 1996; Audia and Greve 2006). While other scholars focus on overall strategic change or one single dimension of it, this Work Project aims to deliver a more nuanced understanding of which specific underlying aspects of strategic change companies tend to change more or less when the achieved performance feedback diverges from the aspired performance feedback. Therefore, several analyses are run for overall strategic change and all the following six underlying dimensions of it: advertising intensity change, R&D intensity change, plant equipment newness change, non-production overhead change, inventory level change, and financial leverage change (Bednar, Boivie, and Prince 2013; Finkelstein and Hambrick 1990). These six complementary key strategic dimensions have been frequently used in previous studies to create the aggregated strategic change variable and each one describes the extent to which an organization changes one specific resource allocation pattern (Yan Zhang 2006; Bednar, Boivie, and Prince 2013; Finkelstein and Hambrick 1990). According to the inconsistent results in previous research, we do not expect performance feedback to impact all those dimensions homogeneously. This brings us to our first hypothesis:

Hypothesis 1: *We expect different aspects of strategic change to be impacted heterogeneously by positive and negative performance feedback.*

When organizations adapt their strategy, they probably perform this change management according to the findings of the "Prospect Theory". This theory is widely viewed as the best available description of how people evaluate and react to risk and uncertainty in experimental settings (Kahneman and Tversky 1979; 1992). This theory makes, among others, the following two assumptions:

1. **Reference Dependence**: Humans feel the change in attributes, such as temperature, brightness, and loudness, and not the absolute magnitude of them. Accordingly, Kőszegi and Rabin (2006, 2007, 2009) found that people tend to evaluate losses in relation to a personal expectations-related reference point (Kőszegi and Rabin 2006; 2009; 2007). This is the reasons we use performance feedback (performance relative to aspiration) instead of the absolute performance of a company for our empirical analyses.

2. **Loss Aversion:** People are much more sensitive to losses than to gains. Risk-averse people will turn down a bet with a 50% chance of losing EUR 100 and winning EUR 120 because the pain of losing EUR 100 outweighs the pleasure resulting from winning EUR 120 (Kahneman and Tversky 1979; Gonzalez and Wu 1999; Bruhin, Fehr-Duda, and Epper 2010).

Since companies are led by managers and managers are supposed to evaluate and react to risk and uncertainty according to their psychological process of risk perception explained in the "Prospect Theory", we also expect companies to react to risk and uncertainty following the same assumptions (Kahneman and Tversky 1979; 1992). Therefore, following the "reference dependence" assumption, we use performance feedback to test the "loss aversion" assumption of

the “Prospect Theory” in the business context. According to the “loss aversion” assumption, people are more sensitive to losses than to gains. Hence, we formulate the following hypothesis:

> ***Hypothesis 2:*** *Companies tend to have a stronger strategic reaction when they are in a loss situation than in a gain situation for both cases when performance is below and above aspiration level.*

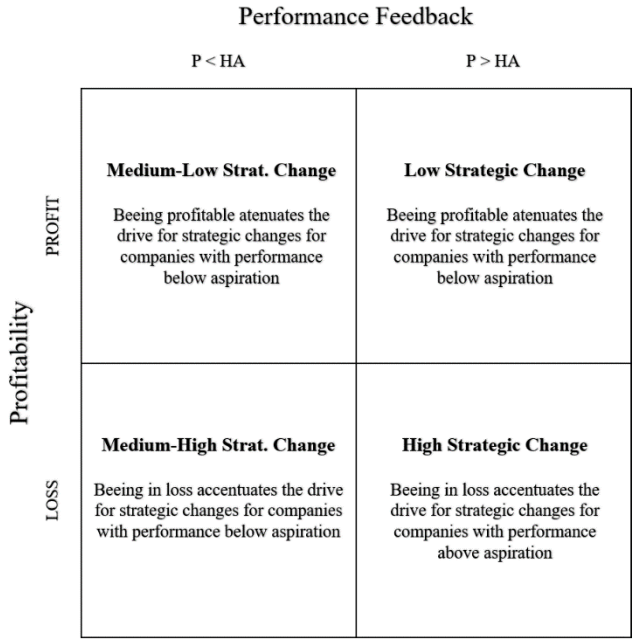

Figure 1 - Summary of Proposed Relationships in H3

Furthermore, adding the moderating condition “profit/loss situation of the company” allows a comparison between the strategical reactions of profitable- and non-profitable companies when the achieved performance diverges from the aspired performance. Since companies might face different types and intensities of stakeholder pressure when in profit or loss (Yu Zhang and Gong 2018), we expect performance feedback to have a different impact on the strategy of profitable and non-profitable companies. Furthermore, given the empirical ambiguity in previous research, we analyze if this moderator adds valuable insights into the relationship between performance feedback and corporate risk-taking. Hence, this brings us to the second hypothesis:

Hypothesis 3: *The relationship between performance feedback and strategic changes will be moderated by the company's profitability. We expect profitable and non-profitable companies to strategically react in heterogeneous ways to both performances above and below aspiration.*

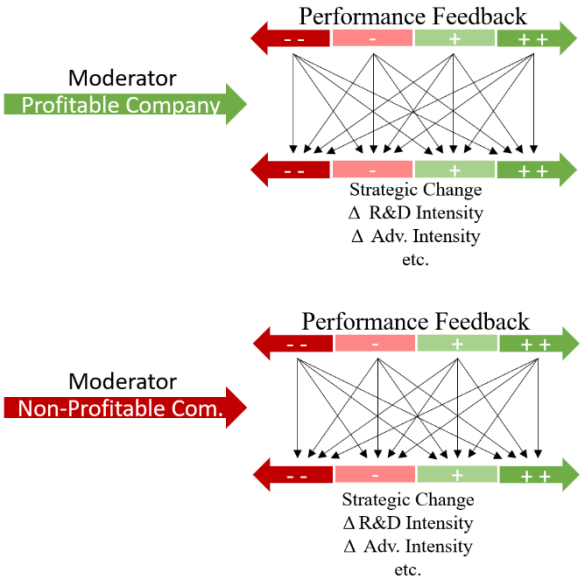

Figure 2 - Profit/Loss Moderator

To better explain the heterogeneity of strategic changes in responses to performance feedback, as a next step, we look at the characteristics of the CEO. The "Upper Echelons Theory" describes an important cognitive characteristic in strategic decision making, namely how the CEO's perception of time (temporal focus) and motivational attributes (regulatory focus) influence his strategic decisions (DesJardine and Shi 2020; Nadkarni and Chen 2014; Souder and Bromiley 2012; Gamache and McNamara 2019; Shipp and Aeon 2019; Jiang et al. 2020; Mount and Baer 2021). Empirical studies have shown that temporal focus, as a stable cognitive disposition among individuals (DesJardine and Shi 2020), has been influenced by several factors, such as socioeconomic background, national culture, and significant life events such as childhood experiences (Watson and Milfont 2017; Zimbardo and Boyd 1999; Shipp and Aeon 2019). Despite

CEOs with a strong past focus try to learn from their past experiences, which they strongly build on in their strategic decision-making processes (Nadkarni and Chen 2014; Clark and Collins 1993), this Work Project focuses exclusively on the moderating implications of present- and future focus since only these two dimensions of temporal foci are connected to changes in the organization's strategy as a response to performance feedback (DesJardine and Shi 2020; Gamache and McNamara 2019; Nadkarni and Chen 2014; Jiang et al. 2020; Mount and Baer 2021).

1. **Present Focus:** CEOs with a strong present (short-term) focus put more emphasis on events and developments in the near (short-term) future, while partly disregarding long-term consequences of their actions (Zimbardo and Boyd 1999; Choi, Rhee, and Kim 2019; A. Kim, Bansal, and Haugh 2019; Nadkarni and Chen 2014; Shipp, Edwards, and Lambert 2009). CEOs of listed firms are particularly prone to short-term orientation due to the stakeholders' pressure to meet aspired short-term targets (Yu Zhang and Gong 2018). Empirical research found that present-focused CEOs tend to temporarily reduce certain future-oriented investments to improve the financial bottom-line performance of an organization at the expense of long-term competitiveness (Bromiley and Washburn 2011; Yu, Minniti, and Nason 2019; Chen and Miller 2007; DesJardine and Shi 2020).

2. **Future Focus:** CEOs with a strong future (long-term) focus put more emphasis on the positive development of a company in the long-term future, while partly disregarding the short-term consequences of their actions. (Zimbardo and Boyd 1999; A. Kim, Bansal, and Haugh 2019; Nadkarni and Chen 2014; Yadav, Prabhu, and Chandy 2007; DesJardine and Shi 2020). Even in listed firms, where the pressure to meet aspired short-term targets is higher, CEOs with a strong future focus emphasize primarily on the creation of long-term value for the stakeholders (e.g. by investing in research and innovation) rather than

maximizing short-term profits (Yu Zhang and Gong 2018; Yadav, Prabhu, and Chandy 2007; DesJardine and Shi 2020; Ocasio 2011). Empirical research has shown that future-oriented CEOs have a positive effect on the company´s investments in strategic actions (DesJardine and Shi 2020), its development of new product ideas (Ocasio 2011), and other innovative efforts (Yadav, Prabhu, and Chandy 2007).

When facing performance shortfalls, we, therefore, expect more present-oriented CEOs to reduce certain investments to improve short-term performance. In contrast, we expect more future-oriented CEOs to keep those investments more constant. When facing performance surpluses, we expect more present-oriented CEOs to keep certain investments constant to not impair the short-term performance. At the same time, we expect more future-oriented CEOs to increase those investments further to ensure better competitive positioning of the company in the long term.

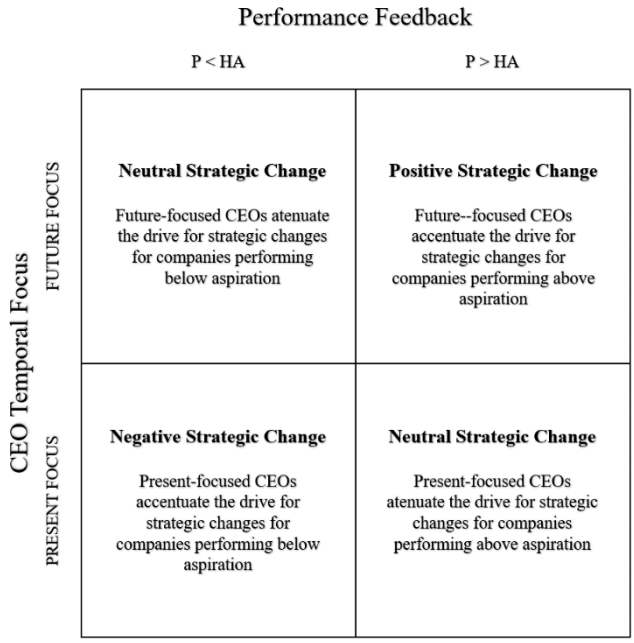

Figure 3 - Summary of Proposed Relationships in H4

Hence, we connect these insights with the insights from the "Performance Feedback Theory" and formulate the following hypothesis:

Hypothesis 4: *The relationship between performance feedback and strategic changes will be moderated by the CEOs' temporal foci. When facing performance shortfalls, we expect more present-oriented CEOs to reduce certain investments to improve short-term performance, while, when facing performance surpluses, we expect more future-oriented CEOs to increase those investments to ensure better competitive positioning of the company in the long term.*

The "Regulatory Focus Theory" (Crowe and Higgins 1997; Higgins 1998) combines the influence of two hedonic motivational attributes in the CEOs' decision-making process. When CEOs engage in external threats and opportunities, they pursue their goals either through a promotion- (approaching gains) or a prevention focus (avoiding pains) (Idson, Liberman, and Higgins 2000; Lanaj, Chang, and Johnson 2012; Mount and Baer 2021). According to the regulatory fit, different situations can either accentuate or attenuate CEOs' regulatory foci (Higgins 2000; Ahmadi et al. 2017). Furthermore, regulatory foci are interdependent of one another (they can be both high, both low, or asymmetrical) (Johnson, Chang, and Yang 2010; Higgins 1998) and they have a significant impact on strategic changes (Jiang et al. 2020; Gamache et al. 2015; Das and Kumar 2011). The interaction of regulatory foci and the "Performance Feedback Theory" has rarely been studied. Mount and Baer (2021) found that promotion- and prevention-focused CEOs strategically respond to performance feedback in the following two asymmetrical ways:

1. **Promotion Focus:** Consistent with the BTOF, promotion-focused CEOs are concerned with advancement, growth, accomplishment, and the presence of positive outcomes (Crowe and Higgins 1997; Higgins 1998). Since they look at challenges with bold aspirations and evaluate whether there is a gain potential or not (Higgins 1998), they are

positively inclined toward strategic risk-taking. They tend to engage in increased (decreased) strategic change when the performance of the company is increasingly below (above) aspiration. (Mount and Baer 2021)

2. **Prevention Focus:** Prevention-focused CEOs are primarily concerned about safety (Crowe and Higgins 1997; Higgins 1998) and they focus more on the loss potential of challenges with the intent to avoid costly mistakes (Higgins 1998). Although they are in general less inclined toward strategic risk-taking, they have been found to engage in increased (decreased) strategic change when the performance of the company is increasingly above (below) aspirations. (Mount and Baer 2021)

Hence, we can formulate the following hypothesis:

Hypothesis 5: *The CEOs' regulatory foci will moderate the relationship between performance feedback and strategic changes. We expect more promotion-focused CEOs to engage in increased (decreased) strategic changes when the performance of the company is increasingly below (above) aspiration. Moreover, we expect more prevention-focused CEOs to engage in increased (decreased) strategic changes when the performance of the company is increasingly above (below) aspirations.*

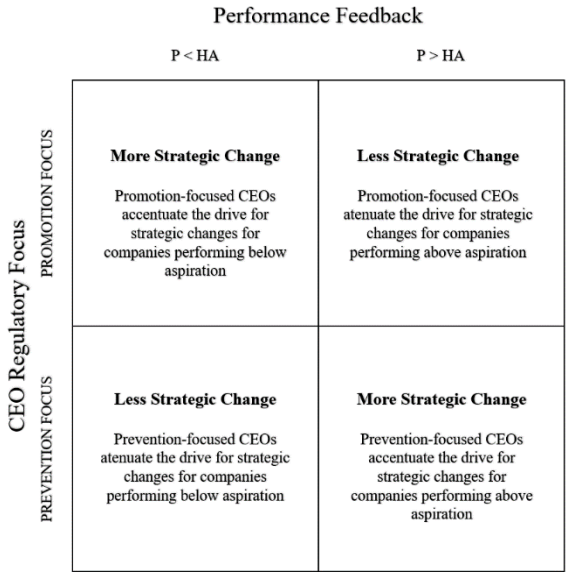

Figure 4 - Summary of Proposed Relationships in H5
Adapted from Mount and Baer (2021)

RESEARCH DESIGN

In the following chapter, the research methodology will be described. More precisely, we present and clarify our data sources, the samples, the procedures, the measurement techniques of the variables, the moderators, and our analytical approach.

Sample

To measure the variables of interest and test the proposed hypotheses we use three quantitative data sources. We gather the firm-level data from the "Compustat" database and the individual-level data from the "Execucomp" database. Furthermore, to create the temporal- and regulatory foci variables, we run an analysis in the "Linguistic Inquiry and Word Count" (LIWC) text analysis software of the "quarterly earnings conference calls transcripts" from Seeking Alpha.

To test hypotheses 1 to 3, the analyses are performed with the data on all US-based pharmaceutical manufacturing companies (SIC-code: 2833 and 2834) between 1990 and 2020 contained in the "Compustat" database. This results in an unbalanced panel sample of 723 organizations and 6617 year-observations (3376 with performance below aspiration and 3241 with performance above aspirations). To test for our hypotheses regarding the moderating effect of the CEO foci (H4 and H5), the analyses are performed with the data on 65 randomly chosen US-based pharmaceutical manufacturing companies between 1990 and 2020. This results in an unbalanced panel sample of 65 organizations and 368 year-observations (200 with performance below aspiration and 164 with performance above aspirations). Even though the pharmaceutical manufacturing industry might be quite diverse within itself, we choose it, because this industry is widely covered by both databases, which consist of observational panel data that gives the data

external validity (generated under natural conditions) and generalizability (data can be generalized to different situations).

Dependent Variables

In this section, the dependent variables (DV) of interest are presented, and their conceptual definition is operationalized to measure them.

The aggregated variable of "Strategic Change" has been frequently used in previous studies and it can be seen as the extent to which an organization changes its resource allocation patterns in six complementary key strategic dimensions (Yan Zhang 2006; Bednar, Boivie, and Prince 2013; Finkelstein and Hambrick 1990): advertising intensity (advertising expense / sales turnover), R&D intensity (R&D expense / sales turnover), plant & equipment newness (net PPE / gross PPE), non-production overhead (SGA expense / sales turnover), inventory levels (inventories total / sales turnover), and financial leverage (liabilities total / equity total). First, we calculate the values of the differences in the ratios between the prior and current year. Second, we standardize these values, so that the mean of each dimension equals 0 and the standard deviation equals 1. Finally, to find the overall strategic change variable, we use the absolute values to calculate the average of these six dimensions. Consequently, if the dependent variable is 0, it indicates that there has been no strategic change, while positive values above 0 represent the extent to which the strategy has changed (increased or decreased).

Additionally, each underlying strategic change variable is analyzed separately since we want to determine what type of strategic changes companies tend to engage more or less in with different performance feedbacks. Also in this case, all dimensions need to be made comparable by calculating the relative change (%) of each dimension between two consecutive years:

$$\boldsymbol{\Delta DV}(\%) = \frac{\boldsymbol{DV_{t1} - DV_{t0}}}{\boldsymbol{|DV_{t0}|}}$$

Equation 1 – Formula for Δ Strategic Change

If the dependent variable is 0, it indicates that there has been no change in that specific strategic dimension, while all other positive or negative values represent the extent to which the strategy has changed (increased or decreased in %). Furthermore, all dependent variables are "led" with one year since this approach is widely used in "Performance Feedback Theory" research and it reflects the temporal order between an action (performance feedback$_{t0}$) and the subsequent reaction (strategic change$_{t+1}$) (Greve 2003b; Argote and Greve 2007).

Independent Variables

In this section, the independent variable (IV) "Performance Feedback" will be presented, and its conceptual definition will be operationalized to measure it.

Performance feedback is defined as performance relative to aspiration. Therefore, it can be seen as the divergence between achieved- and aspired performance (Greve 1996; Verver et al. 2019; Sengul and Obloj 2017; Greve 2003b). Like in most studies, to measure both achieved- and aspired performance we use the financial key performance indicator return on assets (ROA) in our modeling due to its standardization and more straightforward comparability across companies, industries, and time (Bromiley and Washburn 2011; Greve 2003b; Gaba and Bhattacharya 2012; Levinthal and March 1981). The achieved performance corresponds to the return on assets and is calculated by dividing net income by total assets.

There are several different ways to calculate the aspired performance variable. As mentioned before, the aspired performance is defined as "the smallest outcome that would be

deemed satisfactory by the decision-maker" (Schneider 1992, 1053). We use the historical aspiration (HA) because the results of studies using the historical aspiration have been more consistent (Ref and Shapira 2017; Verver et al. 2019; Mount and Baer 2021) and the social aspiration is in many cases hard to get and ambiguous to evaluate (J.-Y. Kim, Finkelstein, and Haleblian 2015; Mount and Baer 2021). Since the historical aspiration is influenced by the aspiration level of the last period and the current period's performance (Greve 1996; Schneider 1992; T. K. Lant 1992), we calculate it as a weighted sum of its past aspiration level (HA_{it-1}) and the current performance (P_i) (Greve 1996; Choi, Rhee, and Kim 2019; Mount and Baer 2021):

$$\boldsymbol{HA_{it} = \alpha * P_{it} + (1 - \alpha) * HA_{it-1}}$$

HA_i = Historical Aspiration Level of the selected company i
HA_{it-1} = $ROA_{it-1} = P_{it-1}$
P_i = Performance (ROA) of the selected company i
$\alpha * P_t$ = weighted average of performance at t
$(1 - \alpha)$ = carryover (how much the past influences the present or how fast this influence decays

Equation 2 – Formula for Weighted Historical Aspiration Variable

We determine α by testing various values (between 0.0 and 1.0 in step sizes of 0.1) to find the value with the highest log-likelihood (adj. R2). If α is low, the influence of recent performance on the aspiration level is weak and the influence of past performance stays stronger over time. If α is high, the influence of the present performance is strong, but it is not lasting long over time. For our sample, the best α has a value of 0.3.

Finally, we create the independent variable "performance feedback" by calculating the relative difference (%) between the achieved performance (P) and the aspired performance (HA):

$$\boldsymbol{Performance\ Feedback}\ (\%)\ = \frac{\boldsymbol{P_{it} - HA_{it}}}{\boldsymbol{|HA_{it}|}}$$

Equation 3 – Formula for Performance Feedback

If the performance feedback variable is 0, it indicates that there is no difference between the achieved performance (ROA) and the aspired performance (HA), while all other values represent the extent (in %) to which the two values differ from one another. Finally, to create the two separate indicator variables – positive performance feedback (P > HA) and negative performance feedback (P < HA) – we use a spline function to capture the slope differences of performance below or above historical aspiration.

Moderator: Positive vs. Negative Performance

Adding the moderating variable "profit/loss situation of the company" allows a comparison between the strategical reactions of profitable- and non-profitable companies when the achieved performance feedback diverges from the aspired performance feedback. The profit/loss situation is measured as a categorical variable indicating whether the company is profitable (positive performance = 1; 0 otherwise) or not (negative performance = 1; 0 otherwise)

Moderators: CEO Temporal & Regulatory Foci

The moderating variables "temporal foci of the CEO" and "regulatory foci of the CEO" are also added to gather a deeper understanding of the impact of these personality traits on different aspects of the organizational strategy. To measure the CEOs' foci, we analyze the content of different randomly chosen quarterly earnings conference calls (QECC) of publicly traded firms in the pharmaceutical manufacturing industry. We use these calls because they are widely available and, in contrast to shareholder letters and annual reports, relatively spontaneous (mostly

unscripted) (Nadkarni, Chen, and Chen 2016), worldly transcribed, and un-ceremonious, so that they better reflect the CEOs' foci and their view on the companys' strategies (DesJardine and Shi 2020; DesJardine and Bansal 2019). To perform this analysis, we use the "Linguistic Inquiry and Word Count" (LIWC) text analysis software. The measures used by this software have been validated and demonstrate a strong validity of its measurements (Nadkarni and Chen 2014; Gamache and McNamara 2019).

Control Variables

To better quantify a relation between cause and effect, we reduce noise in estimation by using the following individual- and firm-level control variables. At the individual level, we use CEO age and CEO total compensation (salary + bonus in TUSD) (DesJardine and Shi 2020). At the firm level, we use firm size (log[nr. of employees]) and financial slack (current assets / current liabilities = current ratio) instead, as company size and excess financial resources have been linked to a reduction of company failure rates due to the higher amount of available resources (Audia and Greve 2006; Nohria and Gulati 1996).

Models

All statistical analyses are performed with the latest available version of the open-source software R-Studio. Appropriate summary statistics will first describe the sample. Secondly, since the database consists of unbalanced panel data, we use fixed- or random-effects panel-data regression models according to the empirical indication given by each "Hausman Specification Test". Finally, to gather a deeper insight into our results, Linear Probability Models are used to determine the probability of specific strategic reactions, and Log-Log Models, which are non-linear multiplicative models which assume a curvilinear relationship between the input and the output, are used to calculate the respective elasticities between cause and effect.

RESEARCH INSIGHTS

Descriptive Statistics

Table I displays the main descriptive statistics for all variables included in the analyses. Table II (see Appendix) displays the main bivariate correlation coefficients and Table III (see Appendix) contains the variance inflation factors (VIF) and tolerances (1/VIF) of the variables in the study. All correlations are low to modest and the variance inflation factors (VIF) do not exceed the recommended threshold of '10' (Alessandri and Pattit 2014). Therefore, multicollinearity is apparently not a concern for the outcomes of this research project.

TABLE I
Descriptive Statistics

		n	Mean	S.D.	Min	Max	Median
Dependent variable							
1	Strategic Change	1134	0.08	0.14	0.02	3.64	0.05
Control variables							
2	Firm size	6640	5.11	17.52	0	135.7	0.11
3	Financial slack	7362	5.26	13.12	0	812	2.76
4	CEO Tot. Comp.	1212	1136.3	828.9	100	6650	893.51
5	CEO Age	1178	55.98	7.34	36	86	56
Independent variables							
6	P > A	3241	1.06	3.41	0	47.49	0.42
7	P < A	3376	-1.37	4.87	-70.34	0	-0.46
Moderators							
8	Pos. Performance	2456	0.33	0.47	0	1	0
9	Neg. Performance	4916	0.67	0.47	0	1	1
10	CEO Present Focus	365	6.9	1.65	3.49	14.04	6.66
11	CEO Future Focus	365	1.82	0.52	0.49	3.42	1.82
12	CEO Prevention Focus	368	0.16	0.2	0	1.5	0.1
13	CEO Promotion Focus	368	0.48	0.21	0	1.26	0.46

When looking at the standard deviations (sd) of the dependent variables in Table IV, companies in a loss situation appear to have stronger and more diverse strategical reactions to

performance feedback (sdNegPerf > sdPosPerf). Hence, we find some preliminary support for Hypothesis 2.

TABLE IV
Standard Deviations of Dependent Variables

	Pos Perf	Neg Perf	Pos Perf Abo Asp	Pos Perf Bel Asp	Neg Perf Abo Asp	Neg Perf Bel Asp
Strategic Change	0.14	0.13	0.18	0.03	0.14	0.13
Δ Advert. Intens.	15.08	28.46	20.36	1.10	23.91	31.24
Δ R&D Intensity	1.84	86.60	1.65	2.09	9.08	113.06
Δ Pl. Equip. New.	0.41	2.20	0.47	0.29	1.12	2.74
Δ NonProd. Ov.	3.28	20.50	4.32	0.24	31.72	5.95
Δ Invent. Levels	0.61	10.00	0.71	0.41	5.27	12.20
Δ Fin. Leverage	6.72	21.68	5.55	8.19	20.97	22.23

Empirical Results

Hypothesis 1: In Table V, which reports the fixed- and random-effects regression estimates of our models, we find some significant ($p < .05$) - and marginally significant ($p < .10$) results on how performance below and above aspiration influences overall strategic change and its underlying strategic dimensions. Performance above aspiration has a significant strong positive effect *(B = 1.049, p-value =.028)* on non-production overhead. Performance below aspiration has a significant marginally negative effect on the change in R&D intensity *(B = -.014, p-value =.046)* and in the change of non-production overhead *(B = -.010, p-value =.021)*. For all other dimensions, we fail to find evidence to reject the null hypothesis, that different dimensions of strategic change are not influenced by performance feedback. Hence, these results only selectively deliver empirical evidence to support Hypothesis 1.

Hypothesis 2: To get additional insights into the hypothesized heterogeneity of reactions, we can find the significant results of several linear probability models in Table VI (see Appendix). This table visualizes the probability of big or small strategic changes according to the four possible combinations of profitability level and performance feedback. In line with Hypothesis 2 and the

"loss aversion" assumption of the "Prospect Theory", we find that companies in a loss situation are more likely to have bigger strategic reactions compared to companies in a gain situation for both performances below and above aspiration. Therefore, the results of this analysis do support Hypothesis 2.

Hypothesis 3: In Hypothesis 3, we empirically investigate in Tables V and VI (see Appendix), if companies exhibit different reactions to performance feedback between profitable and non-profitable companies. To motivate this analysis, we observe that, although several studies have analyzed the impact of performance above and below aspiration on organizational behaviors, one can hardly expect them to be homogeneous for companies being in a profit- or loss situation. Therefore, we expect that profitable and non-profitable companies react in heterogeneous ways to both types of performance feedback. To estimate the treatment effects, we estimate a new specification that adds two interaction effects between profitability type (binary variable) and the percentage change in positive and negative performance feedback (continuous variable):

$$\boldsymbol{DV_{it+1} = \beta_1\, \Delta PositivePF_{it} \times PositivePerformance_{it} + \beta_2\, \Delta NegativePF_{it} \times PositivePerformance_{it} + CV_{it} + \varepsilon_{it}}$$

Equation 4 - Fixed- and Random-Effects Regression Equation of (Non-)Profitable Companies

The coefficients β_1 and β_2 capture the differential impact of performance feedback on profitable and non-profitable companies and they tell us if there is a difference between profitable and non-profitable companies regarding how their performance feedback affects a company´s strategy of the following year. The results of the fixed- or random-effects panel-data regression models are displayed in Table V.

TABLE V
Fixed- & Random-Effects Regression Estimates of (Non-)Profitable Companies

	Strategic Change	**Δ Advert. Intensity**	**Δ R&D Intensity**	**Δ Pl. Equip. Newness**	**Δ NonProd. Overhead**	**Δ Inventory Levels**	**Δ Financial Leverage**
Independent variable							
Performance above aspiration	-0.12	-11.08	1.36	0.057	**1.049***	1.304	0.47
	(0.08)	(8.865)	(0.8549)	(0.09)	(0.475)	(1.29)	(0.52)
Performance below aspiration	0.00	0.165	**-0.01***	0.00	**-0.01***	-0.00	0.009
	(0.00)	(0.22)	(0.007)	(0.00)	(0.00)	(0.007)	(0.009)
Positive Performance	**-0.098****	**-9.67***	**0.85***	-0.039	**0.44*****	0.299	0.186
	(0.036)	(3.81)	(0.35)	(0.087)	(0.126)	(0.187)	(0.12)
Interactions							
P>A * Positive Performance	0.119	11.136	-1.37449	0.038	**-1.046***	-1.30	-0.49
	(0.08)	(8.86)	(0.8547)	(0.086)	(0.47)	(1.29)	(0.52)
P<A * Positive Performance	-0.009	0.969	**0.43***	**0.089***	-0.015	0.02	**0.41***
	(0.05)	(5.47)	(0.189)	(0.039)	(0.058)	(0.096)	(0.179)
Control variables							
Firm size	**-0.068***	**-4.3346**$^{\#}$**	0.11	**-0.03****	**0.17***	0.0345	**-0.258***
	(0.027)	(2.518)	(0.159)	(0.01)	(0.08)	(0.058)	(0.117)
Financial slack	-0.00	-0.40	0.02	-0.00	**0.03***	**0.056***	0.02
	(0.007)	(0.685)	(0.02)	(0.00)	(0.0146)	(0.027)	(0.018)
CEO Age	0.00	0.028	-0.00	-0.00	0.008	0.006	0.017
	(0.00)	(0.246)	(0.01)	(0.00)	(0.005)	(0.006)	(0.01)
CEO Total Compensation	-0.00	-0.00	-0.00	**0.00***	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R^2 (within)	0.06	0.04	0.04	0.06	0.07	0.07	0.06

Signif. codes: $^{\#}$ p < .10; * p < .05; ** p < .01; *** p < .001 (2-tailed).
P>A = Performance above aspiration | P<A = Performance below aspiration
Standard error in between brackets

For the interactions of profitability with performance above aspiration, we find a significant negative interaction effect for the change in non-production overhead *(B = -1.046, p-value =.027)*. For performance below aspiration, we find a significant positive interaction effect for the change in R&D intensity *(B =.43, p-value =.02)*, plant equipment newness *(B = .09, p-value =.02)* and financial leverage *(B =.41, p-value =.02)*. Since the profitability variables are binary, we do have significant interaction effects with inverted effect-direction (sign) for companies in a loss situation as well. For all other dimensions, we fail to find evidence to reject

the null hypothesis that the extent to which performance feedback impacts subsequent strategic changes does not depend on the profitability situation of the company. Hence, these results only selectively deliver empirical evidence to support Hypothesis 3.

Hypothesis 4: According to Hypothesis 4, we empirically investigate in Table VII, if companies exhibit different reactions to performance feedback if their CEO is more present- or future-oriented. To estimate heterogeneous treatment effects, we estimate a new specification that analyses the interaction effects between the temporal focus (continuous variable) and the percentage change in positive and negative performance feedback (continuous variable):

$$\begin{aligned} DV_{it+1} = {} & \beta_1 \, \Delta PositivePF_{it} \times PresentFocus_{it} + \beta_2 \, \Delta NegativePF_{it} \times PresentFocus_{it} \\ & + \beta_3 \, \Delta PositivePF_{it} \times FutureFocus_{it} \\ & + \beta_4 \, \Delta NegativePF_{it} \times FutureFocus_{it} + CV_{it} + \varepsilon_{it} \end{aligned}$$

Equation 5 - Fixed- and Random-Effects Regression Equation of CEO Temporal Focus

When estimating Equation 6, interacting present focus with performance feedback above aspiration, we find a marginally significant negative interaction effect for the change in inventory levels (B = -.02, p-value =.05), a significant negative interaction effect for the change in non-production overhead (B = -.015, p-value =.006), for the change in R&D intensity (B = -.035, p-value =.03) and a significant positive interaction effect for the change in plant equipment newness (B = .01, p-value =.04). For the interaction between future focus and performance below aspiration, we find a marginally significant negative interaction effect for the change in plant equipment newness (B = -.03, p-value =.07). For all other dimensions, we fail to find evidence to reject the null hypothesis that the extent to which performance feedback impacts subsequent strategic changes does not depend on the temporal focus of the CEO. Hence, these results only selectively deliver empirical evidence to support Hypothesis 4.

TABLE VII
Fixed- & Random-Effects Regression Estimates for Temporal Focus

	Strategic Change	**Δ Advert. Intensity**	**Δ R&D Intensity**	**Δ Pl. Equip. Newness**	**Δ NonProd. Overhead**	**Δ Inventory Levels**	**Δ Financial Leverage**
Independent variable							
Performance above aspiration	0.699	71.555	**0.298**$^{\#}$	-0.02	0.085	**0.53**$^{\#}$	0.036
	(0.518)	(54.0545)	(0.155)	(0.016)	(0.11)	(0.335)	(0.446)
Performance below aspiration	-0.499	-57.035	-0.829	-0.126	0.059	0.019	0.929
	(0.848)	(91.58)	(0.699)	(0.108)	(0.249)	(0.02)	(1.90)
Present Focus	0.01	3.42	-0.00	**0.017**$^{\#}$	0.00	0.19	-0.109
	(0.039)	(4.17)	(0.037)	(0.008)	(0.01)	(0.108)	(0.09)
Future Focus	-0.168	**-24.06**$^{\#}$	0.098	-0.098	0.047	-0.049	0.335
	(0.14)	(13.678)	(0.136)	(0.06)	(0.05)	(0.456)	(0.30)
Interactions							
P>A * CEO Present Focus	-0.05	-5.9446	**-0.035***	**0.01***	**-0.015****	**-0.02**$^{\#}$	0.0146
	(0.035)	(3.62)	(0.015)	(0.00)	(0.008)	(0.01)	(0.0445)
P<A * CEO Present Focus	0.076	8.505	0.106	0.027	-0.02	0.008	-0.137
	(0.115)	(11.819)	(0.085)	(0.017)	(0.03)	(0.056)	(0.23)
P>A * CEO Future Focus	-0.188	-17.929	-0.05	-0.005	0.009	-0.04	-0.089
	(0.16)	(17.279)	(0.078)	(0.006)	(0.03)	(0.05)	(0.22)
P<A * CEO Future Focus	-0.046	-1.7846	0.016	**-0.03**$^{\#}$	0.07	0.005	0.06
	(0.136)	(8.919)	(0.11)	(0.018)	(0.059)	(0.07)	(0.309)
Control variables	Firm size, Financial slack, CEO Age, CEO Total Compensation						
R^2 (within)	0.49	0.44	0.12	0.21	0.28	0.12	0.12

Signif. codes: $^{\#}$ p < .10; * p < .05; ** p < .01; *** p < .001 (2-tailed).
P>A = Performance above aspiration | P<A = Performance below aspiration
Standard error in between brackets

Hypothesis 5: In *Hypothesis 5*, we expect to find different strategic reactions to performance feedback when the CEO's promotion focus is stronger (weaker) than the prevention focus. We expect to find the same relationships proposed by Mount and Baer (2021) (see Figure 5) and we also expect these relationships to apply to all underlying dimensions of strategic change. To estimate the treatment effects, we estimate a new specification that analyses the interaction effects between the regulatory focus (continuous variable) and the percentage change in positive and negative performance feedback:

$$DV_{it} + 1 = \beta_1 \Delta PositivePF_{it} \times PromotionFocus_{it} + \beta_2 \Delta NegativePF_{it} \times PromotionFocus_{it} + \beta_3 \Delta PositivePF_{it} \times PreventionFocus_{it} + \beta_4 \Delta NegativePF_{it} \times PreventionFocus_{it} + CV_{it} + \varepsilon_{it}$$

Equation 6 - Fixed- and Random-Effects Regression Equation of CEO Regulatory Focus

We empirically investigate this equation in Table VIII, which reports the fixed- & random-effects regression estimates of our models.

TABLE VIII
Fixed- & Random-Effects Regression Estimates for Regulatory Focus

	Strategic Change	**Δ Advert. Intensity**	**Δ R&D Intensity**	**Δ Pl. Equip. Newness**	**Δ NonProd. Overhead**	**Δ Inventory Levels**	**Δ Financial Leverage**
Independent variable							
Performance above aspiration	-0.37	-21.94	**0.13*** **	0.00	**0.02**$^{\#}$	0.04	-0.116
	(0.329)	(19.79)	(0.038)	(0.01)	(0.01)	(0.05)	(0.21)
Performance below aspiration	**0.157***	13.60	-0.35	0.05	-0.086	0.155	0.23
	(0.077)	(13.58)	(0.39)	(0.038)	(0.078)	(0.15)	(0.62)
Promotion Focus	-0.33	**-29.336**$^{\#}$	-0.318	-0.075	-0.01	-0.19	-0.27
	(0.21)	(17.265)	(0.24)	(0.099)	(0.116)	(0.1747)	(0.719)
Prevention Focus	-0.21	**78.197***	-0.09	-0.276	-0.08	-0.15	-1.566
	(0.535)	(37.259)	(0.286)	(0.315)	(0.18)	(0.36)	(1.498)
Interactions							
P>A * CEO Promotion Focus	0.308	20.058	**-0.105****	-0.006	-0.005	-0.0347	0.05
	(0.265)	(16.76)	(0.03)	(0.008)	(0.01)	(0.05)	(0.22)
P<A * CEO Promotion Focus	**-0.329**$^{\#}$	-24.57	0.807	-0.096	0.258	-0.33	-0.24
	(0.165)	(25.63)	(0.94)	(0.07)	(0.19)	(0.276)	(1.13)
P>A * CEO Prevention Focus	1.088	50.83	**-0.70*****	0.01	**-0.22*****	-0.269	0.599
	(1.015)	(55.898)	(0.157)	(0.068)	(0.055)	(0.239)	(0.978)
P<A * CEO Prevention Focus	0.52	24.636	-3.16	0.17	-0.225	1.1349	-0.25
	(0.65)	(80.78)	(3.48)	(0.205)	(0.24)	(0.83)	(3.40)
Control variables	Firm size, Financial slack, CEO Age, CEO Total Compensation						
R^2 (within)	0.465	0.41	0.17	0.18	0.286	0.10	0.12

Signif. codes: $^{\#}$ p < .10; * p < .05; ** p < .01; *** p < .001 (2-tailed).
P>A = Performance above aspiration | P<A = Performance below aspiration
Standard error in between brackets

When estimating Equation 5, interacting CEO promotion focus with performance feedback, we find a significant negative interaction effect for the change in R&D intensity (B = -.02, p-value =.05) for performance above aspiration and we find a marginally significant negative interaction effect for overall strategic change for performance below aspiration (B = -.33, p-value =.05. For the interaction between prevention focus and performance above aspiration, we find significant negative interaction effects for the change in R&D intensity (B = -.70, p-value =.00), and non-production overhead (B = -.22, p-value =.00). For all other dimensions, we fail to find evidence to reject the null hypothesis that the extent to which performance feedback impacts subsequent strategic changes does not depend on the regulatory focus of the CEO. Hence, these results fail to deliver empirical evidence to support Hypothesis 5.

Additional Analyses & Robustness Checks

To check whether the results are "robust", the following additional analyses have been performed alongside the main research:

Robustness Check 1: ROA is a flawed measure and dependent on the companies' accounting choices for net income (tax strategies, inventory valuation, etc.) and total assets (inventory valuation techniques, depreciation policies, policies on booking "goodwill", etc.). Hence, the ROA can be manipulated without changing the underlying business activities and it seems not always to represent "real" firm performance. We check the robustness of our findings by using the rates of change in unscaled net income, which is less sensitive to managerial manipulation and measurement bias (Bromiley and Harris 2014), and the return on sales (ROS) to determine the robustness of the results. Even though in this robustness check the interaction results have the same effect-direction (sign) and are generally similar to the ones in the ROA models, they lose some significances. Nevertheless, most results remain consistent for all models.

Robustness Check 2: The variable "advertising intensity" has numerous NAs and omitting this variable when creating the aggregated strategic change variable significantly increases the number of observations. These new interaction results have the same effect-directions (signs) and are similar to the interaction results in the main analyses. Therefore, these results confirm the robustness of our findings.

Robustness Check 3: To test the robustness of the interactions between performance feedback and profitability situation (H1 & H2), the same analyses are performed by using all observations of the full Compustat dataset (SIC: 2000-3999; 1990-2020). The results in Table X (see Appendix) show us, that, despite the higher number of observations and effect-directions mostly being the same, we have less significant effects if compared to our previous models in Table V. One possible explanation could be, that different sectors in the manufacturing industry might react even more heterogeneously to performance feedback than the reactions we find within the pharmaceutical manufacturers industry.

DISCUSSION

This Work Project aims to reduce the empirical ambiguity surrounding the "Performance Feedback Theory" (Greve 1996; Audia and Greve 2006). First, we examine which specific aspects of their strategy companies tend to change as a response to performance feedback. Second, we create a framework to analyze if companies evaluate and similarly react to risk and uncertainty as people do according to their psychological process of risk perception (Kahneman and Tversky 1979; 1992). Finally, we evaluate if a firm's profitability situation, as well as the CEOs' personality traits (temporal- and regulatory foci), have a significant moderating effect on this performance feedback - strategic change relationship. This provides us with valuable insights into the decision makers' selective allocation of time and attention to strategic decisions (DesJardine and Shi 2020; Nadkarni and Chen 2014; Shipp and Aeon 2019; Mount and Baer 2021).

Hypothesis 1: When looking at where performance feedback impacts strategic change (H1), the results indicate that companies performing above aspiration tend to spend significantly more on operations not directly connected to manufacturing. In contrast, companies below aspiration tend to spend slightly less on R&D and non-manufacturing expenditures. This is in line with the findings of Greve (1996) and Baum (2005), where some companies above aspiration tend to increase spendings for experimentation due to their increased slack (Baum et al. 2005; Greve 1996). This is not the case for performance below aspiration. Organizations performing poorly tend to temporarily reduce long-term-oriented expenditures like R&D (Ben-Oz and Greve 2015) and other expenditures (e.g., non-manufacturing costs). Not in line with previous research, we do not find a significant impact of performance feedback on overall strategic change (Cyert and March 1963; Theresa K. Lant, Milliken, and Batra 1992; Theresa K. Lant and Montgomery 1987; Greve 1996).

Hypothesis 2: To get additional insights, Table VI (see Appendix) visualizes the probabilities of big or small strategic changes according to the four possible combinations of profitability level and performance feedback. In line with Hypothesis 2 and with the "loss aversion" assumption from the "Prospect Theory", we find that companies in a loss situation are more likely to have bigger strategic reactions compared to companies in a gain situation for both performances below and above aspiration.

Hypothesis 3: We argue that the extent to which performance feedback impacts subsequent strategic changes depends on whether firms are in profit or loss. When in gain (loss), organizations seem to invest less (more) in non-manufacturing expenditures when performing above aspiration. Furthermore, the extent to which performance below aspiration impacts subsequent changes in R&D intensity, plant equipment newness, and financial leverage depends on whether firms are in profit or loss as well. When in profit (loss) organizations seem to invest more (less) in R&D and non-manufacturing costs when they are performing below aspiration, and they also tend to increase their financial leverage. This is in line with the "problemistic search" principle from the "Behavioral Theory of the Firm", where organizations attempt to find and resolve their problems when performance is lower than the aspiration level (Choi, Rhee, and Kim 2019; Eun and Kang 2015). This is also in line with the "loss aversion" assumption (Kahneman and Tversky 1979; Gonzalez and Wu 1999; Bruhin, Fehr-Duda, and Epper 2010) and the "concave/convex value function" assumption from the "Prospect Theory", where people tend to be risk-seeking over losses and risk-averse over gains (Kahneman and Tversky 1979; 1992).

Hypothesis 4: The findings suggest that the extent to which performance above aspiration impacts subsequent changes in R&D intensity, plant and equipment newness, non-production overhead, and inventory levels depends on whether a firm's CEO has a stronger (weaker) present focus. When a CEO has a stronger present focus, organizations performing above aspiration seem

to invest less in R&D, non-manufacturing cost, and inventory. In contrast, they seem to invest more in new plants and equipment. When the CEO has a stronger future focus, organizations seem to invest less in new plants and equipment when performing below aspiration. All findings except the ones regarding the investments in new plants and equipment are in line with the "problemistic search" principle (Choi, Rhee, and Kim 2019; Eun and Kang 2015) and the insight from the "Upper Echelons Theory", where individuals with a strong present focus tend to improve the financial bottom-line performance of a firm by temporarily reducing certain future-oriented investments.

The findings regarding the investments in new plants and equipment are not in line with our expectations, but, in contrast to most other strategic changes, investments in new plants and equipment does not alter the short-term value of a company, since the total investments are booked as "fixed asset" in the PPE (Property, Plant, and Equipment) section of the balance sheet. Therefore, it seems as if present-oriented CEOs tend to invest excess resources to acquire new plants (market expansion) and new equipment or to renew existing ones. In contrast, future-oriented CEOs performing below aspiration prefer to save this money.

Furthermore, our expectations regarding the future focus have not been met. We expected individuals with a strong future focus to emphasize primarily on the creation of long-term value for the stakeholders rather than maximizing short-term profits instead (DesJardine and Shi 2020; Ocasio 2011; Yadav, Prabhu, and Chandy 2007; Yu Zhang and Gong 2018), but we found no significant empirical evidence to support this. It seems that the temporal focus of the CEO becomes irrelevant in the case of performance shortfalls since in this case companies face increased stakeholder pressure and operate under tight organizational control (Ben-Oz and Greve 2015; Verver 2022). For all other dimensions, we fail to find significant evidence and, therefore, these results only selectively deliver empirical evidence to support Hypothesis 4.

Hypothesis 5: We expect promotion-focused CEOs to engage in increased (decreased) strategic change when the performance of the company is increasingly below (above) aspiration. Moreover, we expect prevention-focused CEOs to engage in increased (decreased) strategic change when the performance of the company is increasingly above (below) aspirations (Mount and Baer 2021). The empirical results suggest that organizations, where the CEO has a stronger promotion or prevention focus, seem to invest less in R&D when they are performing above aspiration. This is not in line with our expectations and the findings of Mount and Baer (2021), since we only expect CEOs with a stronger promotion focus and not CEOs with a stronger prevention focus to engage in decreased R&D when the performance is above aspiration. Furthermore, this negative change in R&D intensity is much stronger for prevention-focused CEOs than for promotion-focused CEOs. Finally, CEOs with a stronger prevention focus seem to spend less on non-manufacturing costs when they are performing above aspiration, and CEOs with a stronger promotion focus seem to change their overall strategy less when they are performing below aspiration. This is not in line with our expectations and the findings of Mount and Baer (2021) as well. There might be several methodological and non-methodological reasons for this ambiguity of results. One reason might be, that our models use the relative change of performance feedback (see Equation 3) instead of the simple performance feedback (P_{it}-HA_{it}) as Mount and Bear (2021) do. Furthermore, Mount and Baer (2021) analyze if the relationship between CEO regulatory foci and strategic risk-taking is moderated by performance feedback, while we analyze if the relationship between performance feedback and strategical change is moderated by CEO regulatory foci. Nevertheless, our findings are mostly in line with the "Behavioral Theory of the Firm", which assumes that CEOs are prone to strategic changes when performance is below aspiration and averse to strategic changes when performance is above aspiration (Greve 1998; 2003a; March and Shapira 1992). Furthermore, our findings suggest, that the CEOs' regulatory

foci accentuate this relationship in certain cases. Further research is needed to give a better insight into this relationship.

TABLE XI
Summary of Empirical Findings for H3, H4 and H5

	Strategic Change	Δ Advert. Intensity	Δ R&D Intensity	Δ Pl. Equip. Newness	Δ NonProd. Overhead	Δ Inventory Levels	Δ Financial Leverage
Interactions							
P>A * Positive Performance	○	○	○	○	▼	○	○
P<A * Positive Performance	○	○	▲	▲	○	○	▲
P>A * Negative Performance	○	○	○	○	▲	○	○
P<A * Negative Performance	○	○	▼	▼	○	○	▼
P>A * CEO Present Focus	○	○	▼	▲	▼	▼	○
P<A * CEO Present Focus	○	○	○	○	○	○	○
P>A * CEO Future Focus	○	○	○	○	○	○	○
P<A * CEO Future Focus	○	○	○	▼	○	○	○
P>A * CEO Promotion Focus	○	○	▼	○	○	○	○
P<A * CEO Promotion Focus	▼	○	○	○	○	○	○
P>A * CEO Prevention Focus	○	○	▼	○	▼	○	○
P<A * CEO Prevention Focus	○	○	○	○	○	○	○
Control variables	Firm size, Financial slack, CEO Age, CEO Total Compensation						

P>A = Performance above aspiration | P<A = Performance below aspiration
▲ Positive Effect | ▼ Negative Effect | ○ Not Significant
■ In line with expectations | ■ Not in line with expectations

Contributions and Theoretical Implications

This Work Project contributes to the "Performance Feedback Theory" literature by providing new insights into our understanding of the heterogeneous relationship between performance feedback and organizational adaptiveness. By looking at each dimension of strategic change individually, we provide an alternative, individual-level analysis for the inconsistent impacts of performance feedback on strategy variations.

Furthermore, by integrating individual-level explanations of managerial risk-taking into the organizational-level explanations, proposed by the "Performance Feedback Theory" (PFT),

we provide an even more nuanced understanding of how, where, and why organizations engage in strategic change. More precisely, we compare the strategic reactions of profitable- and non-profitable companies when the achieved performance feedback diverges from the aspired performance feedback and we analyze if companies evaluate and react to risk and uncertainty in a similar way as individuals do according to their psychological process of risk perception explained in the "Prospect Theory" (Kahneman & Tversky, 1979, 1992).

Moreover, this research outline allows evaluating the specific influences of the moderators CEO temporal- and regulatory foci on the main performance feedback – strategic response relationship. This is highly relevant since CEOs' characteristics have been shown to influence their firm's strategic changes (Lim and McCann 2014; Chatterjee and Hambrick 2011), but the roles of CEOs' temporal and regulatory foci have rarely been studied in connection with the "Performance Feedback Theory" (Jiang et al. 2020; Mount and Baer 2021; DesJardine and Shi 2020; Gamache and McNamara 2019).

Overall, this study suggests that firms adapt their strategy to respond to performance feedback according to the influence of multiple moderators, each one selectively affecting specific aspects of a firm's strategy in different situations. For some situations or strategical aspects, we fail to find significant evidence to reject the null hypotheses. Hence, the results only selectively deliver empirical evidence to support our hypotheses. This inconsistent relationship between organizational performance and organizational adaptiveness might derive from the fact that both increasing and decreasing the number of resources allocated to strategic change can lead to both performance improvement or deterioration (Bromiley and Washburn 2011). Nevertheless, some results are significant and add valuable insights to reduce the empirical ambiguity surrounding the "Performance Feedback Theory".

Managerial Implications

The organizational strategy plays a central role for all companies. For example, product- and business-model innovations have the power to incrementally or even disruptively transform organizations (Nohria and Gulati 1996; Lucas, Knoben, and Meeus 2018). Studying the impact of performance feedback on organizations' efforts to develop and grow beyond themself is essential because it allows us to better understand how companies behave in different situations, how they can be influenced to the desired outcomes, and how competitor moves can be anticipated to achieve strategical advantages.

When selecting a new CEO, the CEO selection committee might consider the time-related dispositions of their CEO candidates to find an optimal fit for the companies' future vision and strategy (Nadkarni and Chen 2014). Knowing how performance feedback has divergent effects on present- and future-oriented CEOs could help to make an even better choice.

Furthermore, regarding CEOs' regulatory focus, the structuring of the CEOs' compensation could have important implications on the firms' strategy. The results of this research suggest that sometimes the relationship between performance feedback and strategic change is moderated by the CEO regulatory focus. Therefore, more promotion-focused CEOs might only need incentives to engage in more overall strategic change when performance is below aspiration. More prevention-focused CEOs might only need strategic change incentives for certain business aspects when performing above aspiration instead.

Finally, our findings suggest, that in specific situations some companies have an increased tendency to adapt their non-manufacturing expenditures or their R&D budget, while others prefer to disrupt internal operations such as innovating their plants and equipment. This insight can help

companies to better anticipate certain strategical reactions of their competitors according to the competitors' performance feedback, profitability situation, and CEO's characteristics.

Limitations And Future Research Avenues

Since our findings represent only a randomly chosen sample of publicly listed North American companies in the pharmaceutical manufacturing industry, this work has some limitations that could be addressed in future research.

First, due to the restrained size of our sample and the resulting limited statistical power, there is a narrow chance to encounter a type I or/and type II error: an incorrect inference regarding the presence or absence of a statistically significant effect. We reduce this possibility for Hypothesis 4 and Hypothesis 5 by using a randomly chosen sample. Nevertheless, using a bigger sample could allow further research to gain a more comprehensive and deeper insight.

Second, since the analysis is performed on a sample of publicly listed companies, future research could test this framework in other empirical settings like privately held companies, state-owned companies, LLCs, and SMEs more in general. We know, that CEOs of listed firms are particularly prone to short-term orientation (present focus) due to the stakeholders' pressure to meet aspired short-term targets (Yu Zhang and Gong 2018), while privately-owned companies are significantly less (more) responsive below (above) aspiration than publicly owned firms (Verver et al. 2019; Capron and Shen 2007; Fitza and Tihanyi 2017; Villagrasa, Buyl, and Escribá-Esteve 2017). Family-owned companies are known to have a rather long-term focus on strategic decision-making instead (Reilly, Souder, and Ranucci 2016; Chrisman and Patel 2012). Therefore, it could be insightful to compare our findings across different types of businesses settings.

Additionally, our empirical findings are strictly representative of the North American pharmaceutical manufacturing industry. Despite a general external validity of the data (data

generated under natural conditions) and given the various business contexts within the industry, it is not possible to exclude that our findings might be limited to the analyzed sample. Company- or industry-specific social phenomena could influence the aspiration level of business organizations and generalizing the results to other companies, industries, and markets might be inappropriate. Additional research that models the impact of profitability situation and CEO foci in and across different industries and markets could be a valuable contribution to future "Performance Feedback Theory" research.

Research suggests, that exposing CEOs to incongruent stimuli of regulatory fit, can influence the disposition of CEOs to act outside of their standard behavior (Gamache et al. 2015). Especially extreme performance shortfalls (windfalls) increase the likelihood of promotion-focused (prevention-focused) CEOs to change their normal behavior to a stronger prevention (promotion) focus (Mount and Baer 2021). Therefore, when looking at the CEO temporal focus, we cannot exclude a data distorting direct influence of being above or below aspiration. Especially when a company is performing below aspiration, CEOs might tend to speak more about long-term issues in their quarterly earnings conference calls to distract from the short-term problems of the company and to alleviate the stakeholders' pressure to meet aspired short-term targets (Yu Zhang and Gong 2018). The same applies to regulatory focus, where the CEOs' regulatory foci might be impacted by performance feedback. This has the potential to artificially distort the measurements of the CEO characteristics.

Furthermore, we have some additional methodological limitations for this research project:

First, similar to prior research, we use six different dimensions of strategic change to create the aggregated strategic change variable (Yan Zhang 2006; Bednar, Boivie, and Prince 2013), but we do not consider other strategical dimensions of organizations, as a change in corporate social responsibility (CSR), overhead efficiency (SGA expenses/sales) or a change in

the digitalization level of a company. Future research could analyze data for even more strategic dimensions.

How we determine the achieved performances is a second methodological limitation. While the determination of the achieved performance seems to be straightforward, this is not the case. In our analysis, we exclude the performance insights of non-financial KPIs from our research, despite they provide more guidance regarding the organization's responsiveness than the financial KPIs (Greve 2003b). Furthermore, the financial key performance indicator ROA is a flawed measure and dependent on the companies' accounting choices for net income (tax strategies, inventory valuation, etc.) and total assets (inventory valuation techniques, depreciation policies, policies on booking "goodwill", etc.). We checked the robustness of our findings by using the unscaled net income, which is less sensitive to measurement bias and managerial manipulation (Bromiley and Harris 2014), and the ROS, but other performance metrics like stock market returns (earnings per share) or company valuations (share prices) might also be suitable performance indicators.

Cyert and March (1963) proposed that the firms' aspirations levels and problemistic search behaviors depend on several dimensions on which firms fail to meet their aspirations (Greve 2003b; Argote and Greve 2007; Cyert and March 1963), but the way we compute each aspiration level further limits the meaningfulness of this research. In fact, the way aspiration levels are determined could vary within industries, time periods, firm sizes, and other factors according to different reference points (Short and Palmer 2003) and the used financial and non-financial KPIs. Since we do not include social aspiration levels in our analysis, we determine the aspired performance as a weighted average of the current financial performance and the financial performance of the prior year. According to our own calculations, we do not expect most firms to put much emphasis on past performance beyond the previous year. Nevertheless, if future research

includes social aspiration in the analysis, it might have to embrace the possibility of even older performance influencing present aspiration levels. Future research could clarify the influence of different aspects on the companies' aspiration levels to give a more comprehensive picture in future "Performance Feedback Theory" research.

When looking at the impact of the CEO on strategic decisions, we must acknowledge that not all strategic decisions come from the CEO. While CEOs and top management often set the targets through strategically allocating the budgets, mid-level managers might also use various performance measures to evaluate and influence performance within their range of authority. Therefore, future research could examine if the relevant performance metrics (e.g. financial performance, social performance, market performance, etc.) vary between different decision-makers and types of decisions (e.g. different historical and social reference points) (Chen and Miller 2007; Audia and Greve 2006; Miller and Chen 2004). Furthermore, future research could also examine more in-depth how CEOs' selective attention to different performance metrics might be influenced through incentives or regulatory requirements of external stakeholders and analysts.

One additional limitation is that we analyze data from 1990 until 2020 without explicitly considering how different macroeconomic events (e.g. the financial crisis of 2008 or the COVID-19 pandemic) might change the behavior of companies. Although we expect companies to be more risk-averse and delay investments when they approach and face challenging times, future research could make use of the "Performance Feedback" Theory to specifically analyze those periods and get an even more nuanced understanding of how companies react to performance feedback in different situations.

Finally, according to our Log-Log models (see Table 9 in Appendix), there appears to be a non-linearity in the impact of performance feedback on strategic change and its different underlying dimensions. In our regression models, we have modeled the effects as a modified spline

function (linear above and below aspiration level, but with potentially different slopes). Still, there appears to be a difference between performance feedback (positive and negative) close to aspiration level and far from aspiration level (Day and Harrison 2007). This non-linear shape of the functions might explain, why occasionally we find inconclusive results in our linear models and why different studies examining the same phenomena have found conflicting significant results (Ref and Shapira 2017; Xu, Zhou, and Du 2018; Chen and Miller 2007; Greve 2003a). Future research might give us more insights into the shape of the relationship by using nonlinear regression models in their study replications.

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APPENDIX

TABLE II
Correlation Table

		1	2	3	4	5	6	7	8	9	10	11	12	13
Dependent variable														
1	Strategic Change	-												
Control variables														
2	Firm size	-0.08*	-											
3	Financial slack	0.00	-0.13*	-										
4	CEO Tot. Comp.	-0.06	0.60*	-0.21*	-									
5	CEO Age	-0.03	0.12*	-0.11*	0.18*	-								
Independent variables														
6	P > A	0.00	-0.01	0.00	0.04	-0.02	-							
7	P < A	0.00	0.03*	0.01	0.05*	-0.02	0.04*	-						
Moderators														
8	Pos. Performance	-0.14*	0.35*	-0.08*	0.27*	0.16*	0.19*	0.12*	-					
9	Neg. Performance	0.14*	-0.35*	0.08*	0.27*	-0.16*	-0.19*	-0.12*	-1.00*	-				
10	Present Focus	-0.03	0.15*	-0.17*	0.07	0.22*	-0.01	-0.05	-0.07	0.07	-			
11	Future Focus	0.18*	-0.12*	0.08	0.05	0.11	0.00	-0.03	-0.17*	0.17*	0.24*	-		
12	Prevention Focus	0.10	-0.14*	0.19*	0.00	0.16*	-0.02	0.07	-0.24*	0.24*	-0.07	0.06	-	
13	Promotion Focus	-0.08	0.01	-0.06	0.16*	0.03	0.06	0.06	0.17*	-0.17*	-0.17*	-0.03	-0.10*	-

* p < .05 (2-tailed)

TABLE III
VIF Analysis

		VIF	1/VIF
Control variables			
2	Firm size	4.94	0.20
3	Financial slack	2.86	0.35
4	CEO Tot. Comp.	4.51	0.22
5	CEO Age	1.27	0.79
Independent variables			
6	P > A	1.20	0.83
7	P < A	1.24	0.81
Moderators			
8	Pos. Performance	1.98	0.51
9	Neg. Performance	1.71	0.59
10	Present Focus	1.22	0.82
11	Future Focus	1.55	0.65
12	Prevention Focus	1.63	0.61
13	Promotion Focus	1.14	0.88

TABLE VI
Linear Probability Model Estimates

	Small Strategic Change	Big Strategic Change	Small Δ Advert. Intensity	Big Δ Advert. Intensity	Small Δ R&D Intensity	Big Δ R&D Intensity	Small Δ Pl. Equip. Newness
Independent variable							
Positive Perf. Above Asp.	0.6485	0.3515	0.6277	0.3723	0.717273	0.282727	0.737977
Positive Perf. Below Asp.	0.6532	0.3468	0.67467	0.32533	0.746685	0.253315	0.79753
Negative Perf. Above Asp.	0.27044	0.72956	0.32463	0.67537	0.361572	0.638428	0.358058
Negative Perf. Below Asp.	0.23707	0.76293	0.32825	0.67175	0.347714	0.652286	0.352438
	Big Δ Pl. Equip. Newness	**Small Δ NonProd. Overhead**	**Big Δ NonProd. Overhead**	**Small Δ Inventory Levels**	**Big Δ Inventory Levels**	**Small Δ Financial Leverage**	**Big Δ Financial Leverage**
Positive Perf. Above Asp.	0.262023	0.65844	0.34156	0.648814	0.351186	0.682476	0.317524
Positive Perf. Below Asp.	0.20247	0.706383	0.293617	0.695167	0.304833	0.760736	0.239264
Negative Perf. Above Asp.	0.641942	0.268022	0.731978	0.289987	0.710013	0.398399	0.601601
Negative Perf. Below Asp.	0.647562	0.304403	0.695597	0.358559	0.641441	0.422406	0.577594

All results are significant ($p < .01$)

TABLE IX
Log-Log Model Estimates (Elasticities)

	Small Strategic Change	Big Strategic Change	Small Δ Advert. Intensity	Big Δ Advert. Intensity	Small Δ R&D Intensity	Big Δ R&D Intensity	Small Δ Pl. Equip. Newness
Independent variable							
Intercept	0.020668*	*0.05242**	0.025683*	0.06366*	0.012901*	0.02932*	0.024944*
Positive Perf. Above Asp.	**0.040392***	**-0.10442***	**0.022828***	*-0.09152*	**0.021311***	*-0.00998*	**0.022481***
Intercept	0.020717*	0.05346*	0.025089*	0.06583*	0.012780*	0.03058*	0.024410*
Positive Perf. Below Asp.	**0.065517***	**-0.21786***	**0.065211***	**-0.25135***	**0.052111***	**-0.11106***	**0.093697***
Intercept	0.024076*	0.04223*	0.027781*	0.05736*	0.014562*	0.02561*	0.028329*
Negative Perf. Above Asp.	**0.021153***	**-0.06900***	**0.012075***	*-0.02517*	**0.005908***	**-0.02316***	**0.011488***
Intercept	0.024541*	0.04091*	0.028446*	0.05608*	0.015123*	0.02602*	0.029678*
Negative Perf. Below Asp.	**0.014030***	**-0.04664***	**0.011696***	*-0.01660*	**0.004243***	*-0.00327*	**0.009535***
	Big Δ Pl. Equip. Newness	**Small Δ NonProd. Overhead**	**Big Δ NonProd. Overhead**	**Small Δ Inventory Levels**	**Big Δ Inventory Levels**	**Small Δ Financial Leverage**	**Big Δ Financial Leverage**
Intercept	0.11375*	0.015233*	0.04848*	0.023776*	0.08544*	0.005179*	0.07207*
Positive Perf. Above Asp.	**-0.07484***	**0.011376***	**-0.11838***	**0.026265***	**-0.12901***	*0.000214*	**-0.02575**$^{\#}$
Intercept	0.11814*	0.015186*	0.04778*	0.023607*	0.08751*	0.005027*	0.07466*
Positive Perf. Below Asp.	**-0.53078***	**0.023398***	**-0.18114***	**0.059881***	**-0.36562***	**0.014246***	**-0.30227***
Intercept	0.09595*	0.016168*	0.03649*	0.026344*	0.06666*	0.005587*	0.06134*
Negative Perf. Above Asp.	**-0.06963***	**0.004886***	**-0.04222***	**0.012950***	**-0.12417***	**0.001514***	**-0.06027***
Intercept	0.09065*	0.016414*	0.03332*	0.027028*	0.06917*	0.005706*	0.06063*
Negative Perf. Below Asp.	**-0.03755***	**0.002863***	**-0.02207***	**0.008510***	**-0.02590***	**0.000707***	**-0.02227***

Signif. codes: $^{\#}$ $p < .10$; * $p < .05$

TABLE X
Fixed- & Random-Effects Regression Estimates of (Non-)Profitable Companies (Robustness 3)

	Strategic Change	**Δ Advert. Intensity**	**Δ R&D Intensity**	**Δ Pl. Equip. Newness**	**Δ NonProd. Overhead**	**Δ Inventory Levels**	**Δ Financial Leverage**
Independent variable							
Performance above aspiration	-0.02	0.27	3.21	**0.41**$^{\#}$	**0.30**$^{\#}$	0.12	0.93
	(0.02)	(0.35)	(2.77)	(0.24)	(0.16)	(0.53)	(0.61)
Performance below aspiration	0.00	0.002	**0.06 .**	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.038)	(0.138)	(0.00)	(0.27)	(0.01)
Positive Performance	0.006	**0.41***	2.28	0.06	**0.21****	0.22	0.13
	(0.01)	(0.18)	(1.60)	(0.00)	(0.08)	(0.01)	(0.35)
Interactions							
P>A * Positive Performance	0.02	-0.276	-3.22	**-0.41**$^{\#}$	**-0.30**$^{\#}$	-0.12	-0.91
	(0.02)	(0.35)	(2.78)	(0.24)	(0.16)	(0.53)	(0.61)
P<A * Positive Performance	0.001	0.37	0.56	-0.03	0.02	0.04	0.03
	(0.001)	(0.30)	(2.81)	(0.24)	(0.13)	(0.46)	(0.61)
Control variables							
Firm size	-0.03	**-0.257***	**-2.33***	**-0.41*****	**0.25*****	**-0.89*****	**0.6****
	(0.02)	(0.12)	(0.94)	(0.076)	(0.05)	(0.16)	(0.1)
Financial slack	-0.01	**-0.067****	-0.027	-0.01	0.00	0.01	0.00
	(0.02)	(0.02)	(0.14)	(0.01)	(0.00)	(0.03)	(0.00)
R^2 (within)	0.06	0.04	0.04	0.03	0.07	0.07	0.06

Signif. codes: $^{\#}$ p < .10; * p < .05; ** p < .01; *** p < .001 (2-tailed).
P>A = Performance above aspiration | P<A = Performance below aspiration
Standard error in between brackets

Master Thesis Data Analysis

Christian Wiedemann

Dec. 2021

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Setting language to English:

```
Sys.setlocale(locale = "English")

## [1] "LC_COLLATE=English_United States.1252;LC_CTYPE=English_United States.
1252;LC_MONETARY=English_United States.1252;LC_NUMERIC=C;LC_TIME=English_Unit
ed States.1252"

#remove scientific notation
options(scipen=999)

library(ATE)
library(tidyverse)
library(sjPlot)
library(afex)
library(emmeans)
library(psych)
library(car)
library(dplyr)
library(ggplot2)
library(readxl)
library(magrittr)
library(rstatix)
library(readr)
library(stargazer)
library(interactions)
library(jtools)
library(devtools)
library(haven)
library(dplyr)
library(ggplot2)
library(tidyverse)
library(psych)
library (car)
library(stargazer)
library(quantmod)
library(readxl)
library (lmtest)
library (moments)
library(sjPlot)
library(afex)
library(emmeans)
library(knitr)
library(interactions)
library(wooldridge)
library(jtools)
library(ggpubr)
library(emmeans)
library(afex)
library(sjPlot)
library(readr)
library(data.table)
library(devtools)
library(plm)
library(stargazer)
```

```
library(tidyverse)
library(foreign)
library(lmtest)
library(tidyr)
library(dplyr)
library(syuzhet)
library(plotly)
```

1 1. Loading & Merging Datasets

```
Pharma_TempF_Data <- read_xlsx("data/Compustat_TempFoc_V2.xlsx")

Execucomp <- read_xlsx("data/Execucomp_SIC_2000_3999.xlsx")

colnames(Pharma_TempF_Data) <- c("Company_ID",  "Data_Date",    "Fiscal_Year"
,  "Industry Format",  "Level of Consolidation - Company Annual Descriptor",
"Population Source",    "Data Format",  "Ticker Symbol",    "CUSIP",    "Comp
any Name", "ISO_Currency_Code",    "Current Assets - Total",   "Acquisitions"
, "Assets_Total", "Equity_Total", "Cash", "Long-Term Debt - Total",   "Divide
nds Common/Ordinary",    "Dividends - Preferred/Preference", "Dividends - Tot
al",    "EBIT", "Earnings Before Interest", "Employees",    "Inventories_Tota
l",    "Current Liabilities - Total",  "Liabilities and Stockholders Equity -
Total",  "Liabilities_Total",    "Net_Income",   "PPE_Total_Gross",  "Propert
y, Plant, and Equipment - Buildings (Net)", "PPE_Total_Net",    "Retained Ear
nings",    "Revenue - Total",  "SalesTurnover",    "Stockholders Equity - Par
ent", "Stockholders Equity - Total",  "Interest Expense - Total (Financial Se
rvices)",    "Deferred Taxes (Balance Sheet)",   "Income Taxes - Deferred",
"Income Taxes Paid",    "Income Taxes - Total", "Working Capital (Balance She
et)",  "Advertising_Expense",  "Interest and Related Expense - Total", "RD_Ex
pense",   "Research & Development - Prior",   "SGA_Expense",  "Active/Inactiv
e Status Marker",    "Market_Value_Total_Fiscal",    "Company Legal Name",
"North American Industry Classification Code",  "Standard_Industry_Classifica
tion_Code", "Prevention", "Promotion", "Company Initial Public Offering Date"
, "Past_Focus", "Present_Focus", "Future_Focus")

names(Execucomp)[names(Execucomp) == 'Fiscal Year'] <- 'Fiscal_Year'
names(Execucomp)[names(Execucomp) == 'Company ID Number'] <- 'Company_ID'
names(Execucomp)[names(Execucomp) == 'Total Current Compensation (Salary + Bo
nus)'] <- 'Total_Compensation'
names(Execucomp)[names(Execucomp) == "Executive's Age"] <- 'Age'
names(Execucomp)[names(Execucomp) == "Annual CEO Flag"] <- 'Job'
names(Execucomp)[names(Execucomp) == "Company Name"] <- 'C_Name'

# Removing companies listed in CAD
Pharma_TempF_Data<- Pharma_TempF_Data[Pharma_TempF_Data$ISO_Currency_Code ==
"USD", ]

# Removing all non-CEO executives
Execucomp$"CEO" <- ifelse(Execucomp$Job == "CEO", 1, 0)
Execucomp<- Execucomp[Execucomp$"CEO" == 1, ]

table(is.na(Pharma_TempF_Data$"Fiscal_Year")) # Eliminate 10 NA´s in the Fisc
al Years
```

```
##
## FALSE  TRUE
##  7827    10

Pharma_TempF_Data <- Pharma_TempF_Data %>% drop_na(Fiscal_Year)

str(Execucomp$Company_ID)

##  chr [1:20468] "001013" "001013" "001013" "001013" "001013" "001013" ...

str(Execucomp$Fiscal_Year)

##  num [1:20468] 1993 1994 1995 1996 1997 ...

str(Pharma_TempF_Data$Company_ID)

##  chr [1:7827] "148293" "148293" "148293" "148293" "148293" "148293" ...

str(Pharma_TempF_Data$Fiscal_Year)

##  num [1:7827] 2000 2001 2002 2003 2004 ...
```

Merge Datasets Together:

```
# merge two data frames by ID and Year
CEO_Data <- left_join(Pharma_TempF_Data, Execucomp,by=c("Company_ID","Fiscal_
Year")) %>%
  group_by(Company_ID, Fiscal_Year) %>% #to avoid duplicates
  filter(rank(Company_ID, ties.method = "first") == 1) #to avoid duplicates

P_CEO_Data <- pdata.frame(CEO_Data, index=c("Company_ID", "Fiscal_Year")) #Cr
eate Panel Data
```

---

2 2. Creating Strategic Change Variables

STRATEGIC CHANGE:

```
P_CEO_Data$"adv_intens" <- as.numeric(P_CEO_Data$Advertising_Expense / P_CEO_
Data$SalesTurnover)
P_CEO_Data$"RD_intens" <- as.numeric(P_CEO_Data$RD_Expense / P_CEO_Data$Sales
Turnover)
P_CEO_Data$"plant_equip" <- as.numeric(P_CEO_Data$PPE_Total_Net / P_CEO_Data$
PPE_Total_Gross)
P_CEO_Data$"nonprod_overhead" <- as.numeric(P_CEO_Data$SGA_Expense / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"invent_lev" <- as.numeric(P_CEO_Data$Inventories_Total / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"fin_leverage" <- as.numeric(P_CEO_Data$Liabilities_Total / P_CEO_
Data$Equity_Total)

P_CEO_Data$"adv_intens_diff" <- as.numeric(P_CEO_Data$adv_intens - plm::lag(P
_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"RD_intens_diff" <- as.numeric(P_CEO_Data$RD_intens - plm::lag(P_C
```

```
EO_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"plant_equip_diff" <- as.numeric(P_CEO_Data$plant_equip - plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"nonprod_overhead_diff" <- as.numeric(P_CEO_Data$nonprod_overhead
- plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL
))
P_CEO_Data$"invent_lev_diff" <- as.numeric(P_CEO_Data$invent_lev - plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"fin_leverage_diff" <- as.numeric(P_CEO_Data$fin_leverage - plm::l
ag(P_CEO_Data$fin_leverage , order_by = NULL))

P_CEO_Data$"pct_adv_intens_diff" <- as.numeric((P_CEO_Data$adv_intens - plm::
lag(P_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_
CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_RD_intens_diff" <- as.numeric((P_CEO_Data$RD_intens - plm::la
g(P_CEO_Data$RD_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_CEO
_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_plant_equip_diff" <- as.numeric((P_CEO_Data$plant_equip - plm
::lag(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))/plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_nonprod_overhead_diff" <- as.numeric((P_CEO_Data$nonprod_over
head - plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by =
NULL))/lead(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NUL
L))
P_CEO_Data$"pct_invent_lev_diff" <- as.numeric((P_CEO_Data$invent_lev - plm::
lag(P_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))/plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_fin_leverage_diff" <- as.numeric((P_CEO_Data$fin_leverage - p
lm::lag(P_CEO_Data$fin_leverage , order_by = NULL))/plm::lag(P_CEO_Data$fin_l
everage , order_by = NULL))
```

Replace Inf. and NAN values:

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA
```

Standardizing -> I standardize the absolute values (mean=0, standard deviation=1)

```
P_CEO_Data$"stand_adv" <- (P_CEO_Data$pct_adv_intens_diff - mean(na.omit(P_CE
O_Data$pct_adv_intens_diff))) / sd(na.omit(P_CEO_Data$pct_adv_intens_diff))
P_CEO_Data$"stand_RD" <- (P_CEO_Data$pct_RD_intens_diff - mean(na.omit(P_CEO_
Data$pct_RD_intens_diff))) / sd(na.omit(P_CEO_Data$pct_RD_intens_diff))
P_CEO_Data$"stand_plant" <- (P_CEO_Data$pct_plant_equip_diff - mean(na.omit(P
_CEO_Data$pct_plant_equip_diff))) / sd(na.omit(P_CEO_Data$pct_plant_equip_dif
f))
P_CEO_Data$"stand_nonprod" <- (P_CEO_Data$pct_nonprod_overhead_diff - mean(na
.omit(P_CEO_Data$pct_nonprod_overhead_diff))) / sd(na.omit(P_CEO_Data$pct_non
prod_overhead_diff))
P_CEO_Data$"stand_invent" <- (P_CEO_Data$pct_invent_lev_diff - mean(na.omit(P
_CEO_Data$pct_invent_lev_diff))) / sd(na.omit(P_CEO_Data$pct_invent_lev_diff)
)
P_CEO_Data$"stand_fin" <- (P_CEO_Data$pct_fin_leverage_diff - mean(na.omit(P_
CEO_Data$pct_fin_leverage_diff))) / sd(na.omit(P_CEO_Data$pct_fin_leverage_di
ff))
```

Check MEAN & SD

```
mean(P_CEO_Data$stand_adv,na.rm=TRUE)

## [1] 0.00000000000000002594323

mean(P_CEO_Data$stand_RD,na.rm=TRUE)

## [1] 0.00000000000000002487215

mean(P_CEO_Data$stand_plant,na.rm=TRUE)

## [1] -0.00000000000000004218672

mean(P_CEO_Data$stand_nonprod,na.rm=TRUE)

## [1] 0.00000000000000007887655

mean(P_CEO_Data$stand_invent,na.rm=TRUE)

## [1] -0.00000000000000002756174

mean(P_CEO_Data$stand_fin,na.rm=TRUE)

## [1] 0.00000000000000002571993

sd(na.omit(P_CEO_Data$stand_adv))

## [1] 1

sd(na.omit(P_CEO_Data$stand_RD))

## [1] 1

sd(na.omit(P_CEO_Data$stand_plant))

## [1] 1

sd(na.omit(P_CEO_Data$stand_nonprod))

## [1] 1

sd(na.omit(P_CEO_Data$stand_invent))

## [1] 1

sd(na.omit(P_CEO_Data$stand_fin))

## [1] 1
```

Check nr. of NA´s

```
table(is.na(P_CEO_Data$"stand_adv"))

##
## FALSE  TRUE
##  1629  6198

table(is.na(P_CEO_Data$"stand_RD"))
```

```
##
## FALSE  TRUE
##  4942  2885

table(is.na(P_CEO_Data$"stand_plant"))

##
## FALSE  TRUE
##  6144  1683

table(is.na(P_CEO_Data$"stand_nonprod"))

##
## FALSE  TRUE
##  3296  4531

table(is.na(P_CEO_Data$"stand_invent"))

##
## FALSE  TRUE
##  4160  3667

table(is.na(P_CEO_Data$"stand_fin"))

##
## FALSE  TRUE
##  6646  1181
```

Standardized Advertising has a lot of NA´s! Since there are too many missing observations, I will create a robustness check, where I omit "stand_adv" in developing the strategic change variable. (-> see "robustness check")

To create the SC variable I need the absolute values

```
P_CEO_Data$"abs_stand_adv" <- abs(P_CEO_Data$stand_adv)
P_CEO_Data$"abs_stand_RD" <- abs(P_CEO_Data$stand_RD)
P_CEO_Data$"abs_stand_plant" <- abs(P_CEO_Data$stand_plant)
P_CEO_Data$"abs_stand_nonprod" <- abs(P_CEO_Data$stand_nonprod)
P_CEO_Data$"abs_stand_invent" <- abs(P_CEO_Data$stand_invent)
P_CEO_Data$"abs_stand_fin" <- abs(P_CEO_Data$stand_fin)
```

Now I can finally create the Strategic change variable:

```
P_CEO_Data$strat_change <- (P_CEO_Data$"abs_stand_adv" + P_CEO_Data$"abs_stan
d_RD" + P_CEO_Data$"abs_stand_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO
_Data$"abs_stand_invent" + P_CEO_Data$"abs_stand_fin") / 6

P_CEO_Data$strat_change2 <- (P_CEO_Data$"abs_stand_RD" + P_CEO_Data$"abs_stan
d_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO_Data$"abs_stand_invent" + P
_CEO_Data$"abs_stand_fin") / 5 #robustness check
```

I compare both strat_change variables and see, that omitting the "stand_adv" variable saves me from a lot additional NA´s

```
table(is.na(P_CEO_Data$"strat_change"))
```

```
##
## FALSE  TRUE
##  1134  6693

table(is.na(P_CEO_Data$"strat_change2")) #for robustness check

##
## FALSE  TRUE
##  2665  5162
```

Assumption check for normal distribution of the data:

I perform the Shapiro-Wilk normality test to check whether the dependent variables follow a normal distribution or not.

H0: he dependent variable follows the normal distribution H1: the dependent variable does not follow a normal distribution If the p value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution.

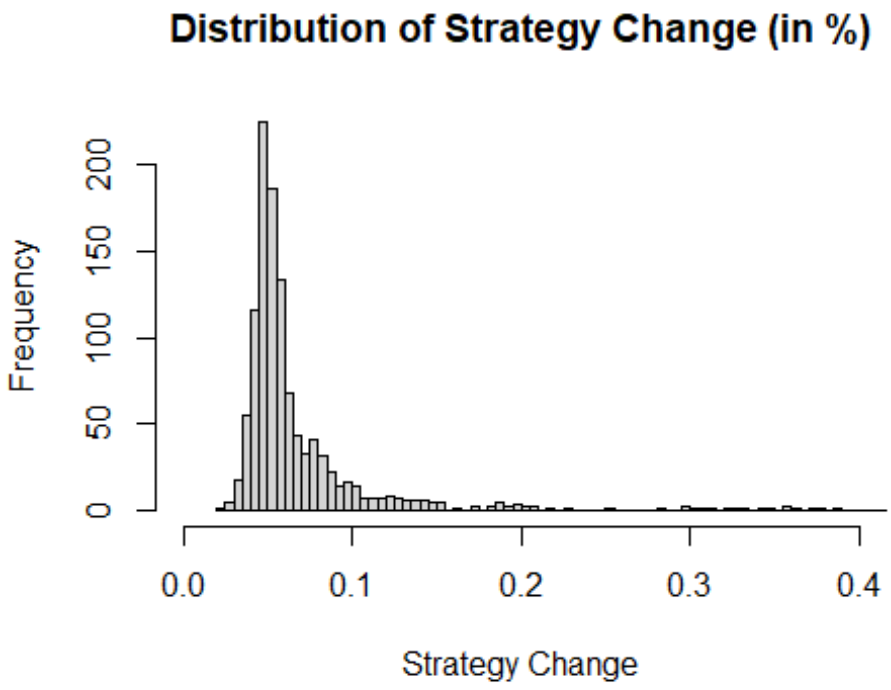
```
saphiroSC <- shapiro.test(P_CEO_Data$strat_change)
saphiroSC # see result of strat_change test

##
##  Shapiro-Wilk normality test
##
## data:  P_CEO_Data$strat_change
## W = 0.1856, p-value < 0.00000000000000022

saphiroAI <- shapiro.test(P_CEO_Data$pct_adv_intens_diff)
saphiroAI # see result of performance test

##
##  Shapiro-Wilk normality test
##
## data:  P_CEO_Data$pct_adv_intens_diff
## W = 0.049579, p-value < 0.00000000000000022

saphiroRD <- shapiro.test(P_CEO_Data$pct_RD_intens_diff)
saphiroRD # see result of performance test

##
##  Shapiro-Wilk normality test
##
## data:  P_CEO_Data$pct_RD_intens_diff
## W = 0.013877, p-value < 0.00000000000000022

#saphiroPE <- shapiro.test(P_CEO_Data$pct_plant_equip_diff) <- too many obser
vations (limit = 5k)
#saphiroPE # see result of performance test

saphiroNPO <- shapiro.test(P_CEO_Data$pct_nonprod_overhead_diff)
saphiroNPO # see result of performance test

##
##  Shapiro-Wilk normality test
##
```

```
## data:  P_CEO_Data$pct_nonprod_overhead_diff
## W = 0.034199, p-value < 0.00000000000000022

saphiroIL <- shapiro.test(P_CEO_Data$pct_invent_lev_diff)
saphiroIL # see result of performance test

##
##  Shapiro-Wilk normality test
##
## data:  P_CEO_Data$pct_invent_lev_diff
## W = 0.070603, p-value < 0.00000000000000022

#saphiroFL <- shapiro.test(P_CEO_Data$pct_fin_leverage_diff)
#saphiroFL # see result of performance test
```

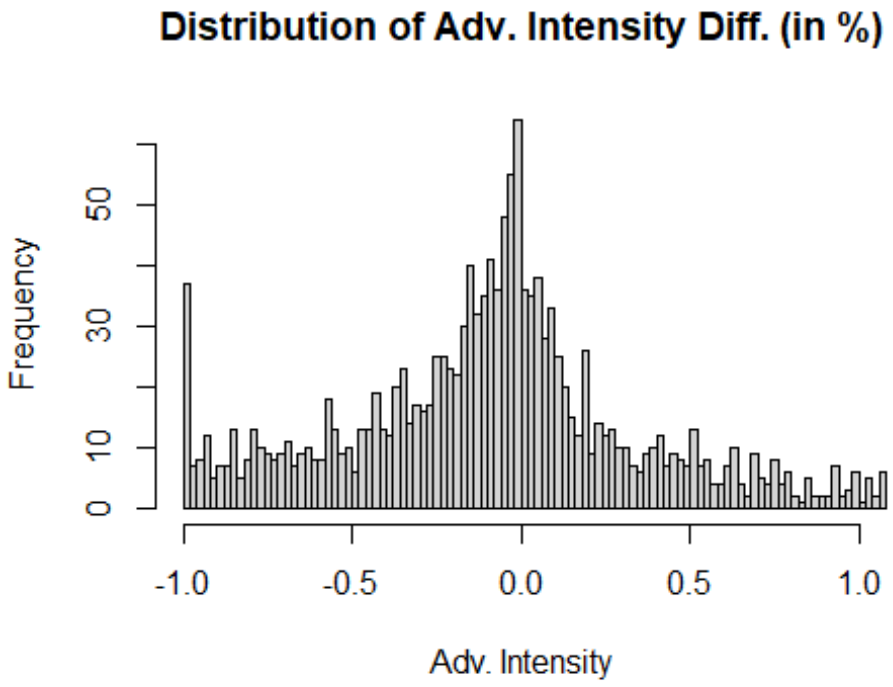
The distribution seems to be not normal. I have to check this later on!

In the Histogram below, it can be observed that the variables do not always follow a normal distribution, but almost always they approache a normal distribution.

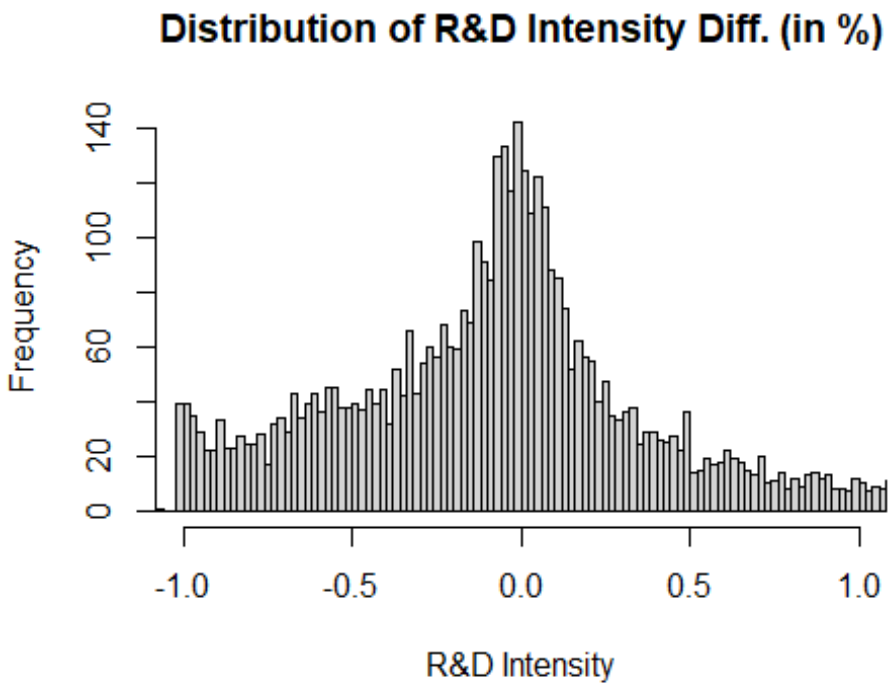
```
hist(P_CEO_Data$strat_change , breaks =(1000), main="Distribution of Strategy
Change (in %)", xlab="Strategy Change", xlim = c(0,0.4))
```



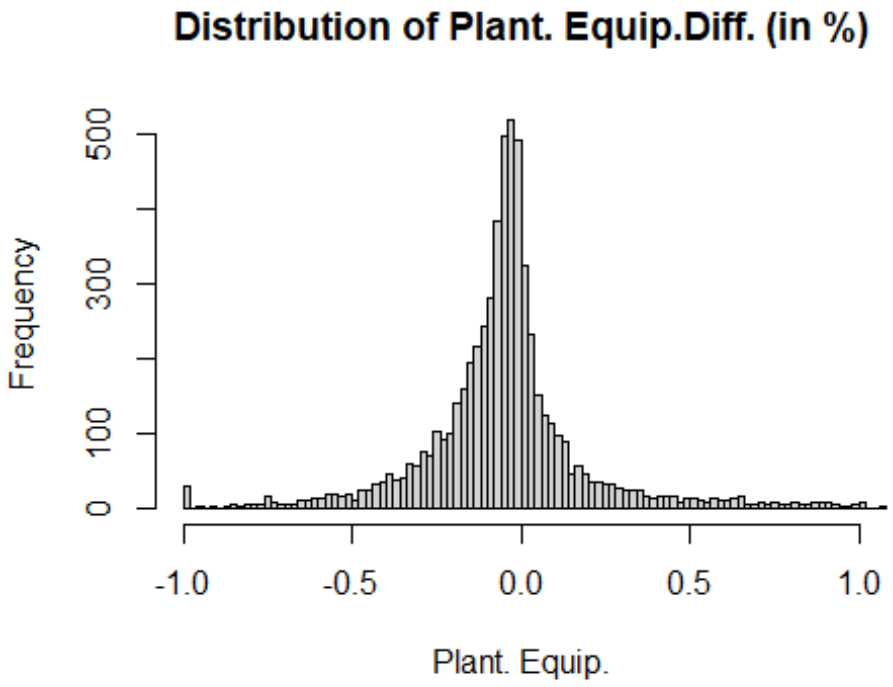

```
hist(P_CEO_Data$pct_adv_intens_diff , breaks =(40000), main="Distribution of
Adv. Intensity Diff. (in %)", xlab="Adv. Intensity", xlim = c(-1,1))
```



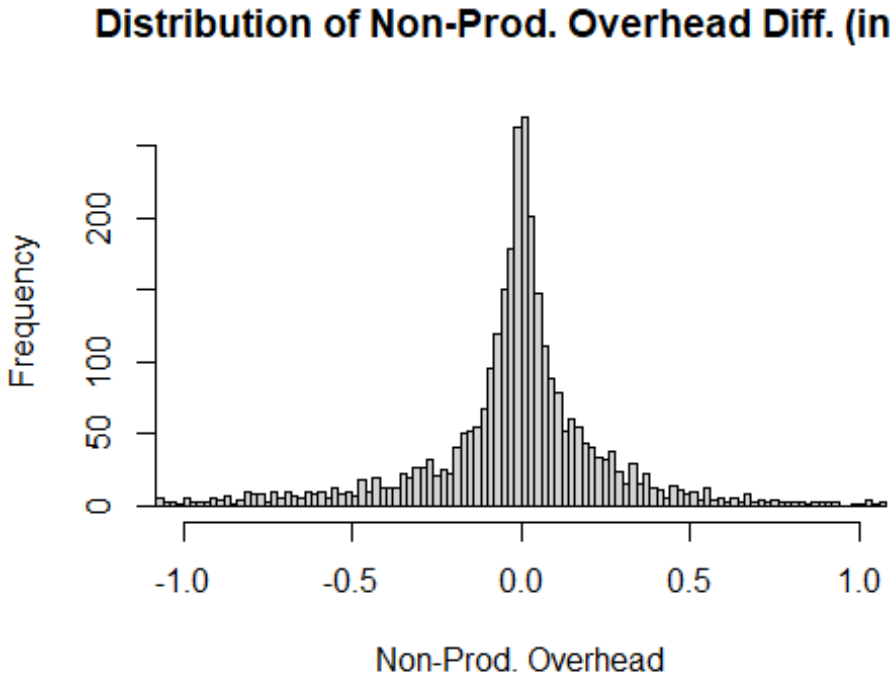

```
hist(P_CEO_Data$pct_RD_intens_diff , breaks =(250000), main="Distribution of
R&D Intensity Diff. (in %)", xlab="R&D Intensity", xlim = c(-1,1))
```



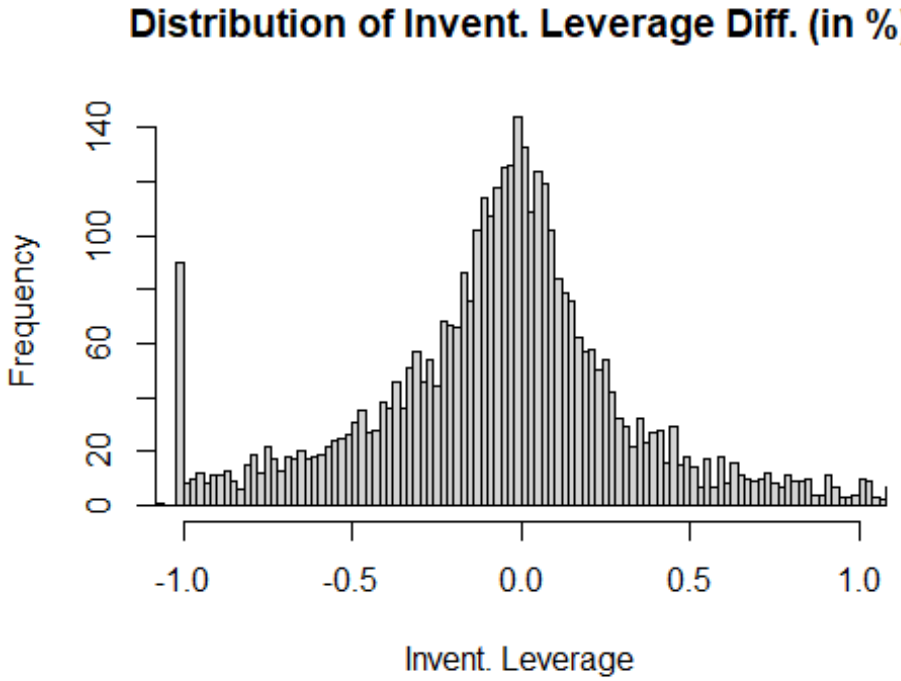

```
hist(P_CEO_Data$pct_plant_equip_diff , breaks =(5000), main="Distribution of
Plant. Equip.Diff. (in %)", xlab="Plant. Equip.", xlim = c(-1,1))
```



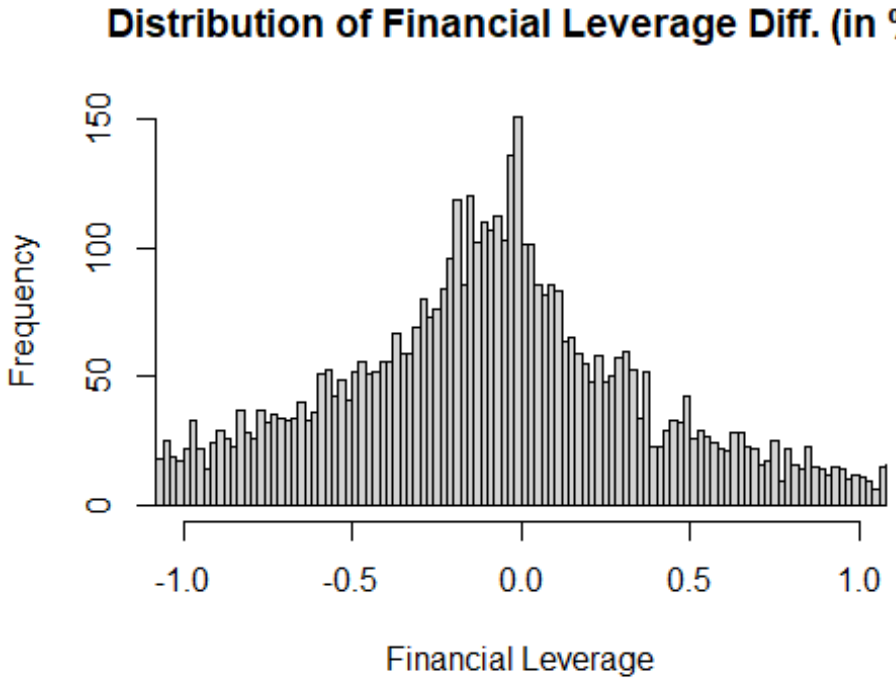

```
#par(mfrow=c(2,2)) # init 4 charts in 1 panel

hist(P_CEO_Data$pct_nonprod_overhead_diff , breaks =(50000), main="Distributi
on of Non-Prod. Overhead Diff. (in %)", xlab="Non-Prod. Overhead", xlim = c(-
1,1))
```



```
hist(P_CEO_Data$pct_invent_lev_diff , breaks =(20000), main="Distribution of
Invent. Leverage Diff. (in %)", xlab="Invent. Leverage", xlim = c(-1,1))
```




```
hist(P_CEO_Data$pct_fin_leverage_diff , breaks =(50000), main="Distribution o
f Financial Leverage Diff. (in %)", xlab="Financial Leverage", xlim = c(-1,1)
)
```



I use the positive and negative median of the strategy changes (=differences) to determine if a strategy change is small or big

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$pct_adv_intens_diff, ifelse(P_CEO_Data$pct_adv_intens_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2465952  0.3758354
```

```
tapply(P_CEO_Data$pct_RD_intens_diff, ifelse(P_CEO_Data$pct_RD_intens_diff >
0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2982761  0.3519554
```

```
tapply(P_CEO_Data$pct_plant_equip_diff, ifelse(P_CEO_Data$pct_plant_equip_dif
f > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.0920045  0.1110405
```

```
tapply(P_CEO_Data$pct_nonprod_overhead_diff, ifelse(P_CEO_Data$pct_nonprod_ov
erhead_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1142313  0.0932076
```

```
tapply(P_CEO_Data$pct_invent_lev_diff, ifelse(P_CEO_Data$pct_invent_lev_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2112387  0.2100990
```

```
tapply(P_CEO_Data$pct_fin_leverage_diff, ifelse(P_CEO_Data$pct_fin_leverage_d
iff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.3880235  0.5415713
```

```
#also using the absolute (not standardized values) would be good
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 1,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ 1))
```

Big Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Positive Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_adv_change = case_when (
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Positive Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_adv_change = case_when (
                                pct_adv_intens_diff <= 0 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Negative Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0))
```

Small Negative Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_adv_change = case_when (
                                pct_adv_intens_diff >= 0 ~ 0,
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1))
```

Big R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff > -0.2982761 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Positive R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_rd_change = case_when (
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small Positive R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_rd_change = case_when (
                                pct_RD_intens_diff <= 0 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Negative R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0))
```

Small Negative R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_rd_change = case_when (
                                P_CEO_Data$pct_RD_intens_diff >= 0 ~ 0,
                                P_CEO_Data$pct_RD_intens_diff <= -0.2982761 ~ 0
,
                                P_CEO_Data$pct_RD_intens_diff > -0.2982761 ~ 1)
)
```

Big Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
```

```
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Positive Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Positive Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Negative Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0))
```

Small Negative Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
1))
```

Big Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0,
                                P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
```

```
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Positive Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Positive Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff <= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Negative Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0))
```

Small Negative Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1))
```

Big Inventory Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_invent_change = case_when (
                              P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                              P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                              P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
,
```

```
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Positive Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Positive Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Negative Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
))
```

Small Negative Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
))
```

Big Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
```

```
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Positive Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Positive Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Negative Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0))
```

Small Negative Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1))
```

Continuous Variables:

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median

##   positive
## 0.05379924

tapply(P_CEO_Data$abs_stand_adv, ifelse(P_CEO_Data$abs_stand_adv > 0, 'positi
ve', 'negative'), median) # median

##   positive
## 0.07193945

tapply(P_CEO_Data$abs_stand_RD, ifelse(P_CEO_Data$abs_stand_RD > 0, 'positive
', 'negative'), median) # median

##   positive
## 0.03553555

tapply(P_CEO_Data$abs_stand_plant, ifelse(P_CEO_Data$abs_stand_plant > 0, 'po
sitive', 'negative'), median) # median

##   positive
## 0.08998155

tapply(P_CEO_Data$abs_stand_nonprod, ifelse(P_CEO_Data$abs_stand_nonprod > 0,
'positive', 'negative'), median) # median

##   positive
## 0.04249124

tapply(P_CEO_Data$abs_stand_invent, ifelse(P_CEO_Data$abs_stand_invent > 0, '
positive', 'negative'), median) # median

##   positive
## 0.07927686

tapply(P_CEO_Data$abs_stand_fin, ifelse(P_CEO_Data$abs_stand_fin > 0, 'positi
ve', 'negative'), median) # median

##   positive
## 0.02525311
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ strat_change,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ strat_change))
```

Big Adv. Change:

```
P_CEO_Data$"big_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv >= 0.07193945,
P_CEO_Data$abs_stand_adv, 0)
```

Small Adv. Change

```
P_CEO_Data$"small_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv <= 0.0719394
5, P_CEO_Data$abs_stand_adv, 0)
```

Big R&D Change:

```
P_CEO_Data$"big_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD >= 0.03553555, P
_CEO_Data$abs_stand_RD, 0)
```

Small R&D Change

```
P_CEO_Data$"small_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD <= 0.03553555,
P_CEO_Data$abs_stand_RD, 0)
```

Big Plant. Change:

```
P_CEO_Data$"big_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant >= 0.08998
155, P_CEO_Data$abs_stand_plant, 0)
```

Small Plant Change

```
P_CEO_Data$"small_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant <= 0.089
98155, P_CEO_Data$abs_stand_plant, 0)
```

Big Nonprod Change:

```
P_CEO_Data$"big_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod >= 0.0
4249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Small Nonprod Change

```
P_CEO_Data$"small_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod <= 0
.04249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Big invent Change:

```
P_CEO_Data$"big_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent >= 0.079
27686, P_CEO_Data$abs_stand_invent, 0)
```

Small invent. Change

```
P_CEO_Data$"small_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent <= 0.0
7927686, P_CEO_Data$abs_stand_invent, 0)
```

Big fin Change:

```
P_CEO_Data$"big_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin >= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

Small fin. Change

```
P_CEO_Data$"small_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin <= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

---

3 3. Creating Performance Feedback Variables

PerformanceROA = Return on Assets: net income / total assets (-> as %)

```
P_CEO_Data$"ROA_Performance" <- P_CEO_Data$Net_Income / P_CEO_Data$Assets_Total

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n mean  sd median trimmed  mad  min  max range skew kurtosis  se
## X1    1 7408 -Inf NaN  -0.21   -0.32 0.43 -Inf 1162   Inf  NaN      NaN NaN

#eliminating Inf & NAN
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.nan)] <- NA
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.infinite)] <- NA

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n  mean     sd median trimmed  mad       min  max    range   skew
## X1    1 7372 -7.36 324.32   -0.2   -0.31 0.43 -25884.81 1162 27046.81 -71.44
##    kurtosis   se
## X1  5547.14 3.78

P_CEO_Data <- P_CEO_Data %>%
    group_by(Company_ID) %>%
     mutate(ROA_PerformanceT_1 = dplyr::lag(ROA_Performance, n = 1, default = NA))

P_CEO_Data <- P_CEO_Data %>%
  group_by(Company_ID) %>%
    mutate(Strat_ChangeT.1 = dplyr::lead(strat_change, n = 1, default = NA))

class(P_CEO_Data) # what type of dataset is it

## [1] "grouped_df" "tbl_df"     "tbl"        "data.frame"
```

```
P_CEO_Data <- pdata.frame(P_CEO_Data, index=c("Company_ID", "Fiscal_Year")) #
go back to Panel Data
class(P_CEO_Data) # what type of dataset is it

## [1] "pdata.frame" "data.frame"
```

ASPIRED PERFORMANCE FEEDBACK:

HAit = α * Pit + (1 - α) * HAit-1

HAi = Historical Aspiration Level of company HAit-1 = ROAit-1 Pi = Performance of company α * Pt = weighted average of performance at t (1 - α) = carryover (how much the past influences the present or how fast this influence decays)

Creating Variable fur HA

```
P_CEO_Data$asp_perf_fb_0 <- P_CEO_Data$ROA_PerformanceT_1
P_CEO_Data$asp_perf_fb_1 <- (0.1*P_CEO_Data$ROA_Performance)+(0.9*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_2 <- (0.2*P_CEO_Data$ROA_Performance)+(0.8*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_3 <- (0.3*P_CEO_Data$ROA_Performance)+(0.7*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_4 <- (0.4*P_CEO_Data$ROA_Performance)+(0.6*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_5 <- (0.5*P_CEO_Data$ROA_Performance)+(0.5*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_6 <- (0.6*P_CEO_Data$ROA_Performance)+(0.4*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_7 <- (0.7*P_CEO_Data$ROA_Performance)+(0.3*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_8 <- (0.8*P_CEO_Data$ROA_Performance)+(0.2*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_9 <- (0.9*P_CEO_Data$ROA_Performance)+(0.1*P_CEO_Data$
ROA_PerformanceT_1)
```

Check the best Alpha before continuing!

```
αModel0 <- lm(strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
αModel1 <- lm(strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
αModel2 <- lm(strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
αModel3 <- lm(strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
αModel4 <- lm(strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
αModel5 <- lm(strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
αModel6 <- lm(strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
αModel7 <- lm(strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
αModel8 <- lm(strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
αModel9 <- lm(strat_change ~ asp_perf_fb_9, data = P_CEO_Data)

summary(αModel0)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3141 -0.0272 -0.0211 -0.0078  3.5633
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074818   0.004098  18.256 < 0.0000000000000002 ***
## asp_perf_fb_0 -0.013056   0.003324  -3.927            0.0000911 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01344,    Adjusted R-squared:  0.01257
## F-statistic: 15.42 on 1 and 1132 DF,  p-value: 0.00009106

summary(αModel1)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3088 -0.0271 -0.0209 -0.0080  3.5637
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074738   0.004099  18.235 < 0.0000000000000002 ***
## asp_perf_fb_1 -0.013477   0.003372  -3.997            0.0000682 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01392,    Adjusted R-squared:  0.01305
## F-statistic: 15.98 on 1 and 1132 DF,  p-value: 0.00006824

summary(αModel2)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2987 -0.0270 -0.0209 -0.0077  3.5642
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074682   0.004099  18.220 < 0.0000000000000002 ***
## asp_perf_fb_2 -0.013752   0.003400  -4.044             0.000056 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01424,    Adjusted R-squared:  0.01337
## F-statistic: 16.36 on 1 and 1132 DF,  p-value: 0.00005599

summary(αModel3)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2838 -0.0269 -0.0207 -0.0077  3.5647
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074652   0.004099  18.211 < 0.0000000000000002 ***
## asp_perf_fb_3 -0.013863   0.003409  -4.067            0.0000509 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1367 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.0144, Adjusted R-squared:  0.01353
## F-statistic: 16.54 on 1 and 1132 DF,  p-value: 0.00005089

summary(αModel4)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2647 -0.0270 -0.0206 -0.0078  3.5652
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074650   0.004099  18.210 < 0.0000000000000002 ***
## asp_perf_fb_4 -0.013804   0.003396  -4.064            0.0000515 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1367 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01438,    Adjusted R-squared:  0.01351
## F-statistic: 16.52 on 1 and 1132 DF,  p-value: 0.0000515

summary(αModel5)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2422 -0.0270 -0.0207 -0.0077  3.5657
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074676   0.004099  18.216 < 0.0000000000000002 ***
## asp_perf_fb_5 -0.013579   0.003364  -4.037            0.0000579 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01419,    Adjusted R-squared:  0.01332
## F-statistic: 16.29 on 1 and 1132 DF,  p-value: 0.00005787

summary(αModel6)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2330 -0.0270 -0.0207 -0.0078  3.5662
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074727   0.004099  18.229 < 0.0000000000000002 ***
## asp_perf_fb_6 -0.013206   0.003313  -3.986            0.0000715 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01384,    Adjusted R-squared:  0.01297
## F-statistic: 15.89 on 1 and 1132 DF,  p-value: 0.0000715

summary(αModel7)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2316 -0.0271 -0.0208 -0.0077  3.5666
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074799   0.004099  18.247 < 0.0000000000000002 ***
## asp_perf_fb_7 -0.012711   0.003246  -3.915            0.0000957 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01336,    Adjusted R-squared:  0.01249
## F-statistic: 15.33 on 1 and 1132 DF,  p-value: 0.00009566
```

```
summary(αModel8)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2318 -0.0271 -0.0209 -0.0077  3.5670
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074887   0.004099  18.270 < 0.0000000000000002 ***
## asp_perf_fb_8 -0.012124   0.003167  -3.828             0.000136 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1369 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01278,    Adjusted R-squared:  0.01191
## F-statistic: 14.66 on 1 and 1132 DF,  p-value: 0.0001361
```

```
summary(αModel9)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_9, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2437 -0.0273 -0.0210 -0.0079  3.5674
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074988   0.004099  18.295 < 0.0000000000000002 ***
## asp_perf_fb_9 -0.011474   0.003077  -3.729             0.000202 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1369 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01213,    Adjusted R-squared:  0.01126
## F-statistic:  13.9 on 1 and 1132 DF,  p-value: 0.0002022
```

α=0.3 gives the best Adj. R2 results

```
P_CEO_Data$"neg_perf" <- ifelse(P_CEO_Data$ROA_Performance < 0, 1, 0)
```

1 = we have negative performance; 0 = we have not a negative performance (= we have a positive performance)

```
P_CEO_Data$"pos_perf" <- ifelse(P_CEO_Data$ROA_Performance > 0, 1, 0)
```

1 = we have positive performance; 0 = we have not a positive performance (= we have a negative performance)

```
P_CEO_Data <- P_CEO_Data %>% mutate(Performance_below_aspiration = case_when
(
                        asp_perf_fb_3 >= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_3 < ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(Performance_above_aspiration = case_when
(
                        asp_perf_fb_3 <= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_3 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$PosPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$PosPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$NegPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$NegPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
```

To calculate the PF I create the % difference between the performance and the aspired performance of a company

```
P_CEO_Data$"pct_PerfFB" <- (P_CEO_Data$"ROA_Performance" - P_CEO_Data$"asp_pe
rf_fb_3") /abs(P_CEO_Data$"asp_perf_fb_3")
#eliminating Inf & NAN
```

```
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.nan)] <- NA
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.infinite)] <- NA

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean   sd median trimmed  mad     min    max  range   skew
## X1    1 6617 -0.22 8.55  -0.01   -0.04 0.65 -389.52 200.64 590.16 -16.48
##    kurtosis   se
## X1   903.89 0.11

#winsorize to keep observations but make extreme observations not so extreme
P_CEO_Data$pct_PerfFB <- DescTools::Winsorize(P_CEO_Data$pct_PerfFB, minval =
NULL, maxval = NULL, probs = c(0.001, 0.999),
          na.rm = TRUE, type = 7)

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean   sd median trimmed  mad    min   max  range skew kurto
sis
## X1    1 6617 -0.18 4.39  -0.01   -0.04 0.65 -70.34 47.49 117.83 -5.3   128
.56
##      se
## X1 0.05

P_CEO_Data$"pct_neg_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB < 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have negative performance feedback difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

```
P_CEO_Data$"pct_pos_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB > 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

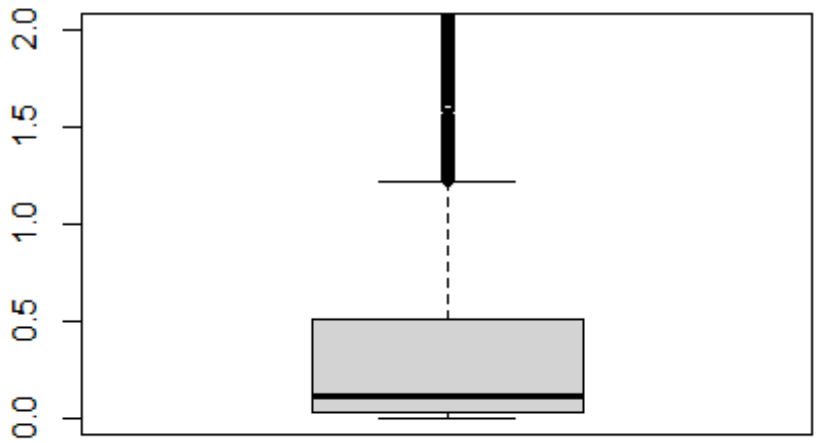
```
#Creating additional Binary Variables
P_CEO_Data <- P_CEO_Data %>% mutate(BV_Performance_above_aspiration = case_wh
en (
                        asp_perf_fb_1 <= ROA_Performance ~ 1,
                        asp_perf_fb_1 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_AboAsp = case_when (
```

```
                        (Performance_above_aspiration != 0 & neg_perf == 1) ~
1,
                        (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & neg_perf == 1) ~
1,
                        (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$BV_PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_BelAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_BelAsp, k =
1, default = NA, order_by = NULL)
```

4 4. Control Variables

Firm Size: “log(Employees)” -> in K

```
boxplot(P_CEO_Data$Employees,data=P_CEO_Data, ylim = c(0,2))
```

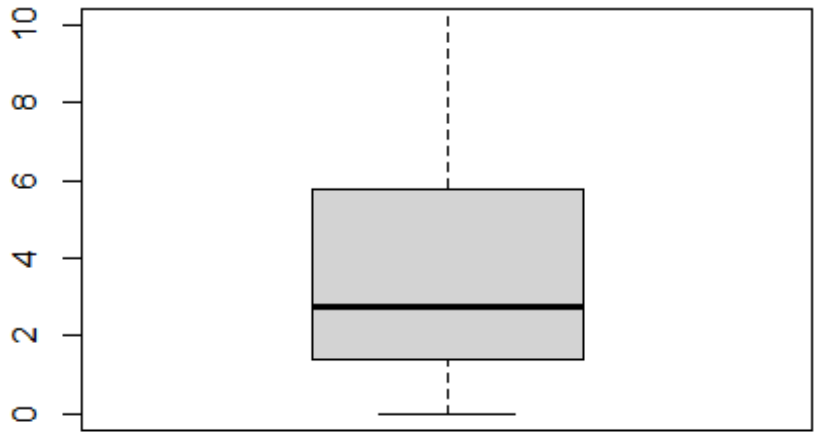


Some companies have 0 employees, so to do log(Emloyees) I need to eliminate them -> log(-1) returns NaN and log(0) return Inf

```
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6727 5.05 17.41   0.11    0.49 0.15   0 135.7 135.7  4.5    21.38
0.21

P_CEO_Data$Employees[P_CEO_Data$Employees == 0.000] <- NA
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21
```

Financial Slack

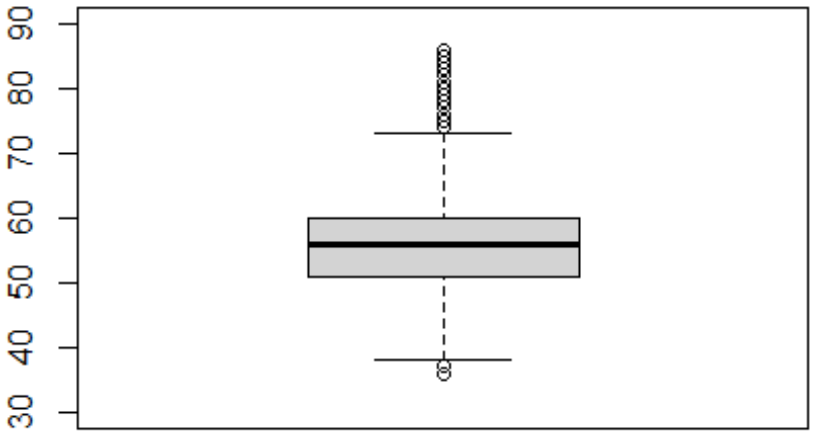
```
P_CEO_Data$"Financial_Slack" <- as.numeric(P_CEO_Data$Current.Assets...Total
/ P_CEO_Data$Current.Liabilities...Total)

boxplot(P_CEO_Data$Financial_Slack,data=P_CEO_Data, ylim = c(0,10))
```




```
P_CEO_Data$Financial_Slack[P_CEO_Data$Financial_Slack == 0.00000000000] <- NA

P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.nan)] <- NA
P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.infinite)] <
- NA
```

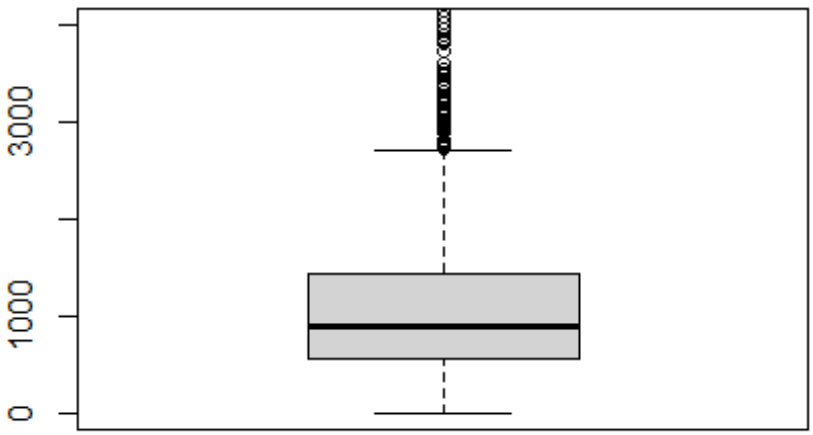
CEO Age -> “Age”

```
boxplot(P_CEO_Data$Age,data=P_CEO_Data, ylim = c(30,90))
```



Total compensation of the CEO -> Total_Compensation (in K)

```
boxplot(P_CEO_Data$Total_Compensation,data=P_CEO_Data, ylim = c(0,4000))
```




```
psych::describe(P_CEO_Data$Total_Compensation)
```

```
##    vars    n    mean     sd median trimmed    mad min    max  range skew
## X1    1 1220 1128.86 831.25 884.96  989.54 570.74   0 6650.1 6650.1 2.07
```

```
##    kurtosis   se
## X1     6.22 23.8

P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.000] <- NA
P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.001] <- NA
psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81
```

5 5. Additional Datasets

```
# Deviding in profitable and non-profitable companies:
Data_PosPerf<- P_CEO_Data[P_CEO_Data$"pos_perf" != 0, ]
Data_NegPerf<- P_CEO_Data[P_CEO_Data$"neg_perf" != 0, ]

#Deviding into above and below aspiration
Data_PosPerf_AboAsp<- Data_PosPerf[Data_PosPerf$Performance_above_aspiration
!= 0, ]
Data_PosPerf_BelAsp<- Data_PosPerf[Data_PosPerf$Performance_below_aspiration
!= 0, ]
Data_NegPerf_AboAsp<- Data_NegPerf[Data_NegPerf$Performance_above_aspiration
!= 0, ]
Data_NegPerf_BelAsp<- Data_NegPerf[Data_NegPerf$Performance_below_aspiration
!= 0, ]

#eliminating Inf & NAN
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.nan)] <- NA
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.infinite)] <- NA

Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.nan)] <- NA
Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.infinite)] <- NA

Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.nan)] <- NA
Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.infinite)] <- NA

Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.nan)] <- NA
Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.infinite)] <- NA
```

EXPORT dataset to Excel for final check:

```
#library(writexl)
#write_xlsx(P_CEO_Data,"data/Merged.xlsx")
```

6 6. Descriptive Statistics

Assessing the impact of the Perf.FB of both types of companies depending on their profitability level:

```
#I used this part to find out the real descriptive statistics by eliminating
the 0 values i inserted for if the numbers where part of the opposite categor
y. This part should not be run!
#P_CEO_Data$pct_pos_perfFB[P_CEO_Data$pct_pos_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_pos_perfFB)

#P_CEO_Data$pct_neg_perfFB[P_CEO_Data$pct_neg_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_neg_perfFB)

psych::describe(P_CEO_Data$strat_change)

##    vars    n mean   sd median trimmed  mad  min  max range  skew kurtosis
se
## X1    1 1134 0.08 0.14   0.05    0.06 0.01 0.02 3.64  3.62 17.69   413.14
0

psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21

psych::describe(P_CEO_Data$Financial_Slack)

##    vars    n mean    sd median trimmed  mad min max range skew kurtosis
se
## X1    1 7362 5.26 13.12   2.76    3.59 2.53   0 812   812   37  2076.74 0.
15

psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81

psych::describe(P_CEO_Data$Age)

##    vars    n  mean   sd median trimmed  mad min max range skew kurtosis
se
## X1    1 1178 55.98 7.34     56   55.87 7.41  36  86    50 0.27     0.68 0.
21

psych::describe(P_CEO_Data$pct_pos_perfFB)

##    vars    n mean   sd median trimmed mad min   max range  skew kurtosis
se
## X1    1 6617 0.52 2.44      0    0.17   0   0 47.49 47.49 13.45   218.84 0
.03

psych::describe(P_CEO_Data$pct_neg_perfFB)

##    vars    n mean   sd median trimmed  mad    min max range   skew kurtosi
s
## X1    1 6617 -0.7 3.54  -0.01   -0.21 0.02 -70.34   0 70.34 -14.32   244.0
5
```

```
##      se
## X1 0.04

psych::describe(P_CEO_Data$pos_perf)

##    vars    n mean   sd median trimmed mad min max range skew kurtosis   se
## X1    1 7372 0.33 0.47      0    0.29   0   0   1     1 0.71     -1.5 0.01

psych::describe(P_CEO_Data$neg_perf)

##    vars    n mean   sd median trimmed mad min max range  skew kurtosis   s
e
## X1    1 7372 0.67 0.47      1    0.71   0   0   1     1 -0.71     -1.5 0.0
1

psych::describe(P_CEO_Data$Present_Focus)

##    vars   n mean   sd median trimmed  mad  min   max range skew kurtosis
se
## X1    1 365  6.9 1.65   6.66    6.78 1.42 3.49 14.04 10.55 0.83     1.44 0
.09

psych::describe(P_CEO_Data$Future_Focus)

##    vars   n mean   sd median trimmed  mad  min  max range skew kurtosis
se
## X1    1 365 1.82 0.52   1.82    1.81 0.49 0.49 3.42  2.93 0.23     0.14 0.
03

psych::describe(P_CEO_Data$Prevention)

##    vars   n mean  sd median trimmed mad min max range skew kurtosis   se
## X1    1 368 0.16 0.2    0.1    0.12 0.1   0 1.5   1.5 2.96     11.4 0.01

psych::describe(P_CEO_Data$Promotion)

##    vars   n mean   sd median trimmed  mad min  max range skew kurtosis   s
e
## X1    1 368 0.48 0.21   0.46    0.46 0.19   0 1.26  1.26 0.76     1.09 0.0
1
```

Variance Inflation Factors (VIF)

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

PLM1 <- lm(strat_change ~  pct_pos_perfFB*pos_perf + pct_neg_perfFB*pos_perf
+ log(Financial_Slack) +  log(Employees) + Age + Total_Compensation ,data=P_C
EO_Data)

PLM2 <- lm(strat_change ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotio
n + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) + log
(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

PLM3 <- lm(strat_change ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Pres
ent_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus + Age +
Total_Compensation ,data=P_CEO_Data)
```

```
PLM4 <- lm(strat_change ~  pct_pos_perfFB  + pct_neg_perfFB + neg_perf + Prom
otion + Prevention + Present_Focus + Future_Focus+ log(Financial_Slack) +  lo
g(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

regclass::VIF(PLM1)

##          pct_pos_perfFB                pos_perf          pct_neg_perfFB
##              950.348021                1.981961                1.157123
##    log(Financial_Slack)          log(Employees)                     Age
##                1.374431                2.566101                1.051958
##      Total_Compensation pct_pos_perfFB:pos_perf pos_perf:pct_neg_perfFB
##                1.864680              954.091617                1.129905

regclass::VIF(PLM2)

##                     pct_pos_perfFB                           Promotion
##                         140.316967                            1.530835
##                     pct_neg_perfFB                 log(Prevention + 1)
##                         101.436597                            1.624441
##                     log(Employees)                                Age
##                              3.020585                            1.299635
##                  Total_Compensation           pct_pos_perfFB:Promotion
##                              3.206056                           48.450106
##           Promotion:pct_neg_perfFB pct_pos_perfFB:log(Prevention + 1)
##                         105.489226                           44.990782
## pct_neg_perfFB:log(Prevention + 1)
##                              4.138853

regclass::VIF(PLM3)

##                pct_pos_perfFB                Present_Focus
##                    879.898898                    1.476171
##                pct_neg_perfFB                Future_Focus
##                   1434.672817                    1.601659
##                           Age           Total_Compensation
##                      1.113861                    1.148388
## pct_pos_perfFB:Present_Focus Present_Focus:pct_neg_perfFB
##                    221.589397                 1274.309369
##  pct_pos_perfFB:Future_Focus  pct_neg_perfFB:Future_Focus
##                    269.718968                   68.420831

regclass::VIF(PLM4)

##       pct_pos_perfFB       pct_neg_perfFB             neg_perf
##             1.195452             1.244667             1.707695
##            Promotion           Prevention        Present_Focus
##             1.136798             1.629929             1.217049
##         Future_Focus log(Financial_Slack)       log(Employees)
##             1.556941             2.861468             4.935448
##                  Age   Total_Compensation
##             1.272808             4.508843
```

Correlation Matrix

```r
# Select columns of interest
Correlation_Data <- P_CEO_Data %>%
  select(strat_change, Employees, Financial_Slack,Total_Compensation, Age, pc
t_pos_perfFB,  pct_neg_perfFB, pos_perf, neg_perf, Present_Focus,Future_Focus
, Prevention, Promotion)

psych::describe(Correlation_Data)
```

```
##                    vars    n    mean     sd median trimmed    mad    min
## strat_change          1 1134    0.08   0.14   0.05    0.06   0.01   0.02
## Employees             2 6640    5.11  17.52   0.11    0.51   0.15   0.00
## Financial_Slack       3 7362    5.26  13.12   2.76    3.59   2.53   0.00
## Total_Compensation    4 1212 1136.31 828.90 893.51  994.90 572.11 100.00
## Age                   5 1178   55.98   7.34  56.00   55.87   7.41  36.00
## pct_pos_perfFB        6 6617    0.52   2.44   0.00    0.17   0.00   0.00
## pct_neg_perfFB        7 6617   -0.70   3.54  -0.01   -0.21   0.02 -70.34
## pos_perf              8 7372    0.33   0.47   0.00    0.29   0.00   0.00
## neg_perf              9 7372    0.67   0.47   1.00    0.71   0.00   0.00
## Present_Focus        10  365    6.90   1.65   6.66    6.78   1.42   3.49
## Future_Focus         11  365    1.82   0.52   1.82    1.81   0.49   0.49
## Prevention           12  368    0.16   0.20   0.10    0.12   0.10   0.00
## Promotion            13  368    0.48   0.21   0.46    0.46   0.19   0.00
##                       max   range   skew kurtosis    se
## strat_change         3.64    3.62  17.69   413.14  0.00
## Employees          135.70  135.70   4.46    21.05  0.21
## Financial_Slack    812.00  812.00  37.00  2076.74  0.15
## Total_Compensation 6650.10 6550.10   2.09     6.29 23.81
## Age                  86.00   50.00   0.27     0.68  0.21
## pct_pos_perfFB       47.49   47.49  13.45   218.84  0.03
## pct_neg_perfFB        0.00   70.34 -14.32   244.05  0.04
## pos_perf              1.00    1.00   0.71    -1.50  0.01
## neg_perf              1.00    1.00  -0.71    -1.50  0.01
## Present_Focus        14.04   10.55   0.83     1.44  0.09
## Future_Focus          3.42    2.93   0.23     0.14  0.03
## Prevention            1.50    1.50   2.96    11.40  0.01
## Promotion             1.26    1.26   0.76     1.09  0.01
```

```r
library(Hmisc)
Correlation_Matrix <- rcorr(as.matrix(Correlation_Data))
Correlation_Matrix
```

```
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change               1.00     -0.08            0.00              -0.
06
## Employees                 -0.08      1.00           -0.13               0.
60
## Financial_Slack            0.00     -0.13            1.00              -0.
22
## Total_Compensation        -0.06      0.60           -0.22               1.
00
## Age                       -0.03      0.12           -0.11               0.
19
## pct_pos_perfFB             0.00     -0.01            0.00               0.
```

```
04
## pct_neg_perfFB             0.00      0.03            0.01               0.
06
## pos_perf                  -0.14      0.35           -0.08               0.
28
## neg_perf                   0.14     -0.35            0.08              -0.
28
## Present_Focus             -0.03      0.15           -0.17               0.
06
## Future_Focus               0.18     -0.12            0.08               0.
06
## Prevention                 0.10     -0.14            0.19              -0.
01
## Promotion                 -0.08      0.01           -0.06              -0.
17
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       -0.03           0.00           0.00    -0.14     0.14
## Employees           0.12          -0.01           0.03     0.35    -0.35
## Financial_Slack    -0.11           0.00           0.01    -0.08     0.08
## Total_Compensation  0.19           0.04           0.06     0.28    -0.28
## Age                 1.00          -0.02          -0.02     0.16    -0.16
## pct_pos_perfFB     -0.02           1.00           0.04     0.19    -0.19
## pct_neg_perfFB     -0.02           0.04           1.00     0.12    -0.12
## pos_perf            0.16           0.19           0.12     1.00    -1.00
## neg_perf           -0.16          -0.19          -0.12    -1.00     1.00
## Present_Focus       0.22          -0.01          -0.05    -0.07     0.07
## Future_Focus        0.11           0.00          -0.03    -0.17     0.17
## Prevention          0.16          -0.02           0.07    -0.24     0.24
## Promotion           0.03           0.06           0.06     0.17    -0.17
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change               -0.03         0.18       0.10     -0.08
## Employees                   0.15        -0.12      -0.14      0.01
## Financial_Slack            -0.17         0.08       0.19     -0.06
## Total_Compensation          0.06         0.06      -0.01     -0.17
## Age                         0.22         0.11       0.16      0.03
## pct_pos_perfFB             -0.01         0.00      -0.02      0.06
## pct_neg_perfFB             -0.05        -0.03       0.07      0.06
## pos_perf                   -0.07        -0.17      -0.24      0.17
## neg_perf                    0.07         0.17       0.24     -0.17
## Present_Focus               1.00         0.24      -0.07     -0.17
## Future_Focus                0.24         1.00       0.06     -0.03
## Prevention                 -0.07         0.06       1.00     -0.10
## Promotion                  -0.17        -0.03      -0.10      1.00
##
## n
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change               1134      1118            1134                4
07
## Employees                  1118      6640            6608               12
00
## Financial_Slack            1134      6608            7362               12
07
## Total_Compensation          407      1200            1207               12
```

```
12
## Age                          386      1167            1173               11
70
## pct_pos_perfFB              1134      6244            6594               11
97
## pct_neg_perfFB              1134      6244            6594               11
97
## pos_perf                    1134      6617            7338               12
05
## neg_perf                    1134      6617            7338               12
05
## Present_Focus                123       365             365                1
97
## Future_Focus                 123       365             365                1
97
## Prevention                   123       368             368                1
97
## Promotion                    123       368             368                1
97
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change         386           1134           1134     1134     1134
## Employees           1167           6244           6244     6617     6617
## Financial_Slack     1173           6594           6594     7338     7338
## Total_Compensation  1170           1197           1197     1205     1205
## Age                 1178           1163           1163     1171     1171
## pct_pos_perfFB      1163           6617           6617     6617     6617
## pct_neg_perfFB      1163           6617           6617     6617     6617
## pos_perf            1171           6617           6617     7372     7372
## neg_perf            1171           6617           6617     7372     7372
## Present_Focus        198            364            364      365      365
## Future_Focus         198            364            364      365      365
## Prevention           198            366            366      368      368
## Promotion            198            366            366      368      368
##                     Present_Focus Future_Focus Prevention Promotion
## strat_change                  123          123        123       123
## Employees                     365          365        368       368
## Financial_Slack               365          365        368       368
## Total_Compensation            197          197        197       197
## Age                           198          198        198       198
## pct_pos_perfFB                364          364        366       366
## pct_neg_perfFB                364          364        366       366
## pos_perf                      365          365        368       368
## neg_perf                      365          365        368       368
## Present_Focus                 365          365        365       365
## Future_Focus                  365          365        365       365
## Prevention                    365          365        368       368
## Promotion                     365          365        368       368
##
## P
##                     strat_change Employees Financial_Slack Total_Compensati
on
## strat_change                          0.0065         0.8811          0.2557
## Employees           0.0065                           0.0000          0.0000
## Financial_Slack     0.8811       0.0000                              0.0000
```

```
## Total_Compensation 0.2557       0.0000    0.0000
## Age                0.5522       0.0000    0.0000          0.0000
## pct_pos_perfFB     0.8682       0.5580    0.8297          0.1876
## pct_neg_perfFB     0.9577       0.0115    0.3822          0.0535
## pos_perf           0.0000       0.0000    0.0000          0.0000
## neg_perf           0.0000       0.0000    0.0000          0.0000
## Present_Focus      0.7207       0.0044    0.0009          0.3651
## Future_Focus       0.0466       0.0258    0.1059          0.4107
## Prevention         0.2890       0.0059    0.0002          0.9299
## Promotion          0.3814       0.9014    0.2742          0.0153
##                    Age    pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       0.5522 0.8682         0.9577         0.0000   0.0000
## Employees          0.0000 0.5580         0.0115         0.0000   0.0000
## Financial_Slack    0.0000 0.8297         0.3822         0.0000   0.0000
## Total_Compensation 0.0000 0.1876         0.0535         0.0000   0.0000
## Age                       0.5023         0.4259         0.0000   0.0000
## pct_pos_perfFB     0.5023                0.0006         0.0000   0.0000
## pct_neg_perfFB     0.4259 0.0006                        0.0000   0.0000
## pos_perf           0.0000 0.0000         0.0000                  0.0000
## neg_perf           0.0000 0.0000         0.0000         0.0000
## Present_Focus      0.0017 0.8990         0.3558         0.2086   0.2086
## Future_Focus       0.1406 0.9575         0.5598         0.0009   0.0009
## Prevention         0.0288 0.6711         0.1965         0.0000   0.0000
## Promotion          0.6370 0.2916         0.2576         0.0015   0.0015
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change       0.7207        0.0466       0.2890     0.3814
## Employees          0.0044        0.0258       0.0059     0.9014
## Financial_Slack    0.0009        0.1059       0.0002     0.2742
## Total_Compensation 0.3651        0.4107       0.9299     0.0153
## Age                0.0017        0.1406       0.0288     0.6370
## pct_pos_perfFB     0.8990        0.9575       0.6711     0.2916
## pct_neg_perfFB     0.3558        0.5598       0.1965     0.2576
## pos_perf           0.2086        0.0009       0.0000     0.0015
## neg_perf           0.2086        0.0009       0.0000     0.0015
## Present_Focus                    0.0000       0.1619     0.0009
## Future_Focus       0.0000                     0.2878     0.5464
## Prevention         0.1619        0.2878                  0.0457
## Promotion          0.0009        0.5464       0.0457
```

```
#Check 2nd method for correlations and it gives the same results! :D
cor.mat <- Correlation_Data %>% cor_mat()
# Significance levels
cor.mat %>% cor_get_pval()
```

```
## # A tibble: 13 x 14
##    rowname      strat_change Employees Financial_Slack Total_Compensat~
Age
##    <chr>               <dbl>     <dbl>           <dbl>            <dbl>
<dbl>
##  1 strat_change   0          6.46e-  3       8.81e- 1        2.56e-  1 5.
52e- 1
##  2 Employees      0.00646    0               9.04e-26        5.28e-118 7.
12e- 5
##  3 Financial_S~   0.881      9.04e- 26       0               1.13e- 14 8.
```

```
25e- 5
##  4 Total_Compe~   0.256      5.28e-118        1.13e-14        0         1.
08e-10
##  5 Age            0.552      7.12e-  5        8.25e- 5        1.08e- 10 0
##  6 pct_pos_per~   0.868      5.58e-  1        8.3 e- 1        1.88e-  1 5.
02e- 1
##  7 pct_neg_per~   0.958      1.15e-  2        3.82e- 1        5.35e-  2 4.
26e- 1
##  8 pos_perf       0.00000162 7.62e-191        5.47e-11        1.72e- 22 2.
25e- 8
##  9 neg_perf       0.00000162 7.62e-191        5.47e-11        1.72e- 22 2.
25e- 8
## 10 Present_Foc~   0.721      4.42e-  3        9.1 e- 4        3.65e-  1 1.
66e- 3
## 11 Future_Focus   0.0466     2.58e-  2        1.06e- 1        4.11e-  1 1.
41e- 1
## 12 Prevention     0.289      5.93e-  3        2.1 e- 4        9.3 e-  1 2.
88e- 2
## 13 Promotion      0.381      9.01e-  1        2.74e- 1        1.53e-  2 6.
37e- 1
## # ... with 8 more variables: pct_pos_perfFB <dbl>, pct_neg_perfFB <dbl>,
## #   pos_perf <dbl>, neg_perf <dbl>, Present_Focus <dbl>, Future_Focus <dbl
>,
## #   Prevention <dbl>, Promotion <dbl>

# Visualize
# Gather/collapse correlation matrix into long format
cor.mat %>% cor_gather()

## # A tibble: 169 x 4
##    var1               var2             cor          p
##    <chr>              <chr>          <dbl>      <dbl>
##  1 strat_change       strat_change  1      0
##  2 Employees          strat_change -0.081  0.00646
##  3 Financial_Slack    strat_change -0.0044 0.881
##  4 Total_Compensation strat_change -0.056  0.256
##  5 Age                strat_change -0.03   0.552
##  6 pct_pos_perfFB     strat_change -0.0049 0.868
##  7 pct_neg_perfFB     strat_change  0.0016 0.958
##  8 pos_perf           strat_change -0.14   0.00000162
##  9 neg_perf           strat_change  0.14   0.00000162
## 10 Present_Focus      strat_change -0.033  0.721
## # ... with 159 more rows
```

SD analysis:

```
sd(Data_PosPerf$strat_change, na.rm = TRUE)

## [1] 0.1374371

sd(Data_NegPerf$strat_change, na.rm = TRUE)

## [1] 0.1344077

sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1844622
```

```
sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.03923201
```

```
sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1379102
```

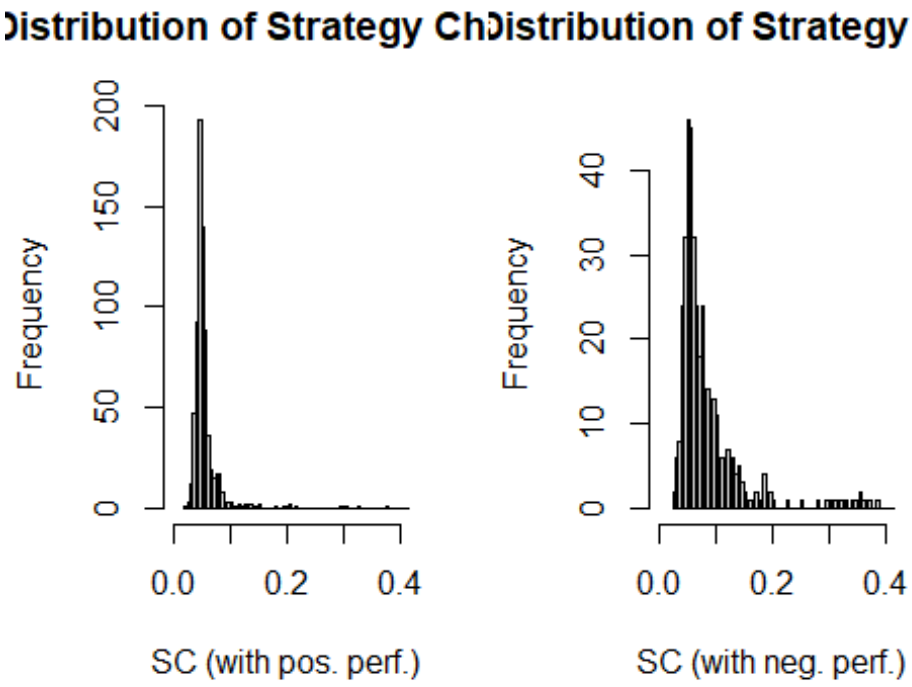
```
sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1324113
```

```
par(mfrow=c(1,2)) # init 2 charts in 1 panel
```

```
hist(Data_PosPerf$strat_change , breaks =(1000), main="Distribution of Strate
gy Change", xlab="SC (with pos. perf.)", xlim = c(0,0.4))
```

```
hist(Data_NegPerf$strat_change , breaks =(500), main="Distribution of Strateg
y Change", xlab="SC (with neg. perf.)", xlim = c(0,0.4))
```




```
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1844622
```

```
sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1379102
```

```
sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.03923201
```

```
sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1324113
```

```
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1844622
```

```
sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.03923201
```

```
sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1379102
```

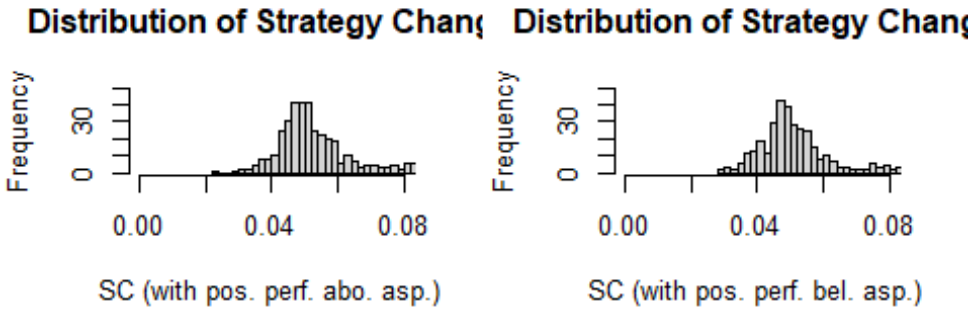
```
sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)
```

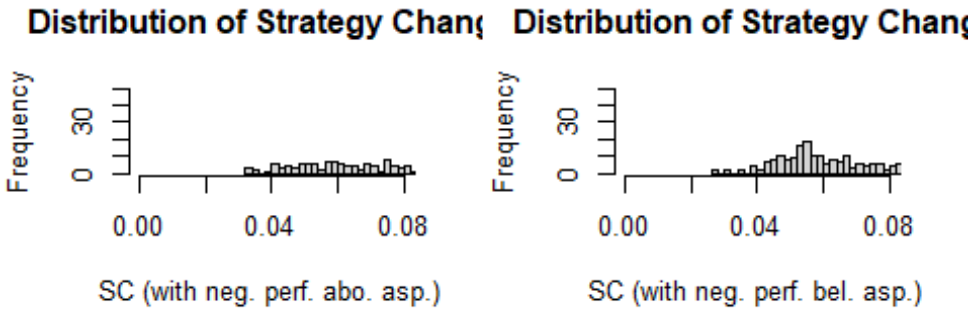
```
## [1] 0.1324113
```

Here again I can see, that neg. perf. there tend to be a bigger strategic change than with a positive performance

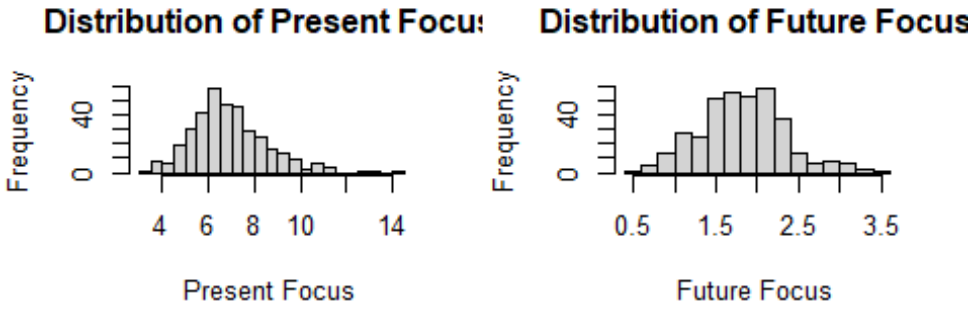
When comparing the implications of the aspiration level, I can see, that companies performing below asp. tend to change their strategy more if compared with companies performing above asp. level. This difference is the highest when the perf. fb. is negative.

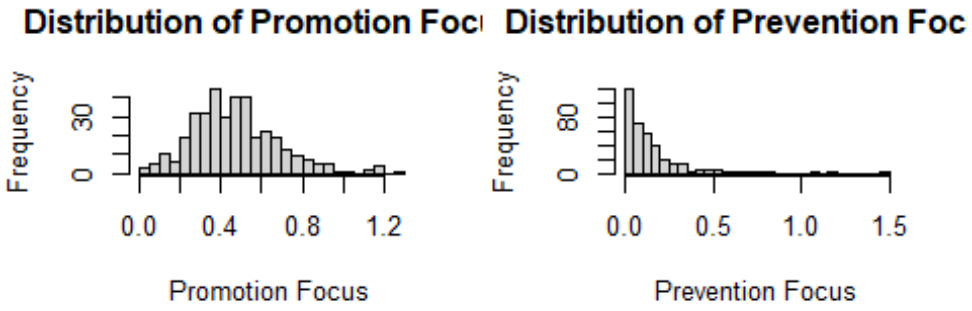
```
par(mfrow=c(2,2)) # init 2 charts in 1 panel

hist(Data_PosPerf_AboAsp$strat_change , breaks =(2000), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,50))

hist(Data_PosPerf_BelAsp$strat_change , breaks =(200), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,50))

hist(Data_NegPerf_AboAsp$strat_change , breaks =(600), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,50))

hist(Data_NegPerf_BelAsp$strat_change , breaks =(1000), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,50))
```






```
par(mfrow=c(2,2)) # init 2 charts in 1 panel

hist(P_CEO_Data$Present_Focus , breaks =(30), main="Distribution of Present F
ocus", xlab="Present Focus")

hist(P_CEO_Data$Future_Focus , breaks =(20), main="Distribution of Future Foc
us", xlab="Future Focus")

hist(P_CEO_Data$Promotion , breaks =(20), main="Distribution of Promotion Foc
us", xlab="Promotion Focus")

hist(P_CEO_Data$Prevention , breaks =(50), main="Distribution of Prevention F
ocus", xlab="Prevention Focus")
```





An analysis of SD´s might be interesting also for the values (changes) of the other SC dimensions

```
sd(Data_PosPerf$pct_adv_intens_diff, na.rm = TRUE)

## [1] 15.08337

sd(Data_NegPerf$pct_adv_intens_diff, na.rm = TRUE)

## [1] 28.45518

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 20.35779

sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 23.91172

sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 1.097935

sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 31.23616

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 20.35779

sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 1.097935

sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 23.91172

sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 31.23616

sd(Data_PosPerf$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.83996

sd(Data_NegPerf$pct_RD_intens_diff, na.rm = TRUE)

## [1] 86.59883

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.648907

sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 9.079246

sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 2.085544

sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 113.0635

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.648907

sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 2.085544

sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 9.079246

sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 113.0635

sd(Data_PosPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 0.4059812

sd(Data_NegPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 2.195989
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.4679371
```

```r
sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 1.11679
```

```r
sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.2884473
```

```r
sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 2.738927
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.4679371
```

```r
sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.2884473
```

```r
sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 1.11679
```

```r
sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 2.738927
```

```r
sd(Data_PosPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 3.281176
```

```r
sd(Data_NegPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 20.50173
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 4.316517
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 31.72392
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.2369319
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.952901
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 4.316517
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.2369319
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 31.72392
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.952901
```

```r
sd(Data_PosPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.605827
```

```r
sd(Data_NegPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 9.999944
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.7084382
```

```r
sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 5.268438
```

```r
sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.4087447
```

```r
sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 12.20013
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.7084382
```

```r
sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.4087447
```

```r
sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 5.268438
```

```r
sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 12.20013
```

```r
sd(Data_PosPerf$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 6.715135
```

```
sd(Data_NegPerf$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 21.68283
```

```
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 5.553035
```

```
sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 20.96586
```

```
sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 8.187118
```

```
sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 22.23035
```

```
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 5.553035
```

```
sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 8.187118
```

```
sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 20.96586
```

```
sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 22.23035
```

7 7. Statistical Models:

Since I have panel data I use the random/fixed model

7.1 7.1 Hypothesis 1: SC Dimensions

```
FLM_PF_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB + pct_neg_perfFB +
Financial_Slack +  log(Employees) + Age + Total_Compensation ,data=P_CEO_Data
, model = "within") # pos_perf is a binary variable -> interaction model
```

```
RLM_PF_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB + pct_neg_perfFB +
Financial_Slack +  log(Employees) + Age + Total_Compensation ,data=P_CEO_Data
, model = "random") # pos_perf is a binary variable -> interaction model vs.
split sample model!
```

```
phtest(FLM_PF_SC, RLM_PF_SC) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB + pct_neg_perfFB + Financi
al_Slack +  ...
## chisq = 19.384, df = 6, p-value = 0.003561
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PF_SC)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB + pct_neg_perfFB +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 46, T = 1-25, N = 352
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.74102723 -0.02076768 -0.00005304  0.01829744  2.78421081
##
## Coefficients:
##                         Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB     -0.001605146  0.002723562 -0.5894 0.556067
## pct_neg_perfFB      0.000304271  0.001902340  0.1599 0.873032
## Financial_Slack    -0.005686034  0.006963471 -0.8166 0.414833
## log(Employees)     -0.072801484  0.027737797 -2.6246 0.009119 **
## Age                -0.000767716  0.002463960 -0.3116 0.755578
## Total_Compensation -0.000020151  0.000015982 -1.2608 0.208343
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.461
## Residual Sum of Squares: 10.113
## R-Squared:      0.033241
## Adj. R-Squared: -0.13111
## F-statistic: 1.71919 on 6 and 300 DF, p-value: 0.11612
```

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PF_SC) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PF_SC
## BP = 6.6268, df = 6, p-value = 0.3567

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Null Hypothesis (H0): Homoscedasticity is present (the residuals are distributed with equal variance) Alternative Hypothesis (HA): Heteroscedasticity is present (the residuals are not distributed with equal variance)

7.2 7.2 Hypothesis 2: Profitability Moderator

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_SC, RLM_SC) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf + pct_neg_perfF
B *  ...
## chisq = 26.212, df = 9, p-value = 0.001886
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf +
##     pct_neg_perfFB * pos_perf + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 46, T = 1-25, N = 352
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.71946705 -0.02489157 -0.00025941  0.02304757  2.71611228
##
## Coefficients:
##                             Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -0.119123615  0.081658908 -1.4588 0.145678
## pos_perf                -0.098003708  0.036713208 -2.6694 0.008016 **
## pct_neg_perfFB           0.001616718  0.001947347  0.8302 0.407084
## Financial_Slack         -0.001500343  0.007102993 -0.2112 0.832855
## log(Employees)          -0.068693869  0.027977125 -2.4554 0.014647 *
## Age                      0.000208707  0.002492972  0.0837 0.933337
## Total_Compensation      -0.000020501  0.000015876 -1.2913 0.197589
## pct_pos_perfFB:pos_perf  0.119469904  0.081619955  1.4637 0.144324
```

```
## pos_perf:pct_neg_perfFB -0.009863381  0.052499985 -0.1879 0.851104
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.461
## Residual Sum of Squares: 9.8582
## R-Squared:      0.057598
## Adj. R-Squared: -0.11375
## F-statistic: 2.01691 on 9 and 297 DF, p-value: 0.037258
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC
## BP = 9.3232, df = 9, p-value = 0.408

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_AI, RLM_AI) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 19.789, df = 9, p-value = 0.01926
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI)

## Oneway (individual) effect Within Model
##
## Call:
```

```
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 54, T = 1-26, N = 435
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -76.5372  -2.0318   0.1976   2.3814 366.4253
##
## Coefficients:
##                             Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -11.0804665   8.8657312 -1.2498  0.21216
## pos_perf                 -9.6734826   3.8132199 -2.5368  0.01159 *
## pct_neg_perfFB            0.1659119   0.2214019  0.7494  0.45411
## Financial_Slack          -0.4029117   0.6852291 -0.5880  0.55689
## log(Employees)           -4.3346921   2.5185096 -1.7211  0.08606 .
## Age                       0.0284748   0.2462040  0.1157  0.90799
## Total_Compensation       -0.0016838   0.0016863 -0.9985  0.31867
## pct_pos_perfFB:pos_perf  11.1367236   8.8622246  1.2567  0.20967
## pos_perf:pct_neg_perfFB   0.9691823   5.4682542  0.1772  0.85942
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173430
## Residual Sum of Squares: 167420
## R-Squared:      0.034621
## Adj. R-Squared: -0.12628
## F-statistic: 1.48234 on 9 and 372 DF, p-value: 0.15247
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI
## BP = 9.8519, df = 9, p-value = 0.3626

#coeftest(FLM_AI,vcov=vcovHC(FLM_AI,type="HC0",cluster="group"))
```

```
FLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
eg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compens
ation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable ->
interaction model vs. split sample model!
```

```
phtest(FLM_RD, RLM_RD) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * pos_perf + pct_neg
_perfFB *  ...
## chisq = 19.736, df = 9, p-value = 0.01961
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 90, T = 1-28, N = 1048
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -3.70453 -0.34794 -0.10654  0.11519 26.28231
##
## Coefficients:
##                             Estimate   Std. Error t-value     Pr(>|t|)
## pct_pos_perfFB           1.364244885  0.356438607  3.8274    0.0001380 ***
## pos_perf                 0.853537807  0.167051877  5.1094 0.0000003906 ***
## pct_neg_perfFB          -0.014322179  0.011723937 -1.2216    0.2221553
## Financial_Slack          0.024126395  0.016726047  1.4424    0.1495070
## log(Employees)           0.112566070  0.094602930  1.1899    0.2343914
## Age                     -0.003098968  0.011376587 -0.2724    0.7853747
## Total_Compensation      -0.000025737  0.000097402 -0.2642    0.7916551
## pct_pos_perfFB:pos_perf -1.374490663  0.356579813 -3.8547    0.0001237 ***
## pos_perf:pct_neg_perfFB  0.430660589  0.298169111  1.4444    0.1489706
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2542.7
## Residual Sum of Squares: 2447.1
## R-Squared:      0.037585
## Adj. R-Squared: -0.0618
## F-statistic: 4.11795 on 9 and 949 DF, p-value: 0.000032448
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD
## BP = 18.457, df = 9, p-value = 0.03022
```

```
coeftest(FLM_RD,vcov=vcovHC(FLM_RD,type="HC0",cluster="group"))
```

```
##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           1.364244885  0.854932216  1.5957  0.11088
## pos_perf                 0.853537807  0.350358357  2.4362  0.01503 *
## pct_neg_perfFB          -0.014322179  0.007184044 -1.9936  0.04648 *
## Financial_Slack          0.024126395  0.022934582  1.0520  0.29308
## log(Employees)           0.112566070  0.159388182  0.7062  0.48021
## Age                     -0.003098968  0.010995007 -0.2819  0.77812
## Total_Compensation      -0.000025737  0.000057083 -0.4509  0.65219
## pct_pos_perfFB:pos_perf -1.374490663  0.854779304 -1.6080  0.10817
## pos_perf:pct_neg_perfFB  0.430660589  0.189418359  2.2736  0.02321 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model
```

```
RLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_PE, RLM_PE) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 9.2327, df = 9, p-value = 0.4161
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(RLM_PE)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
```

```
## Unbalanced Panel: n = 92, T = 1-28, N = 1087
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1086  0.3295     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.022910 -0.093897 -0.025284  0.032298  5.000716
##
## Coefficients:
##                              Estimate   Std. Error z-value    Pr(>|z|)
## (Intercept)              0.057586675  0.081041955  0.7106     0.47735
## pct_pos_perfFB          -0.039108596  0.070787584 -0.5525     0.58062
## pos_perf                 0.056480755  0.028684979  1.9690     0.04895 *
## pct_neg_perfFB           0.000808753  0.002267030  0.3567     0.72128
## Financial_Slack         -0.000700874  0.002990723 -0.2343     0.81471
## log(Employees)          -0.032286083  0.006987880 -4.6203 0.000003832 ***
## Age                     -0.001297103  0.001406429 -0.9223     0.35639
## Total_Compensation       0.000030102  0.000015656  1.9228     0.05451 .
## pct_pos_perfFB:pos_perf  0.038975658  0.070824436  0.5503     0.58210
## pos_perf:pct_neg_perfFB  0.089936236  0.057073570  1.5758     0.11507
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    118.58
## Residual Sum of Squares: 115.38
## R-Squared:      0.027035
## Adj. R-Squared: 0.018904
## Chisq: 29.9254 on 9 DF, p-value: 0.00045172
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_PE)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_PE
## BP = 29.378, df = 9, p-value = 0.0005595

coeftest(RLM_PE,vcov=vcovHC(RLM_PE,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## (Intercept)              0.057586675  0.091238591  0.6312 0.528066
## pct_pos_perfFB          -0.039108596  0.087157506 -0.4487 0.653730
```

```
## pos_perf                 0.056480755  0.038066098  1.4838 0.138167
## pct_neg_perfFB           0.000808753  0.001453618  0.5564 0.578072
## Financial_Slack         -0.000700874  0.003565247 -0.1966 0.844189
## log(Employees)          -0.032286083  0.011314414 -2.8535 0.004406 **
## Age                     -0.001297103  0.001586755 -0.8175 0.413848
## Total_Compensation       0.000030102  0.000012334  2.4407 0.014821 *
## pct_pos_perfFB:pos_perf  0.038975658  0.086803468  0.4490 0.653515
## pos_perf:pct_neg_perfFB  0.089936236  0.039215984  2.2934 0.022019 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# do it if I have heteroscedasticity!!!!

FLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary var
iable -> interaction model

RLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary var
iable -> interaction model vs. split sample model!

phtest(FLM_NPO, RLM_NPO) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * pos_perf +
...
## chisq = 36.529, df = 9, p-value = 0.00003193
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 83, T = 1-26, N = 879
##
## Residuals:
##         Min.      1st Qu.       Median      3rd Qu.         Max.
## -17.22371993  -0.10512475  -0.00027147   0.11603975   4.63715665
##
## Coefficients:
##                            Estimate   Std. Error t-value    Pr(>|t|)
## pct_pos_perfFB           1.049265790  0.214594560  4.8895 0.000001226 ***
## pos_perf                 0.442622157  0.097219110  4.5528 0.000006130 ***
## pct_neg_perfFB          -0.010229629  0.006293274 -1.6255     0.10446
```

```
## Financial_Slack          0.033341894  0.013802388  2.4157     0.01593 *
## log(Employees)           0.173761491  0.058993431  2.9454     0.00332 **
## Age                      0.008697477  0.006437662  1.3510     0.17707
## Total_Compensation      -0.000023568  0.000051680 -0.4560     0.64849
## pct_pos_perfFB:pos_perf -1.046393744  0.214682303 -4.8741 0.000001322 ***
## pos_perf:pct_neg_perfFB -0.015271229  0.154487329 -0.0989     0.92128
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    545.24
## Residual Sum of Squares: 509.88
## R-Squared:      0.064852
## Adj. R-Squared: -0.043278
## F-statistic: 6.06422 on 9 and 787 DF, p-value: 0.000000029206
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO
## BP = 27.546, df = 9, p-value = 0.001135

coeftest(FLM_NPO,vcov=vcovHC(FLM_NPO,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                             Estimate   Std. Error t value  Pr(>|t|)
## pct_pos_perfFB           1.049265790  0.475167216  2.2082 0.0275177 *
## pos_perf                 0.442622157  0.126104950  3.5100 0.0004737 ***
## pct_neg_perfFB          -0.010229629  0.004420383 -2.3142 0.0209137 *
## Financial_Slack          0.033341894  0.014659774  2.2744 0.0232115 *
## log(Employees)           0.173761491  0.080414748  2.1608 0.0310106 *
## Age                      0.008697477  0.005956307  1.4602 0.1446306
## Total_Compensation      -0.000023568  0.000019797 -1.1905 0.2342095
## pct_pos_perfFB:pos_perf -1.046393744  0.472600167 -2.2141 0.0271064 *
## pos_perf:pct_neg_perfFB -0.015271229  0.058707352 -0.2601 0.7948357
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -
> interaction model

RLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!
```

```
phtest(FLM_IL, RLM_IL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 18.006, df = 9, p-value = 0.03511
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_IL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 89, T = 1-27, N = 1011
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -7.206203 -0.200426 -0.037878  0.125823 31.630222
##
## Coefficients:
##                              Estimate   Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB           1.304423759  0.337445326  3.8656 0.0001187 ***
## pos_perf                 0.299818832  0.146914633  2.0408 0.0415610 *
## pct_neg_perfFB          -0.001998012  0.010020969 -0.1994 0.8420074
## Financial_Slack          0.056758184  0.015270199  3.7169 0.0002139 ***
## log(Employees)           0.034568369  0.085702232  0.4034 0.6867820
## Age                      0.006444880  0.009888308  0.6518 0.5147150
## Total_Compensation      -0.000029741  0.000081481 -0.3650 0.7151932
## pct_pos_perfFB:pos_perf -1.303967843  0.337464732 -3.8640 0.0001194 ***
## pos_perf:pct_neg_perfFB  0.020330782  0.247543535  0.0821 0.9345612
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1749.2
## Residual Sum of Squares: 1687.4
## R-Squared:      0.035298
## Adj. R-Squared: -0.067195
## F-statistic: 3.71185 on 9 and 913 DF, p-value: 0.00013706
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_IL)

##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_IL
## BP = 33.546, df = 9, p-value = 0.0001073

coeftest(FLM_IL,vcov=vcovHC(FLM_IL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           1.304423759  1.294219317  1.0079  0.31378
## pos_perf                 0.299818832  0.187026578  1.6031  0.10926
## pct_neg_perfFB          -0.001998012  0.007546073 -0.2648  0.79124
## Financial_Slack          0.056758184  0.027469423  2.0662  0.03909 *
## log(Employees)           0.034568369  0.058272020  0.5932  0.55318
## Age                      0.006444880  0.006711973  0.9602  0.33721
## Total_Compensation      -0.000029741  0.000020745 -1.4336  0.15201
## pct_pos_perfFB:pos_perf -1.303967843  1.292366412 -1.0090  0.31325
## pos_perf:pct_neg_perfFB  0.020330782  0.096715813  0.2102  0.83355
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!

phtest(FLM_FL, RLM_FL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 39.026, df = 9, p-value = 0.00001139
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1085
##
## Residuals:
```

```
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -6.12626 -0.43908 -0.12003  0.16966 19.59957
##
## Coefficients:
##                              Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.471240701  0.338537958  1.3920 0.164241
## pos_perf                 0.186627556  0.157183273  1.1873 0.235386
## pct_neg_perfFB           0.009914820  0.011193348  0.8858 0.375954
## Financial_Slack          0.023741273  0.013060331  1.8178 0.069396 .
## log(Employees)          -0.258702451  0.088607098 -2.9197 0.003584 **
## Age                      0.017352446  0.011420373  1.5194 0.128976
## Total_Compensation      -0.000039500  0.000090929 -0.4344 0.664092
## pct_pos_perfFB:pos_perf -0.491842695  0.338651403 -1.4524 0.146721
## pos_perf:pct_neg_perfFB  0.412701680  0.278727663  1.4807 0.139017
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2374.6
## Residual Sum of Squares: 2313.4
## R-Squared:      0.025757
## Adj. R-Squared: -0.073252
## F-statistic: 2.89054 on 9 and 984 DF, p-value: 0.0022293
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL
## BP = 17.801, df = 9, p-value = 0.03755

coeftest(FLM_FL,vcov=vcovHC(FLM_FL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           0.471240701  0.523141132  0.9008  0.36792
## pos_perf                 0.186627556  0.120336540  1.5509  0.12125
## pct_neg_perfFB           0.009914820  0.009693368  1.0228  0.30663
## Financial_Slack          0.023741273  0.018908914  1.2556  0.20957
## log(Employees)          -0.258702451  0.117217422 -2.2070  0.02754 *
## Age                      0.017352446  0.011293787  1.5365  0.12475
## Total_Compensation      -0.000039500  0.000044044 -0.8968  0.37003
## pct_pos_perfFB:pos_perf -0.491842695  0.522311189 -0.9417  0.34659
## pos_perf:pct_neg_perfFB  0.412701680  0.179384013  2.3007  0.02162 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

7.3 7.3 Hypothesis 4: Temporal Foci Moderators

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data
=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction
model

RLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Total_Compensation,data=P_CEO_
Data, model = "random") # pos_perf is a binary variable -> interaction model
vs. split sample model!

#For Random Model I need to eliminate one CV (Age), since my dataset is not b
ig enough and I would get the error: Error in swar_Between_check(estm[[2L]],
method) : model not estimable: 16 coefficient(s) (incl. intercept) to be esti
mated for the between model but only 13 individual(s)

phtest(FLM_SC3, RLM_SC3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus + pct_neg_
perfFB *  ...
## chisq = 41.567, df = 11, p-value = 0.00001924
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus +
##     pct_neg_perfFB * Present_Focus + pct_pos_perfFB * Future_Focus +
##     pct_neg_perfFB * Future_Focus + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.78420860 -0.09404055  0.00070084  0.10475846  1.46476841
##
## Coefficients:
##                                Estimate  Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB               0.69962594  0.51812320  1.3503 0.1824477
## Present_Focus                0.01230752  0.03988456  0.3086 0.7588079
## pct_neg_perfFB              -0.49967242  0.84864923 -0.5888 0.5584156
## Future_Focus                -0.16815521  0.14271210 -1.1783 0.2437568
```

```
## Financial_Slack               -0.13515031  0.05150761 -2.6239 0.0112293 *
## log(Employees)                -0.68532872  0.19530125 -3.5091 0.0009048 ***
## Age                           -0.00784529  0.01058664 -0.7411 0.4618120
## Total_Compensation            -0.00060477  0.00025110 -2.4085 0.0193986 *
## pct_pos_perfFB:Present_Focus -0.05437149  0.03505766 -1.5509 0.1266575
## Present_Focus:pct_neg_perfFB  0.07616592  0.11596817  0.6568 0.5140594
## pct_pos_perfFB:Future_Focus  -0.18893434  0.16360646 -1.1548 0.2531611
## pct_neg_perfFB:Future_Focus  -0.04678558  0.13665802 -0.3424 0.7333885
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.1973
## R-Squared:      0.49346
## Adj. R-Squared: 0.27242
## F-statistic: 4.46492 on 12 and 55 DF, p-value: 0.000058237
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC3) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC3
## BP = 18.223, df = 12, p-value = 0.1091

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_AI3, RLM_AI3) #H0: I should use the random effect panel model

##
##  Hausman Test
```

```
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 52.085, df = 12, p-value = 0.0000005988
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI3)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##    Min. 1st Qu.  Median 3rd Qu.    Max.
## -92.237 -10.693   0.000  11.751 213.197
##
## Coefficients:
##                                Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                71.555668  54.054591  1.3238 0.1898874
## Present_Focus                  3.423189   4.171975  0.8205 0.4147053
## pct_neg_perfFB               -57.035865  91.583350 -0.6228 0.5354557
## Future_Focus                 -24.060979  13.678708 -1.7590 0.0829459 .
## Financial_Slack              -17.265376   4.944172 -3.4921 0.0008346 ***
## log(Employees)               -75.129179  19.755336 -3.8030 0.0003025 ***
## Age                           -1.756446   1.170086 -1.5011 0.1378206
## Total_Compensation            -0.063988   0.028737 -2.2267 0.0291850 *
## pct_pos_perfFB:Present_Focus  -5.944633   3.623677 -1.6405 0.1053881
## Present_Focus:pct_neg_perfFB   8.505288  11.819946  0.7196 0.4741849
## pct_pos_perfFB:Future_Focus  -17.929685  17.279580 -1.0376 0.3030168
## pct_neg_perfFB:Future_Focus   -1.784650   8.919568 -0.2001 0.8419962
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 97172
## R-Squared:      0.43926
## Adj. R-Squared: 0.23098
## F-statistic: 4.56958 on 12 and 70 DF, p-value: 0.000020858
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI3)
```

```
##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_AI3
## BP = 15.12, df = 12, p-value = 0.2349

#coeftest(FLM_AI3,vcov=vcovHC(FLM_AI3,type="HC0",cluster="group"))

FLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_RD3, RLM_RD3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Present_Focus +  .
..
## chisq = 49.953, df = 12, p-value = 0.000001424
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.818422 -0.134219 -0.021731  0.096335  5.477933
##
## Coefficients:
##                                Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB                0.298229002  0.155687259  1.9156  0.05730 .
## Present_Focus                -0.003988980  0.037530813 -0.1063  0.91550
## pct_neg_perfFB               -0.829909242  0.699259457 -1.1868  0.23714
## Future_Focus                  0.098272739  0.136698046  0.7189  0.47330
## Financial_Slack              -0.045344942  0.031588335 -1.4355  0.15320
## log(Employees)                0.274754068  0.165010068  1.6651  0.09796 .
## Age                          -0.003606003  0.012352041 -0.2919  0.77073
## Total_Compensation            0.000025739  0.000142018  0.1812  0.85642
```

```
## pct_pos_perfFB:Present_Focus -0.035181163  0.015562835 -2.2606  0.02520 *
## Present_Focus:pct_neg_perfFB  0.106125170  0.085435395  1.2422  0.21609
## pct_pos_perfFB:Future_Focus  -0.051287144  0.078505726 -0.6533  0.51456
## pct_neg_perfFB:Future_Focus   0.016806877  0.111921381  0.1502  0.88083
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 50.456
## R-Squared:      0.12008
## Adj. R-Squared: -0.088328
## F-statistic: 1.72851 on 12 and 152 DF, p-value: 0.065741
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD3
## BP = 6.5494, df = 12, p-value = 0.8859

FLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model

RLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> int
eraction model vs. split sample model!

phtest(FLM_PE3, RLM_PE3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 44.426, df = 12, p-value = 0.00001292
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
```

```
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.6210191 -0.0500202 -0.0022013  0.0517803  1.2009827
##
## Coefficients:
##                                   Estimate   Std. Error t-value     Pr(>|t|
)
## pct_pos_perfFB               -0.020955265  0.051676003 -0.4055      0.6856
7
## Present_Focus                 0.017285878  0.012457297  1.3876      0.1672
9
## pct_neg_perfFB               -0.126675663  0.232099494 -0.5458      0.5860
2
## Future_Focus                 -0.098434032  0.045373069 -2.1694      0.0316
0 *
## Financial_Slack              -0.009120197  0.010484859 -0.8698      0.3857
6
## log(Employees)               -0.280113517  0.054770447 -5.1143 0.000000935
5 ***
## Age                           0.001595166  0.004099912  0.3891      0.6977
7
## Total_Compensation           -0.000078886  0.000047139 -1.6735      0.0962
9 .
## pct_pos_perfFB:Present_Focus  0.004275495  0.005165645  0.8277      0.4091
5
## Present_Focus:pct_neg_perfFB  0.027963356  0.028357875  0.9861      0.3256
6
## pct_pos_perfFB:Future_Focus  -0.005114568  0.026057766 -0.1963      0.8446
5
## pct_neg_perfFB:Future_Focus  -0.033086541  0.037149152 -0.8906      0.3745
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.5588
## R-Squared:      0.20596
## Adj. R-Squared: 0.0179
## F-statistic: 3.28554 on 12 and 152 DF, p-value: 0.00030342
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE3)

##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_PE3
## BP = 23.883, df = 12, p-value = 0.0211
```

```
coeftest(FLM_PE3,vcov=vcovHC(FLM_PE3,type="HC0",cluster="group"))
```

```
##
## t test of coefficients:
##
##                                  Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB                -0.020955265  0.016412110 -1.2768 0.203614
## Present_Focus                  0.017285878  0.008795149  1.9654 0.051192 .
## pct_neg_perfFB                -0.126675663  0.108512253 -1.1674 0.244883
## Future_Focus                  -0.098434032  0.062148386 -1.5839 0.115305
## Financial_Slack               -0.009120197  0.012215521 -0.7466 0.456454
## log(Employees)                -0.280113517  0.105331362 -2.6594 0.008668 **
## Age                            0.001595166  0.002370921  0.6728 0.502093
## Total_Compensation            -0.000078886  0.000044443 -1.7750 0.077897 .
## pct_pos_perfFB:Present_Focus   0.004275495  0.002051667  2.0839 0.038842 *
## Present_Focus:pct_neg_perfFB  0.027963356  0.017642026  1.5850 0.115035
## pct_pos_perfFB:Future_Focus   -0.005114568  0.006778566 -0.7545 0.451704
## pct_neg_perfFB:Future_Focus   -0.033086541  0.018530890 -1.7855 0.076177 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# do it if I have heteroscedasticity!!!!
```

```
FLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Presen
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model
```

```
RLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Presen
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_NPO3, RLM_NPO3) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Present_Foc
us +  ...
## chisq = 24.807, df = 12, p-value = 0.01576
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO3)
```

```
## Oneway (individual) effect Within Model
##
## Call:
```

```
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.9100007 -0.0660261 -0.0032265  0.0762048  0.5049370
##
## Coefficients:
##                                  Estimate  Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB                 0.08564588  0.11005355  0.7782    0.43801
## Present_Focus                  0.00301397  0.01317449  0.2288    0.81944
## pct_neg_perfFB                 0.05942404  0.24928113  0.2384    0.81200
## Future_Focus                   0.04751090  0.05252288  0.9046    0.36755
## Financial_Slack                0.00644925  0.01110928  0.5805    0.56267
## log(Employees)                 0.30400724  0.07100179  4.2817 0.00003819 **
*
## Age                            0.00427460  0.00463457  0.9223    0.35826
## Total_Compensation             0.00014568  0.00007542  1.9315    0.05584 .
## pct_pos_perfFB:Present_Focus -0.01527472  0.00886545 -1.7229    0.08754 .
## Present_Focus:pct_neg_perfFB -0.02068893  0.03068346 -0.6743    0.50147
## pct_pos_perfFB:Future_Focus    0.00993483  0.03628494  0.2738    0.78472
## pct_neg_perfFB:Future_Focus    0.07117340  0.05967465  1.1927    0.23540
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.7653
## R-Squared:      0.28258
## Adj. R-Squared: 0.067969
## F-statistic: 3.84039 on 12 and 117 DF, p-value: 0.000060439
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO3
## BP = 20.276, df = 12, p-value = 0.06204

coeftest(FLM_NPO3,vcov=vcovHC(FLM_NPO3,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                  Estimate  Std. Error t value Pr(>|t|)
## pct_pos_perfFB                 0.08564588  0.07861306  1.0895  0.27819
```

```
## Present_Focus                  0.00301397  0.00811264  0.3715  0.71093
## pct_neg_perfFB                 0.05942403  0.15466641  0.3842  0.70152
## Future_Focus                   0.04751090  0.05353073  0.8875  0.37661
## Financial_Slack                0.00644925  0.02347596  0.2747  0.78402
## log(Employees)                 0.30400724  0.16888675  1.8001  0.07443 .
## Age                            0.00427460  0.00309688  1.3803  0.17013
## Total_Compensation             0.00014568  0.00011283  1.2911  0.19921
## pct_pos_perfFB:Present_Focus  -0.01527472  0.00545751 -2.7988  0.00600 **
## Present_Focus:pct_neg_perfFB  -0.02068893  0.02717372 -0.7614  0.44797
## pct_pos_perfFB:Future_Focus    0.00993483  0.02737099  0.3630  0.71728
## pct_neg_perfFB:Future_Focus    0.07117340  0.04746929  1.4994  0.13647
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
```

```
RLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!
```

```
phtest(FLM_IL3, RLM_IL3) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 18.105, df = 12, p-value = 0.1125
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_IL3)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1794  0.4236     1
## individual    0.0000  0.0000     0
```

```
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.151922 -0.151909 -0.025458  0.066686  3.431113
##
## Coefficients:
##                                    Estimate   Std. Error z-value Pr(>|z|)
## (Intercept)                     0.531603043  0.335075342  1.5865 0.112622
## pct_pos_perfFB                  0.192047214  0.108381023  1.7720 0.076401 .
## Present_Focus                   0.019778798  0.021643318  0.9139 0.360794
## pct_neg_perfFB                 -0.049001455  0.456982793 -0.1072 0.914608
## Future_Focus                   -0.060803851  0.069269261 -0.8778 0.380058
## Financial_Slack                 0.004439408  0.016449015  0.2699 0.787246
## log(Employees)                 -0.059368244  0.020485310 -2.8981 0.003754 **
## Age                            -0.009363335  0.005434877 -1.7228 0.084920 .
## Total_Compensation              0.000160383  0.000064124  2.5011 0.012379 *
## pct_pos_perfFB:Present_Focus -0.020860948  0.010798807 -1.9318 0.053386 .
## Present_Focus:pct_neg_perfFB  0.008672029  0.056201917  0.1543 0.877372
## pct_pos_perfFB:Future_Focus  -0.042928946  0.053115395 -0.8082 0.418964
## pct_neg_perfFB:Future_Focus   0.005143603  0.074394697  0.0691 0.944879
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 31.388
## R-Squared:      0.096858
## Adj. R-Squared: 0.03528
## Chisq: 18.8752 on 12 DF, p-value: 0.091586
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL3)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL3
## BP = 6.6535, df = 12, p-value = 0.8796

#coeftest(RLM_IL3,vcov=vcovHC(RLM_IL3,type="HC0",cluster="group"))

FLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model

RLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
```

```
ion ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> in
teraction model vs. split sample model!

phtest(FLM_FL3, RLM_FL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 12.545, df = 12, p-value = 0.403
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_FL3)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 2.9337  1.7128 0.954
## individual    0.1425  0.3774 0.046
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.08493 0.12001 0.16580 0.15101 0.17955 0.17955
##
## Residuals:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -2.602  -0.411  -0.130   0.001   0.149  19.651
##
## Coefficients:
##                                Estimate  Std. Error z-value Pr(>|z|)
## (Intercept)                  -0.39490831  1.49126032 -0.2648 0.791152
## pct_pos_perfFB                0.03679323  0.44657506  0.0824 0.934337
## Present_Focus                -0.10938295  0.09291264 -1.1773 0.239089
## pct_neg_perfFB                0.92916775  1.90321001  0.4882 0.625401
## Future_Focus                  0.33536579  0.30295440  1.1070 0.268301
## Financial_Slack               0.19343533  0.07067068  2.7371 0.006198 **
## log(Employees)                0.06849994  0.09441552  0.7255 0.468136
## Age                           0.00690168  0.02386253  0.2892 0.772408
## Total_Compensation           -0.00028081  0.00028310 -0.9919 0.321242
## pct_pos_perfFB:Present_Focus  0.01463411  0.04451822  0.3287 0.742366
## Present_Focus:pct_neg_perfFB -0.13752809  0.23347884 -0.5890 0.555835
## pct_pos_perfFB:Future_Focus  -0.08994659  0.22041216 -0.4081 0.683212
```

```
## pct_neg_perfFB:Future_Focus   0.06158588  0.30900519  0.1993 0.842025
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    557.52
## Residual Sum of Squares: 519.24
## R-Squared:      0.068675
## Adj. R-Squared: 0.0051759
## Chisq: 12.9588 on 12 DF, p-value: 0.37204
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL3
## BP = 10.725, df = 12, p-value = 0.5527
```

7.4 7.4 Hypothesis 5: Regulatory Foci Moderators

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,da
ta=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interacti
on model
RLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Data, mod
el = "random") # pos_perf is a binary variable -> interaction model vs. split
sample model!

phtest(FLM_SC2, RLM_SC2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Promotion + pct_neg_perf
FB *  ...
## chisq = 74.678, df = 11, p-value = 0.00000000001563
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Promotion +
##     pct_neg_perfFB * Promotion + pct_pos_perfFB * log(Prevention +
```

```
##     1) + pct_neg_perfFB * log(Prevention + 1) + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.930423 -0.072300  0.011952  0.090958  1.536909
##
## Coefficients:
##                                     Estimate  Std. Error t-value Pr(>|t|
)
## pct_pos_perfFB                    -0.37319057  0.25331982 -1.4732 0.14639
8
## Promotion                         -0.33348954  0.31928457 -1.0445 0.30082
8
## pct_neg_perfFB                     0.15724348  0.26731616  0.5882 0.55878
6
## log(Prevention + 1)               -0.21155349  0.71860940 -0.2944 0.76956
6
## Financial_Slack                   -0.14979507  0.06074255 -2.4661 0.01680
7 *
## log(Employees)                    -0.59350512  0.19595836 -3.0287 0.00373
5 **
## Age                               -0.00608306  0.01085067 -0.5606 0.57733
6
## Total_Compensation                -0.00076653  0.00022145 -3.4614 0.00104
7 **
## pct_pos_perfFB:Promotion           0.30835133  0.19748725  1.5614 0.12417
2
## Promotion:pct_neg_perfFB          -0.32917600  0.63273669 -0.5202 0.60498
3
## pct_pos_perfFB:log(Prevention + 1)  1.08807865  0.87309788  1.2462 0.21796
3
## pct_neg_perfFB:log(Prevention + 1)  0.52171829  1.46133687  0.3570 0.72244
7
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.4833
## R-Squared:      0.46558
## Adj. R-Squared: 0.23238
## F-statistic: 3.99295 on 12 and 55 DF, p-value: 0.0001945
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC2) # Breusch-Pagan test
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC2
## BP = 29.247, df = 12, p-value = 0.003621

coeftest(FLM_SC2,vcov=vcovHC(FLM_SC2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                    Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                   -0.37319057  0.32991987 -1.1312  0.2629
0
## Promotion                        -0.33348954  0.21169279 -1.5753  0.1209
1
## pct_neg_perfFB                    0.15724348  0.07749703  2.0290  0.0473
1 *
## log(Prevention + 1)              -0.21155349  0.53528303 -0.3952  0.6942
1
## Financial_Slack                  -0.14979507  0.12134459 -1.2345  0.2222
8
## log(Employees)                   -0.59350512  0.37568675 -1.5798  0.1198
9
## Age                              -0.00608306  0.00734448 -0.8282  0.4111
1
## Total_Compensation               -0.00076653  0.00030432 -2.5188  0.0147
1 *
## pct_pos_perfFB:Promotion          0.30835133  0.26513413  1.1630  0.2498
5
## Promotion:pct_neg_perfFB         -0.32917600  0.16515890 -1.9931  0.0512
2 .
## pct_pos_perfFB:log(Prevention + 1)  1.08807865  1.01527323  1.0717  0.2885
3
## pct_neg_perfFB:log(Prevention + 1)  0.52171829  0.65413271  0.7976  0.4285
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
```

```
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_AI2, RLM_AI2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 54.104, df = 11, p-value = 0.000000113
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -118.02142   -9.56880    0.51997   10.47793  223.32024
##
## Coefficients:
##                                      Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                     -21.944419  20.986872 -1.0456 0.2993311
## Promotion                          -29.336016  32.492931 -0.9028 0.3697056
## pct_neg_perfFB                      13.600909  24.726059  0.5501 0.5840266
## log(Prevention + 1)                 78.197698  69.386729  1.1270 0.2635979
## Financial_Slack                    -16.249050   5.515831 -2.9459 0.0043698
**
## log(Employees)                     -72.026960  20.282545 -3.5512 0.0006908
***
## Age                                 -1.637475   1.186760 -1.3798 0.1720439
## Total_Compensation                  -0.085083   0.024758 -3.4366 0.0009951
***
## pct_pos_perfFB:Promotion            20.058403  16.740725  1.1982 0.2348880
## Promotion:pct_neg_perfFB           -24.570612  45.444120 -0.5407 0.5904463
## pct_pos_perfFB:log(Prevention + 1)  50.835853  73.161782  0.6948 0.4894546
## pct_neg_perfFB:log(Prevention + 1)  24.636095 144.900522  0.1700 0.8654842
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 101760
## R-Squared:      0.41276
```

```
## Adj. R-Squared: 0.19464
## F-statistic: 4.10007 on 12 and 70 DF, p-value: 0.000078676
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI2
## BP = 25.922, df = 12, p-value = 0.01101

coeftest(FLM_AI2,vcov=vcovHC(FLM_AI2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate Std. Error t value Pr(>|t|)
## pct_pos_perfFB                     -21.944419  19.793453 -1.1087  0.27137
## Promotion                          -29.336016  17.265359 -1.6991  0.09374
.
## pct_neg_perfFB                      13.600909  13.582731  1.0013  0.32011
## log(Prevention + 1)                 78.197698  37.259083  2.0988  0.03945
*
## Financial_Slack                    -16.249050  12.129389 -1.3396  0.18469
## log(Employees)                     -72.026960  45.219439 -1.5928  0.11570
## Age                                 -1.637475   1.163403 -1.4075  0.16371
## Total_Compensation                  -0.085083   0.040139 -2.1197  0.03758
*
## pct_pos_perfFB:Promotion            20.058403  16.764089  1.1965  0.23553
## Promotion:pct_neg_perfFB           -24.570612  25.630413 -0.9587  0.34103
## pct_pos_perfFB:log(Prevention + 1)  50.835853  55.898191  0.9094  0.36624
## pct_neg_perfFB:log(Prevention + 1)  24.636095  80.783846  0.3050  0.76130
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!

FLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model
RLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Dat
a, model = "random") # pos_perf is a binary variable -> interaction model vs.
split sample model!

phtest(FLM_RD2, RLM_RD2) #H0: I should use the random effect panel model

##
##  Hausman Test
```

```
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 22.667, df = 11, p-value = 0.01969
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.831207 -0.129732 -0.012912  0.111808  4.750089
##
## Coefficients:
##                                       Estimate    Std. Error t-value Pr(
>|t|)
## pct_pos_perfFB                       0.1313485938  0.0735320019  1.7863  0.
07605
## Promotion                           -0.3185207568  0.2986188352 -1.0666  0.
28782
## pct_neg_perfFB                      -0.3522809863  0.2288298450 -1.5395  0.
12576
## log(Prevention + 1)                 -0.0924351831  0.6650293068 -0.1390  0.
88964
## Financial_Slack                     -0.0295236748  0.0312251767 -0.9455  0.
34590
## log(Employees)                       0.3038001352  0.1674198734  1.8146  0.
07156
## Age                                 -0.0029645166  0.0119106973 -0.2489  0.
80378
## Total_Compensation                  -0.0000013506  0.0001352869 -0.0100  0.
99205
## pct_pos_perfFB:Promotion            -0.1053907686  0.0745976190 -1.4128  0.
15976
## Promotion:pct_neg_perfFB             0.8074722911  0.4177576400  1.9329  0.
05511
## pct_pos_perfFB:log(Prevention + 1) -0.7015122889  0.3445179617 -2.0362  0.
04347
## pct_neg_perfFB:log(Prevention + 1) -3.1619072232  1.2329979004 -2.5644  0.
01130
##
## pct_pos_perfFB                      .
## Promotion
## pct_neg_perfFB
```

```
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      .
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB            .
## pct_pos_perfFB:log(Prevention + 1) *
## pct_neg_perfFB:log(Prevention + 1) *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 47.453
## R-Squared:      0.17244
## Adj. R-Squared: -0.023562
## F-statistic: 2.63936 on 12 and 152 DF, p-value: 0.0031044
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD2
## BP = 69.884, df = 12, p-value = 0.0000000003367

coeftest(FLM_RD2,vcov=vcovHC(FLM_RD2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                       Estimate    Std. Error t value
## pct_pos_perfFB                      0.1313485938  0.0384123035  3.4194
## Promotion                          -0.3185207568  0.2430765753 -1.3104
## pct_neg_perfFB                     -0.3522809863  0.3937158656 -0.8948
## log(Prevention + 1)                -0.0924351831  0.2861171762 -0.3231
## Financial_Slack                    -0.0295236748  0.0112636112 -2.6212
## log(Employees)                      0.3038001352  0.1441646668  2.1073
## Age                                -0.0029645166  0.0052492605 -0.5647
## Total_Compensation                 -0.0000013506  0.0000654814 -0.0206
## pct_pos_perfFB:Promotion           -0.1053907686  0.0331220548 -3.1819
## Promotion:pct_neg_perfFB            0.8074722911  0.9428831588  0.8564
## pct_pos_perfFB:log(Prevention + 1) -0.7015122889  0.1575862015 -4.4516
## pct_neg_perfFB:log(Prevention + 1) -3.1619072232  3.4841082920 -0.9075
##                                       Pr(>|t|)
## pct_pos_perfFB                      0.0008058 ***
## Promotion                           0.1920466
## pct_neg_perfFB                      0.3723304
## log(Prevention + 1)                 0.7470881
## Financial_Slack                     0.0096536 **
## log(Employees)                      0.0367320 *
```

```
## Age                                    0.5730768
## Total_Compensation                     0.9835707
## pct_pos_perfFB:Promotion               0.0017743 **
## Promotion:pct_neg_perfFB               0.3931322
## pct_pos_perfFB:log(Prevention + 1) 0.00001641 ***
## pct_neg_perfFB:log(Prevention + 1)  0.3655670
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_PE2, RLM_PE2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 83.857, df = 11, p-value = 0.0000000000002637
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE2)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.63570074 -0.05720849 -0.00080676  0.05249056  1.18354783
##
## Coefficients:
##                                      Estimate   Std. Error t-value   Pr(
>|t|)
## pct_pos_perfFB                     0.001150330  0.025534867  0.0450    0.
96413
## Promotion                         -0.075506334  0.103698962 -0.7281    0.
46765
## pct_neg_perfFB                     0.053274183  0.079463900  0.6704    0.
```

```
50361
## log(Prevention + 1)                -0.276435833  0.230939380 -1.1970    0.
23317
## Financial_Slack                    -0.007534895  0.010843316 -0.6949    0.
48819
## log(Employees)                     -0.245857204  0.058138553 -4.2288 0.000
04042
## Age                                -0.000289447  0.004136132 -0.0700    0.
94430
## Total_Compensation                 -0.000079396  0.000046980 -1.6900    0.
09308
## pct_pos_perfFB:Promotion           -0.006420726  0.025904915 -0.2479    0.
80458
## Promotion:pct_neg_perfFB           -0.096450501  0.145071336 -0.6648    0.
50715
## pct_pos_perfFB:log(Prevention + 1)  0.010852660  0.119637982  0.0907    0.
92784
## pct_neg_perfFB:log(Prevention + 1)  0.173962642  0.428173266  0.4063    0.
68510
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                     ***
## Age
## Total_Compensation                 .
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.7224
## R-Squared:      0.18259
## Adj. R-Squared: -0.011005
## F-statistic: 2.82947 on 12 and 152 DF, p-value: 0.0015781
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE2
## BP = 22.454, df = 12, p-value = 0.03274

coeftest(FLM_PE2,vcov=vcovHC(FLM_PE2,type="HC0",cluster="group"))
```

```
##
## t test of coefficients:
##
##                                      Estimate   Std. Error t value Pr(>|
t|)
## pct_pos_perfFB                     0.001150330  0.012051502  0.0955  0.92
408
## Promotion                         -0.075506334  0.099948741 -0.7555  0.45
115
## pct_neg_perfFB                     0.053274183  0.038961067  1.3674  0.17
353
## log(Prevention + 1)               -0.276435833  0.315625778 -0.8758  0.38
250
## Financial_Slack                   -0.007534895  0.013013224 -0.5790  0.56
343
## log(Employees)                    -0.245857204  0.106211544 -2.3148  0.02
196 *
## Age                               -0.000289447  0.002684441 -0.1078  0.91
428
## Total_Compensation                -0.000079396  0.000052734 -1.5056  0.13
425
## pct_pos_perfFB:Promotion          -0.006420726  0.008046758 -0.7979  0.42
616
## Promotion:pct_neg_perfFB          -0.096450501  0.070131810 -1.3753  0.17
107
## pct_pos_perfFB:log(Prevention + 1)  0.010852660  0.068538795  0.1583  0.87
440
## pct_neg_perfFB:log(Prevention + 1)  0.173962642  0.205555051  0.8463  0.39
871
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Co
mpensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variabl
e -> interaction model
RLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P
_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction m
odel vs. split sample model!

phtest(FLM_NPO2, RLM_NPO2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Promotion +
...
## chisq = 31.105, df = 11, p-value = 0.00106
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.9678999 -0.0546330 -0.0014635  0.0633909  0.4797168
##
## Coefficients:
##                                    Estimate  Std. Error t-value   Pr(>|
t|)
## pct_pos_perfFB                      0.02437588  0.04363290  0.5587     0.5
775
## Promotion                          -0.01254634  0.11367133 -0.1104     0.9
123
## pct_neg_perfFB                     -0.08659728  0.08857118 -0.9777     0.3
302
## log(Prevention + 1)                -0.08297264  0.25880957 -0.3206     0.7
491
## Financial_Slack                     0.00822656  0.01130524  0.7277     0.4
683
## log(Employees)                      0.29699575  0.07131522  4.1645 0.00005
995
## Age                                 0.00531907  0.00463431  1.1478     0.2
534
## Total_Compensation                  0.00011066  0.00006897  1.6045     0.1
113
## pct_pos_perfFB:Promotion           -0.00533449  0.03865593 -0.1380     0.8
905
## Promotion:pct_neg_perfFB            0.25824515  0.20019755  1.2900     0.1
996
## pct_pos_perfFB:log(Prevention + 1) -0.21447708  0.15534635 -1.3806     0.1
700
## pct_neg_perfFB:log(Prevention + 1) -0.22550115  0.49790103 -0.4529     0.6
515
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                     ***
## Age
## Total_Compensation
```

```
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.7471
## R-Squared:      0.28606
## Adj. R-Squared: 0.072484
## F-statistic: 3.90655 on 12 and 117 DF, p-value: 0.000048165
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO2
## BP = 27.486, df = 12, p-value = 0.006573

coeftest(FLM_NPO2,vcov=vcovHC(FLM_NPO2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                    Estimate  Std. Error t value  Pr(>|t
|)
## pct_pos_perfFB                   0.02437588  0.01429626  1.7051 0.09083
84
## Promotion                       -0.01254634  0.11636793 -0.1078 0.91432
62
## pct_neg_perfFB                  -0.08659728  0.07802367 -1.1099 0.26932
46
## log(Prevention + 1)             -0.08297264  0.18008601 -0.4607 0.64584
11
## Financial_Slack                  0.00822656  0.02480452  0.3317 0.74074
25
## log(Employees)                   0.29699575  0.16080491  1.8469 0.06728
37
## Age                              0.00531907  0.00342529  1.5529 0.12315
27
## Total_Compensation               0.00011066  0.00012020  0.9207 0.35912
60
## pct_pos_perfFB:Promotion        -0.00533449  0.01321394 -0.4037 0.68716
90
## Promotion:pct_neg_perfFB         0.25824515  0.19035679  1.3566 0.17750
83
## pct_pos_perfFB:log(Prevention + 1) -0.21447708  0.05520094 -3.8854 0.00016
98
## pct_neg_perfFB:log(Prevention + 1) -0.22550115  0.24209245 -0.9315 0.35353
```

```
01
##
## pct_pos_perfFB                      .
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      .
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1) ***
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_IL2, RLM_IL2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 15.831, df = 11, p-value = 0.1475
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_IL2)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                   var std.dev share
## idiosyncratic 0.1850  0.4302     1
```

```
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.101590 -0.156081 -0.056457  0.077884  3.340352
##
## Coefficients:
##                                      Estimate   Std. Error z-value Pr(>|
z|)
## (Intercept)                         0.515871500  0.334562983  1.5419  0.12
309
## pct_pos_perfFB                      0.044337079  0.051548796  0.8601  0.38
973
## Promotion                          -0.191800890  0.174763541 -1.0975  0.27
243
## pct_neg_perfFB                      0.155639136  0.150441426  1.0345  0.30
088
## log(Prevention + 1)                -0.151280386  0.362819858 -0.4170  0.67
671
## Financial_Slack                     0.030316489  0.015858806  1.9117  0.05
592 .
## Total_Compensation                  0.000081027  0.000058442  1.3865  0.16
561
## Age                                -0.008124069  0.005580666 -1.4558  0.14
546
## pct_pos_perfFB:Promotion           -0.034781973  0.052517023 -0.6623  0.50
778
## Promotion:pct_neg_perfFB           -0.330653231  0.276675897 -1.1951  0.23
205
## pct_pos_perfFB:log(Prevention + 1) -0.269784240  0.239380622 -1.1270  0.25
974
## pct_neg_perfFB:log(Prevention + 1)  1.134981223  0.830338684  1.3669  0.17
166
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 32.402
## R-Squared:      0.067688
## Adj. R-Squared: 0.0097476
## Chisq: 12.8506 on 11 DF, p-value: 0.3032
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL2)

##
##  studentized Breusch-Pagan test
##
```

```
## data:  RLM_IL2
## BP = 6.8545, df = 11, p-value = 0.8107
```

```
FLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction model
RLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction model vs. split sample model!

phtest(FLM_FL2, RLM_FL2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Promotion +  ..
.
## chisq = 13.493, df = 11, p-value = 0.2623
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_FL2)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                   var std.dev share
## idiosyncratic 2.93109 1.71204 0.991
## individual    0.02762 0.16620 0.009
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.01833 0.02713 0.03989 0.03589 0.04403 0.04403
##
## Residuals:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -2.4773 -0.4768 -0.1327  0.0008  0.1530 20.1258
##
## Coefficients:
##                                      Estimate  Std. Error z-value Pr(>|z|
## )
## (Intercept)                        -0.20724859  1.38679330 -0.1494 0.88120
```

```
3
## pct_pos_perfFB                       -0.11621185  0.21072851 -0.5515 0.58130
7
## Promotion                            -0.27263063  0.71922868 -0.3791 0.70464
4
## pct_neg_perfFB                        0.23029922  0.61658214  0.3735 0.70876
9
## log(Prevention + 1)                  -1.56678771  1.49852737 -1.0456 0.29576
8
## Financial_Slack                       0.17058829  0.06532899  2.6112 0.00902
2 **
## Total_Compensation                   -0.00017293  0.00024299 -0.7117 0.47667
3
## Age                                   0.00754091  0.02306008  0.3270 0.74365
9
## pct_pos_perfFB:Promotion              0.05004050  0.21477695  0.2330 0.81577
1
## Promotion:pct_neg_perfFB             -0.24431458  1.13403972 -0.2154 0.82942
6
## pct_pos_perfFB:log(Prevention + 1)    0.59900633  0.97892729  0.6119 0.54060
3
## pct_neg_perfFB:log(Prevention + 1) -0.25424536  3.40064230 -0.0748 0.94040
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    570.71
## Residual Sum of Squares: 537.23
## R-Squared:      0.058659
## Adj. R-Squared: 0.00015796
## Chisq: 11.0228 on 11 DF, p-value: 0.44136
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_FL2)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_FL2
## BP = 9.9431, df = 11, p-value = 0.5355
```

8 8. Linear Probability Models (Hypothesis 2)

I use the linear probability model for binary variables (and the log-log model for the elasticities of non-binary variables). In this first part I combine all 4 performance possibilities (positive/negative & above/below aspiration) with all 6 possibilities of strategic change (small/big / positive&big / positive & small / negative & small / negative & big). After that I do the same for every single dimension of strategic change (adv_change/rd_change/plant_change/…)

STRATEGIC CHANGE MODELS

Models with binary DV

Linear Probability Model

```
BV_LPM_BSC_PosPerf_AboAsp <- lm(BV_big_strat_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_AboAsp <- lm(BV_small_strat_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5818 -0.5818  0.4182  0.4182  0.6485
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.58182    0.01827  31.854 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.23032    0.03136  -7.344    0.000000000000408 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4884 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.04756,    Adjusted R-squared:  0.04668
## F-statistic: 53.93 on 1 and 1080 DF,  p-value: 0.0000000000004079

summary(BV_LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6485 -0.4182 -0.4182  0.5818  0.5818
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.41818    0.01827  22.895 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.23032    0.03136   7.344    0.000000000000408 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4884 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.04756,    Adjusted R-squared:  0.04668
## F-statistic: 53.93 on 1 and 1080 DF,  p-value: 0.0000000000004079
```

```
BV_LPM_BSC_PosPerf_BelAsp <- lm(BV_big_strat_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_BelAsp <- lm(BV_small_strat_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5631 -0.5631  0.4369  0.4369  0.6532
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.56306    0.01753  32.127 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.21626    0.03345  -6.465       0.000000000153 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.03726,    Adjusted R-squared:  0.03636
## F-statistic: 41.79 on 1 and 1080 DF,  p-value: 0.0000000001533
```

```
summary(BV_LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6532 -0.4369 -0.4369  0.5631  0.5631
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.43694    0.01753  24.931 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.21626    0.03345   6.465       0.000000000153 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.03726,    Adjusted R-squared:  0.03636
## F-statistic: 41.79 on 1 and 1080 DF,  p-value: 0.0000000001533
```

```r
BV_LPM_BSC_NegPerf_AboAsp <- lm(BV_big_strat_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_AboAsp <- lm(BV_small_strat_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7296 -0.4546 -0.4546  0.5454  0.5454
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.45464    0.01595  28.508 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1   0.27492    0.04208   6.533       0.000000000098 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.03719,    Adjusted R-squared:  0.03632
## F-statistic: 42.68 on 1 and 1105 DF,  p-value: 0.00000000009801

summary(BV_LPM_SSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5454 -0.5454  0.4546  0.4546  0.7296
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.54536    0.01595  34.197 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  -0.27492    0.04208  -6.533       0.000000000098 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.03719,    Adjusted R-squared:  0.03632
## F-statistic: 42.68 on 1 and 1105 DF,  p-value: 0.00000000009801

BV_LPM_BSC_NegPerf_BelAsp <- lm(BV_big_strat_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_BelAsp <- lm(BV_small_strat_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7629 -0.4229 -0.4229  0.5771  0.5771
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.42286    0.01626  26.012 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1   0.34007    0.03551   9.577 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4809 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.07664,    Adjusted R-squared:  0.07581
## F-statistic: 91.72 on 1 and 1105 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5771 -0.5771  0.4229  0.4229  0.7629
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.57714    0.01626  35.503 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  -0.34007    0.03551  -9.577 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4809 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.07664,    Adjusted R-squared:  0.07581
## F-statistic: 91.72 on 1 and 1105 DF,  p-value: < 0.00000000000000022

BV_LPM_BAC_PosPerf_AboAsp <- lm(BV_big_adv_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_AboAsp <- lm(BV_small_adv_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5581 -0.5581  0.4419  0.4419  0.6277
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.55810    0.01491  37.422 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.18580    0.02736  -6.791      0.0000000000158 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.493 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02884,    Adjusted R-squared:  0.02821
## F-statistic: 46.12 on 1 and 1553 DF,  p-value: 0.00000000001581

summary(BV_LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6277 -0.4419 -0.4419  0.5581  0.5581
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.44190    0.01491  29.631 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.18580    0.02736   6.791      0.0000000000158 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.493 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02884,    Adjusted R-squared:  0.02821
## F-statistic: 46.12 on 1 and 1553 DF,  p-value: 0.00000000001581

BV_LPM_BAC_PosPerf_BelAsp <- lm(BV_big_adv_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_BelAsp <- lm(BV_small_adv_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -0.5593 -0.5593  0.4407  0.4407  0.6747
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.55932    0.01427  39.196 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.23399    0.02906  -8.052   0.0000000000000016 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.04008,    Adjusted R-squared:  0.03946
## F-statistic: 64.84 on 1 and 1553 DF,  p-value: 0.0000000000000016

summary(BV_LPM_SAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6747 -0.4407 -0.4407  0.5593  0.5593
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.44068    0.01427  30.882 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.23399    0.02906   8.052   0.0000000000000016 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.04008,    Adjusted R-squared:  0.03946
## F-statistic: 64.84 on 1 and 1553 DF,  p-value: 0.0000000000000016

BV_LPM_BAC_NegPerf_AboAsp <- lm(BV_big_adv_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_NegPerf_AboAsp <- lm(BV_small_adv_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6754 -0.4532 -0.4532  0.5468  0.5468
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
```

```
## (Intercept)           0.45322    0.01366  33.183 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  0.22215    0.03308   6.716       0.000000000026 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.02793,    Adjusted R-squared:  0.02731
## F-statistic:  45.1 on 1 and 1570 DF,  p-value: 0.00000000002605
```

```
summary(BV_LPM_SAC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5468 -0.5468  0.4532  0.4532  0.6754
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.54678    0.01366  40.033 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.22215    0.03308  -6.716       0.000000000026 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.02793,    Adjusted R-squared:  0.02731
## F-statistic:  45.1 on 1 and 1570 DF,  p-value: 0.00000000002605
```

```
BV_LPM_BAC_NegPerf_BelAsp <- lm(BV_big_adv_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_NegPerf_BelAsp <- lm(BV_small_adv_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BAC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6718 -0.4309 -0.4309  0.5691  0.5691
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.43087    0.01425  30.241 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  0.24088    0.02850   8.453 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.4892 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.04353,    Adjusted R-squared:  0.04292
## F-statistic: 71.46 on 1 and 1570 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5691 -0.5691  0.4309  0.4309  0.6718
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.56913    0.01425  39.944 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.24088    0.02850  -8.453 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4892 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.04353,    Adjusted R-squared:  0.04292
## F-statistic: 71.46 on 1 and 1570 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_PosPerf_AboAsp <- lm(BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_AboAsp <- lm(BV_small_rd_change ~ BV_PosPerf_AboAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5696 -0.5696  0.4304  0.4304  0.7173
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.569576   0.007978   71.39 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.286849   0.016667  -17.21 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4853 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.05814,    Adjusted R-squared:  0.05794
## F-statistic: 296.2 on 1 and 4799 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7173 -0.4304 -0.4304  0.5696  0.5696
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.430424   0.007978   53.95 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.286849   0.016667   17.21 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4853 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.05814,    Adjusted R-squared:  0.05794
## F-statistic: 296.2 on 1 and 4799 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_PosPerf_BelAsp <- lm(BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_BelAsp <- lm(BV_small_rd_change ~ BV_PosPerf_BelAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5505 -0.5505  0.4495  0.4495  0.7467
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.550531   0.007675   71.73 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.297216   0.019367  -15.35 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.04678,    Adjusted R-squared:  0.04658
## F-statistic: 235.5 on 1 and 4799 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7467 -0.4495 -0.4495  0.5505  0.5505
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.449469   0.007675   58.56 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.297216   0.019367   15.35 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.04678,    Adjusted R-squared:  0.04658
## F-statistic: 235.5 on 1 and 4799 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_NegPerf_AboAsp <- lm(BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_AboAsp <- lm(BV_small_rd_change ~ BV_NegPerf_AboAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6384 -0.4417 -0.4417  0.5583  0.5583
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.441657   0.008273   53.38 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.196771   0.016750   11.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.02858,    Adjusted R-squared:  0.02837
## F-statistic:   138 on 1 and 4691 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5583 -0.5583  0.4417  0.4417  0.6384
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
```

```
## (Intercept)           0.558343   0.008273   67.49 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.196771   0.016750  -11.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.02858,    Adjusted R-squared:  0.02837
## F-statistic:   138 on 1 and 4691 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_BelAsp <- lm(BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_BelAsp <- lm(BV_small_rd_change ~ BV_NegPerf_BelAspT_1, da
ta=P_CEO_Data)
```

```
summary(BV_LPM_BRC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6523 -0.4092 -0.4092  0.5908  0.5908
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.409236   0.008686   47.11 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.243050   0.015100   16.10 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4867 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.05234,    Adjusted R-squared:  0.05214
## F-statistic: 259.1 on 1 and 4691 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5908 -0.5908  0.4092  0.4092  0.6523
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.590764   0.008686   68.01 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.243050   0.015100  -16.10 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4867 on 4691 degrees of freedom
```

```
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.05234,    Adjusted R-squared:  0.05214
## F-statistic: 259.1 on 1 and 4691 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_PosPerf_AboAsp <- lm(BV_big_plant_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_AboAsp <- lm(BV_small_plant_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5689 -0.5689  0.4311  0.4311  0.7380
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.568867   0.007038   80.83 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.306844   0.015628  -19.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.0609, Adjusted R-squared:  0.06074
## F-statistic: 385.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7380 -0.4311 -0.4311  0.5689  0.5689
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.431133   0.007038   61.26 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.306844   0.015628   19.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.0609, Adjusted R-squared:  0.06074
## F-statistic: 385.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_PosPerf_BelAsp <- lm(BV_big_plant_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_BelAsp <- lm(BV_small_plant_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5546 -0.5546  0.4454  0.4454  0.7975
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.55460    0.00677   81.92 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.35213    0.01834  -19.20 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4852 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.05837,    Adjusted R-squared:  0.05821
## F-statistic: 368.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7975 -0.4454 -0.4454  0.5546  0.5546
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.44540    0.00677   65.79 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.35213    0.01834   19.20 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4852 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.05837,    Adjusted R-squared:  0.05821
## F-statistic: 368.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_NegPerf_AboAsp <- lm(BV_big_plant_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_AboAsp <- lm(BV_small_plant_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6419 -0.4352 -0.4352  0.5648  0.5648
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435156   0.007598   57.27 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.206786   0.014857   13.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4916 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.03305,    Adjusted R-squared:  0.03288
## F-statistic: 193.7 on 1 and 5668 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5648 -0.5648  0.4352  0.4352  0.6419
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564844   0.007598   74.34 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.206786   0.014857  -13.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4916 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.03305,    Adjusted R-squared:  0.03288
## F-statistic: 193.7 on 1 and 5668 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_NegPerf_BelAsp <- lm(BV_big_plant_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_BelAsp <- lm(BV_small_plant_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6476 -0.4037 -0.4037  0.5963  0.5963
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.403695   0.008014   50.37 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.243867   0.013531   18.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4862 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.0542, Adjusted R-squared:  0.05403
## F-statistic: 324.8 on 1 and 5668 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5963 -0.5963  0.4037  0.4037  0.6476
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.596305   0.008014   74.41 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.243867   0.013531  -18.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4862 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.0542, Adjusted R-squared:  0.05403
## F-statistic: 324.8 on 1 and 5668 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_PosPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_AboAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5759 -0.5759  0.4240  0.4240  0.6584
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.57595    0.01046   55.06 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.23439    0.01883  -12.45 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.04688,    Adjusted R-squared:  0.04658
## F-statistic: 154.9 on 1 and 3149 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6584 -0.4240 -0.4240  0.5759  0.5759
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.42405    0.01046   40.54 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.23439    0.01883   12.45 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.04688,    Adjusted R-squared:  0.04658
## F-statistic: 154.9 on 1 and 3149 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_PosPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_BelAspT
_1, data=P_CEO_Data)
```

```
summary(BV_LPM_BNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5642 -0.5642  0.4358  0.4358  0.7064
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564186   0.009852   57.27 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.270569   0.020829  -12.99 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4873 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.05086,    Adjusted R-squared:  0.05056
## F-statistic: 168.7 on 1 and 3149 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7064 -0.4358 -0.4358  0.5642  0.5642
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435814   0.009852   44.23 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.270569   0.020829   12.99 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4873 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.05086,    Adjusted R-squared:  0.05056
## F-statistic: 168.7 on 1 and 3149 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_NegPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_AboAspT
_1, data=P_CEO_Data)
```

```
summary(BV_LPM_BNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7320 -0.4406 -0.4406  0.5594  0.5594
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.440581   0.009537   46.20 <0.0000000000000002 ***
```

```
## BV_NegPerf_AboAspT_1 0.291397   0.023041   12.65 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4879 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.04824,    Adjusted R-squared:  0.04793
## F-statistic: 159.9 on 1 and 3156 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5594 -0.5594  0.4406  0.4406  0.7320
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.559419   0.009537   58.66 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.291397   0.023041  -12.65 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4879 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.04824,    Adjusted R-squared:  0.04793
## F-statistic: 159.9 on 1 and 3156 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_NegPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_BelAspT
_1, data=P_CEO_Data)
```

```
summary(BV_LPM_BNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6956 -0.4215 -0.4215  0.5785  0.5785
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.421498   0.009992   42.19 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.274099   0.019914   13.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.4857 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.05663,    Adjusted R-squared:  0.05633
## F-statistic: 189.4 on 1 and 3156 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5785 -0.5785  0.4215  0.4215  0.6956
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.578502   0.009992   57.90 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.274099   0.019914  -13.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4857 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.05663,    Adjusted R-squared:  0.05633
## F-statistic: 189.4 on 1 and 3156 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_PosPerf_AboAsp <- lm(BV_big_invent_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_AboAsp <- lm(BV_small_invent_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5641 -0.5641  0.4359  0.4359  0.6488
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564076   0.009184   61.42 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.212890   0.017199  -12.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4908 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03695,    Adjusted R-squared:  0.03671
## F-statistic: 153.2 on 1 and 3993 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6488 -0.4359 -0.4359  0.5641  0.5641
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435924   0.009184   47.47 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.212890   0.017199   12.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4908 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03695,    Adjusted R-squared:  0.03671
## F-statistic: 153.2 on 1 and 3993 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_PosPerf_BelAsp <- lm(BV_big_invent_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_BelAsp <- lm(BV_small_invent_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5536 -0.5536  0.4464  0.4464  0.6952
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.553639   0.008679   63.79 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.248806   0.019310  -12.88 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.49 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03992,    Adjusted R-squared:  0.03968
## F-statistic:   166 on 1 and 3993 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_PosPerf_BelAsp)

##
## Call:
```

```
## lm(formula = BV_small_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6952 -0.4464 -0.4464  0.5536  0.5536
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.446361   0.008679   51.43 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.248806   0.019310   12.88 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.49 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03992,    Adjusted R-squared:  0.03968
## F-statistic:   166 on 1 and 3993 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_NegPerf_AboAsp <- lm(BV_big_invent_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_AboAsp <- lm(BV_small_invent_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -0.710 -0.443 -0.443  0.557  0.557
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.443030   0.008614   51.43 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.266983   0.019621   13.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4889 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.04437,    Adjusted R-squared:  0.04413
## F-statistic: 185.1 on 1 and 3988 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
```

```
##    Min     1Q Median     3Q    Max
## -0.557 -0.557  0.443  0.443  0.710
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.556970   0.008614   64.66 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.266983   0.019621  -13.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4889 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.04437,    Adjusted R-squared:  0.04413
## F-statistic: 185.1 on 1 and 3988 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_NegPerf_BelAsp <- lm(BV_big_invent_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_BelAsp <- lm(BV_small_invent_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6414 -0.4379 -0.4379  0.5622  0.5622
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.437847   0.009162   47.79 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.203594   0.017371   11.72 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4917 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.0333, Adjusted R-squared:  0.03306
## F-statistic: 137.4 on 1 and 3988 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5622 -0.5622  0.4379  0.4379  0.6414
##
## Coefficients:
```

```
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.562153   0.009162   61.35 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.203594   0.017371  -11.72 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4917 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.0333, Adjusted R-squared:  0.03306
## F-statistic: 137.4 on 1 and 3988 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_PosPerf_AboAsp <- lm(BV_big_fin_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_AboAsp <- lm(BV_small_fin_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5420 -0.5420 -0.3175  0.4580  0.6825
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.542022   0.006848   79.15 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.224498   0.015543  -14.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4921 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03154,    Adjusted R-squared:  0.03139
## F-statistic: 208.6 on 1 and 6406 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6825 -0.4580  0.3175  0.5420  0.5420
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.457978   0.006848   66.88 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.224498   0.015543   14.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.4921 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03154,    Adjusted R-squared:  0.03139
## F-statistic: 208.6 on 1 and 6406 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_PosPerf_BelAsp <- lm(BV_big_fin_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_BelAsp <- lm(BV_small_fin_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5362 -0.5362 -0.2393  0.4638  0.7607
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.536206   0.006555   81.81 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.296942   0.018379  -16.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03915,    Adjusted R-squared:  0.039
## F-statistic:   261 on 1 and 6406 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7607 -0.4638  0.2393  0.5362  0.5362
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.463794   0.006555   70.76 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.296942   0.018379   16.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03915,    Adjusted R-squared:  0.039
## F-statistic:   261 on 1 and 6406 DF,  p-value: < 0.00000000000000022
```

```r
BV_LPM_BFC_NegPerf_AboAsp <- lm(BV_big_fin_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_AboAsp <- lm(BV_small_fin_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6016 -0.4397 -0.4397  0.5603  0.5603
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.439720   0.007439   59.11 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.161881   0.014352   11.28 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4946 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02062,    Adjusted R-squared:  0.02046
## F-statistic: 127.2 on 1 and 6043 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5603 -0.5603  0.4397  0.4397  0.6016
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.560280   0.007439   75.32 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.161881   0.014352  -11.28 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4946 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02062,    Adjusted R-squared:  0.02046
## F-statistic: 127.2 on 1 and 6043 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_NegPerf_BelAsp <- lm(BV_big_fin_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_BelAsp <- lm(BV_small_fin_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5776 -0.4300 -0.4300  0.5699  0.5699
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.430049   0.007956   54.05 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.147545   0.013255   11.13 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4948 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02009,    Adjusted R-squared:  0.01993
## F-statistic: 123.9 on 1 and 6043 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5699 -0.5699  0.4300  0.4300  0.5776
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.569951   0.007956   71.64 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.147545   0.013255  -11.13 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4948 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02009,    Adjusted R-squared:  0.01993
## F-statistic: 123.9 on 1 and 6043 DF,  p-value: < 0.00000000000000022
```

9 9. Log-Log Models

the variables are absolute (only positive) and standardized values!

Log-Log Model with elasticities of continuous DV and IVs:

```
LPM_BSC_PosPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05242 -0.05242  0.00016  0.02029  1.48284
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.052421   0.003036  17.267 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.104428   0.035810  -2.916              0.003
62
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08781 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.007813,   Adjusted R-squared:  0.006894
## F-statistic: 8.504 on 1 and 1080 DF,  p-value: 0.003617

summary(LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05296 -0.02067 -0.02067  0.02290  0.03170
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0206685  0.0007809  26.469 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0403922  0.0092108   4.385            0.00001
27
##
## (Intercept)                 ***
```

```
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02259 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.01749,    Adjusted R-squared:  0.01659
## F-statistic: 19.23 on 1 and 1080 DF,  p-value: 0.00001271
```

```
LPM_BSC_PosPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05347 -0.05347 -0.00091  0.01971  1.48179
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.053466   0.002936  18.212 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.217867   0.051603  -4.222            0.00002
63
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08744 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.01624,    Adjusted R-squared:  0.01533
## F-statistic: 17.82 on 1 and 1080 DF,  p-value: 0.00002626
```

```
summary(LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04383 -0.02072 -0.02072  0.02334  0.03168
##
## Coefficients:
```

```
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0207173  0.0007566  27.382 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0655176  0.0132992   4.926          0.0000009
68
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02253 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.02198,    Adjusted R-squared:  0.02107
## F-statistic: 24.27 on 1 and 1080 DF,  p-value: 0.0000009684
```

```
LPM_BSC_NegPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.13363 -0.04224 -0.04224  0.01982  1.49302
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.042235   0.002632  16.045 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.069004   0.014695  -4.696             0.0000
03
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08413 on 1088 degrees of freedom
##   (6737 observations deleted due to missingness)
## Multiple R-squared:  0.01986,    Adjusted R-squared:  0.01896
## F-statistic: 22.05 on 1 and 1088 DF,  p-value: 0.000002996
```

```
summary(LPM_SSC_NegPerf_AboAsp)
```

```
##
## Call:
```

```
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.024076 -0.024076  0.009076  0.022319  0.045717
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0240764  0.0007049  34.158 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0211532  0.0039349   5.376         0.00000009
32
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02253 on 1088 degrees of freedom
##   (6737 observations deleted due to missingness)
## Multiple R-squared:  0.02587,    Adjusted R-squared:  0.02498
## F-statistic:  28.9 on 1 and 1088 DF,  p-value: 0.00000009324

LPM_BSC_NegPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.12068 -0.04091 -0.04091  0.01910  1.47520
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.040915   0.002659  15.387 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.046643   0.007849  -5.943        0.000000003
78
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.08435 on 1078 degrees of freedom
##   (6747 observations deleted due to missingness)
## Multiple R-squared:  0.03172,    Adjusted R-squared:  0.03082
## F-statistic: 35.32 on 1 and 1078 DF,  p-value: 0.000000003777

summary(LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02454 -0.02454  0.01025  0.02182  0.04963
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0245414  0.0007047  34.824 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0140307  0.0020802   6.745      0.00000000002
49
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02236 on 1078 degrees of freedom
##   (6747 observations deleted due to missingness)
## Multiple R-squared:  0.04049,    Adjusted R-squared:  0.0396
## F-statistic: 45.49 on 1 and 1078 DF,  p-value: 0.00000000002492

P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BAC_PosPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0637 -0.0637 -0.0338  0.0226  3.3059
##
## Coefficients:
##                              Estimate Std. Error t value           Pr(>|t|
```

```
)
## (Intercept)                 0.063664   0.004963  12.827 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.091522   0.064810  -1.412               0.15
8
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1755 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.001282,   Adjusted R-squared:  0.0006394
## F-statistic: 1.994 on 1 and 1553 DF,  p-value: 0.1581

summary(LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04394 -0.02568 -0.02497  0.03345  0.04379
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0256832  0.0008216  31.258 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0228283  0.0107293   2.128              0.033
5 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02905 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.002906,   Adjusted R-squared:  0.002264
## F-statistic: 4.527 on 1 and 1553 DF,  p-value: 0.03352

LPM_BAC_PosPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0658 -0.0658 -0.0028  0.0218  3.3033
##
```

```
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.065833   0.004842  13.597 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.251355   0.091813  -2.738              0.006
26
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1752 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.004803,   Adjusted R-squared:  0.004162
## F-statistic: 7.495 on 1 and 1553 DF,  p-value: 0.006258
```

```
summary(LPM_SAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04809 -0.02509 -0.02347  0.03263  0.04424
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0250894  0.0007994  31.385 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0652110  0.0151586   4.302              0.0000
18
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02892 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.01178,    Adjusted R-squared:  0.01114
## F-statistic: 18.51 on 1 and 1553 DF,  p-value: 0.00001799
```

```
LPM_BAC_NegPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_NegPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1218 -0.0574 -0.0574  0.0226  3.3118
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.057364   0.004636  12.373 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) -0.025172   0.021195  -1.188               0.23
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1751 on 1534 degrees of freedom
##   (6291 observations deleted due to missingness)
## Multiple R-squared:  0.0009186,  Adjusted R-squared:  0.0002673
## F-statistic:  1.41 on 1 and 1534 DF,  p-value: 0.2352

summary(LPM_SAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02778 -0.02778 -0.01632  0.03304  0.05926
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0277816  0.0007713  36.019 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0120754  0.0035262   3.424             0.0006
32
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02912 on 1534 degrees of freedom
##   (6291 observations deleted due to missingness)
## Multiple R-squared:  0.007587,   Adjusted R-squared:  0.00694
## F-statistic: 11.73 on 1 and 1534 DF,  p-value: 0.0006322
```

```
LPM_BAC_NegPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_NegPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0872 -0.0561 -0.0561  0.0230  3.3131
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.056088   0.004642   12.08 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.016604   0.011372   -1.46               0.14
4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1731 on 1508 degrees of freedom
##   (6317 observations deleted due to missingness)
## Multiple R-squared:  0.001412,   Adjusted R-squared:  0.0007495
## F-statistic: 2.132 on 1 and 1508 DF,  p-value: 0.1445

summary(LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02845 -0.02845 -0.01169  0.03274  0.05381
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0284461  0.0007747  36.720 < 0.000000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0116969  0.0018980   6.163       0.0000000009
15
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.02889 on 1508 degrees of freedom
##   (6317 observations deleted due to missingness)
## Multiple R-squared:  0.02457,    Adjusted R-squared:  0.02392
## F-statistic: 37.98 on 1 and 1508 DF,  p-value: 0.0000000009149
```

```
LPM_BRDC_PosPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0293 -0.0293  0.0057  0.0109  3.9658
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.029325   0.001643  17.848 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.009987   0.019337  -0.516               0.60
6
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1074 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  5.558e-05,  Adjusted R-squared:  -0.0001528
## F-statistic: 0.2667 on 1 and 4799 DF,  p-value: 0.6056
```

```
summary(LPM_SRDC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04206 -0.01290 -0.01290  0.01694  0.02202
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0129011  0.0002268  56.871 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0213117  0.0026698   7.983  0.000000000000001
78
```

```
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01483 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.0131, Adjusted R-squared:  0.0129
## F-statistic: 63.72 on 1 and 4799 DF,  p-value: 0.000000000000001778
```

```
LPM_BRDC_PosPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0306 -0.0306  0.0044  0.0106  3.9645
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.030581   0.001624  18.832 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.111066   0.035363  -3.141              0.001
7 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1073 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.002051,   Adjusted R-squared:  0.001843
## F-statistic: 9.864 on 1 and 4799 DF,  p-value: 0.001695
```

```
summary(LPM_SRDC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04672 -0.01278 -0.01278  0.01646  0.02214
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
```

```
)
## (Intercept)                0.0127808  0.0002233   57.25 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0521115  0.0048617   10.72 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01475 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.02338,    Adjusted R-squared:  0.02318
## F-statistic: 114.9 on 1 and 4799 DF,  p-value: < 0.00000000000000022

LPM_BRDC_NegPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1261 -0.0256 -0.0256  0.0122  3.9695
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.025618   0.001660  15.433 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.023169   0.004825  -4.802           0.000001
62
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1071 on 4587 degrees of freedom
##   (3238 observations deleted due to missingness)
## Multiple R-squared:  0.005002,   Adjusted R-squared:  0.004785
## F-statistic: 23.06 on 1 and 4587 DF,  p-value: 0.000001621

summary(LPM_SRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
```

```
##       Min        1Q    Median        3Q       Max
## -0.014562 -0.014562 -0.007874  0.017053  0.034281
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0145624  0.0002313  62.959 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) 0.0059082  0.0006723   8.788 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01492 on 4587 degrees of freedom
##   (3238 observations deleted due to missingness)
## Multiple R-squared:  0.01656,    Adjusted R-squared:  0.01634
## F-statistic: 77.23 on 1 and 4587 DF,  p-value: < 0.00000000000000022

LPM_BRDC_NegPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0460 -0.0260 -0.0260  0.0122  3.9684
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.026023   0.001679   15.49 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.003273   0.003209   -1.02               0.30
8
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1043 on 4385 degrees of freedom
##   (3440 observations deleted due to missingness)
## Multiple R-squared:  0.0002372,  Adjusted R-squared:  9.169e-06
## F-statistic:  1.04 on 1 and 4385 DF,  p-value: 0.3078

summary(LPM_SRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
```

```
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015123 -0.015123 -0.006443  0.016799  0.035766
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0151231  0.0002408  62.799 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0042434  0.0004602   9.221 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01496 on 4385 degrees of freedom
##   (3440 observations deleted due to missingness)
## Multiple R-squared:  0.01902,    Adjusted R-squared:  0.0188
## F-statistic: 85.03 on 1 and 4385 DF,  p-value: < 0.00000000000000022
```

```
LPM_BPC_PosPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1138 -0.1138 -0.0266  0.0370  3.9210
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.113758   0.002906  39.147 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.074849   0.032308  -2.317              0.020
6 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2146 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.000902,   Adjusted R-squared:  0.000734
## F-statistic: 5.367 on 1 and 5945 DF,  p-value: 0.02055
```

```
summary(LPM_SPC_PosPerf_AboAsp)
```

```
##
## Call:
```

```
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.07076 -0.02494 -0.02494  0.02994  0.06119
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0249442  0.0004116  60.607 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0224811  0.0045758   4.913          0.0000009
21
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03039 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.004044,   Adjusted R-squared:  0.003876
## F-statistic: 24.14 on 1 and 5945 DF,  p-value: 0.0000009207

LPM_BPC_PosPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1181 -0.1181 -0.0290  0.0366  3.9033
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.118142   0.002886  40.939 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.530788   0.068074  -7.797  0.000000000000007
42
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.2136 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.01012,    Adjusted R-squared:  0.009957
## F-statistic:  60.8 on 1 and 5945 DF,  p-value: 0.000000000000007422

summary(LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.14706 -0.02441 -0.02441  0.02884  0.06173
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0244109  0.0004082   59.80 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0936979  0.0096295    9.73 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03021 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.01568,    Adjusted R-squared:  0.01551
## F-statistic: 94.68 on 1 and 5945 DF,  p-value: < 0.00000000000000022

LPM_BPC_NegPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SPC_NegPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3385 -0.0960 -0.0960  0.0379  3.9255
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.095956   0.002916   32.91 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) -0.069637   0.007585   -9.18 <0.000000000000000
2 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2052 on 5512 degrees of freedom
##   (2313 observations deleted due to missingness)
## Multiple R-squared:  0.01506,    Adjusted R-squared:  0.01488
## F-statistic: 84.28 on 1 and 5512 DF,  p-value: < 0.00000000000000022

summary(LPM_SPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02833 -0.02833 -0.01508  0.02935  0.07582
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0283293  0.0004316   65.63 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) 0.0114885  0.0011229   10.23 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03037 on 5512 degrees of freedom
##   (2313 observations deleted due to missingness)
## Multiple R-squared:  0.01864,    Adjusted R-squared:  0.01846
## F-statistic: 104.7 on 1 and 5512 DF,  p-value: < 0.00000000000000022

LPM_BPC_NegPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_NegPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3213 -0.0907 -0.0907  0.0349  3.9308
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.090658   0.002953  30.705 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.037552   0.005277  -7.116     0.000000000001
```

```
27
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1993 on 5198 degrees of freedom
##   (2627 observations deleted due to missingness)
## Multiple R-squared:  0.009647,   Adjusted R-squared:  0.009456
## F-statistic: 50.63 on 1 and 5198 DF,  p-value: 0.000000000001266

summary(LPM_SPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02968 -0.02968 -0.01240  0.02903  0.08803
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                0.0296781  0.0004496   66.01 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0095352  0.0008037   11.87 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03035 on 5198 degrees of freedom
##   (2627 observations deleted due to missingness)
## Multiple R-squared:  0.02637,    Adjusted R-squared:  0.02618
## F-statistic: 140.8 on 1 and 5198 DF,  p-value: < 0.00000000000000022

LPM_BNPC_PosPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0485 -0.0485 -0.0077  0.0077  3.9133
##
## Coefficients:
```

```
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.048485   0.003003  16.143 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.118381   0.037371  -3.168              0.001
55
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1515 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.003176,   Adjusted R-squared:  0.00286
## F-statistic: 10.03 on 1 and 3149 DF,  p-value: 0.001551
```

```
summary(LPM_SNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02557 -0.01523 -0.01420  0.01986  0.02638
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0152337  0.0003435  44.350 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0113768  0.0042738   2.662              0.007
81
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01733 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.002245,   Adjusted R-squared:  0.001928
## F-statistic: 7.086 on 1 and 3149 DF,  p-value: 0.007808
```

```
LPM_BNPC_PosPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BNPC_PosPerf_BelAsp)
```

```
##
## Call:
```

```
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0478 -0.0478 -0.0102  0.0077  3.9140
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.047785   0.002927  16.328 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.181142   0.058950  -3.073              0.002
14
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1515 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.002989,   Adjusted R-squared:  0.002673
## F-statistic: 9.442 on 1 and 3149 DF,  p-value: 0.002139

summary(LPM_SNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02396 -0.01519 -0.01408  0.01986  0.02643
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0151861  0.0003344  45.414 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0233987  0.0067358   3.474              0.000
52
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01732 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.003817,   Adjusted R-squared:  0.003501
## F-statistic: 12.07 on 1 and 3149 DF,  p-value: 0.0005201
```

```
LPM_BNPC_NegPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.22556 -0.03650 -0.03650  0.01147  2.36529
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.036497   0.002213  16.492 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.042220   0.009200  -4.589           0.000004
63
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1194 on 3095 degrees of freedom
##   (4730 observations deleted due to missingness)
## Multiple R-squared:  0.006759,   Adjusted R-squared:  0.006438
## F-statistic: 21.06 on 1 and 3095 DF,  p-value: 0.000004628

summary(LPM_SNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01617 -0.01617 -0.01114  0.01990  0.03312
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0161688  0.0003223  50.174 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0048865  0.0013397   3.647             0.0002
69
##
## (Intercept)                 ***
```

```
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01739 on 3095 degrees of freedom
##   (4730 observations deleted due to missingness)
## Multiple R-squared:  0.00428,    Adjusted R-squared:  0.003958
## F-statistic:  13.3 on 1 and 3095 DF,  p-value: 0.0002693
```

```
LPM_BNPC_NegPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.13182 -0.03332 -0.03332  0.01421  2.34439
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.033325   0.001901  17.533 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.022073   0.005085  -4.341            0.00001
47
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1004 on 3018 degrees of freedom
##   (4807 observations deleted due to missingness)
## Multiple R-squared:  0.006205,   Adjusted R-squared:  0.005875
## F-statistic: 18.84 on 1 and 3018 DF,  p-value: 0.00001467
```

```
summary(LPM_SNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01641 -0.01641 -0.01060  0.01970  0.03469
##
## Coefficients:
```

```
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0164141  0.0003305  49.667 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0028632  0.0008842   3.238              0.001
22
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01745 on 3018 degrees of freedom
##   (4807 observations deleted due to missingness)
## Multiple R-squared:  0.003462,   Adjusted R-squared:  0.003132
## F-statistic: 10.49 on 1 and 3018 DF,  p-value: 0.001216
```

```
LPM_BIC_PosPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_AboAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0854 -0.0854 -0.0086  0.0295  3.8143
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.085442   0.003178   26.89 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.129010   0.033600   -3.84              0.0001
25
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1882 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.003678,   Adjusted R-squared:  0.003429
## F-statistic: 14.74 on 1 and 3993 DF,  p-value: 0.0001252
```

```
summary(LPM_SIC_PosPerf_AboAsp)
```

```
##
## Call:
```

```
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.11614 -0.02378 -0.02378  0.02952  0.05251
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0237769  0.0004812  49.412 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0262654  0.0050880   5.162          0.0000002
56
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0285 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.00663,    Adjusted R-squared:  0.006381
## F-statistic: 26.65 on 1 and 3993 DF,  p-value: 0.0000002559

LPM_BIC_PosPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_BelAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0875 -0.0875 -0.0101  0.0305  3.8065
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.087512   0.003195   27.39 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.365626   0.067702   -5.40          0.00000007
03
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.1879 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.007251,   Adjusted R-squared:  0.007003
## F-statistic: 29.17 on 1 and 3993 DF,  p-value: 0.00000007033

summary(LPM_SIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04473 -0.02361 -0.02361  0.02959  0.05264
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0236077  0.0004842  48.752 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0598811  0.0102610   5.836        0.000000005
78
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02847 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.008457,   Adjusted R-squared:  0.008209
## F-statistic: 34.06 on 1 and 3993 DF,  p-value: 0.000000005778

LPM_BIC_NegPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)
LPM_SIC_NegPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4387 -0.0667 -0.0667  0.0320  3.8274
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.066663   0.002892   23.05 <0.000000000000000
2 ***
```

```
## log(NegPerf_AboAspT_1 + 1) -0.124173   0.010862  -11.43 <0.000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1745 on 3914 degrees of freedom
##   (3911 observations deleted due to missingness)
## Multiple R-squared:  0.03231,    Adjusted R-squared:  0.03206
## F-statistic: 130.7 on 1 and 3914 DF,  p-value: < 0.00000000000000022
```

```
summary(LPM_SIC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02635 -0.02635 -0.01516  0.02997  0.07280
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t|)
## (Intercept)                 0.0263446  0.0004737  55.614 < 0.00000000000002
## log(NegPerf_AboAspT_1 + 1) 0.0129503  0.0017792   7.279    0.0000000000405
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02858 on 3914 degrees of freedom
##   (3911 observations deleted due to missingness)
## Multiple R-squared:  0.01336,    Adjusted R-squared:  0.0131
## F-statistic: 52.98 on 1 and 3914 DF,  p-value: 0.0000000000004046
```

```
LPM_BIC_NegPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_BelAspT_1+1), data=P_CEO_Data)
LPM_SIC_NegPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_BelAspT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1832 -0.0692 -0.0692  0.0329  3.8249
##
```

```
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.069179   0.002855  24.230 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.025904   0.006422  -4.034             0.0000
56
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1683 on 3810 degrees of freedom
##   (4015 observations deleted due to missingness)
## Multiple R-squared:  0.004252,   Adjusted R-squared:  0.003991
## F-statistic: 16.27 on 1 and 3810 DF,  p-value: 0.00005597
```

```
summary(LPM_SIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02703 -0.02703 -0.01424  0.02980  0.06973
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                0.0270288  0.0004865  55.563 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0085105  0.0010941   7.778  0.000000000000009
39
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02868 on 3810 degrees of freedom
##   (4015 observations deleted due to missingness)
## Multiple R-squared:  0.01563,    Adjusted R-squared:  0.01537
## F-statistic:  60.5 on 1 and 3810 DF,  p-value: 0.000000000000009389
```

```
psych::describe(P_CEO_Data$NegPerf_AboAsp)
```

```
##    vars    n  mean   sd median trimmed mad    min max range   skew kurtosi
s
## X1    1 6806 -0.28 2.16      0   -0.05   0 -93.09   0 93.09 -23.83   750.1
3
##      se
## X1 0.03
```

```r
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BFC_PosPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0721 -0.0721 -0.0470 -0.0132  3.6881
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.072078   0.002618  27.528 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.025759   0.013989  -1.841              0.065
6 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2068 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.000529,   Adjusted R-squared:  0.000373
## F-statistic: 3.391 on 1 and 6406 DF,  p-value: 0.06561

summary(LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.006462 -0.005180 -0.005180  0.004360  0.019755
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.00517962 0.00009003  57.530 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.00021474 0.00048100   0.446              0.6
55
##
## (Intercept)                 ***
```

```
## log(PosPerf_AboAspT_1 + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007112 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  3.111e-05,  Adjusted R-squared:  -0.000125
## F-statistic: 0.1993 on 1 and 6406 DF,  p-value: 0.6553
```

```
LPM_BFC_PosPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0747 -0.0747 -0.0463 -0.0133  3.6855
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.074665   0.002681  27.849 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.302275   0.065387  -4.623           0.000003
86
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2065 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.003325,   Adjusted R-squared:  0.003169
## F-statistic: 21.37 on 1 and 6406 DF,  p-value: 0.000003859
```

```
summary(LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.023676 -0.005027 -0.005027  0.004254  0.019907
##
## Coefficients:
```

```
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.00502734 0.00009203  54.628 < 0.0000000000000
002
## log(PosPerf_BelAspT_1 + 1) 0.01424670 0.00224447   6.347       0.000000000
234
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007089 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.00625,    Adjusted R-squared:  0.006095
## F-statistic: 40.29 on 1 and 6406 DF,  p-value: 0.0000000002339
```

```
LPM_BFC_NegPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_NegPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3892 -0.0613 -0.0613 -0.0121  3.6988
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|t|
)
## (Intercept)                 0.061347   0.002858  21.463 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) -0.060271   0.007208  -8.362 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2069 on 5812 degrees of freedom
##   (2013 observations deleted due to missingness)
## Multiple R-squared:  0.01189,    Adjusted R-squared:  0.01172
## F-statistic: 69.92 on 1 and 5812 DF,  p-value: < 0.00000000000000022
```

```
summary(LPM_SFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
```

```
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.005587 -0.005587 -0.004049  0.004435  0.021384
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.00558713 0.00009872  56.596 < 0.0000000000000
002
## log(NegPerf_AboAspT_1 + 1) 0.00151437 0.00024894   6.083        0.00000000
125
##
## (Intercept)                    ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007145 on 5812 degrees of freedom
##   (2013 observations deleted due to missingness)
## Multiple R-squared:  0.006327,   Adjusted R-squared:  0.006156
## F-statistic: 37.01 on 1 and 5812 DF,  p-value: 0.000000001253
```

```
LPM_BFC_NegPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_NegPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1636 -0.0606 -0.0606 -0.0121  3.6738
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.060630   0.002770  21.888 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.022279   0.004847  -4.596            0.00000
44
##
## (Intercept)                    ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1914 on 5445 degrees of freedom
##   (2380 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.003865,   Adjusted R-squared:  0.003682
## F-statistic: 21.13 on 1 and 5445 DF,  p-value: 0.0000044

summary(LPM_SFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.005707 -0.005707 -0.004162  0.004722  0.020942
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0057068  0.0001041  54.839 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0007075  0.0001821   3.885             0.0001
04
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.00719 on 5445 degrees of freedom
##   (2380 observations deleted due to missingness)
## Multiple R-squared:  0.002764,   Adjusted R-squared:  0.002581
## F-statistic: 15.09 on 1 and 5445 DF,  p-value: 0.0001035
```

9.1 9.1 Additional Analysis for SC Elasticisties

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_SC_PF <- lm(log(strat_change+1) ~ log(PosPerf_AboAspT_1+1) + log(PosPerf_
BelAspT_1+1) + log(NegPerf_AboAspT_1+1) + log(NegPerf_BelAspT_1+1), data=P_CE
O_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_SC_PF)

##
## Call:
## lm(formula = log(strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1) + log(PosPerf_BelAspT_1 + 1) + log(NegPerf_AboAspT_1 +
##     1) + log(NegPerf_BelAspT_1 + 1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.09423 -0.01852 -0.01198 -0.00329  1.45694
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
```

```
|)
## (Intercept)                 0.064686   0.003610  17.917 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.016834   0.033604  -0.501             0.6165
11
## log(PosPerf_BelAspT_1 + 1) -0.081506   0.048164  -1.692             0.0909
08
## log(NegPerf_AboAspT_1 + 1) -0.050129   0.013610  -3.683             0.0002
43
## log(NegPerf_BelAspT_1 + 1) -0.033206   0.007266  -4.570           0.000005
49
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1)
## log(PosPerf_BelAspT_1 + 1) .
## log(NegPerf_AboAspT_1 + 1) ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07472 on 1006 degrees of freedom
##   (6816 observations deleted due to missingness)
## Multiple R-squared:  0.04138,    Adjusted R-squared:  0.03757
## F-statistic: 10.86 on 4 and 1006 DF,  p-value: 0.0000000128
```

1010 Robustness Checks

10.1 10.1 ROS

1. Loading & Merging Datasets

```
Pharma_TempF_Data <- read_xlsx("data/Compustat_TempFoc_V2.xlsx")

Execucomp <- read_xlsx("data/Execucomp_SIC_2000_3999.xlsx")

colnames(Pharma_TempF_Data) <- c("Company_ID",  "Data_Date",    "Fiscal_Year"
,  "Industry Format",  "Level of Consolidation - Company Annual Descriptor",
"Population Source",    "Data Format",  "Ticker Symbol",    "CUSIP",    "Comp
any Name", "ISO_Currency_Code",    "Current Assets - Total",   "Acquisitions"
, "Assets_Total", "Equity_Total", "Cash", "Long-Term Debt - Total",   "Divide
nds Common/Ordinary",    "Dividends - Preferred/Preference", "Dividends - Tot
al",    "EBIT", "Earnings Before Interest", "Employees",    "Inventories_Tota
l",    "Current Liabilities - Total",  "Liabilities and Stockholders Equity -
Total",  "Liabilities_Total",    "Net_Income",   "PPE_Total_Gross",  "Propert
y, Plant, and Equipment - Buildings (Net)", "PPE_Total_Net",    "Retained Ear
nings",    "Revenue - Total",  "SalesTurnover",    "Stockholders Equity - Par
ent", "Stockholders Equity - Total",  "Interest Expense - Total (Financial Se
rvices)",    "Deferred Taxes (Balance Sheet)",   "Income Taxes - Deferred",
"Income Taxes Paid",    "Income Taxes - Total", "Working Capital (Balance She
et)",  "Advertising_Expense",  "Interest and Related Expense - Total", "RD_Ex
pense",   "Research & Development - Prior",   "SGA_Expense",  "Active/Inactiv
```

```
e Status Marker",    "Market_Value_Total_Fiscal",    "Company Legal Name",
"North American Industry Classification Code",  "Standard_Industry_Classifica
tion_Code", "Prevention", "Promotion", "Company Initial Public Offering Date"
, "Past_Focus", "Present_Focus", "Future_Focus")

names(Execucomp)[names(Execucomp) == 'Fiscal Year'] <- 'Fiscal_Year'
names(Execucomp)[names(Execucomp) == 'Company ID Number'] <- 'Company_ID'
names(Execucomp)[names(Execucomp) == 'Total Current Compensation (Salary + Bo
nus)'] <- 'Total_Compensation'
names(Execucomp)[names(Execucomp) == "Executive's Age"] <- 'Age'
names(Execucomp)[names(Execucomp) == "Annual CEO Flag"] <- 'Job'
names(Execucomp)[names(Execucomp) == "Company Name"] <- 'C_Name'

# Removing companies listed in CAD
Pharma_TempF_Data<- Pharma_TempF_Data[Pharma_TempF_Data$ISO_Currency_Code ==
"USD", ]

# Removing all non-CEO executives
Execucomp$"CEO" <- ifelse(Execucomp$Job == "CEO", 1, 0)
Execucomp<- Execucomp[Execucomp$"CEO" == 1, ]

table(is.na(Pharma_TempF_Data$"Fiscal_Year")) # Eliminate 10 NA´s in the Fisc
al Years

##
## FALSE  TRUE
##  7827    10

Pharma_TempF_Data <- Pharma_TempF_Data %>% drop_na(Fiscal_Year)

str(Execucomp$Company_ID)

##  chr [1:20468] "001013" "001013" "001013" "001013" "001013" "001013" ...

str(Execucomp$Fiscal_Year)

##  num [1:20468] 1993 1994 1995 1996 1997 ...

str(Pharma_TempF_Data$Company_ID)

##  chr [1:7827] "148293" "148293" "148293" "148293" "148293" "148293" ...

str(Pharma_TempF_Data$Fiscal_Year)

##  num [1:7827] 2000 2001 2002 2003 2004 ...
```

Merge Datasets Together:

```
# merge two data frames by ID and Year
CEO_Data <- left_join(Pharma_TempF_Data, Execucomp,by=c("Company_ID","Fiscal_
Year")) %>%
  group_by(Company_ID, Fiscal_Year) %>% #to avoid duplicates
  filter(rank(Company_ID, ties.method = "first") == 1) #to avoid duplicates

P_CEO_Data <- pdata.frame(CEO_Data, index=c("Company_ID", "Fiscal_Year")) #Cr
eate Panel Data
```

2. Creating Strategic Change Variables

STRATEGIC CHANGE:

```
P_CEO_Data$"adv_intens" <- as.numeric(P_CEO_Data$Advertising_Expense / P_CEO_
Data$SalesTurnover)
P_CEO_Data$"RD_intens" <- as.numeric(P_CEO_Data$RD_Expense / P_CEO_Data$Sales
Turnover)
P_CEO_Data$"plant_equip" <- as.numeric(P_CEO_Data$PPE_Total_Net / P_CEO_Data$
PPE_Total_Gross)
P_CEO_Data$"nonprod_overhead" <- as.numeric(P_CEO_Data$SGA_Expense / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"invent_lev" <- as.numeric(P_CEO_Data$Inventories_Total / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"fin_leverage" <- as.numeric(P_CEO_Data$Liabilities_Total / P_CEO_
Data$Equity_Total)

P_CEO_Data$"adv_intens_diff" <- as.numeric(P_CEO_Data$adv_intens - plm::lag(P
_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"RD_intens_diff" <- as.numeric(P_CEO_Data$RD_intens - plm::lag(P_C
EO_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"plant_equip_diff" <- as.numeric(P_CEO_Data$plant_equip - plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"nonprod_overhead_diff" <- as.numeric(P_CEO_Data$nonprod_overhead
- plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL
))
P_CEO_Data$"invent_lev_diff" <- as.numeric(P_CEO_Data$invent_lev - plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"fin_leverage_diff" <- as.numeric(P_CEO_Data$fin_leverage - plm::l
ag(P_CEO_Data$fin_leverage , order_by = NULL))

P_CEO_Data$"pct_adv_intens_diff" <- as.numeric((P_CEO_Data$adv_intens - plm::
lag(P_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_
CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_RD_intens_diff" <- as.numeric((P_CEO_Data$RD_intens - plm::la
g(P_CEO_Data$RD_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_CEO
_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_plant_equip_diff" <- as.numeric((P_CEO_Data$plant_equip - plm
::lag(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))/plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_nonprod_overhead_diff" <- as.numeric((P_CEO_Data$nonprod_over
head - plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by =
NULL))/lead(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NUL
L))
P_CEO_Data$"pct_invent_lev_diff" <- as.numeric((P_CEO_Data$invent_lev - plm::
lag(P_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))/plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_fin_leverage_diff" <- as.numeric((P_CEO_Data$fin_leverage - p
lm::lag(P_CEO_Data$fin_leverage , order_by = NULL))/plm::lag(P_CEO_Data$fin_l
everage , order_by = NULL))
```

Replace Inf. and NAN values:

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA
```

Standardizing -> I standardize the absolute values (mean=0, standard deviation=1)

```
P_CEO_Data$"stand_adv" <- (P_CEO_Data$pct_adv_intens_diff - mean(na.omit(P_CE
O_Data$pct_adv_intens_diff))) / sd(na.omit(P_CEO_Data$pct_adv_intens_diff))
P_CEO_Data$"stand_RD" <- (P_CEO_Data$pct_RD_intens_diff - mean(na.omit(P_CEO_
Data$pct_RD_intens_diff))) / sd(na.omit(P_CEO_Data$pct_RD_intens_diff))
P_CEO_Data$"stand_plant" <- (P_CEO_Data$pct_plant_equip_diff - mean(na.omit(P
_CEO_Data$pct_plant_equip_diff))) / sd(na.omit(P_CEO_Data$pct_plant_equip_dif
f))
P_CEO_Data$"stand_nonprod" <- (P_CEO_Data$pct_nonprod_overhead_diff - mean(na
.omit(P_CEO_Data$pct_nonprod_overhead_diff))) / sd(na.omit(P_CEO_Data$pct_non
prod_overhead_diff))
P_CEO_Data$"stand_invent" <- (P_CEO_Data$pct_invent_lev_diff - mean(na.omit(P
_CEO_Data$pct_invent_lev_diff))) / sd(na.omit(P_CEO_Data$pct_invent_lev_diff)
)
P_CEO_Data$"stand_fin" <- (P_CEO_Data$pct_fin_leverage_diff - mean(na.omit(P_
CEO_Data$pct_fin_leverage_diff))) / sd(na.omit(P_CEO_Data$pct_fin_leverage_di
ff))
```

Check MEAN & SD

```
mean(P_CEO_Data$stand_adv,na.rm=TRUE)

## [1] 0.00000000000000002594323

mean(P_CEO_Data$stand_RD,na.rm=TRUE)

## [1] 0.00000000000000002487215

mean(P_CEO_Data$stand_plant,na.rm=TRUE)

## [1] -0.00000000000000004218672

mean(P_CEO_Data$stand_nonprod,na.rm=TRUE)

## [1] 0.00000000000000007887655

mean(P_CEO_Data$stand_invent,na.rm=TRUE)

## [1] -0.00000000000000002756174

mean(P_CEO_Data$stand_fin,na.rm=TRUE)

## [1] 0.00000000000000002571993

sd(na.omit(P_CEO_Data$stand_adv))

## [1] 1

sd(na.omit(P_CEO_Data$stand_RD))

## [1] 1

sd(na.omit(P_CEO_Data$stand_plant))
```

```
## [1] 1

sd(na.omit(P_CEO_Data$stand_nonprod))

## [1] 1

sd(na.omit(P_CEO_Data$stand_invent))

## [1] 1

sd(na.omit(P_CEO_Data$stand_fin))

## [1] 1
```

Check nr. of NA´s

```
table(is.na(P_CEO_Data$"stand_adv"))

##
## FALSE  TRUE
##  1629  6198

table(is.na(P_CEO_Data$"stand_RD"))

##
## FALSE  TRUE
##  4942  2885

table(is.na(P_CEO_Data$"stand_plant"))

##
## FALSE  TRUE
##  6144  1683

table(is.na(P_CEO_Data$"stand_nonprod"))

##
## FALSE  TRUE
##  3296  4531

table(is.na(P_CEO_Data$"stand_invent"))

##
## FALSE  TRUE
##  4160  3667

table(is.na(P_CEO_Data$"stand_fin"))

##
## FALSE  TRUE
##  6646  1181
```

Standardized Advertising has a lot of NA´s! Since there are too many missing observations, I will create a robustness check, where I omit “stand_adv” in developing the strategic change variable. (-> see “robustness check”)

To create the SC variable I need the absolute values

```
P_CEO_Data$"abs_stand_adv" <- abs(P_CEO_Data$stand_adv)
P_CEO_Data$"abs_stand_RD" <- abs(P_CEO_Data$stand_RD)
P_CEO_Data$"abs_stand_plant" <- abs(P_CEO_Data$stand_plant)
P_CEO_Data$"abs_stand_nonprod" <- abs(P_CEO_Data$stand_nonprod)
P_CEO_Data$"abs_stand_invent" <- abs(P_CEO_Data$stand_invent)
P_CEO_Data$"abs_stand_fin" <- abs(P_CEO_Data$stand_fin)
```

Now I can finally create the Strategic change variable:

```
P_CEO_Data$strat_change <- (P_CEO_Data$"abs_stand_adv" + P_CEO_Data$"abs_stan
d_RD" + P_CEO_Data$"abs_stand_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO
_Data$"abs_stand_invent" + P_CEO_Data$"abs_stand_fin") / 6

P_CEO_Data$strat_change2 <- (P_CEO_Data$"abs_stand_RD" + P_CEO_Data$"abs_stan
d_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO_Data$"abs_stand_invent" + P
_CEO_Data$"abs_stand_fin") / 5 #robustness check
```

I compare both strat_change variables and see, that omitting the “stand_adv” variable saves me from a lot additional NA´s (-> but I still have 17K observations)

```
table(is.na(P_CEO_Data$"strat_change"))

##
## FALSE  TRUE
##  1134  6693

table(is.na(P_CEO_Data$"strat_change2")) #for robustness check

##
## FALSE  TRUE
##  2665  5162
```

Assumption check for normal distribution of the data:

I perform the Shapiro-Wilk normality test to check whether the dependent variables follow a normal distribution or not.

H0: he dependent variable follows the normal distribution H1: the dependent variable does not follow a normal distribution If the p value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution.

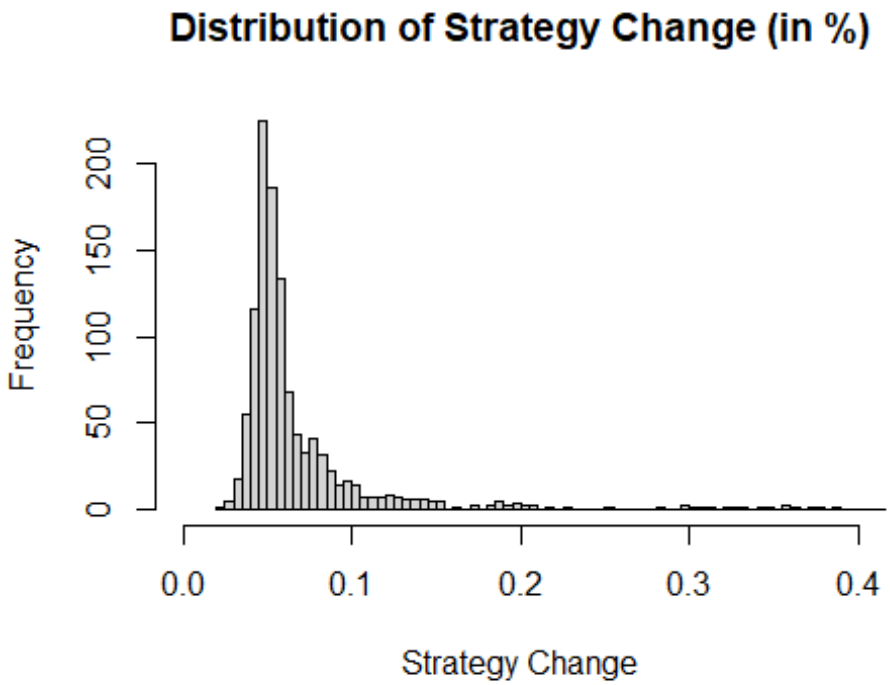
```
#saphiroSC <- shapiro.test(P_CEO_Data$strat_change)
#saphiroSC # see result of strat_change test

#saphiroAI <- shapiro.test(P_CEO_Data$adv_intens)
#saphiroAI # see result of performance test

#saphiroRD <- shapiro.test(P_CEO_Data$RD_intens)
#saphiroRD # see result of performance test

#saphiroPE <- shapiro.test(P_CEO_Data$plant_equip)
#saphiroPE # see result of performance test

#saphiroNPO <- shapiro.test(P_CEO_Data$nonprod_overhead)
#saphiroNPO # see result of performance test
```

```
#saphiroIL <- shapiro.test(P_CEO_Data$invent_lev)
#saphiroIL # see result of performance test

#saphiroFL <- shapiro.test(P_CEO_Data$fin_leverage)
#saphiroFL # see result of performance test
```

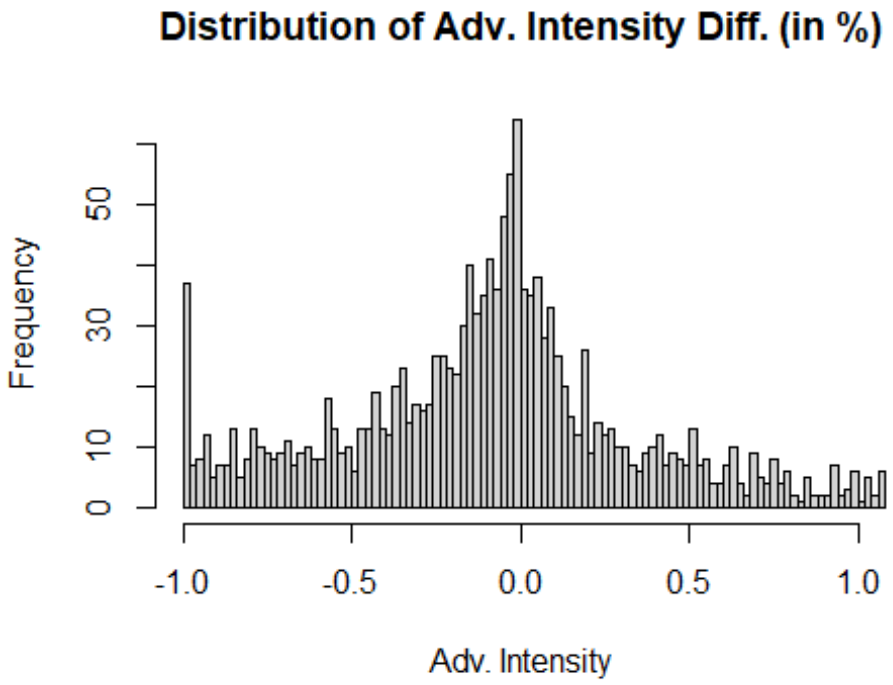
cannot do it because I have too many observations -> max. 5000 observations

In the Histogram below, it can be observed that the variables do not always follow a normal distribution, but almost every time it approaches a normal distribution. In

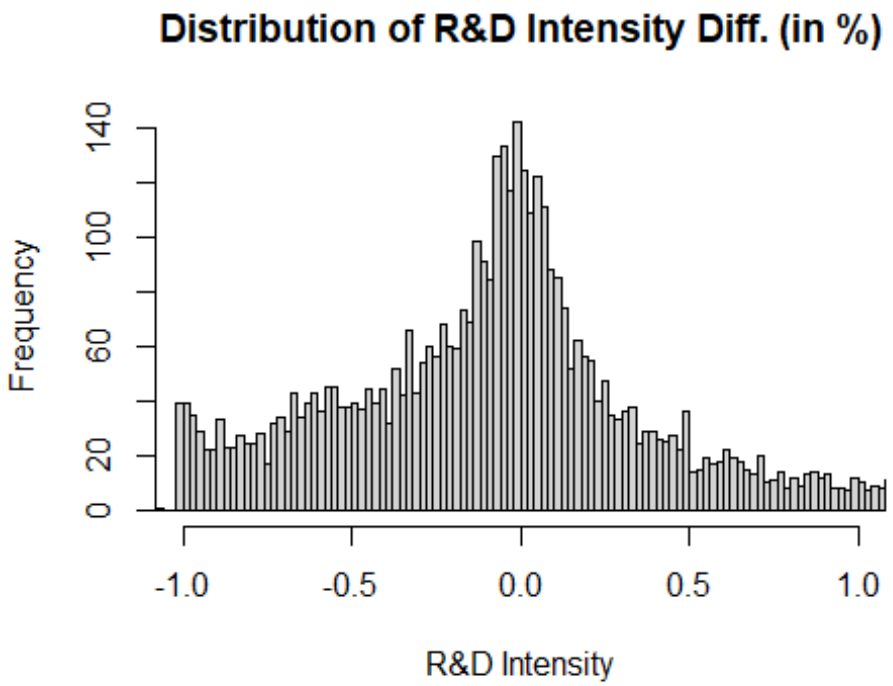
```
hist(P_CEO_Data$strat_change , breaks =(1000), main="Distribution of Strategy
Change (in %)", xlab="Strategy Change", xlim = c(0,0.4))
```



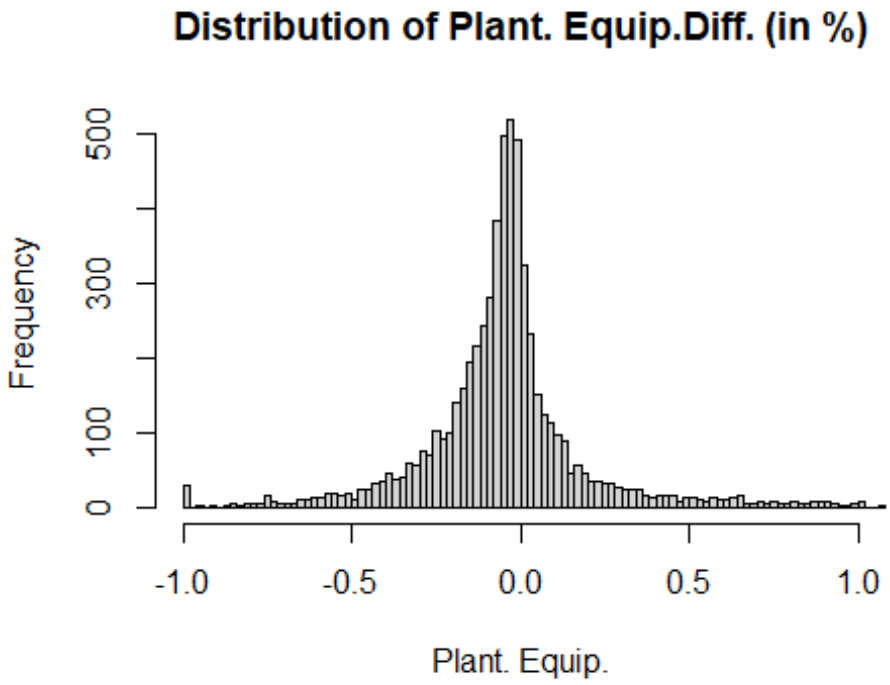

```
hist(P_CEO_Data$pct_adv_intens_diff , breaks =(40000), main="Distribution of
Adv. Intensity Diff. (in %)", xlab="Adv. Intensity", xlim = c(-1,1))
```



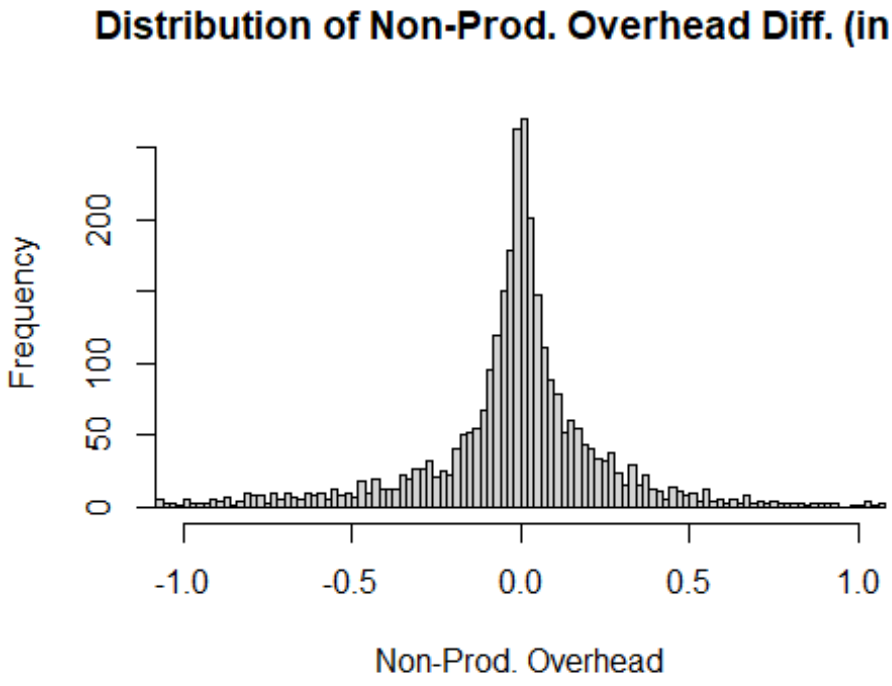

```
hist(P_CEO_Data$pct_RD_intens_diff , breaks =(250000), main="Distribution of
R&D Intensity Diff. (in %)", xlab="R&D Intensity", xlim = c(-1,1))
```



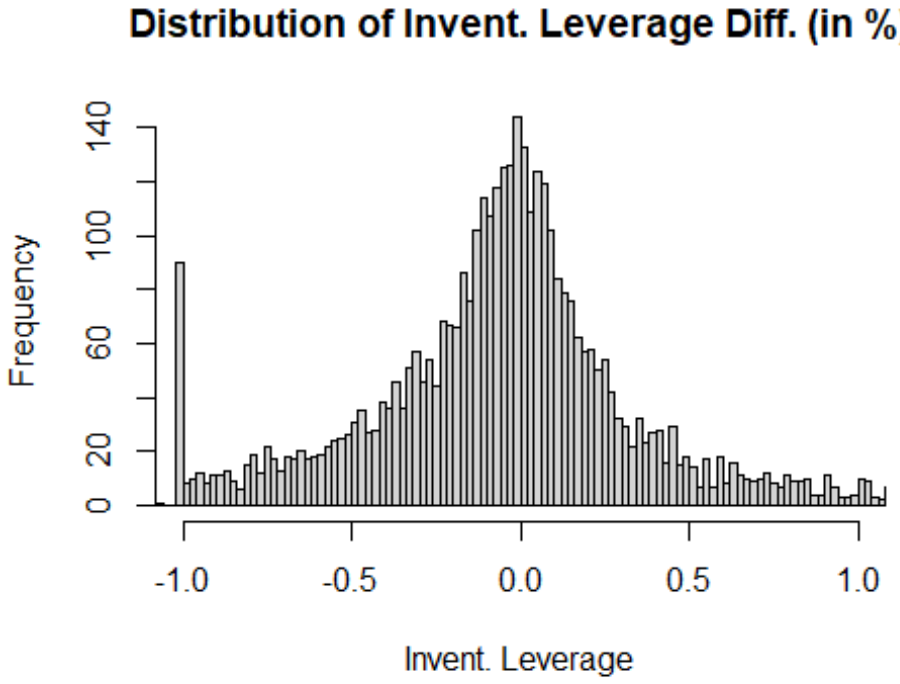

```
hist(P_CEO_Data$pct_plant_equip_diff , breaks =(5000), main="Distribution of
Plant. Equip.Diff. (in %)", xlab="Plant. Equip.", xlim = c(-1,1))
```



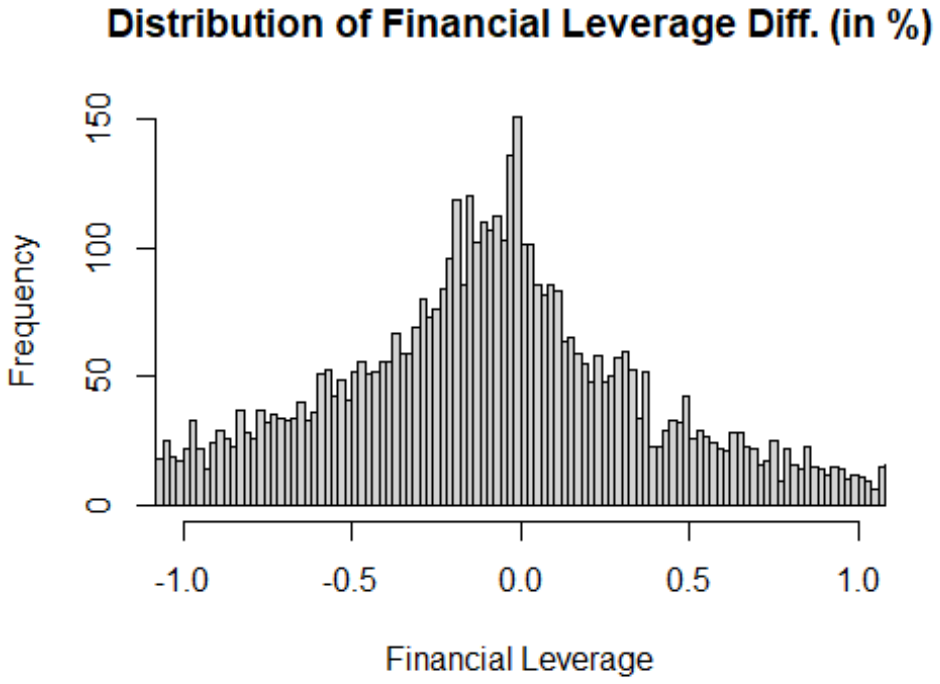

```
#par(mfrow=c(2,2)) # init 4 charts in 1 panel

hist(P_CEO_Data$pct_nonprod_overhead_diff , breaks =(50000), main="Distributi
on of Non-Prod. Overhead Diff. (in %)", xlab="Non-Prod. Overhead", xlim = c(-
1,1))
```



```
hist(P_CEO_Data$pct_invent_lev_diff , breaks =(20000), main="Distribution of
Invent. Leverage Diff. (in %)", xlab="Invent. Leverage", xlim = c(-1,1))
```




```
hist(P_CEO_Data$pct_fin_leverage_diff , breaks =(50000), main="Distribution o
f Financial Leverage Diff. (in %)", xlab="Financial Leverage", xlim = c(-1,1)
)
```



I use the positive and negative median of the strategy changes (=differences) to determine if a strategy change is small or big

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$pct_adv_intens_diff, ifelse(P_CEO_Data$pct_adv_intens_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2465952  0.3758354
```

```
tapply(P_CEO_Data$pct_RD_intens_diff, ifelse(P_CEO_Data$pct_RD_intens_diff >
0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2982761  0.3519554
```

```
tapply(P_CEO_Data$pct_plant_equip_diff, ifelse(P_CEO_Data$pct_plant_equip_dif
f > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.0920045  0.1110405
```

```
tapply(P_CEO_Data$pct_nonprod_overhead_diff, ifelse(P_CEO_Data$pct_nonprod_ov
erhead_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1142313  0.0932076
```

```
tapply(P_CEO_Data$pct_invent_lev_diff, ifelse(P_CEO_Data$pct_invent_lev_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2112387  0.2100990
```

```
tapply(P_CEO_Data$pct_fin_leverage_diff, ifelse(P_CEO_Data$pct_fin_leverage_d
iff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.3880235  0.5415713
```

```
#also using the absolute (not standardized values) would be good
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 1,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ 1))
```

Big Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Positive Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_adv_change = case_when (
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Positive Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_adv_change = case_when (
                                pct_adv_intens_diff <= 0 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Negative Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0))
```

Small Negative Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_adv_change = case_when (
                                pct_adv_intens_diff >= 0 ~ 0,
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1))
```

Big R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff > -0.2982761 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Positive R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_rd_change = case_when (
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small Positive R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_rd_change = case_when (
                                pct_RD_intens_diff <= 0 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Negative R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0))
```

Small Negative R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_rd_change = case_when (
                                P_CEO_Data$pct_RD_intens_diff >= 0 ~ 0,
                                P_CEO_Data$pct_RD_intens_diff <= -0.2982761 ~ 0
,
                                P_CEO_Data$pct_RD_intens_diff > -0.2982761 ~ 1)
)
```

Big Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
```

```
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Positive Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Positive Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Negative Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0))
```

Small Negative Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
1))
```

Big Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0,
                                P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
```

```
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Positive Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Positive Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff <= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Negative Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0))
```

Small Negative Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1))
```

Big Inventory Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_invent_change = case_when (
                              P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                              P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                              P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
,
```

```
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Positive Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Positive Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Negative Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
))
```

Small Negative Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
))
```

Big Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
```

```
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Positive Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Positive Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Negative Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0))
```

Small Negative Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1))
```

Continuous Variables:

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$abs_stand_adv, ifelse(P_CEO_Data$abs_stand_adv > 0, 'positi
ve', 'negative'), median) # median
```

```
##   positive
## 0.07193945
```

```
tapply(P_CEO_Data$abs_stand_RD, ifelse(P_CEO_Data$abs_stand_RD > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.03553555
```

```
tapply(P_CEO_Data$abs_stand_plant, ifelse(P_CEO_Data$abs_stand_plant > 0, 'po
sitive', 'negative'), median) # median
```

```
##   positive
## 0.08998155
```

```
tapply(P_CEO_Data$abs_stand_nonprod, ifelse(P_CEO_Data$abs_stand_nonprod > 0,
'positive', 'negative'), median) # median
```

```
##   positive
## 0.04249124
```

```
tapply(P_CEO_Data$abs_stand_invent, ifelse(P_CEO_Data$abs_stand_invent > 0, '
positive', 'negative'), median) # median
```

```
##   positive
## 0.07927686
```

```
tapply(P_CEO_Data$abs_stand_fin, ifelse(P_CEO_Data$abs_stand_fin > 0, 'positi
ve', 'negative'), median) # median
```

```
##   positive
## 0.02525311
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ strat_change,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ strat_change))
```

Big Adv. Change:

```
P_CEO_Data$"big_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv >= 0.07193945, P_CEO_Data$abs_stand_adv, 0)
```

Small Adv. Change

```
P_CEO_Data$"small_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv <= 0.07193945, P_CEO_Data$abs_stand_adv, 0)
```

Big R&D Change:

```
P_CEO_Data$"big_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD >= 0.03553555, P_CEO_Data$abs_stand_RD, 0)
```

Small R&D Change

```
P_CEO_Data$"small_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD <= 0.03553555, P_CEO_Data$abs_stand_RD, 0)
```

Big Plant. Change:

```
P_CEO_Data$"big_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant >= 0.08998155, P_CEO_Data$abs_stand_plant, 0)
```

Small Plant Change

```
P_CEO_Data$"small_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant <= 0.08998155, P_CEO_Data$abs_stand_plant, 0)
```

Big Nonprod Change:

```
P_CEO_Data$"big_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod >= 0.04249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Small Nonprod Change

```
P_CEO_Data$"small_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod <= 0.04249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Big invent Change:

```
P_CEO_Data$"big_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent >= 0.07927686, P_CEO_Data$abs_stand_invent, 0)
```

Small invent. Change

```
P_CEO_Data$"small_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent <= 0.07927686, P_CEO_Data$abs_stand_invent, 0)
```

Big fin Change:

```
P_CEO_Data$"big_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin >= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

Small fin. Change

```
P_CEO_Data$"small_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin <= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

---

3. Creating PF Variables

PerformanceROA = Return on Sales: net income / SalesTurnover (=total revenue) (To not change the code I will keep the "ROA" name, but it is the ROS)

```
P_CEO_Data$"ROA_Performance" <- P_CEO_Data$Net_Income / P_CEO_Data$SalesTurnover

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n mean  sd median trimmed  mad  min max range skew kurtosis  se
## X1    1 7410  NaN NaN  -0.57    -Inf 1.16 -Inf Inf   Inf  NaN      NaN NaN

#eliminating Inf & NAN
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.nan)] <- NA
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.infinite)] <- NA

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n   mean     sd median trimmed  mad    min    max    range   skew
## X1    1 6276 -33.04 360.05  -0.21   -1.55 0.62 -16885 587.33 17472.33 -28.45
##    kurtosis   se
## X1  1048.21 4.54

P_CEO_Data <- P_CEO_Data %>%
    group_by(Company_ID) %>%
     mutate(ROA_PerformanceT_1 = dplyr::lag(ROA_Performance, n = 1, default = NA))

P_CEO_Data <- P_CEO_Data %>%
  group_by(Company_ID) %>%
    mutate(Strat_ChangeT.1 = dplyr::lead(strat_change, n = 1, default = NA))

class(P_CEO_Data) # what type of dataset is it

## [1] "grouped_df" "tbl_df"     "tbl"        "data.frame"

P_CEO_Data <- pdata.frame(P_CEO_Data, index=c("Company_ID", "Fiscal_Year")) # go back to Panel Data
class(P_CEO_Data) # what type of dataset is it

## [1] "pdata.frame" "data.frame"
```

Creating Variable fur HA

```
P_CEO_Data$asp_perf_fb_0 <- P_CEO_Data$ROA_PerformanceT_1
P_CEO_Data$asp_perf_fb_1 <- (0.1*P_CEO_Data$ROA_Performance)+(0.9*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_2 <- (0.2*P_CEO_Data$ROA_Performance)+(0.8*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_3 <- (0.3*P_CEO_Data$ROA_Performance)+(0.7*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_4 <- (0.4*P_CEO_Data$ROA_Performance)+(0.6*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_5 <- (0.5*P_CEO_Data$ROA_Performance)+(0.5*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_6 <- (0.6*P_CEO_Data$ROA_Performance)+(0.4*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_7 <- (0.7*P_CEO_Data$ROA_Performance)+(0.3*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_8 <- (0.8*P_CEO_Data$ROA_Performance)+(0.2*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_9 <- (0.9*P_CEO_Data$ROA_Performance)+(0.1*P_CEO_Data$
ROA_PerformanceT_1)
```

Check the best Alpha before continuing!

```
αModel0 <- lm(strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
αModel1 <- lm(strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
αModel2 <- lm(strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
αModel3 <- lm(strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
αModel4 <- lm(strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
αModel5 <- lm(strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
αModel6 <- lm(strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
αModel7 <- lm(strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
αModel8 <- lm(strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
αModel9 <- lm(strat_change ~ asp_perf_fb_9, data = P_CEO_Data)

summary(αModel0)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2063 -0.0288 -0.0221 -0.0070  3.5659
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0757955  0.0040983  18.494 < 0.0000000000000002 ***
## asp_perf_fb_0 -0.0009086  0.0003338  -2.722              0.00658 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.006504,   Adjusted R-squared:  0.005626
## F-statistic: 7.411 on 1 and 1132 DF,  p-value: 0.006583

summary(αModel1)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1999 -0.0288 -0.0221 -0.0070  3.5659
##
## Coefficients:
##                 Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0758150  0.0040980  18.500 < 0.0000000000000002 ***
## asp_perf_fb_1 -0.0009042  0.0003344  -2.704              0.00695 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.006418,   Adjusted R-squared:  0.00554
## F-statistic: 7.312 on 1 and 1132 DF,  p-value: 0.006953

summary(αModel2)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2044 -0.0288 -0.0222 -0.0069  3.5660
##
## Coefficients:
##                 Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0758387  0.0040977  18.507 < 0.0000000000000002 ***
## asp_perf_fb_2 -0.0008964  0.0003344  -2.681              0.00746 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.006307,   Adjusted R-squared:  0.00543
## F-statistic: 7.185 on 1 and 1132 DF,  p-value: 0.007457

summary(αModel3)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.2083 -0.0289 -0.0222 -0.0070  3.5661
##
## Coefficients:
##                 Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0758662  0.0040974  18.516 < 0.0000000000000002 ***
## asp_perf_fb_3 -0.0008851  0.0003338  -2.652              0.00812 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.006174,   Adjusted R-squared:  0.005296
## F-statistic: 7.033 on 1 and 1132 DF,  p-value: 0.008115

summary(αModel4)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2112 -0.0289 -0.0222 -0.0070  3.5661
##
## Coefficients:
##                 Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0758972  0.0040971  18.525 < 0.0000000000000002 ***
## asp_perf_fb_4 -0.0008707  0.0003325  -2.618              0.00895 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.00602,    Adjusted R-squared:  0.005142
## F-statistic: 6.856 on 1 and 1132 DF,  p-value: 0.008951

summary(αModel5)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2131 -0.0290 -0.0223 -0.0070  3.5662
##
## Coefficients:
##                 Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.0759313  0.0040967   18.54 < 0.0000000000000002 ***
## asp_perf_fb_5 -0.0008532  0.0003307   -2.58              0.00999 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.005847,   Adjusted R-squared:  0.004969
## F-statistic: 6.658 on 1 and 1132 DF,  p-value: 0.009995

summary(αModel6)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2141 -0.0290 -0.0223 -0.0068  3.5663
##
## Coefficients:
##                 Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.0759680  0.0040964  18.545 <0.0000000000000002 ***
## asp_perf_fb_6 -0.0008330  0.0003282  -2.538              0.0113 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1373 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.005659,   Adjusted R-squared:  0.00478
## F-statistic: 6.442 on 1 and 1132 DF,  p-value: 0.01128

summary(αModel7)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2140 -0.0290 -0.0223 -0.0066  3.5663
##
## Coefficients:
##                 Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.0760068  0.0040960  18.556 <0.0000000000000002 ***
## asp_perf_fb_7 -0.0008105  0.0003252  -2.492              0.0128 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1374 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.005456,   Adjusted R-squared:  0.004578
## F-statistic:  6.21 on 1 and 1132 DF,  p-value: 0.01284

summary(αModel8)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.2131 -0.0291 -0.0224 -0.0065  3.5663
##
## Coefficients:
##                 Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.0760471  0.0040956  18.568 <0.0000000000000002 ***
## asp_perf_fb_8 -0.0007860  0.0003218  -2.443              0.0147 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1374 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.005243,   Adjusted R-squared:  0.004364
## F-statistic: 5.966 on 1 and 1132 DF,  p-value: 0.01473

summary(αModel9)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_9, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2113 -0.0291 -0.0224 -0.0065  3.5664
##
## Coefficients:
##                 Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.0760885  0.0040953   18.58 <0.0000000000000002 ***
## asp_perf_fb_9 -0.0007599  0.0003179   -2.39               0.017 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1374 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.005022,   Adjusted R-squared:  0.004143
## F-statistic: 5.714 on 1 and 1132 DF,  p-value: 0.01699
```

α=0.0 gives the best Adj. R2 results

```
P_CEO_Data$"neg_perf" <- ifelse(P_CEO_Data$ROA_Performance < 0, 1, 0)
```

1 = we have negative performance; 0 = we have not a negative performance (= we have a positive performance)

```
P_CEO_Data$"pos_perf" <- ifelse(P_CEO_Data$ROA_Performance > 0, 1, 0)
```

1 = we have positive performance; 0 = we have not a positive performance (= we have a negative performance)

```
P_CEO_Data <- P_CEO_Data %>% mutate(Performance_below_aspiration = case_when
(
                        asp_perf_fb_0 >= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_0 < ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(Performance_above_aspiration = case_when
(
```

```
                        asp_perf_fb_0 <= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_0 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$PosPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$PosPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$NegPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$NegPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
```

To calculate the PF I create the % difference between the performance and the aspired performance of a company

```
P_CEO_Data$"pct_PerfFB" <- (P_CEO_Data$"ROA_Performance" - P_CEO_Data$"asp_pe
rf_fb_0") /abs(P_CEO_Data$"asp_perf_fb_0")
#eliminating Inf & NAN
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.nan)] <- NA
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.infinite)] <- NA

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean    sd median trimmed  mad      min     max   range   sk
ew
## X1    1 5528 -4.17 82.71   0.04   -0.12 0.96 -4047.44 1412.88 5460.32 -33.
15
##    kurtosis   se
## X1  1444.34 1.11
```

```
#winsorize to keep observations but make extreme observations not so extreme
P_CEO_Data$pct_PerfFB <- DescTools::Winsorize(P_CEO_Data$pct_PerfFB, minval =
NULL, maxval = NULL, probs = c(0.001, 0.999),
          na.rm = TRUE, type = 7)

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean    sd median trimmed  mad     min    max  range  skew
## X1    1 5528 -3.09 32.12   0.04   -0.12 0.96 -668.78 117.39 786.17 -15.7
##    kurtosis   se
## X1   291.93 0.43

P_CEO_Data$"pct_neg_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB < 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have negative performance feedback difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

```
P_CEO_Data$"pct_pos_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB > 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

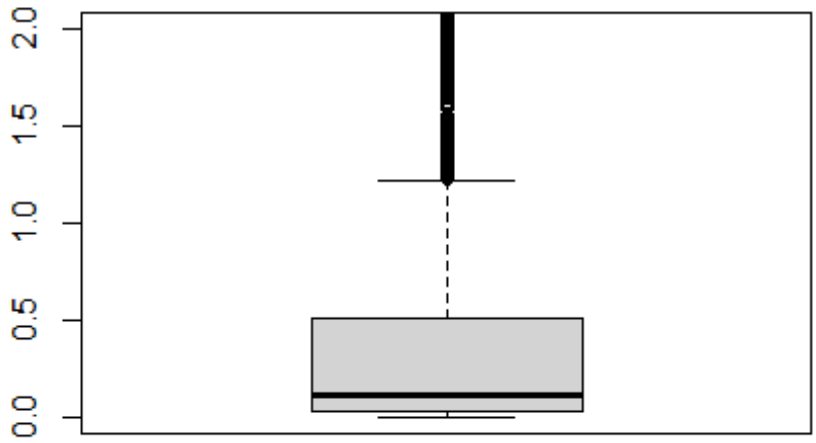
```
#Creating additional Binary Variables
P_CEO_Data <- P_CEO_Data %>% mutate(BV_Performance_above_aspiration = case_wh
en (
                        asp_perf_fb_0 <= ROA_Performance ~ 1,
                        asp_perf_fb_0 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$BV_PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_AboAsp, k =
```

```
1, default = NA, order_by = NULL)
P_CEO_Data$BV_PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_BelAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_BelAsp, k =
1, default = NA, order_by = NULL)
```

4. Control Variables

Firm Size: “log(Employees)” -> in K

```
boxplot(P_CEO_Data$Employees,data=P_CEO_Data, ylim = c(0,2))
```

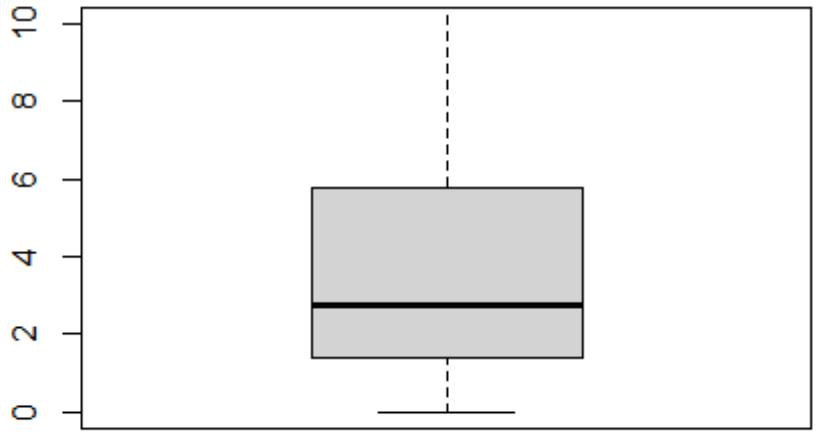


Some companies have 0 employees, so to do log(Emloyees) I need to eliminate them -> log(-1) returns NaN and log(0) return Inf

```
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6727 5.05 17.41   0.11    0.49 0.15   0 135.7 135.7  4.5    21.38
0.21

P_CEO_Data$Employees[P_CEO_Data$Employees == 0.000] <- NA
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21
```

Financial Slack

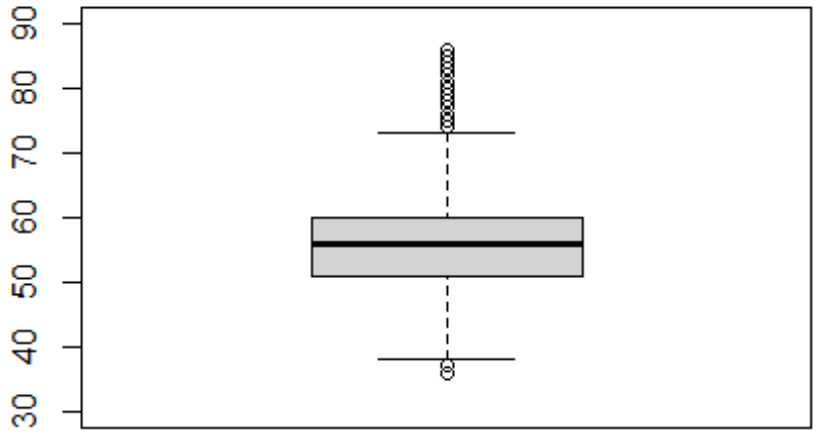
```
P_CEO_Data$"Financial_Slack" <- as.numeric(P_CEO_Data$Current.Assets...Total
/ P_CEO_Data$Current.Liabilities...Total)

boxplot(P_CEO_Data$Financial_Slack,data=P_CEO_Data, ylim = c(0,10))
```




```
P_CEO_Data$Financial_Slack[P_CEO_Data$Financial_Slack == 0.00000000000] <- NA

P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.nan)] <- NA
P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.infinite)] <
- NA
```

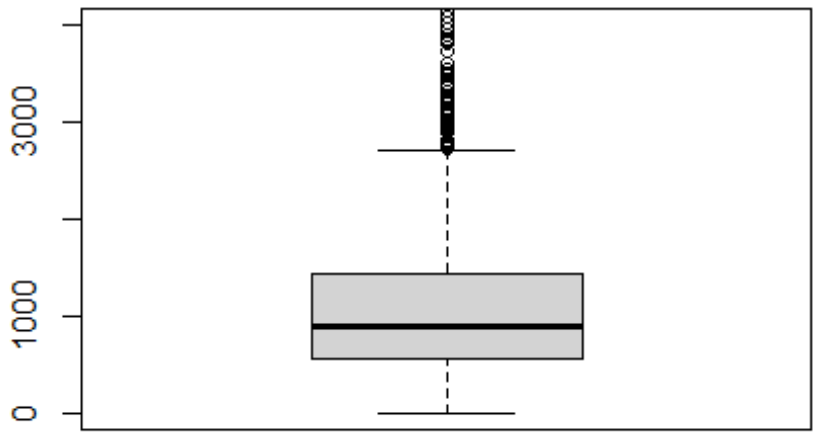
CEO Age -> “Age”

```
boxplot(P_CEO_Data$Age,data=P_CEO_Data, ylim = c(30,90))
```



Total compensation of the CEO -> Total_Compensation (in K)

```
boxplot(P_CEO_Data$Total_Compensation,data=P_CEO_Data, ylim = c(0,4000))
```




```
psych::describe(P_CEO_Data$Total_Compensation)
```

```
##    vars    n    mean     sd median trimmed    mad min    max  range skew
## X1    1 1220 1128.86 831.25 884.96  989.54 570.74   0 6650.1 6650.1 2.07
```

```
##    kurtosis   se
## X1     6.22 23.8

P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.000] <- NA
P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.001] <- NA
psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81
```

5. Additional Datasets

```
# Deviding in profitable and non-profitable companies:
Data_PosPerf<- P_CEO_Data[P_CEO_Data$"pos_perf" != 0, ]
Data_NegPerf<- P_CEO_Data[P_CEO_Data$"neg_perf" != 0, ]

#Deviding into above and below aspiration
Data_PosPerf_AboAsp<- Data_PosPerf[Data_PosPerf$Performance_above_aspiration
!= 0, ]
Data_PosPerf_BelAsp<- Data_PosPerf[Data_PosPerf$Performance_below_aspiration
!= 0, ]
Data_NegPerf_AboAsp<- Data_NegPerf[Data_NegPerf$Performance_above_aspiration
!= 0, ]
Data_NegPerf_BelAsp<- Data_NegPerf[Data_NegPerf$Performance_below_aspiration
!= 0, ]

#eliminating Inf & NAN
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.nan)] <- NA
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.infinite)] <- NA

Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.nan)] <- NA
Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.infinite)] <- NA

Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.nan)] <- NA
Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.infinite)] <- NA

Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.nan)] <- NA
Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.infinite)] <- NA
```

EXPORT dataset to Excel for final check:

```
#library(writexl)
#write_xlsx(P_CEO_Data,"data/Merged.xlsx")
```

6. Descriptive Statistics

Assessing the impact of the Perf.FB of both types of companies depending on their profitability level:

```
#I used this part to find out the real descriptive statistics by eliminating
the 0 values i inserted for if the numbers where part of the opposite categor
y. This part should not be run!
#P_CEO_Data$pct_pos_perfFB[P_CEO_Data$pct_pos_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_pos_perfFB)
```

```
#P_CEO_Data$pct_neg_perfFB[P_CEO_Data$pct_neg_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_neg_perfFB)

psych::describe(P_CEO_Data$strat_change)

##    vars    n mean   sd median trimmed  mad  min  max range  skew kurtosis
se
## X1    1 1134 0.08 0.14   0.05    0.06 0.01 0.02 3.64  3.62 17.69   413.14
0

psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21

psych::describe(P_CEO_Data$Financial_Slack)

##    vars    n mean    sd median trimmed  mad min max range skew kurtosis
se
## X1    1 7362 5.26 13.12   2.76    3.59 2.53   0 812   812   37  2076.74 0.
15

psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81

psych::describe(P_CEO_Data$Age)

##    vars    n  mean   sd median trimmed  mad min max range skew kurtosis
se
## X1    1 1178 55.98 7.34     56   55.87 7.41  36  86    50 0.27     0.68 0.
21

psych::describe(P_CEO_Data$pct_pos_perfFB)

##    vars    n mean   sd median trimmed  mad min    max  range  skew kurtosi
s
## X1    1 5528 0.81 4.99   0.04    0.26 0.06   0 117.39 117.39 18.04   380.4
6
##      se
## X1 0.07

psych::describe(P_CEO_Data$pct_neg_perfFB)

##    vars    n  mean    sd median trimmed mad     min max  range   skew kurt
osis
## X1    1 5528 -3.91 31.63      0   -0.38   0 -668.78   0 668.78 -16.44   30
8.65
##      se
## X1 0.43
```

```
psych::describe(P_CEO_Data$pos_perf)

##    vars    n mean   sd median trimmed mad min max range skew kurtosis   se
## X1    1 6276 0.39 0.49      0    0.36   0   0   1     1 0.46    -1.79 0.01

psych::describe(P_CEO_Data$neg_perf)

##    vars    n mean   sd median trimmed mad min max range  skew kurtosis   s
e
## X1    1 6276 0.61 0.49      1    0.64   0   0   1     1 -0.46    -1.79 0.0
1

psych::describe(P_CEO_Data$Present_Focus)

##    vars   n mean   sd median trimmed  mad  min   max range skew kurtosis
se
## X1    1 365  6.9 1.65   6.66    6.78 1.42 3.49 14.04 10.55 0.83     1.44 0
.09

psych::describe(P_CEO_Data$Future_Focus)

##    vars   n mean   sd median trimmed  mad  min  max range skew kurtosis
se
## X1    1 365 1.82 0.52   1.82    1.81 0.49 0.49 3.42  2.93 0.23     0.14 0.
03

psych::describe(P_CEO_Data$Prevention)

##    vars   n mean  sd median trimmed mad min max range skew kurtosis   se
## X1    1 368 0.16 0.2    0.1    0.12 0.1   0 1.5   1.5 2.96     11.4 0.01

psych::describe(P_CEO_Data$Promotion)

##    vars   n mean   sd median trimmed  mad min  max range skew kurtosis   s
e
## X1    1 368 0.48 0.21   0.46    0.46 0.19   0 1.26  1.26 0.76     1.09 0.0
1
```

Variance Inflation Factors (VIF)

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

PLM1 <- lm(strat_change ~  pct_pos_perfFB*pos_perf + pct_neg_perfFB*pos_perf
+ log(Financial_Slack) +  log(Employees) + Age + Total_Compensation ,data=P_C
EO_Data)

PLM2 <- lm(strat_change ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotio
n + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) + log
(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

PLM3 <- lm(strat_change ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Pres
ent_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus + Age +
Total_Compensation ,data=P_CEO_Data)

PLM4 <- lm(strat_change ~  pct_pos_perfFB  + pct_neg_perfFB + neg_perf + Prom
otion + Prevention + Present_Focus + Future_Focus+ log(Financial_Slack) +  lo
```

```
g(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

regclass::VIF(PLM1)

##          pct_pos_perfFB                pos_perf          pct_neg_perfFB
##             3140.566051                1.988898                1.163274
##    log(Financial_Slack)          log(Employees)                     Age
##                1.363386                2.470747                1.039107
##      Total_Compensation pct_pos_perfFB:pos_perf pos_perf:pct_neg_perfFB
##                1.864668             3145.917955                1.103152

regclass::VIF(PLM2)

##                     pct_pos_perfFB                           Promotion
##                          22.615657                            1.807262
##                     pct_neg_perfFB                log(Prevention + 1)
##                        1000.931350                            1.587248
##                     log(Employees)                                 Age
##                          3.984282                            1.297990
##                Total_Compensation           pct_pos_perfFB:Promotion
##                          4.230492                           27.588879
##          Promotion:pct_neg_perfFB pct_pos_perfFB:log(Prevention + 1)
##                        2266.902767                            3.394378
## pct_neg_perfFB:log(Prevention + 1)
##                         294.099114

regclass::VIF(PLM3)

##               pct_pos_perfFB                Present_Focus
##                   107.162328                     1.455437
##               pct_neg_perfFB                Future_Focus
##                  2463.805590                     1.365629
##                          Age           Total_Compensation
##                     1.123851                     1.157947
## pct_pos_perfFB:Present_Focus Present_Focus:pct_neg_perfFB
##                    78.829997                   997.508822
##  pct_pos_perfFB:Future_Focus  pct_neg_perfFB:Future_Focus
##                    17.894089                   434.964273

regclass::VIF(PLM4)

##       pct_pos_perfFB       pct_neg_perfFB             neg_perf
##             1.426559             1.332686             1.651784
##            Promotion           Prevention        Present_Focus
##             1.109808             1.717184             1.284740
##         Future_Focus log(Financial_Slack)       log(Employees)
##             1.620933             3.191538             5.741456
##                  Age   Total_Compensation
##             1.286900             4.981615
```

Correlation Matrix

```
# Select columns of interest
Correlation_Data <- P_CEO_Data %>%
  select(strat_change, Employees, Financial_Slack,Total_Compensation, Age, pc
t_pos_perfFB,  pct_neg_perfFB, pos_perf, neg_perf, Present_Focus,Future_Focus
```

```
, Prevention, Promotion)

psych::describe(Correlation_Data)

##                     vars    n    mean     sd median trimmed    mad     min
## strat_change           1 1134    0.08   0.14   0.05    0.06   0.01    0.02
## Employees              2 6640    5.11  17.52   0.11    0.51   0.15    0.00
## Financial_Slack        3 7362    5.26  13.12   2.76    3.59   2.53    0.00
## Total_Compensation     4 1212 1136.31 828.90 893.51  994.90 572.11  100.00
## Age                    5 1178   55.98   7.34  56.00   55.87   7.41   36.00
## pct_pos_perfFB         6 5528    0.81   4.99   0.04    0.26   0.06    0.00
## pct_neg_perfFB         7 5528   -3.91  31.63   0.00   -0.38   0.00 -668.78
## pos_perf               8 6276    0.39   0.49   0.00    0.36   0.00    0.00
## neg_perf               9 6276    0.61   0.49   1.00    0.64   0.00    0.00
## Present_Focus         10  365    6.90   1.65   6.66    6.78   1.42    3.49
## Future_Focus          11  365    1.82   0.52   1.82    1.81   0.49    0.49
## Prevention            12  368    0.16   0.20   0.10    0.12   0.10    0.00
## Promotion             13  368    0.48   0.21   0.46    0.46   0.19    0.00
##                        max   range   skew kurtosis    se
## strat_change          3.64    3.62  17.69   413.14  0.00
## Employees           135.70  135.70   4.46    21.05  0.21
## Financial_Slack     812.00  812.00  37.00  2076.74  0.15
## Total_Compensation 6650.10 6550.10   2.09     6.29 23.81
## Age                  86.00   50.00   0.27     0.68  0.21
## pct_pos_perfFB      117.39  117.39  18.04   380.46  0.07
## pct_neg_perfFB        0.00  668.78 -16.44   308.65  0.43
## pos_perf              1.00    1.00   0.46    -1.79  0.01
## neg_perf              1.00    1.00  -0.46    -1.79  0.01
## Present_Focus        14.04   10.55   0.83     1.44  0.09
## Future_Focus          3.42    2.93   0.23     0.14  0.03
## Prevention            1.50    1.50   2.96    11.40  0.01
## Promotion             1.26    1.26   0.76     1.09  0.01

library(Hmisc)
Correlation_Matrix <- rcorr(as.matrix(Correlation_Data))
Correlation_Matrix

##                     strat_change Employees Financial_Slack Total_Compensati
on
## strat_change                1.00     -0.08            0.00              -0.
06
## Employees                  -0.08      1.00           -0.13               0.
60
## Financial_Slack             0.00     -0.13            1.00              -0.
22
## Total_Compensation         -0.06      0.60           -0.22               1.
00
## Age                        -0.03      0.12           -0.11               0.
19
## pct_pos_perfFB             -0.01      0.00           -0.01              -0.
03
## pct_neg_perfFB             -0.09      0.04           -0.03               0.
04
## pos_perf                   -0.14      0.34           -0.09               0.
```

```
27
## neg_perf                   0.14     -0.34            0.09              -0.
27
## Present_Focus             -0.03      0.15           -0.17               0.
06
## Future_Focus               0.18     -0.12            0.08               0.
06
## Prevention                 0.10     -0.14            0.19              -0.
01
## Promotion                 -0.08      0.01           -0.06              -0.
17
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       -0.03          -0.01          -0.09    -0.14     0.14
## Employees           0.12           0.00           0.04     0.34    -0.34
## Financial_Slack    -0.11          -0.01          -0.03    -0.09     0.09
## Total_Compensation  0.19          -0.03           0.04     0.27    -0.27
## Age                 1.00          -0.04           0.02     0.16    -0.16
## pct_pos_perfFB     -0.04           1.00           0.02     0.14    -0.14
## pct_neg_perfFB      0.02           0.02           1.00     0.10    -0.10
## pos_perf            0.16           0.14           0.10     1.00    -1.00
## neg_perf           -0.16          -0.14          -0.10    -1.00     1.00
## Present_Focus       0.22           0.00          -0.10    -0.09     0.09
## Future_Focus        0.11           0.03          -0.20    -0.18     0.18
## Prevention          0.16          -0.04          -0.14    -0.18     0.18
## Promotion           0.03           0.11           0.04     0.11    -0.11
##                   Present_Focus Future_Focus Prevention Promotion
## strat_change              -0.03         0.18       0.10     -0.08
## Employees                  0.15        -0.12      -0.14      0.01
## Financial_Slack           -0.17         0.08       0.19     -0.06
## Total_Compensation         0.06         0.06      -0.01     -0.17
## Age                        0.22         0.11       0.16      0.03
## pct_pos_perfFB             0.00         0.03      -0.04      0.11
## pct_neg_perfFB            -0.10        -0.20      -0.14      0.04
## pos_perf                  -0.09        -0.18      -0.18      0.11
## neg_perf                   0.09         0.18       0.18     -0.11
## Present_Focus              1.00         0.24      -0.07     -0.17
## Future_Focus               0.24         1.00       0.06     -0.03
## Prevention                -0.07         0.06       1.00     -0.10
## Promotion                 -0.17        -0.03      -0.10      1.00
##
## n
##                   strat_change Employees Financial_Slack Total_Compensati
on
## strat_change              1134      1118            1134                4
07
## Employees                 1118      6640            6608               12
00
## Financial_Slack           1134      6608            7362               12
07
## Total_Compensation         407      1200            1207               12
12
## Age                        386      1167            1173               11
70
## pct_pos_perfFB            1134      5311            5515               11
```

```
92
## pct_neg_perfFB             1134      5311            5515               11
92
## pos_perf                   1134      5817            6254               12
02
## neg_perf                   1134      5817            6254               12
02
## Present_Focus               123       365             365                1
97
## Future_Focus                123       365             365                1
97
## Prevention                  123       368             368                1
97
## Promotion                   123       368             368                1
97
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change         386           1134           1134     1134     1134
## Employees           1167           5311           5311     5817     5817
## Financial_Slack     1173           5515           5515     6254     6254
## Total_Compensation  1170           1192           1192     1202     1202
## Age                 1178           1158           1158     1168     1168
## pct_pos_perfFB      1158           5528           5528     5528     5528
## pct_neg_perfFB      1158           5528           5528     5528     5528
## pos_perf            1168           5528           5528     6276     6276
## neg_perf            1168           5528           5528     6276     6276
## Present_Focus        198            326            326      337      337
## Future_Focus         198            326            326      337      337
## Prevention           198            327            327      340      340
## Promotion            198            327            327      340      340
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change                 123          123        123       123
## Employees                    365          365        368       368
## Financial_Slack              365          365        368       368
## Total_Compensation           197          197        197       197
## Age                          198          198        198       198
## pct_pos_perfFB               326          326        327       327
## pct_neg_perfFB               326          326        327       327
## pos_perf                     337          337        340       340
## neg_perf                     337          337        340       340
## Present_Focus                365          365        365       365
## Future_Focus                 365          365        365       365
## Prevention                   365          365        368       368
## Promotion                    365          365        368       368
##
## P
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change                     0.0065    0.8811          0.2557
## Employees          0.0065                 0.0000          0.0000
## Financial_Slack    0.8811       0.0000                    0.0000
## Total_Compensation 0.2557       0.0000    0.0000
## Age                0.5522       0.0000    0.0000          0.0000
## pct_pos_perfFB     0.6944       0.9332    0.6780          0.2634
## pct_neg_perfFB     0.0035       0.0105    0.0139          0.1721
```

```
## pos_perf           0.0000       0.0000    0.0000          0.0000
## neg_perf           0.0000       0.0000    0.0000          0.0000
## Present_Focus      0.7207       0.0044    0.0009          0.3651
## Future_Focus       0.0466       0.0258    0.1059          0.4107
## Prevention         0.2890       0.0059    0.0002          0.9299
## Promotion          0.3814       0.9014    0.2742          0.0153
##                    Age    pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       0.5522 0.6944         0.0035         0.0000   0.0000
## Employees          0.0000 0.9332         0.0105         0.0000   0.0000
## Financial_Slack    0.0000 0.6780         0.0139         0.0000   0.0000
## Total_Compensation 0.0000 0.2634         0.1721         0.0000   0.0000
## Age                       0.1352         0.4777         0.0000   0.0000
## pct_pos_perfFB     0.1352                 0.1349         0.0000   0.0000
## pct_neg_perfFB     0.4777 0.1349                         0.0000   0.0000
## pos_perf           0.0000 0.0000         0.0000                  0.0000
## neg_perf           0.0000 0.0000         0.0000         0.0000
## Present_Focus      0.0017 0.9660         0.0792         0.0973   0.0973
## Future_Focus       0.1406 0.6405         0.0002         0.0007   0.0007
## Prevention         0.0288 0.4605         0.0106         0.0012   0.0012
## Promotion          0.6370 0.0460         0.4416         0.0352   0.0352
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change       0.7207        0.0466       0.2890     0.3814
## Employees          0.0044        0.0258       0.0059     0.9014
## Financial_Slack    0.0009        0.1059       0.0002     0.2742
## Total_Compensation 0.3651        0.4107       0.9299     0.0153
## Age                0.0017        0.1406       0.0288     0.6370
## pct_pos_perfFB     0.9660        0.6405       0.4605     0.0460
## pct_neg_perfFB     0.0792        0.0002       0.0106     0.4416
## pos_perf           0.0973        0.0007       0.0012     0.0352
## neg_perf           0.0973        0.0007       0.0012     0.0352
## Present_Focus                    0.0000       0.1619     0.0009
## Future_Focus       0.0000                     0.2878     0.5464
## Prevention         0.1619        0.2878                  0.0457
## Promotion          0.0009        0.5464       0.0457
```

```
#Check 2nd method for correlations and it gives the same results! :D
cor.mat <- Correlation_Data %>% cor_mat()
# Significance levels
cor.mat %>% cor_get_pval()
```

```
## # A tibble: 13 x 14
##    rowname      strat_change Employees Financial_Slack Total_Compensat~
Age
##    <chr>               <dbl>     <dbl>           <dbl>            <dbl>
<dbl>
##  1 strat_change   0          6.46e-  3       8.81e- 1        2.56e-  1 5.
52e- 1
##  2 Employees      0.00646    0               9.04e-26        5.28e-118 7.
12e- 5
##  3 Financial_S~   0.881      9.04e- 26       0               1.13e- 14 8.
25e- 5
##  4 Total_Compe~   0.256      5.28e-118       1.13e-14        0         1.
08e-10
##  5 Age            0.552      7.12e-  5       8.25e- 5        1.08e- 10 0
```

```
##  6 pct_pos_per~   0.694      9.33e-  1        6.78e- 1        2.63e-  1 1.
35e- 1
##  7 pct_neg_per~   0.00345    1.05e-  2        1.39e- 2        1.72e-  1 4.
78e- 1
##  8 pos_perf       0.00000162 1.3 e-155        1.06e-11        3.33e- 22 3.
14e- 8
##  9 neg_perf       0.00000162 1.3 e-155        1.06e-11        3.33e- 22 3.
14e- 8
## 10 Present_Foc~   0.721      4.42e-  3        9.1 e- 4        3.65e-  1 1.
66e- 3
## 11 Future_Focus   0.0466     2.58e-  2        1.06e- 1        4.11e-  1 1.
41e- 1
## 12 Prevention     0.289      5.93e-  3        2.1 e- 4        9.3 e-  1 2.
88e- 2
## 13 Promotion      0.381      9.01e-  1        2.74e- 1        1.53e-  2 6.
37e- 1
## # ... with 8 more variables: pct_pos_perfFB <dbl>, pct_neg_perfFB <dbl>,
## #   pos_perf <dbl>, neg_perf <dbl>, Present_Focus <dbl>, Future_Focus <dbl
>,
## #   Prevention <dbl>, Promotion <dbl>
```

```
# Visualize
# Gather/collapse correlation matrix into long format
cor.mat %>% cor_gather()
```

```
## # A tibble: 169 x 4
##    var1               var2             cor          p
##    <chr>              <chr>          <dbl>      <dbl>
##  1 strat_change       strat_change  1      0
##  2 Employees          strat_change -0.081  0.00646
##  3 Financial_Slack    strat_change -0.0044 0.881
##  4 Total_Compensation strat_change -0.056  0.256
##  5 Age                strat_change -0.03   0.552
##  6 pct_pos_perfFB     strat_change -0.012  0.694
##  7 pct_neg_perfFB     strat_change -0.087  0.00345
##  8 pos_perf           strat_change -0.14   0.00000162
##  9 neg_perf           strat_change  0.14   0.00000162
## 10 Present_Focus      strat_change -0.033  0.721
## # ... with 159 more rows
```

7. Statistical Models:

Since I have panel data I use the random/fixed model

```
**PROFITABILITY INTERACTION**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
```

```
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_SC, RLM_SC) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf + pct_neg_perfF
B *  ...
## chisq = 19.013, df = 9, p-value = 0.02508
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf +
##     pct_neg_perfFB * pos_perf + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 46, T = 1-25, N = 352
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.720566 -0.024074  0.000000  0.024114  2.713874
##
## Coefficients:
##                             Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -0.114632162  0.070943987 -1.6158 0.107197
## pos_perf                -0.100396366  0.036631918 -2.7407 0.006503 **
## pct_neg_perfFB           0.001630148  0.002680664  0.6081 0.543577
## Financial_Slack         -0.001581449  0.007005868 -0.2257 0.821565
## log(Employees)          -0.068063391  0.028130113 -2.4196 0.016138 *
## Age                     -0.000115356  0.002455714 -0.0470 0.962565
## Total_Compensation      -0.000020679  0.000015886 -1.3017 0.194021
## pct_pos_perfFB:pos_perf  0.114731264  0.070982179  1.6163 0.107083
## pos_perf:pct_neg_perfFB  0.000567222  0.047544763  0.0119 0.990489
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.461
## Residual Sum of Squares: 9.854
## R-Squared:      0.058002
## Adj. R-Squared: -0.11327
## F-statistic: 2.03192 on 9 and 297 DF, p-value: 0.035713
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC
## BP = 9.4539, df = 9, p-value = 0.3965

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_AI, RLM_AI) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 18.703, df = 9, p-value = 0.02784
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 54, T = 1-26, N = 435
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -76.8026  -2.1012   0.2153   2.4149 366.2456
##
## Coefficients:
##                             Estimate  Std. Error t-value Pr(>|t|)
```

```
## pct_pos_perfFB          -10.4276551   7.4402204 -1.4015  0.16189
## pos_perf                 -9.6394431   3.7966448 -2.5389  0.01153 *
## pct_neg_perfFB            0.1680926   0.3060192  0.5493  0.58314
## Financial_Slack          -0.4788275   0.6795102 -0.7047  0.48146
## log(Employees)           -4.2315319   2.5142753 -1.6830  0.09321 .
## Age                       0.0028223   0.2430048  0.0116  0.99074
## Total_Compensation       -0.0016862   0.0016865 -0.9998  0.31804
## pct_pos_perfFB:pos_perf  10.4153111   7.4434596  1.3993  0.16257
## pos_perf:pct_neg_perfFB   1.9853019   5.0805748  0.3908  0.69620
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173430
## Residual Sum of Squares: 167330
## R-Squared:      0.035159
## Adj. R-Squared: -0.12565
## F-statistic: 1.50617 on 9 and 372 DF, p-value: 0.14373
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI
## BP = 10.024, df = 9, p-value = 0.3485

#coeftest(FLM_AI,vcov=vcovHC(FLM_AI,type="HC0",cluster="group"))

FLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
eg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compens
ation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable ->
interaction model vs. split sample model!

phtest(FLM_RD, RLM_RD) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * pos_perf + pct_neg
_perfFB *  ...
## chisq = 50.904, df = 9, p-value = 0.00000007279
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD)

## Oneway (individual) effect Within Model
##
```

```
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 90, T = 1-28, N = 1046
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -3.70578 -0.32913 -0.10915  0.10619 26.38978
##
## Coefficients:
##                              Estimate   Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB           0.537840219  0.299857105  1.7937    0.07319 .
## pos_perf                 0.647270703  0.163766412  3.9524 0.00008312 ***
## pct_neg_perfFB           0.012623928  0.005822354  2.1682    0.03039 *
## Financial_Slack          0.029968726  0.016815781  1.7822    0.07504 .
## log(Employees)           0.132211010  0.095738910  1.3810    0.16762
## Age                     -0.000989514  0.011378072 -0.0870    0.93072
## Total_Compensation      -0.000026136  0.000097609 -0.2678    0.78894
## pct_pos_perfFB:pos_perf -0.542382932  0.299996346 -1.8080    0.07093 .
## pos_perf:pct_neg_perfFB  0.271723473  0.280094349  0.9701    0.33224
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2540.5
## Residual Sum of Squares: 2461.9
## R-Squared:      0.030935
## Adj. R-Squared: -0.069349
## F-statistic: 3.35893 on 9 and 947 DF, p-value: 0.00046209
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD
## BP = 15.725, df = 9, p-value = 0.07286

#coeftest(FLM_RD,vcov=vcovHC(FLM_RD,type="HC0",cluster="group"))

FLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_PE, RLM_PE) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 8.414, df = 9, p-value = 0.493
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(RLM_PE)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1082
##
## Effects:
##                   var std.dev share
## idiosyncratic 0.08021 0.28322     1
## individual    0.00000 0.00000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.342134 -0.082343 -0.018008  0.035304  3.303751
##
## Coefficients:
##                              Estimate   Std. Error  z-value
## (Intercept)             -0.020904072  0.070222780  -0.2977
## pct_pos_perfFB           0.059507079  0.049423903   1.2040
## pos_perf                 0.115705684  0.024632442   4.6973
## pct_neg_perfFB          -0.014355044  0.000959794 -14.9564
## Financial_Slack         -0.000769441  0.002570680  -0.2993
## log(Employees)          -0.022592916  0.006041136  -3.7398
## Age                     -0.001123458  0.001204599  -0.9326
## Total_Compensation       0.000017990  0.000013413   1.3412
## pct_pos_perfFB:pos_perf -0.053096685  0.049422347  -1.0743
## pos_perf:pct_neg_perfFB  0.084463383  0.045762328   1.8457
##                                    Pr(>|z|)
## (Intercept)                       0.7659457
## pct_pos_perfFB                    0.2285841
## pos_perf                          0.000002636 ***
## pct_neg_perfFB          < 0.00000000000000022 ***
## Financial_Slack                   0.7647003
```

```
## log(Employees)                        0.0001841 ***
## Age                                   0.3510058
## Total_Compensation                    0.1798397
## pct_pos_perfFB:pos_perf               0.2826678
## pos_perf:pct_neg_perfFB               0.0649362 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    106.51
## Residual Sum of Squares: 84.535
## R-Squared:      0.20633
## Adj. R-Squared: 0.19967
## Chisq: 278.688 on 9 DF, p-value: < 0.00000000000000222
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_PE)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_PE
## BP = 83.837, df = 9, p-value = 0.00000000000002784

coeftest(RLM_PE,vcov=vcovHC(RLM_PE,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                               Estimate    Std. Error t value  Pr(>|t|)
## (Intercept)             -0.0209040720  0.0809368737 -0.2583 0.7962433
## pct_pos_perfFB           0.0595070790  0.0547268528  1.0873 0.2771279
## pos_perf                 0.1157056841  0.0296956607  3.8964 0.0001037 ***
## pct_neg_perfFB          -0.0143550438  0.0044959156 -3.1929 0.0014495 **
## Financial_Slack         -0.0007694412  0.0037811663 -0.2035 0.8387883
## log(Employees)          -0.0225929159  0.0088663528 -2.5482 0.0109678 *
## Age                     -0.0011234576  0.0013482888 -0.8332 0.4048911
## Total_Compensation       0.0000179898  0.0000086859  2.0711 0.0385848 *
## pct_pos_perfFB:pos_perf -0.0530966853  0.0573574624 -0.9257 0.3548023
## pos_perf:pct_neg_perfFB  0.0844633827  0.0278628050  3.0314 0.0024927 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!

FLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary var
iable -> interaction model

RLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary var
```

```
iable -> interaction model vs. split sample model!

phtest(FLM_NPO, RLM_NPO) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * pos_perf +
...
## chisq = 30.245, df = 9, p-value = 0.0003986
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 83, T = 1-26, N = 877
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -17.2582280  -0.0885369  -0.0026064   0.1154396   5.0049169
##
## Coefficients:
##                              Estimate   Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB           0.391743133  0.188774855  2.0752 0.0382944 *
## pos_perf                 0.371882551  0.097193949  3.8262 0.0001405 ***
## pct_neg_perfFB          -0.028955265  0.009905524 -2.9231 0.0035648 **
## Financial_Slack          0.046551360  0.013702482  3.3973 0.0007148 ***
## log(Employees)           0.122349904  0.058832542  2.0796 0.0378835 *
## Age                      0.006726174  0.006325033  1.0634 0.2879180
## Total_Compensation      -0.000017045  0.000050913 -0.3348 0.7378741
## pct_pos_perfFB:pos_perf -0.392069095  0.188864736 -2.0759 0.0382258 *
## pos_perf:pct_neg_perfFB -0.020477970  0.143112235 -0.1431 0.8862556
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    516.75
## Residual Sum of Squares: 493.82
## R-Squared:      0.044378
## Adj. R-Squared: -0.066401
## F-statistic: 4.0505 on 9 and 785 DF, p-value: 0.000043171
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO
## BP = 24.118, df = 9, p-value = 0.004119

coeftest(FLM_NPO,vcov=vcovHC(FLM_NPO,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value    Pr(>|t|)
## pct_pos_perfFB           0.391743133  0.309801100  1.2645     0.20643
## pos_perf                 0.371882551  0.094381867  3.9402 0.000088671 ***
## pct_neg_perfFB          -0.028955265  0.006104066 -4.7436 0.000002494 ***
## Financial_Slack          0.046551360  0.018867069  2.4673     0.01382 *
## log(Employees)           0.122349904  0.058453570  2.0931     0.03666 *
## Age                      0.006726174  0.005033547  1.3363     0.18185
## Total_Compensation      -0.000017045  0.000014058 -1.2125     0.22568
## pct_pos_perfFB:pos_perf -0.392069095  0.309368159 -1.2673     0.20542
## pos_perf:pct_neg_perfFB -0.020477970  0.057100149 -0.3586     0.71997
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -
> interaction model

RLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_IL, RLM_IL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 229.28, df = 9, p-value < 0.00000000000000022
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_IL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 89, T = 1-27, N = 1009
```

```
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -7.893500 -0.207802 -0.036719  0.130494 30.657395
##
## Coefficients:
##                              Estimate   Std. Error t-value    Pr(>|t|)
## pct_pos_perfFB           0.923502153  0.282600153  3.2679    0.001124 **
## pos_perf                 0.228110856  0.141603329  1.6109    0.107545
## pct_neg_perfFB           0.023879624  0.005239173  4.5579 0.000005871 ***
## Financial_Slack          0.062517735  0.015109779  4.1376 0.000038351 ***
## log(Employees)           0.057767497  0.085292557  0.6773    0.498396
## Age                      0.008858906  0.009739581  0.9096    0.363286
## Total_Compensation      -0.000025932  0.000080418 -0.3225    0.747170
## pct_pos_perfFB:pos_perf -0.926077951  0.282750321 -3.2752    0.001096 **
## pos_perf:pct_neg_perfFB  0.043553084  0.230230264  0.1892    0.850000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1748.8
## Residual Sum of Squares: 1646
## R-Squared:      0.058779
## Adj. R-Squared: -0.041439
## F-statistic: 6.32131 on 9 and 911 DF, p-value: 0.000000010233
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_IL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_IL
## BP = 28.656, df = 9, p-value = 0.0007405

coeftest(FLM_IL,vcov=vcovHC(FLM_IL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value            Pr(>|
t|)
## pct_pos_perfFB           0.923502153  1.068200408  0.8645             0.38
752
## pos_perf                 0.228110856  0.183272118  1.2447             0.21
358
## pct_neg_perfFB           0.023879624  0.003083739  7.7437 0.00000000000002
565
## Financial_Slack          0.062517735  0.032009760  1.9531             0.05
112
## log(Employees)           0.057767497  0.073129262  0.7899             0.42
977
## Age                      0.008858906  0.008812835  1.0052             0.31
```

```
505
## Total_Compensation      -0.000025932  0.000019847 -1.3066             0.19
167
## pct_pos_perfFB:pos_perf -0.926077951  1.068401316 -0.8668             0.38
629
## pos_perf:pct_neg_perfFB  0.043553084  0.072940293  0.5971             0.55
059
##
## pct_pos_perfFB
## pos_perf
## pct_neg_perfFB          ***
## Financial_Slack         .
## log(Employees)
## Age
## Total_Compensation
## pct_pos_perfFB:pos_perf
## pos_perf:pct_neg_perfFB
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!

phtest(FLM_FL, RLM_FL) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 30.591, df = 9, p-value = 0.0003478
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(FLM_FL)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1080
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -5.69904 -0.43535 -0.11414  0.16403 19.59136
```

```
##
## Coefficients:
##                              Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.146774568  0.283152621  0.5184 0.604325
## pos_perf                 0.143573504  0.153446739  0.9357 0.349681
## pct_neg_perfFB           0.010224861  0.005503838  1.8578 0.063502 .
## Financial_Slack          0.022265752  0.013070529  1.7035 0.088790 .
## log(Employees)          -0.237260869  0.089324333 -2.6562 0.008032 **
## Age                      0.016420540  0.011335676  1.4486 0.147777
## Total_Compensation      -0.000042655  0.000090539 -0.4711 0.637660
## pct_pos_perfFB:pos_perf -0.163248456  0.283283774 -0.5763 0.564564
## pos_perf:pct_neg_perfFB  0.275128401  0.260838209  1.0548 0.291784
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2351.2
## Residual Sum of Squares: 2289.1
## R-Squared:      0.026391
## Adj. R-Squared: -0.073058
## F-statistic: 2.94857 on 9 and 979 DF, p-value: 0.0018401
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL
## BP = 15.174, df = 9, p-value = 0.08626

#coeftest(FLM_FL,vcov=vcovHC(FLM_FL,type="HC0",cluster="group"))

**TEMPORAL FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data
=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction
model

RLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Total_Compensation,data=P_CEO_
Data, model = "random") # pos_perf is a binary variable -> interaction model
vs. split sample model!

#For Random Model I need to eliminate one CV (Age), since my dataset is not b
ig enough and I would get the error: Error in swar_Between_check(estm[[2L]],
method) : model not estimable: 16 coefficient(s) (incl. intercept) to be esti
mated for the between model but only 13 individual(s)
```

```
phtest(FLM_SC3, RLM_SC3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus + pct_neg_
perfFB *  ...
## chisq = 63.462, df = 11, p-value = 0.000000002095
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus +
##     pct_neg_perfFB * Present_Focus + pct_pos_perfFB * Future_Focus +
##     pct_neg_perfFB * Future_Focus + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.89660721 -0.08818861  0.00099075  0.10987723  1.51775149
##
## Coefficients:
##                                  Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB                -0.02417240  0.31716271 -0.0762 0.939525
## Present_Focus                 -0.01600458  0.04305197 -0.3718 0.711507
## pct_neg_perfFB                -0.22576316  0.24723494 -0.9132 0.365148
## Future_Focus                  -0.21063324  0.12995021 -1.6209 0.110764
## Financial_Slack               -0.09386134  0.04793824 -1.9580 0.055315 .
## log(Employees)                -0.56995039  0.18323139 -3.1105 0.002958 **
## Age                           -0.00470698  0.01094833 -0.4299 0.668929
## Total_Compensation            -0.00079237  0.00028559 -2.7745 0.007537 **
## pct_pos_perfFB:Present_Focus -0.00072979  0.04044036 -0.0180 0.985667
## Present_Focus:pct_neg_perfFB  0.02170402  0.02186068  0.9928 0.325139
## pct_pos_perfFB:Future_Focus   0.00963142  0.04359190  0.2209 0.825953
## pct_neg_perfFB:Future_Focus   0.02524740  0.04023844  0.6274 0.532964
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.3969
## R-Squared:      0.474
## Adj. R-Squared: 0.24447
## F-statistic: 4.13022 on 12 and 55 DF, p-value: 0.00013645
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC3) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC3
## BP = 12.873, df = 12, p-value = 0.3784

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_AI3, RLM_AI3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 32.752, df = 12, p-value = 0.001058
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
```

```
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -105.64393  -12.12597   -0.67928   12.16300  221.70579
##
## Coefficients:
##                                Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                -5.732263  28.096302 -0.2040 0.8389283
## Present_Focus                  0.669479   4.346472  0.1540 0.8780307
## pct_neg_perfFB               -17.260620  27.257883 -0.6332 0.5286443
## Future_Focus                 -24.892867  13.305995 -1.8708 0.0655530 .
## Financial_Slack              -13.176648   5.013413 -2.6283 0.0105394 *
## log(Employees)               -68.479941  19.913085 -3.4389 0.0009877 ***
## Age                           -1.185307   1.196994 -0.9902 0.3254694
## Total_Compensation            -0.075164   0.032113 -2.3406 0.0221069 *
## pct_pos_perfFB:Present_Focus   0.507695   3.220676  0.1576 0.8751973
## Present_Focus:pct_neg_perfFB   1.829969   2.429935  0.7531 0.4539189
## pct_pos_perfFB:Future_Focus   -0.078525   5.062841 -0.0155 0.9876693
## pct_neg_perfFB:Future_Focus    1.389982   4.483091  0.3101 0.7574441
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 101060
## R-Squared:      0.41685
## Adj. R-Squared: 0.20025
## F-statistic: 4.16981 on 12 and 70 DF, p-value: 0.000064468
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI3
## BP = 13.707, df = 12, p-value = 0.3198

#coeftest(FLM_AI3,vcov=vcovHC(FLM_AI3,type="HC0",cluster="group"))

FLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_RD3, RLM_RD3) #H0: I should use the random effect panel model

##
##  Hausman Test
```

```
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Present_Focus +  .
..
## chisq = 54.972, df = 12, p-value = 0.0000001831
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD3)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.568875 -0.156031 -0.029713  0.103732  5.399066
##
## Coefficients:
##                                    Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB                -0.028523086  0.058590423 -0.4868 0.627086
## Present_Focus                 -0.038701790  0.035057749 -1.1039 0.271362
## pct_neg_perfFB                -0.155721530  0.339630689 -0.4585 0.647246
## Future_Focus                   0.186152809  0.130536307  1.4261 0.155901
## Financial_Slack               -0.039042930  0.031731933 -1.2304 0.220449
## log(Employees)                 0.439550591  0.165102397  2.6623 0.008596 **
## Age                           -0.008007357  0.012320120 -0.6499 0.516711
## Total_Compensation             0.000070043  0.000138957  0.5041 0.614944
## pct_pos_perfFB:Present_Focus -0.004083357  0.007901447 -0.5168 0.606057
## Present_Focus:pct_neg_perfFB  0.012777905  0.030355483  0.4209 0.674392
## pct_pos_perfFB:Future_Focus   0.025691932  0.024205106  1.0614 0.290180
## pct_neg_perfFB:Future_Focus   0.035721801  0.055069822  0.6487 0.517535
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 49.65
## R-Squared:      0.13413
## Adj. R-Squared: -0.070943
## F-statistic: 1.96219 on 12 and 152 DF, p-value: 0.031344
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD3)
```

```
##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_RD3
## BP = 4.8339, df = 12, p-value = 0.9633
```

```
FLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model
```

```
RLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> int
eraction model vs. split sample model!
```

```
phtest(FLM_PE3, RLM_PE3) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 55.412, df = 12, p-value = 0.0000001527
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE3)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.620471 -0.046104 -0.001540  0.047196  1.203154
##
## Coefficients:
##                                  Estimate   Std. Error t-value     Pr(>|t|
)
## pct_pos_perfFB               -0.014988981  0.019663750 -0.7623      0.4470
8
## Present_Focus                 0.012280644  0.011765861  1.0438      0.2982
6
## pct_neg_perfFB                0.072710188  0.113984717  0.6379      0.5245
0
## Future_Focus                 -0.095375232  0.043809775 -2.1770      0.0310
2 *
```

```
## Financial_Slack               -0.008578073  0.010649672 -0.8055      0.4218
0
## log(Employees)                -0.284453288  0.055410629 -5.1336 0.000000857
6 ***
## Age                            0.000975614  0.004134801  0.2360      0.8137
9
## Total_Compensation            -0.000079942  0.000046636 -1.7142      0.0885
4 .
## pct_pos_perfFB:Present_Focus   0.002665856  0.002651834  1.0053      0.3163
6
## Present_Focus:pct_neg_perfFB -0.004156119  0.010187716 -0.4080      0.6838
8
## pct_pos_perfFB:Future_Focus   -0.001669609  0.008123565 -0.2055      0.8374
4
## pct_neg_perfFB:Future_Focus   -0.017641779  0.018482188 -0.9545      0.3413
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.5924
## R-Squared:      0.20117
## Adj. R-Squared: 0.01197
## F-statistic: 3.1898 on 12 and 152 DF, p-value: 0.00042986
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE3
## BP = 24.748, df = 12, p-value = 0.01606

coeftest(FLM_PE3,vcov=vcovHC(FLM_PE3,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                 Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB                -0.014988981  0.005009199 -2.9923 0.003232 **
## Present_Focus                  0.012280644  0.007593444  1.6173 0.107894
## pct_neg_perfFB                 0.072710188  0.054086643  1.3443 0.180845
## Future_Focus                  -0.095375232  0.061983852 -1.5387 0.125954
## Financial_Slack               -0.008578073  0.011564391 -0.7418 0.459374
## log(Employees)                -0.284453288  0.112288490 -2.5332 0.012315 *
## Age                            0.000975614  0.002154199  0.4529 0.651274
## Total_Compensation            -0.000079942  0.000044248 -1.8067 0.072792 .
## pct_pos_perfFB:Present_Focus   0.002665856  0.001004568  2.6537 0.008807 **
## Present_Focus:pct_neg_perfFB -0.004156119  0.004688616 -0.8864 0.376787
## pct_pos_perfFB:Future_Focus   -0.001669609  0.002650455 -0.6299 0.529684
## pct_neg_perfFB:Future_Focus   -0.017641779  0.008337653 -2.1159 0.035982 *
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!

FLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Present
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Present
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!

phtest(FLM_NPO3, RLM_NPO3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Present_Foc
us +  ...
## chisq = 32.011, df = 12, p-value = 0.001378
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.895991 -0.056232 -0.002307  0.075836  0.506992
##
## Coefficients:
##                                Estimate   Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB               -0.008337167  0.019798595 -0.4211 0.6744554
## Present_Focus                 0.000568965  0.012270142  0.0464 0.9630945
## pct_neg_perfFB                0.093408023  0.130618980  0.7151 0.4759605
## Future_Focus                  0.034146515  0.049805580  0.6856 0.4943240
## Financial_Slack               0.009168494  0.011597882  0.7905 0.4308167
## log(Employees)                0.297344185  0.074517257  3.9903 0.0001155 *
**
## Age                           0.003796076  0.004831887  0.7856 0.4336724
```

```
## Total_Compensation            0.000136544  0.000080793  1.6900 0.0936833 .
## pct_pos_perfFB:Present_Focus -0.001955773  0.002859670 -0.6839 0.4953807
## Present_Focus:pct_neg_perfFB -0.007468092  0.011617116 -0.6429 0.5215776
## pct_pos_perfFB:Future_Focus   0.010537320  0.008819660  1.1948 0.2345997
## pct_neg_perfFB:Future_Focus  -0.014894855  0.021560210 -0.6908 0.4910286
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.9671
## R-Squared:      0.24414
## Adj. R-Squared: 0.018024
## F-statistic: 3.14916 on 12 and 117 DF, p-value: 0.00065019
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_NPO3)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_NPO3
## BP = 20.436, df = 12, p-value = 0.05928

FLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_IL3, RLM_IL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 13.354, df = 12, p-value = 0.3438
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_IL3)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
```

```
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1872  0.4326     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.143650 -0.156940 -0.022286  0.078685  3.303220
##
## Coefficients:
##                                  Estimate   Std. Error z-value Pr(>|z|)
## (Intercept)                   0.455431420  0.340815539  1.3363 0.181452
## pct_pos_perfFB               -0.006456443  0.039220200 -0.1646 0.869243
## Present_Focus                 0.015822599  0.020275282  0.7804 0.435162
## pct_neg_perfFB               -0.341456514  0.223325687 -1.5290 0.126274
## Future_Focus                 -0.070481474  0.066469571 -1.0604 0.288982
## Financial_Slack               0.013262679  0.016605450  0.7987 0.424468
## log(Employees)               -0.045014005  0.020537432 -2.1918 0.028394 *
## Age                          -0.009024751  0.005521437 -1.6345 0.102155
## Total_Compensation            0.000170904  0.000063513  2.6908 0.007127 **
## pct_pos_perfFB:Present_Focus -0.004179361  0.005501441 -0.7597 0.447443
## Present_Focus:pct_neg_perfFB  0.028834192  0.020102191  1.4344 0.151464
## pct_pos_perfFB:Future_Focus   0.016732137  0.016798560  0.9960 0.319228
## pct_neg_perfFB:Future_Focus   0.053171880  0.036164409  1.4703 0.141485
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 31.905
## R-Squared:      0.081977
## Adj. R-Squared: 0.019384
## Chisq: 15.7163 on 12 DF, p-value: 0.20458
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL3)

##
##  studentized Breusch-Pagan test
##
```

```
## data:  RLM_IL3
## BP = 14.272, df = 12, p-value = 0.2837

#coeftest(RLM_IL3,vcov=vcovHC(RLM_IL3,type="HC0",cluster="group"))

FLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model

RLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> in
teraction model vs. split sample model!

phtest(FLM_FL3, RLM_FL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 92.006, df = 12, p-value = 0.00000000000002017
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -4.713251 -0.382448 -0.025953  0.211602 16.087261
##
## Coefficients:
##                                Estimate  Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB               0.09213616  0.17347094  0.5311 0.5961018
## Present_Focus               -0.10565907  0.10379684 -1.0179 0.3103235
## pct_neg_perfFB               1.03582707  1.00555775  1.0301 0.3045984
## Future_Focus                 0.01547257  0.38648390  0.0400 0.9681184
## Financial_Slack              0.33669436  0.09394997  3.5838 0.0004556 ***
## log(Employees)              -0.23998182  0.48882507 -0.4909 0.6241798
## Age                          0.04672445  0.03647666  1.2809 0.2021653
## Total_Compensation          -0.00043182  0.00041141 -1.0496 0.2955632
```

```
## pct_pos_perfFB:Present_Focus  0.01127350  0.02339412  0.4819 0.6305741
## Present_Focus:pct_neg_perfFB -0.08592763  0.08987466 -0.9561 0.3405484
## pct_pos_perfFB:Future_Focus  -0.10227600  0.07166499 -1.4271 0.1555905
## pct_neg_perfFB:Future_Focus  -0.16292548  0.16304736 -0.9993 0.3192605
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    506.04
## Residual Sum of Squares: 435.23
## R-Squared:      0.13993
## Adj. R-Squared: -0.063776
## F-statistic: 2.06074 on 12 and 152 DF, p-value: 0.022684
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL3
## BP = 11.354, df = 12, p-value = 0.4988

**REGULATORY FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,da
ta=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interacti
on model
RLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Data, mod
el = "random") # pos_perf is a binary variable -> interaction model vs. split
sample model!

phtest(FLM_SC2, RLM_SC2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Promotion + pct_neg_perf
FB *  ...
## chisq = 33.195, df = 11, p-value = 0.0004892
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC2)

## Oneway (individual) effect Within Model
##
## Call:
```

```
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Promotion +
##     pct_neg_perfFB * Promotion + pct_pos_perfFB * log(Prevention +
##     1) + pct_neg_perfFB * log(Prevention + 1) + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.7595064 -0.0751820  0.0012855  0.1010588  1.2619045
##
## Coefficients:
##                                      Estimate  Std. Error t-value  Pr(>|t
|)
## pct_pos_perfFB                     -0.05021124  0.13115695 -0.3828 0.70331
90
## Promotion                           0.15954053  0.31797815  0.5017 0.61785
71
## pct_neg_perfFB                     -0.69443407  0.19253056 -3.6069 0.00066
90
## log(Prevention + 1)                -0.47200109  0.63386799 -0.7446 0.45966
16
## Financial_Slack                    -0.01011155  0.05186399 -0.1950 0.84614
04
## log(Employees)                     -0.64350525  0.17024650 -3.7798 0.00038
82
## Age                                -0.00543065  0.00988869 -0.5492 0.58510
62
## Total_Compensation                 -0.00068602  0.00022729 -3.0182 0.00384
83
## pct_pos_perfFB:Promotion            0.02682242  0.19215224  0.1396 0.88949
43
## Promotion:pct_neg_perfFB            1.85552279  0.50310809  3.6881 0.00051
89
## pct_pos_perfFB:log(Prevention + 1)  0.38939889  0.44326622  0.8785 0.38350
70
## pct_neg_perfFB:log(Prevention + 1) -3.99596396  1.05461826 -3.7890 0.00037
70
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB                     ***
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                     ***
## Age
## Total_Compensation                 **
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB           ***
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 4.5027
## R-Squared:      0.56115
## Adj. R-Squared: 0.36966
## F-statistic: 5.86071 on 12 and 55 DF, p-value: 0.0000020454
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC2) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC2
## BP = 30.227, df = 12, p-value = 0.002581

coeftest(FLM_SC2,vcov=vcovHC(FLM_SC2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                     -0.05021124  0.11815369 -0.4250  0.6725
2
## Promotion                           0.15954053  0.20332211  0.7847  0.4360
1
## pct_neg_perfFB                     -0.69443407  0.40971003 -1.6949  0.0957
4 .
## log(Prevention + 1)                -0.47200109  0.59235896 -0.7968  0.4289
8
## Financial_Slack                    -0.01011155  0.05025758 -0.2012  0.8412
9
## log(Employees)                     -0.64350525  0.32008445 -2.0104  0.0493
0 *
## Age                                -0.00543065  0.00524460 -1.0355  0.3049
8
## Total_Compensation                 -0.00068602  0.00031097 -2.2061  0.0315
7 *
## pct_pos_perfFB:Promotion            0.02682242  0.17709917  0.1515  0.8801
7
## Promotion:pct_neg_perfFB            1.85552279  1.08640689  1.7079  0.0932
9 .
## pct_pos_perfFB:log(Prevention + 1)  0.38939889  0.40016135  0.9731  0.3347
6
## pct_neg_perfFB:log(Prevention + 1) -3.99596396  2.29952015 -1.7377  0.0878
5 .
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_AI2, RLM_AI2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 246.15, df = 11, p-value < 0.00000000000000022
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -113.26603  -11.28245    0.20223   12.20402  214.93803
##
## Coefficients:
##                                      Estimate  Std. Error t-value  Pr(>|t
|)
## pct_pos_perfFB                     -7.198938   13.673385 -0.5265 0.60021
02
## Promotion                         -18.942581   33.279600 -0.5692 0.57104
```

```
58
## pct_neg_perfFB                       -15.845435   11.875480 -1.3343 0.18643
05
## log(Prevention + 1)                   54.701421   68.014804  0.8043 0.42397
12
## Financial_Slack                      -10.514233    5.430576 -1.9361 0.05689
19
## log(Employees)                       -74.532268   19.850345 -3.7547 0.00035
53
## Age                                   -1.277551    1.159528 -1.1018 0.27432
89
## Total_Compensation                    -0.089237    0.027546 -3.2396 0.00183
26
## pct_pos_perfFB:Promotion              14.724116   22.179436  0.6639 0.50895
84
## Promotion:pct_neg_perfFB              44.356528   29.478482  1.5047 0.13689
80
## pct_pos_perfFB:log(Prevention + 1)  -13.226960   44.366601 -0.2981 0.76648
80
## pct_neg_perfFB:log(Prevention + 1) -107.149037   61.035041 -1.7555 0.08354
29
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack                     .
## log(Employees)                      ***
## Age
## Total_Compensation                  **
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1) .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 97914
## R-Squared:      0.43498
## Adj. R-Squared: 0.22512
## F-statistic: 4.49079 on 12 and 70 DF, p-value: 0.000026005
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI2
## BP = 20.71, df = 12, p-value = 0.05478
```

```
#coeftest(FLM_AI2,vcov=vcovHC(FLM_AI2,type="HC0",cluster="group"))
# do it if I have heteroscedasticity!!!!

FLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model
RLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Dat
a, model = "random") # pos_perf is a binary variable -> interaction model vs.
split sample model!

phtest(FLM_RD2, RLM_RD2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 69.378, df = 11, p-value = 0.0000000001604
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.559968 -0.164603 -0.027028  0.132446  5.260777
##
## Coefficients:
##                                      Estimate   Std. Error t-value Pr(>|
t|)
## pct_pos_perfFB                    -0.027417909  0.048383492 -0.5667  0.57
177
## Promotion                         -0.559824662  0.283218353 -1.9767  0.04
989
## pct_neg_perfFB                    -0.012835900  0.082412831 -0.1558  0.87
644
## log(Prevention + 1)                0.329754733  0.668539899  0.4932  0.62
255
## Financial_Slack                   -0.046886925  0.033456843 -1.4014  0.16
313
## log(Employees)                     0.498399226  0.169648614  2.9378  0.00
```

```
382
## Age                                  -0.006412647  0.012333786 -0.5199  0.60
387
## Total_Compensation                    0.000091222  0.000137569  0.6631  0.50
827
## pct_pos_perfFB:Promotion              0.048585317  0.056041169  0.8670  0.38
733
## Promotion:pct_neg_perfFB              0.021127151  0.160490714  0.1316  0.89
544
## pct_pos_perfFB:log(Prevention + 1) -0.144512480  0.167085877 -0.8649  0.38
846
## pct_neg_perfFB:log(Prevention + 1)  0.244684517  0.312225202  0.7837  0.43
445
##
## pct_pos_perfFB
## Promotion                           *
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      **
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 48.616
## R-Squared:      0.15217
## Adj. R-Squared: -0.048636
## F-statistic: 2.27338 on 12 and 152 DF, p-value: 0.011094
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD2
## BP = 14.264, df = 12, p-value = 0.2841

#coeftest(FLM_RD2,vcov=vcovHC(FLM_RD2,type="HC0",cluster="group"))

FLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
```

```
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_PE2, RLM_PE2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 23.676, df = 11, p-value = 0.01417
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.624783 -0.059552  0.004481  0.043702  1.184280
##
## Coefficients:
##                                    Estimate   Std. Error t-value   Pr(
>|t|)
## pct_pos_perfFB                     0.009282843  0.016597884  0.5593    0.
57679
## Promotion                         -0.044683775  0.097157630 -0.4599    0.
64624
## pct_neg_perfFB                    -0.009846487  0.028271598 -0.3483    0.
72811
## log(Prevention + 1)               -0.327807199  0.229341608 -1.4293    0.
15496
## Financial_Slack                   -0.004666089  0.011477320 -0.4065    0.
68491
## log(Employees)                    -0.247502758  0.058197702 -4.2528 0.000
03674
## Age                               -0.000036200  0.004231087 -0.0086    0.
99318
## Total_Compensation                -0.000089971  0.000047193 -1.9065    0.
05848
## pct_pos_perfFB:Promotion          -0.012163262  0.019224839 -0.6327    0.
52789
## Promotion:pct_neg_perfFB           0.030502613  0.055056098  0.5540    0.
```

```
58037
## pct_pos_perfFB:log(Prevention + 1) -0.001671434  0.057318559 -0.0292    0.
97677
## pct_neg_perfFB:log(Prevention + 1) -0.077901592  0.107108386 -0.7273    0.
46815
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      ***
## Age
## Total_Compensation                  .
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.7212
## R-Squared:      0.18277
## Adj. R-Squared: -0.010789
## F-statistic: 2.83278 on 12 and 152 DF, p-value: 0.0015595
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE2
## BP = 22.841, df = 12, p-value = 0.02911

coeftest(FLM_PE2,vcov=vcovHC(FLM_PE2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate   Std. Error t value Pr(>|
t|)
## pct_pos_perfFB                     0.009282843  0.008003592  1.1598  0.24
793
## Promotion                         -0.044683775  0.094075902 -0.4750  0.63
549
## pct_neg_perfFB                    -0.009846487  0.016130032 -0.6104  0.54
248
## log(Prevention + 1)               -0.327807199  0.332780077 -0.9851  0.32
616
## Financial_Slack                   -0.004666089  0.013562441 -0.3440  0.73
```

```
129
## log(Employees)                      -0.247502758  0.113189826 -2.1866  0.03
030 *
## Age                                 -0.000036200  0.002736924 -0.0132  0.98
946
## Total_Compensation                  -0.000089971  0.000051910 -1.7332  0.08
509 .
## pct_pos_perfFB:Promotion            -0.012163262  0.008400473 -1.4479  0.14
970
## Promotion:pct_neg_perfFB             0.030502613  0.039978323  0.7630  0.44
666
## pct_pos_perfFB:log(Prevention + 1) -0.001671434  0.041408654 -0.0404  0.96
786
## pct_neg_perfFB:log(Prevention + 1) -0.077901592  0.083174146 -0.9366  0.35
045
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Co
mpensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variabl
e -> interaction model
RLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P
_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction m
odel vs. split sample model!

phtest(FLM_NPO2, RLM_NPO2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Promotion +
...
## chisq = 37.935, df = 11, p-value = 0.00008023
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO2)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
```

```
## -0.9170730 -0.0551682  0.0019349  0.0681725  0.4778152
##
## Coefficients:
##                                     Estimate   Std. Error t-value   Pr(
>|t|)
## pct_pos_perfFB                    -0.004996678  0.018466362 -0.2706     0
.7872
## Promotion                         -0.058124461  0.117758609 -0.4936     0
.6225
## pct_neg_perfFB                     0.051672993  0.071580372  0.7219     0
.4718
## log(Prevention + 1)               -0.249406413  0.270025527 -0.9236     0
.3576
## Financial_Slack                    0.012718502  0.012623382  1.0075     0
.3158
## log(Employees)                     0.317920640  0.074360144  4.2754 0.000
03913
## Age                                0.004843175  0.004892676  0.9899     0
.3243
## Total_Compensation                 0.000111272  0.000079421  1.4010     0
.1639
## pct_pos_perfFB:Promotion           0.005623276  0.021504352  0.2615     0
.7942
## Promotion:pct_neg_perfFB          -0.120444160  0.183463736 -0.6565     0
.5128
## pct_pos_perfFB:log(Prevention + 1)  0.020025583  0.060425080  0.3314     0
.7409
## pct_neg_perfFB:log(Prevention + 1)  0.207553116  0.382540294  0.5426     0
.5885
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                     ***
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 4.014
## R-Squared:      0.23519
## Adj. R-Squared: 0.0064016
## F-statistic: 2.99828 on 12 and 117 DF, p-value: 0.0010901
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO2
## BP = 35.755, df = 12, p-value = 0.0003548

coeftest(FLM_NPO2,vcov=vcovHC(FLM_NPO2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                     -0.00499668  0.01028884 -0.4856  0.6281
3
## Promotion                          -0.05812446  0.07867963 -0.7387  0.4615
4
## pct_neg_perfFB                      0.05167299  0.10594291  0.4877  0.6266
4
## log(Prevention + 1)                -0.24940641  0.23871891 -1.0448  0.2982
8
## Financial_Slack                     0.01271850  0.02624029  0.4847  0.6288
0
## log(Employees)                      0.31792064  0.16143218  1.9694  0.0512
7 .
## Age                                 0.00484318  0.00324804  1.4911  0.1386
2
## Total_Compensation                  0.00011127  0.00011622  0.9574  0.3403
3
## pct_pos_perfFB:Promotion            0.00562328  0.01191739  0.4719  0.6379
1
## Promotion:pct_neg_perfFB           -0.12044416  0.28155069 -0.4278  0.6695
9
## pct_pos_perfFB:log(Prevention + 1)  0.02002558  0.03964452  0.5051  0.6144
2
## pct_neg_perfFB:log(Prevention + 1)  0.20755312  0.60165832  0.3450  0.7307
4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_IL2, RLM_IL2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 8.007, df = 11, p-value = 0.7127
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_IL2)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1931  0.4394     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.054752 -0.147489 -0.048535  0.060002  3.253389
##
## Coefficients:
##                                    Estimate   Std. Error z-value Pr(>|
z|)
## (Intercept)                         0.386803967  0.328858447  1.1762  0.23
951
## pct_pos_perfFB                     -0.006450049  0.032724230 -0.1971  0.84
375
## Promotion                          -0.168680045  0.166043412 -1.0159  0.30
969
## pct_neg_perfFB                      0.016297728  0.057669355  0.2826  0.77
748
## log(Prevention + 1)                -0.267642251  0.354208274 -0.7556  0.44
988
## Financial_Slack                     0.033355624  0.016784892  1.9872  0.04
690 *
## Total_Compensation                  0.000097786  0.000056968  1.7165  0.08
607 .
## Age                                -0.006879626  0.005430535 -1.2668  0.20
521
## pct_pos_perfFB:Promotion            0.009441784  0.037993097  0.2485  0.80
```

```
374
## Promotion:pct_neg_perfFB           -0.088913858  0.110298348 -0.8061  0.42
017
## pct_pos_perfFB:log(Prevention + 1) -0.018981612  0.114245967 -0.1661  0.86
804
## pct_neg_perfFB:log(Prevention + 1)  0.326330214  0.209005446  1.5613  0.11
844
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 32.782
## R-Squared:      0.056731
## Adj. R-Squared: -0.0018898
## Chisq: 10.6454 on 11 DF, p-value: 0.47343
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL2)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL2
## BP = 8.9157, df = 11, p-value = 0.6297

FLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_FL2, RLM_FL2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Promotion +  ..
.
## chisq = 19.065, df = 11, p-value = 0.05994
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_FL2)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
```

```
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 2.830   1.682     1
## individual    0.000   0.000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -2.96656 -0.52518 -0.12683  0.21939 20.03781
##
## Coefficients:
##                                    Estimate  Std. Error z-value Pr(>|z|
)
## (Intercept)                       -0.20172843  1.32627638 -0.1521 0.87910
7
## pct_pos_perfFB                    -0.04804810  0.13197585 -0.3641 0.71580
8
## Promotion                         -0.18792895  0.66964816 -0.2806 0.77898
8
## pct_neg_perfFB                     0.01068336  0.23257880  0.0459 0.96336
3
## log(Prevention + 1)               -2.41775960  1.42851148 -1.6925 0.09055
0 .
## Financial_Slack                    0.20426763  0.06769297  3.0176 0.00254
8 **
## Total_Compensation                -0.00022492  0.00022975 -0.9790 0.32758
8
## Age                                0.00671181  0.02190119  0.3065 0.75925
6
## pct_pos_perfFB:Promotion          -0.00954117  0.15322504 -0.0623 0.95034
9
## Promotion:pct_neg_perfFB           0.09620832  0.44482997  0.2163 0.82876
9
## pct_pos_perfFB:log(Prevention + 1)  0.69523591  0.46075060  1.5089 0.13131
9
## pct_neg_perfFB:log(Prevention + 1) -0.55210094  0.84291278 -0.6550 0.51247
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    574.97
## Residual Sum of Squares: 533.2
## R-Squared:      0.072649
```

```
## Adj. R-Squared: 0.015017
## Chisq: 13.8662 on 11 DF, p-value: 0.24049
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_FL2)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_FL2
## BP = 11.293, df = 11, p-value = 0.4191
```

8. Linear Probability Models

I use the linear probability model for binary variables (and the log-log model for the elasticities of non-binary variables). In this first part I combine all 4 performance possibilities (positive/negative & above/below aspiration) with all 6 possibilities of strategic change (small/big / positive&big / positive & small / negative & small / negative & big). After that I do the same for every single dimension of strategic change (adv_change/rd_change/plant_change/…)

STRATEGIC CHANGE MODELS

Models with binary DV

Linear Probability Model

```
BV_LPM_BSC_PosPerf_AboAsp <- lm(BV_big_strat_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_AboAsp <- lm(BV_small_strat_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5959 -0.5959  0.4041  0.4041  0.6541
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.59590    0.01858  32.066 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.25004    0.03060  -8.171 0.000000000000000852 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4857 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.05821,    Adjusted R-squared:  0.05734
## F-statistic: 66.76 on 1 and 1080 DF,  p-value: 0.0000000000000008522

summary(BV_LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6541 -0.4041 -0.4041  0.5959  0.5959
##
## Coefficients:
##                      Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.40410    0.01858  21.745 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.25004    0.03060   8.171 0.000000000000000852 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4857 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.05821,    Adjusted R-squared:  0.05734
## F-statistic: 66.76 on 1 and 1080 DF,  p-value: 0.0000000000000008522

BV_LPM_BSC_PosPerf_BelAsp <- lm(BV_big_strat_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_BelAsp <- lm(BV_small_strat_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5520 -0.5520  0.4480  0.4480  0.6453
##
## Coefficients:
##                      Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.55202    0.01725  31.993 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.19730    0.03487  -5.659         0.0000000195 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.0288, Adjusted R-squared:  0.0279
## F-statistic: 32.02 on 1 and 1080 DF,  p-value: 0.0000000195

summary(BV_LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6453 -0.4480 -0.4480  0.5520  0.5520
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.44798    0.01725  25.963 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.19730    0.03487   5.659         0.0000000195 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.0288, Adjusted R-squared:  0.0279
## F-statistic: 32.02 on 1 and 1080 DF,  p-value: 0.0000000195

BV_LPM_BSC_NegPerf_AboAsp <- lm(BV_big_strat_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_AboAsp <- lm(BV_small_strat_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7381 -0.4434 -0.4434  0.5566  0.5566
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.44337    0.01606  27.611 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  0.29473    0.04100   7.189      0.0000000000012 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4889 on 1093 degrees of freedom
##   (6732 observations deleted due to missingness)
## Multiple R-squared:  0.04515,    Adjusted R-squared:  0.04428
## F-statistic: 51.69 on 1 and 1093 DF,  p-value: 0.000000000001204

summary(BV_LPM_SSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5566 -0.5566  0.4434  0.4434  0.7381
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.55663    0.01606  34.665 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.29473    0.04100  -7.189      0.0000000000012 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4889 on 1093 degrees of freedom
##   (6732 observations deleted due to missingness)
## Multiple R-squared:  0.04515,    Adjusted R-squared:  0.04428
## F-statistic: 51.69 on 1 and 1093 DF,  p-value: 0.000000000001204
```

```
BV_LPM_BSC_NegPerf_BelAsp <- lm(BV_big_strat_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_BelAsp <- lm(BV_small_strat_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7441 -0.4276 -0.4276  0.5724  0.5724
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.42760    0.01629  26.242 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  0.31647    0.03712   8.526 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4845 on 1093 degrees of freedom
##   (6732 observations deleted due to missingness)
## Multiple R-squared:  0.06235,    Adjusted R-squared:  0.0615
## F-statistic: 72.69 on 1 and 1093 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SSC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5724 -0.5724  0.4276  0.4276  0.7441
```

```
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.57240    0.01629  35.128 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.31647    0.03712  -8.526 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4845 on 1093 degrees of freedom
##   (6732 observations deleted due to missingness)
## Multiple R-squared:  0.06235,    Adjusted R-squared:  0.0615
## F-statistic: 72.69 on 1 and 1093 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BAC_PosPerf_AboAsp <- lm(BV_big_adv_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_AboAsp <- lm(BV_small_adv_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5605 -0.5605  0.4395  0.4395  0.6166
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.56053    0.01523  36.797 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.17713    0.02670  -6.633      0.0000000000452 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4934 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02755,    Adjusted R-squared:  0.02693
## F-statistic:    44 on 1 and 1553 DF,  p-value: 0.00000000004521
```

```
summary(BV_LPM_SAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6166 -0.4395 -0.4395  0.5605  0.5605
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.43947    0.01523  28.849 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.17713    0.02670   6.633      0.0000000000452 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4934 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02755,    Adjusted R-squared:  0.02693
## F-statistic:    44 on 1 and 1553 DF,  p-value: 0.00000000004521
```

```
BV_LPM_BAC_PosPerf_BelAsp <- lm(BV_big_adv_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_BelAsp <- lm(BV_small_adv_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5572 -0.5572  0.4428  0.4428  0.6979
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.55719    0.01399  39.841 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.25507    0.03031  -8.415 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4893 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.04361,    Adjusted R-squared:  0.04299
## F-statistic: 70.81 on 1 and 1553 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6979 -0.4428 -0.4428  0.5572  0.5572
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.44281    0.01399  31.663 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.25507    0.03031   8.415 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4893 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.04361,    Adjusted R-squared:  0.04299
## F-statistic: 70.81 on 1 and 1553 DF,  p-value: < 0.00000000000000022

BV_LPM_BAC_NegPerf_AboAsp <- lm(BV_big_adv_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_NegPerf_AboAsp <- lm(BV_small_adv_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6667 -0.4450 -0.4450  0.5550  0.5550
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.44497    0.01382  32.197 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  0.22170    0.03303   6.712      0.0000000000268 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4929 on 1540 degrees of freedom
##   (6285 observations deleted due to missingness)
## Multiple R-squared:  0.02843,    Adjusted R-squared:  0.0278
## F-statistic: 45.06 on 1 and 1540 DF,  p-value: 0.00000000002681

summary(BV_LPM_SAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5550 -0.5550  0.4450  0.4450  0.6667
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.55503    0.01382  40.161 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.22170    0.03303  -6.712      0.0000000000268 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4929 on 1540 degrees of freedom
##   (6285 observations deleted due to missingness)
## Multiple R-squared:  0.02843,    Adjusted R-squared:  0.0278
## F-statistic: 45.06 on 1 and 1540 DF,  p-value: 0.00000000002681

BV_LPM_BAC_NegPerf_BelAsp <- lm(BV_big_adv_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
```

```
BV_LPM_SAC_NegPerf_BelAsp <- lm(BV_small_adv_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6621 -0.4293 -0.4293  0.5707  0.5707
##
## Coefficients:
##                      Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.42930    0.01427  30.094 < 0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  0.23275    0.02948   7.894   0.0000000000000055 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1540 degrees of freedom
##   (6285 observations deleted due to missingness)
## Multiple R-squared:  0.0389, Adjusted R-squared:  0.03827
## F-statistic: 62.32 on 1 and 1540 DF,  p-value: 0.000000000000005495

summary(BV_LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5707 -0.5707  0.4293  0.4293  0.6621
##
## Coefficients:
##                      Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.57070    0.01427  40.006 < 0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.23275    0.02948  -7.894   0.0000000000000055 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1540 degrees of freedom
##   (6285 observations deleted due to missingness)
## Multiple R-squared:  0.0389, Adjusted R-squared:  0.03827
## F-statistic: 62.32 on 1 and 1540 DF,  p-value: 0.000000000000005495

BV_LPM_BRC_PosPerf_AboAsp <- lm(BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_AboAsp <- lm(BV_small_rd_change ~ BV_PosPerf_AboAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5757 -0.5757  0.4243  0.4243  0.7248
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.57567    0.00801   71.87 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.30049    0.01634  -18.39 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4833 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.06595,    Adjusted R-squared:  0.06575
## F-statistic: 338.3 on 1 and 4791 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7248 -0.4243 -0.4243  0.5757  0.5757
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.42433    0.00801   52.98 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.30049    0.01634   18.39 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4833 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.06595,    Adjusted R-squared:  0.06575
## F-statistic: 338.3 on 1 and 4791 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_PosPerf_BelAsp <- lm(BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_BelAsp <- lm(BV_small_rd_change ~ BV_PosPerf_BelAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.5449 -0.5449  0.4551  0.4551  0.7410
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.544900   0.007652   71.21 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.285907   0.020095  -14.23 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4899 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.04054,    Adjusted R-squared:  0.04034
## F-statistic: 202.4 on 1 and 4791 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7410 -0.4551 -0.4551  0.5449  0.5449
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.455100   0.007652   59.47 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.285907   0.020095   14.23 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4899 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.04054,    Adjusted R-squared:  0.04034
## F-statistic: 202.4 on 1 and 4791 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_AboAsp <- lm(BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_AboAsp <- lm(BV_small_rd_change ~ BV_NegPerf_AboAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6187 -0.4306 -0.4306  0.5694  0.5694
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.430560   0.008481   50.77 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.188121   0.016735   11.24 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4929 on 4542 degrees of freedom
##   (3283 observations deleted due to missingness)
## Multiple R-squared:  0.02707,    Adjusted R-squared:  0.02685
## F-statistic: 126.4 on 1 and 4542 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5694 -0.5694  0.4306  0.4306  0.6187
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.569440   0.008481   67.14 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.188121   0.016735  -11.24 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4929 on 4542 degrees of freedom
##   (3283 observations deleted due to missingness)
## Multiple R-squared:  0.02707,    Adjusted R-squared:  0.02685
## F-statistic: 126.4 on 1 and 4542 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_BelAsp <- lm(BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_BelAsp <- lm(BV_small_rd_change ~ BV_NegPerf_BelAspT_1, da
ta=P_CEO_Data)
```

```
summary(BV_LPM_BRC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6510 -0.4037 -0.4037  0.5963  0.5963
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.403731   0.008651   46.67 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.247247   0.015693   15.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4865 on 4542 degrees of freedom
##   (3283 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.05182,    Adjusted R-squared:  0.05161
## F-statistic: 248.2 on 1 and 4542 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5963 -0.5963  0.4037  0.4037  0.6510
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.596269   0.008651   68.92 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.247247   0.015693  -15.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4865 on 4542 degrees of freedom
##   (3283 observations deleted due to missingness)
## Multiple R-squared:  0.05182,    Adjusted R-squared:  0.05161
## F-statistic: 248.2 on 1 and 4542 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_PosPerf_AboAsp <- lm(BV_big_plant_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_AboAsp <- lm(BV_small_plant_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5395 -0.5395 -0.2574  0.4605  0.7426
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.539467   0.007683   70.21 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.282073   0.015708  -17.96 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.05811,    Adjusted R-squared:  0.05793
## F-statistic: 322.5 on 1 and 5227 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7426 -0.4605  0.2574  0.5395  0.5395
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.460533   0.007683   59.94 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.282073   0.015708   17.96 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.05811,    Adjusted R-squared:  0.05793
## F-statistic: 322.5 on 1 and 5227 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_PosPerf_BelAsp <- lm(BV_big_plant_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_BelAsp <- lm(BV_small_plant_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5191 -0.5191 -0.1898  0.4809  0.8102
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.519081   0.007257   71.52 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.329241   0.019189  -17.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4858 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.05332,    Adjusted R-squared:  0.05314
## F-statistic: 294.4 on 1 and 5227 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8102 -0.4809  0.1898  0.5191  0.5191
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.480919   0.007257   66.27 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.329241   0.019189   17.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4858 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.05332,    Adjusted R-squared:  0.05314
## F-statistic: 294.4 on 1 and 5227 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_NegPerf_AboAsp <- lm(BV_big_plant_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_AboAsp <- lm(BV_small_plant_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6356 -0.3858 -0.3858  0.6142  0.6142
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.385757   0.007974   48.38 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.249871   0.015951   15.66 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4855 on 4940 degrees of freedom
##   (2885 observations deleted due to missingness)
## Multiple R-squared:  0.04732,    Adjusted R-squared:  0.04713
## F-statistic: 245.4 on 1 and 4940 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6142 -0.6142  0.3858  0.3858  0.6356
```

```
##
## Coefficients:
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)             0.614243   0.007974   77.03 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.249871   0.015951  -15.66 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4855 on 4940 degrees of freedom
##   (2885 observations deleted due to missingness)
## Multiple R-squared:  0.04732,    Adjusted R-squared:  0.04713
## F-statistic: 245.4 on 1 and 4940 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_NegPerf_BelAsp <- lm(BV_big_plant_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_BelAsp <- lm(BV_small_plant_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5967 -0.3822 -0.3822  0.6178  0.6178
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.382233   0.008333   45.87 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.214478   0.015025   14.27 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4875 on 4940 degrees of freedom
##   (2885 observations deleted due to missingness)
## Multiple R-squared:  0.03961,    Adjusted R-squared:  0.03942
## F-statistic: 203.8 on 1 and 4940 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6178 -0.6178  0.3822  0.3822  0.5967
##
## Coefficients:
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)             0.617767   0.008333   74.14 <0.0000000000000002 ***
```

```
## BV_NegPerf_BelAspT_1 -0.214478   0.015025  -14.27 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4875 on 4940 degrees of freedom
##   (2885 observations deleted due to missingness)
## Multiple R-squared:  0.03961,    Adjusted R-squared:  0.03942
## F-statistic: 203.8 on 1 and 4940 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_PosPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_AboAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5812 -0.5812  0.4188  0.4188  0.6595
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.58122    0.01056   55.05 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.24069    0.01856  -12.97 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4873 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.05072,    Adjusted R-squared:  0.05042
## F-statistic: 168.2 on 1 and 3147 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6595 -0.4188 -0.4188  0.5812  0.5812
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.41878    0.01056   39.66 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.24069    0.01856   12.97 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.4873 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.05072,    Adjusted R-squared:  0.05042
## F-statistic: 168.2 on 1 and 3147 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_PosPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_BelAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5596 -0.5596  0.4404  0.4404  0.7104
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.559567   0.009773   57.26 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.269933   0.021413  -12.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.488 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.04807,    Adjusted R-squared:  0.04777
## F-statistic: 158.9 on 1 and 3147 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7104 -0.4404 -0.4404  0.5596  0.5596
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.440433   0.009773   45.06 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.269933   0.021413   12.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.488 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.04807,    Adjusted R-squared:  0.04777
## F-statistic: 158.9 on 1 and 3147 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_NegPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_AboAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7308 -0.4286 -0.4286  0.5714  0.5714
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.428571   0.009641   44.45 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.302198   0.022492   13.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.486 on 3111 degrees of freedom
##   (4714 observations deleted due to missingness)
## Multiple R-squared:  0.05484,    Adjusted R-squared:  0.05454
## F-statistic: 180.5 on 1 and 3111 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5714 -0.5714  0.4286  0.4286  0.7308
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.571429   0.009641   59.27 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.302198   0.022492  -13.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.486 on 3111 degrees of freedom
##   (4714 observations deleted due to missingness)
## Multiple R-squared:  0.05484,    Adjusted R-squared:  0.05454
## F-statistic: 180.5 on 1 and 3111 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_NegPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_BelAspT
_1, data=P_CEO_Data)
```

```
summary(BV_LPM_BNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6801 -0.4252 -0.4252  0.5748  0.5748
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.425230   0.009978   42.62 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.254882   0.020763   12.28 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4882 on 3111 degrees of freedom
##   (4714 observations deleted due to missingness)
## Multiple R-squared:  0.0462, Adjusted R-squared:  0.0459
## F-statistic: 150.7 on 1 and 3111 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5748 -0.5748  0.4252  0.4252  0.6801
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.574770   0.009978   57.60 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.254882   0.020763  -12.28 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4882 on 3111 degrees of freedom
##   (4714 observations deleted due to missingness)
## Multiple R-squared:  0.0462, Adjusted R-squared:  0.0459
## F-statistic: 150.7 on 1 and 3111 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_PosPerf_AboAsp <- lm(BV_big_invent_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_AboAsp <- lm(BV_small_invent_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5637 -0.5637  0.4363  0.4363  0.6383
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.563754   0.009301   60.61 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.202087   0.016964  -11.91 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4915 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.03435,    Adjusted R-squared:  0.0341
## F-statistic: 141.9 on 1 and 3990 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6383 -0.4363 -0.4363  0.5637  0.5637
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.436246   0.009301   46.90 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.202087   0.016964   11.91 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4915 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.03435,    Adjusted R-squared:  0.0341
## F-statistic: 141.9 on 1 and 3990 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_PosPerf_BelAsp <- lm(BV_big_invent_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_BelAsp <- lm(BV_small_invent_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Dat
a)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5536 -0.5536  0.4464  0.4464  0.7177
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.553571   0.008577   64.54 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.271313   0.019868  -13.66 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4888 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.04465,    Adjusted R-squared:  0.04441
## F-statistic: 186.5 on 1 and 3990 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7177 -0.4464 -0.4464  0.5536  0.5536
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.446429   0.008577   52.05 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.271313   0.019868   13.66 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4888 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.04465,    Adjusted R-squared:  0.04441
## F-statistic: 186.5 on 1 and 3990 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_NegPerf_AboAsp <- lm(BV_big_invent_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_AboAsp <- lm(BV_small_invent_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)
```

```
summary(BV_LPM_BIC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6912 -0.4329 -0.4329  0.5671  0.5671
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.43289    0.00877   49.36 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  0.25828    0.01923   13.43 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4888 on 3921 degrees of freedom
##   (3904 observations deleted due to missingness)
## Multiple R-squared:  0.04399,    Adjusted R-squared:  0.04375
## F-statistic: 180.4 on 1 and 3921 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5671 -0.5671  0.4329  0.4329  0.6912
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.56711    0.00877   64.67 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.25828    0.01923  -13.43 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4888 on 3921 degrees of freedom
##   (3904 observations deleted due to missingness)
## Multiple R-squared:  0.04399,    Adjusted R-squared:  0.04375
## F-statistic: 180.4 on 1 and 3921 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_NegPerf_BelAsp <- lm(BV_big_invent_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_BelAsp <- lm(BV_small_invent_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)
```

```
summary(BV_LPM_BIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6322 -0.4372 -0.4372  0.5628  0.5628
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.437158   0.009105   48.01 <0.0000000000000002 ***
```

```
## BV_NegPerf_BelAspT_1 0.195002   0.018080   10.79 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4927 on 3921 degrees of freedom
##   (3904 observations deleted due to missingness)
## Multiple R-squared:  0.02881,    Adjusted R-squared:  0.02857
## F-statistic: 116.3 on 1 and 3921 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5628 -0.5628  0.4372  0.4372  0.6322
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.562842   0.009105   61.81 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.195002   0.018080  -10.79 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4927 on 3921 degrees of freedom
##   (3904 observations deleted due to missingness)
## Multiple R-squared:  0.02881,    Adjusted R-squared:  0.02857
## F-statistic: 116.3 on 1 and 3921 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_PosPerf_AboAsp <- lm(BV_big_fin_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_AboAsp <- lm(BV_small_fin_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5177 -0.5177 -0.3088  0.4824  0.6912
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.517647   0.007611   68.01 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.208812   0.015702  -13.30 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4912 on 5442 degrees of freedom
```

```
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.03147,    Adjusted R-squared:  0.03129
## F-statistic: 176.8 on 1 and 5442 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6912 -0.4824  0.3088  0.5177  0.5177
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.482353   0.007611   63.38 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.208812   0.015702   13.30 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4912 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.03147,    Adjusted R-squared:  0.03129
## F-statistic: 176.8 on 1 and 5442 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_PosPerf_BelAsp <- lm(BV_big_fin_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_BelAsp <- lm(BV_small_fin_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5052 -0.5052 -0.2404  0.4948  0.7596
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.505223   0.007164   70.53 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.264851   0.019262  -13.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4907 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.03357,    Adjusted R-squared:  0.0334
## F-statistic: 189.1 on 1 and 5442 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7596 -0.4948  0.2404  0.5052  0.5052
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.494777   0.007164   69.07 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.264851   0.019262   13.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4907 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.03357,    Adjusted R-squared:  0.0334
## F-statistic: 189.1 on 1 and 5442 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_NegPerf_AboAsp <- lm(BV_big_fin_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_AboAsp <- lm(BV_small_fin_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5656 -0.4090 -0.4090  0.5910  0.5910
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.409032   0.007961  51.377 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.156555   0.015835   9.887 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 5125 degrees of freedom
##   (2700 observations deleted due to missingness)
## Multiple R-squared:  0.01872,    Adjusted R-squared:  0.01852
## F-statistic: 97.75 on 1 and 5125 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5910 -0.5910  0.4090  0.4090  0.5656
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.590968   0.007961  74.229 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.156555   0.015835  -9.887 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 5125 degrees of freedom
##   (2700 observations deleted due to missingness)
## Multiple R-squared:  0.01872,    Adjusted R-squared:  0.01852
## F-statistic: 97.75 on 1 and 5125 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_NegPerf_BelAsp <- lm(BV_big_fin_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_BelAsp <- lm(BV_small_fin_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5551 -0.4000 -0.4000  0.6000  0.6000
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.400000   0.008296   48.21 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.155072   0.014819   10.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4922 on 5125 degrees of freedom
##   (2700 observations deleted due to missingness)
## Multiple R-squared:  0.02092,    Adjusted R-squared:  0.02073
## F-statistic: 109.5 on 1 and 5125 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6000 -0.6000  0.4000  0.4000  0.5551
##
## Coefficients:
```

```
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)             0.600000   0.008296   72.32 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.155072   0.014819  -10.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4922 on 5125 degrees of freedom
##   (2700 observations deleted due to missingness)
## Multiple R-squared:  0.02092,    Adjusted R-squared:  0.02073
## F-statistic: 109.5 on 1 and 5125 DF,  p-value: < 0.00000000000000022
```

9. Log-Log Models

the variables are absolute (only positive) and standardized values!

Log-Log Model with elasticities of continuous DV and IVs:

```
LPM_BSC_PosPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05222 -0.05222  0.00034  0.02007  1.48303
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.052225   0.003027  17.250 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.069613   0.024712  -2.817              0.004
94
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08784 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.007294,   Adjusted R-squared:  0.006375
## F-statistic: 7.935 on 1 and 1080 DF,  p-value: 0.004937

summary(LPM_SSC_PosPerf_AboAsp)

##
## Call:
```

```
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.06850 -0.02063 -0.02063  0.02276  0.03174
##
## Coefficients:
##                             Estimate Std. Error t value             Pr(>|t|
)
## (Intercept)                 0.020630   0.000778  26.518 < 0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.028903   0.006350   4.551           0.0000059
3 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02257 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.01882,    Adjusted R-squared:  0.01791
## F-statistic: 20.72 on 1 and 1080 DF,  p-value: 0.000005931
```

```
LPM_BSC_PosPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05303 -0.05303 -0.00040  0.01980  1.48222
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.053034   0.002914  18.199 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.189581   0.046749  -4.055           0.00005
37
##
## (Intercept)                  ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08749 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.015,  Adjusted R-squared:  0.01409
## F-statistic: 16.45 on 1 and 1080 DF,  p-value: 0.00005367

summary(LPM_SSC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.03837 -0.02076 -0.02076  0.02328  0.03163
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0207615  0.0007503  27.672 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0603784  0.0120357   5.017          0.0000006
15
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02253 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.02277,    Adjusted R-squared:  0.02187
## F-statistic: 25.17 on 1 and 1080 DF,  p-value: 0.0000006146

LPM_BSC_NegPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.14778 -0.04020 -0.04020  0.02082  1.49506
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t|
)
## (Intercept)                  0.04020    0.00253  15.890 < 0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) -0.03741    0.01126  -3.322             0.00092
4 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08007 on 1045 degrees of freedom
##   (6780 observations deleted due to missingness)
## Multiple R-squared:  0.01045,    Adjusted R-squared:  0.009505
## F-statistic: 11.04 on 1 and 1045 DF,  p-value: 0.0009239
```

```
summary(LPM_SSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02443 -0.02443  0.01125  0.02202  0.05964
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0244298  0.0007146  34.186 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0125623  0.0031814   3.949            0.00008
38
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02262 on 1045 degrees of freedom
##   (6780 observations deleted due to missingness)
## Multiple R-squared:  0.0147, Adjusted R-squared:  0.01376
## F-statistic: 15.59 on 1 and 1045 DF,  p-value: 0.00008385
```

```
LPM_BSC_NegPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BSC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.24054 -0.03808 -0.03808  0.02185  1.34273
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
```

```
|)
## (Intercept)                 0.038077   0.002481  15.349 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.054490   0.006985  -7.801   0.00000000000001
48
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07832 on 1047 degrees of freedom
##   (6778 observations deleted due to missingness)
## Multiple R-squared:  0.05493,    Adjusted R-squared:  0.05403
## F-statistic: 60.85 on 1 and 1047 DF,  p-value: 0.00000000000001483

summary(LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02449 -0.02449  0.01119  0.02205  0.05766
##
## Coefficients:
##                             Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                0.0244875  0.0007167  34.168 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0080242  0.0020180   3.976            0.00007
48
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02263 on 1047 degrees of freedom
##   (6778 observations deleted due to missingness)
## Multiple R-squared:  0.01488,    Adjusted R-squared:  0.01394
## F-statistic: 15.81 on 1 and 1047 DF,  p-value: 0.0000748

P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BAC_PosPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0642 -0.0642 -0.0323  0.0225  3.3056
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.064199   0.004921   13.05 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.074895   0.043288   -1.73              0.083
8 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1754 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.001924,   Adjusted R-squared:  0.001281
## F-statistic: 2.993 on 1 and 1553 DF,  p-value: 0.0838

summary(LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05581 -0.02557 -0.02502  0.03338  0.04390
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0255703  0.0008143  31.400 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0182599  0.0071641   2.549              0.010
9 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02903 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.004166,   Adjusted R-squared:  0.003524
## F-statistic: 6.496 on 1 and 1553 DF,  p-value: 0.0109

LPM_BAC_PosPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0642 -0.0642 -0.0188  0.0224  3.3050
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.064165   0.004796  13.378 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.168277   0.083843  -2.007              0.044
9 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1754 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.002587,   Adjusted R-squared:  0.001945
## F-statistic: 4.028 on 1 and 1553 DF,  p-value: 0.04492

summary(LPM_SAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04453 -0.02513 -0.02356  0.03272  0.04434
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0251327  0.0007906  31.789 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0618327  0.0138208   4.474           0.000008
24
##
## (Intercept)                  ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02891 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.01272,    Adjusted R-squared:  0.01209
## F-statistic: 20.02 on 1 and 1553 DF,  p-value: 0.00000824

#LPM_BAC_NegPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_CEO_Data)
#LPM_SAC_NegPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BAC_NegPerf_AboAsp)
#summary(LPM_SAC_NegPerf_AboAsp)

LPM_BAC_NegPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_NegPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3333 -0.0506 -0.0506  0.0258  3.3186
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.050562   0.004777  10.584 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.061747   0.013405  -4.606           0.000004
46
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1749 on 1421 degrees of freedom
##   (6404 observations deleted due to missingness)
## Multiple R-squared:  0.01471,    Adjusted R-squared:  0.01402
## F-statistic: 21.22 on 1 and 1421 DF,  p-value: 0.000004464

summary(LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02870 -0.02870 -0.01020  0.03309  0.05006
```

```
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0287033  0.0008008  35.844 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0062927  0.0022469   2.801              0.005
17
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02933 on 1421 degrees of freedom
##   (6404 observations deleted due to missingness)
## Multiple R-squared:  0.005489,   Adjusted R-squared:  0.004789
## F-statistic: 7.843 on 1 and 1421 DF,  p-value: 0.00517
```

```
LPM_BRDC_PosPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0493 -0.0288  0.0053  0.0111  3.9663
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|)
## (Intercept)                 0.028782   0.001621  17.751 <0.0000000000000002
***
## log(PosPerf_AboAspT_1 + 1) 0.004339   0.011012   0.394              0.694
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1074 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  3.24e-05,   Adjusted R-squared:  -0.0001763
## F-statistic: 0.1552 on 1 and 4791 DF,  p-value: 0.6936
```

```
summary(LPM_SRDC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.03341 -0.01309 -0.01309  0.01715  0.02182
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0130937  0.0002245  58.328 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0098167  0.0015247   6.439       0.0000000001
32
##
## (Intercept)                    ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01486 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.008579,   Adjusted R-squared:  0.008372
## F-statistic: 41.46 on 1 and 4791 DF,  p-value: 0.0000000001324
```

```
LPM_BRDC_PosPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0306 -0.0306  0.0044  0.0106  3.9645
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                    0.030579   0.001632   18.73 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.099202   0.031691   -3.13              0.001
76
##
## (Intercept)                    ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1073 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.002041,   Adjusted R-squared:  0.001833
## F-statistic: 9.798 on 1 and 4791 DF,  p-value: 0.001757

summary(LPM_SRDC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02803 -0.01280 -0.01280  0.01661  0.02212
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0128000  0.0002248   56.93 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0440704  0.0043649   10.10 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01477 on 4791 degrees of freedom
##   (3034 observations deleted due to missingness)
## Multiple R-squared:  0.02083,    Adjusted R-squared:  0.02063
## F-statistic: 101.9 on 1 and 4791 DF,  p-value: < 0.00000000000000022

LPM_BRDC_NegPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0282 -0.0257 -0.0257  0.0127  3.9694
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0257097  0.0017315  14.848 <0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.0006405  0.0043575  -0.147               0.8
83
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1)
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1053 on 3917 degrees of freedom
##   (3908 observations deleted due to missingness)
## Multiple R-squared:  5.515e-06,  Adjusted R-squared:  -0.0002498
## F-statistic: 0.0216 on 1 and 3917 DF,  p-value: 0.8832
```

```
summary(LPM_SRDC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015273 -0.015273 -0.003974  0.016846  0.027620
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0152728  0.0002497  61.171 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0025528  0.0006283   4.063            0.00004
94
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01518 on 3917 degrees of freedom
##   (3908 observations deleted due to missingness)
## Multiple R-squared:  0.004196,   Adjusted R-squared:  0.003942
## F-statistic: 16.51 on 1 and 3917 DF,  p-value: 0.00004945
```

```
LPM_BRDC_NegPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BRDC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0751 -0.0241 -0.0241  0.0133  3.9574
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
```

```
)
## (Intercept)                 0.024074   0.001793  13.429 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.009491   0.004669  -2.033              0.042
1 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1064 on 3708 degrees of freedom
##   (4117 observations deleted due to missingness)
## Multiple R-squared:  0.001113,   Adjusted R-squared:  0.0008439
## F-statistic: 4.133 on 1 and 3708 DF,  p-value: 0.04214

summary(LPM_SRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015495 -0.015495 -0.002591  0.016822  0.026157
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0154951  0.0002570   60.28 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0019481  0.0006694    2.91              0.003
64
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01525 on 3708 degrees of freedom
##   (4117 observations deleted due to missingness)
## Multiple R-squared:  0.002279,   Adjusted R-squared:  0.00201
## F-statistic: 8.468 on 1 and 3708 DF,  p-value: 0.003635

LPM_BPC_PosPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -0.0996 -0.0996 -0.0919  0.0397  3.2314
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.099581   0.002778  35.846 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.032772   0.019410  -1.688              0.091
4 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1925 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.0005451,  Adjusted R-squared:  0.0003539
## F-statistic: 2.851 on 1 and 5227 DF,  p-value: 0.09139

summary(LPM_SPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.08620 -0.02668 -0.01977  0.03029  0.05946
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0266754  0.0004431  60.205 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0121075  0.0030957   3.911            0.00009
31
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0307 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.002918,   Adjusted R-squared:  0.002727
## F-statistic:  15.3 on 1 and 5227 DF,  p-value: 0.00009307

LPM_BPC_PosPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1054 -0.1054 -0.0321  0.0371  3.2256
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.105407   0.002783   37.88 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.462916   0.055839   -8.29 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1913 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.01298,    Adjusted R-squared:  0.01279
## F-statistic: 68.73 on 1 and 5227 DF,  p-value: < 0.00000000000000022

summary(LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.06627 -0.02562 -0.02030  0.02912  0.06052
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0256220  0.0004419   57.98 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.1000660  0.0088676   11.28 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03037 on 5227 degrees of freedom
##   (2598 observations deleted due to missingness)
## Multiple R-squared:  0.02378,    Adjusted R-squared:  0.0236
## F-statistic: 127.3 on 1 and 5227 DF,  p-value: < 0.00000000000000022

#LPM_BPC_NegPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)
#LPM_SPC_NegPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```r
#summary(LPM_BPC_NegPerf_AboAsp)
#summary(LPM_SPC_NegPerf_AboAsp)

LPM_BPC_NegPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_NegPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2470 -0.0775 -0.0775  0.0378  3.2535
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.077549   0.002835  27.354 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.032443   0.007411  -4.378            0.00001
23
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1758 on 4054 degrees of freedom
##   (3771 observations deleted due to missingness)
## Multiple R-squared:  0.004706,   Adjusted R-squared:  0.00446
## F-statistic: 19.17 on 1 and 4054 DF,  p-value: 0.00001228

summary(LPM_SPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.031354 -0.031354 -0.005901  0.029612  0.070245
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0313537  0.0004977  63.002 < 0.00000000000000
02
```

```
## log(NegPerf_BelAspT_1 + 1) 0.0059649  0.0013008   4.585           0.000004
67
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03085 on 4054 degrees of freedom
##   (3771 observations deleted due to missingness)
## Multiple R-squared:  0.00516,    Adjusted R-squared:  0.004914
## F-statistic: 21.03 on 1 and 4054 DF,  p-value: 0.000004668
```

```
LPM_BNPC_PosPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0472 -0.0472 -0.0214  0.0069  3.9146
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.047204   0.002939  16.063 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.058021   0.022860  -2.538              0.011
2 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1517 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.002043,   Adjusted R-squared:  0.001726
## F-statistic: 6.442 on 1 and 3147 DF,  p-value: 0.01119
```

```
summary(LPM_SNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01855 -0.01557 -0.01436  0.02000  0.02605
##
```

```
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                0.0155656  0.0003362  46.300 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0015614  0.0026152   0.597               0.55
1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01735 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.0001133,  Adjusted R-squared:  -0.0002045
## F-statistic: 0.3564 on 1 and 3147 DF,  p-value: 0.5505
```

```
LPM_BNPC_PosPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0478 -0.0478 -0.0071  0.0067  3.9140
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.04776    0.00292  16.358 < 0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.15945    0.05072  -3.144              0.0016
8 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1516 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.003131,   Adjusted R-squared:  0.002814
## F-statistic: 9.883 on 1 and 3147 DF,  p-value: 0.001684
```

```
summary(LPM_SNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -0.02540 -0.01511 -0.01400  0.01980  0.02651
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                0.0151062  0.0003333  45.329 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0246227  0.0057892   4.253            0.00002
17
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0173 on 3147 degrees of freedom
##   (4678 observations deleted due to missingness)
## Multiple R-squared:  0.005715,   Adjusted R-squared:  0.005399
## F-statistic: 18.09 on 1 and 3147 DF,  p-value: 0.00002169
```

```
LPM_BNPC_NegPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.03375 -0.03375 -0.03208  0.01440  2.36804
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|)
## (Intercept)                0.033747   0.001754  19.237 <0.0000000000000002
***
## log(NegPerf_AboAspT_1 + 1) 0.001590   0.005742   0.277               0.782
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09239 on 2909 degrees of freedom
##   (4916 observations deleted due to missingness)
## Multiple R-squared:  2.636e-05,  Adjusted R-squared:  -0.0003174
## F-statistic: 0.07667 on 1 and 2909 DF,  p-value: 0.7819
```

```
summary(LPM_SNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
```

```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01642 -0.01642 -0.01176  0.01996  0.02744
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                0.0164182  0.0003334  49.243 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) 0.0015315  0.0010914   1.403               0.16
1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01756 on 2909 degrees of freedom
##   (4916 observations deleted due to missingness)
## Multiple R-squared:  0.0006765,  Adjusted R-squared:  0.0003329
## F-statistic: 1.969 on 1 and 2909 DF,  p-value: 0.1606

LPM_BNPC_NegPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.03057 -0.03057 -0.02899  0.01733  1.55955
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|)
## (Intercept)                 0.030565   0.001189  25.705 <0.0000000000000002
***
## log(NegPerf_BelAspT_1 + 1) 0.002089   0.003567   0.586               0.558
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06203 on 2858 degrees of freedom
##   (4967 observations deleted due to missingness)
## Multiple R-squared:  0.00012,    Adjusted R-squared:  -0.0002299
## F-statistic: 0.3429 on 1 and 2858 DF,  p-value: 0.5582

summary(LPM_SNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
```

```
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.016636 -0.016636 -0.009793  0.019850  0.029773
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0166357  0.0003371  49.351 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0016405  0.0010112   1.622                0.10
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01758 on 2858 degrees of freedom
##   (4967 observations deleted due to missingness)
## Multiple R-squared:  0.00092,    Adjusted R-squared:  0.0005705
## F-statistic: 2.632 on 1 and 2858 DF,  p-value: 0.1048
```

```
LPM_BIC_PosPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_AboAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0841 -0.0841 -0.0072  0.0294  3.8267
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.084072   0.003183  26.416 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.060833   0.022998  -2.645                0.008
2 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1884 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.001751,   Adjusted R-squared:  0.0015
## F-statistic: 6.997 on 1 and 3990 DF,  p-value: 0.008197
```

```
summary(LPM_SIC_PosPerf_AboAsp)
```

```
##
## Call:
```

```
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.07241 -0.02404 -0.02404  0.02968  0.05225
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0240406  0.0004821  49.862 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0128890  0.0034840   3.699             0.0002
19
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02855 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.003418,   Adjusted R-squared:  0.003169
## F-statistic: 13.69 on 1 and 3990 DF,  p-value: 0.0002189

LPM_BIC_PosPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_BelAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0876 -0.0876 -0.0100  0.0304  3.8065
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.087571   0.003181  27.526 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.323083   0.056821  -5.686         0.00000001
39
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.1879 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.008038,   Adjusted R-squared:  0.007789
## F-statistic: 32.33 on 1 and 3990 DF,  p-value: 0.00000001394

summary(LPM_SIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04551 -0.02351 -0.02351  0.02946  0.05274
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0235119  0.0004816  48.822 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0577825  0.0086015   6.718      0.00000000002
11
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02844 on 3990 degrees of freedom
##   (3835 observations deleted due to missingness)
## Multiple R-squared:  0.01118,    Adjusted R-squared:  0.01094
## F-statistic: 45.13 on 1 and 3990 DF,  p-value: 0.00000000002107

#LPM_BIC_NegPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)
#LPM_SIC_NegPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_AboAsp
T_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BIC_NegPerf_AboAsp)
#summary(LPM_SIC_NegPerf_AboAsp)

LPM_BIC_NegPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_BelAspT_1
+1), data=P_CEO_Data)
LPM_SIC_NegPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -0.1384 -0.0654 -0.0654  0.0322  3.8287
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.065359   0.002873  22.751 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.015947   0.008104  -1.968              0.049
2 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1656 on 3513 degrees of freedom
##   (4312 observations deleted due to missingness)
## Multiple R-squared:  0.001101,   Adjusted R-squared:  0.0008166
## F-statistic: 3.872 on 1 and 3513 DF,  p-value: 0.04918
```

```
summary(LPM_SIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02755 -0.02755 -0.01273  0.03004  0.05887
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0275531  0.0005024  54.846 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0058426  0.0014172   4.123            0.00003
83
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02896 on 3513 degrees of freedom
##   (4312 observations deleted due to missingness)
## Multiple R-squared:  0.004815,   Adjusted R-squared:  0.004531
## F-statistic:    17 on 1 and 3513 DF,  p-value: 0.00003834
```

```
psych::describe(P_CEO_Data$NegPerf_AboAsp)
```

```
##    vars    n  mean    sd median trimmed mad      min max   range   skew
## X1    1 5726 -2.59 27.38      0   -0.11   0 -1137.31   0 1137.31 -25.17
##    kurtosis   se
## X1   799.21 0.36
```

```r
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BFC_PosPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.06074 -0.06074 -0.05678 -0.00758  3.15474
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.060744   0.002383  25.493 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.017973   0.012513  -1.436               0.15
1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1709 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.000379,   Adjusted R-squared:  0.0001953
## F-statistic: 2.063 on 1 and 5442 DF,  p-value: 0.151

summary(LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.009815 -0.005454 -0.004377  0.004589  0.019481
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0054536  0.0001001  54.506 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0006838  0.0005254   1.301               0.19
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.007178 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.0003111,  Adjusted R-squared:  0.0001274
## F-statistic: 1.694 on 1 and 5442 DF,  p-value: 0.1932
```

```
LPM_BFC_PosPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.06358 -0.06358 -0.03735 -0.00711  3.15191
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.063578   0.002426  26.203 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.240999   0.048822  -4.936           0.000000
82
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1706 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.004458,   Adjusted R-squared:  0.004275
## F-statistic: 24.37 on 1 and 5442 DF,  p-value: 0.0000008198
```

```
summary(LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.010293 -0.005307 -0.004536  0.004572  0.019627
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0053071  0.0001018  52.131 < 0.00000000000000
```

```
02
## log(PosPerf_BelAspT_1 + 1) 0.0117325  0.0020484   5.728         0.00000001
07
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007157 on 5442 degrees of freedom
##   (2383 observations deleted due to missingness)
## Multiple R-squared:  0.005992,   Adjusted R-squared:  0.005809
## F-statistic: 32.81 on 1 and 5442 DF,  p-value: 0.00000001073

#LPM_BFC_NegPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_CEO_Data)
#LPM_SFC_NegPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BFC_NegPerf_AboAsp)
#summary(LPM_SFC_NegPerf_AboAsp)

LPM_BFC_NegPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_NegPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.10884 -0.04616 -0.04616 -0.00473  2.57607
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.046163   0.002252  20.497 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.013689   0.005864  -2.334              0.019
6 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1415 on 4168 degrees of freedom
##   (3657 observations deleted due to missingness)
## Multiple R-squared:  0.001306,   Adjusted R-squared:  0.001066
## F-statistic: 5.449 on 1 and 4168 DF,  p-value: 0.01962

summary(LPM_SFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.006088 -0.006088 -0.003364  0.005042  0.019852
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0060884  0.0001150  52.929 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0007923  0.0002995   2.645              0.008
2 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007229 on 4168 degrees of freedom
##   (3657 observations deleted due to missingness)
## Multiple R-squared:  0.001676,   Adjusted R-squared:  0.001436
## F-statistic: 6.997 on 1 and 4168 DF,  p-value: 0.008197
```

10.2 10.2 Net Income

1. Loading & Merging Datasets

```
Pharma_TempF_Data <- read_xlsx("data/Compustat_TempFoc_V2.xlsx")

Execucomp <- read_xlsx("data/Execucomp_SIC_2000_3999.xlsx")

colnames(Pharma_TempF_Data) <- c("Company_ID",  "Data_Date",    "Fiscal_Year"
,  "Industry Format",  "Level of Consolidation - Company Annual Descriptor",
"Population Source",    "Data Format",  "Ticker Symbol",    "CUSIP",    "Comp
any Name", "ISO_Currency_Code",    "Current Assets - Total",   "Acquisitions"
, "Assets_Total", "Equity_Total", "Cash", "Long-Term Debt - Total",   "Divide
nds Common/Ordinary",    "Dividends - Preferred/Preference", "Dividends - Tot
al",    "EBIT", "Earnings Before Interest", "Employees",    "Inventories_Tota
l",    "Current Liabilities - Total",  "Liabilities and Stockholders Equity -
Total",  "Liabilities_Total",    "Net_Income",   "PPE_Total_Gross",  "Propert
y, Plant, and Equipment - Buildings (Net)", "PPE_Total_Net",    "Retained Ear
nings",    "Revenue - Total",  "SalesTurnover",    "Stockholders Equity - Par
ent", "Stockholders Equity - Total",  "Interest Expense - Total (Financial Se
rvices)",    "Deferred Taxes (Balance Sheet)",   "Income Taxes - Deferred",
"Income Taxes Paid",    "Income Taxes - Total", "Working Capital (Balance She
et)",  "Advertising_Expense",  "Interest and Related Expense - Total", "RD_Ex
pense",   "Research & Development - Prior",   "SGA_Expense",  "Active/Inactiv
e Status Marker",    "Market_Value_Total_Fiscal",    "Company Legal Name",
"North American Industry Classification Code",  "Standard_Industry_Classifica
tion_Code", "Prevention", "Promotion", "Company Initial Public Offering Date"
```

```
, "Past_Focus", "Present_Focus", "Future_Focus")

names(Execucomp)[names(Execucomp) == 'Fiscal Year'] <- 'Fiscal_Year'
names(Execucomp)[names(Execucomp) == 'Company ID Number'] <- 'Company_ID'
names(Execucomp)[names(Execucomp) == 'Total Current Compensation (Salary + Bo
nus)'] <- 'Total_Compensation'
names(Execucomp)[names(Execucomp) == "Executive's Age"] <- 'Age'
names(Execucomp)[names(Execucomp) == "Annual CEO Flag"] <- 'Job'
names(Execucomp)[names(Execucomp) == "Company Name"] <- 'C_Name'

# Removing companies listed in CAD
Pharma_TempF_Data<- Pharma_TempF_Data[Pharma_TempF_Data$ISO_Currency_Code ==
"USD", ]

# Removing all non-CEO executives
Execucomp$"CEO" <- ifelse(Execucomp$Job == "CEO", 1, 0)
Execucomp<- Execucomp[Execucomp$"CEO" == 1, ]

table(is.na(Pharma_TempF_Data$"Fiscal_Year")) # Eliminate 10 NA´s in the Fisc
al Years

##
## FALSE  TRUE
##  7827    10

Pharma_TempF_Data <- Pharma_TempF_Data %>% drop_na(Fiscal_Year)

str(Execucomp$Company_ID)

##  chr [1:20468] "001013" "001013" "001013" "001013" "001013" "001013" ...

str(Execucomp$Fiscal_Year)

##  num [1:20468] 1993 1994 1995 1996 1997 ...

str(Pharma_TempF_Data$Company_ID)

##  chr [1:7827] "148293" "148293" "148293" "148293" "148293" "148293" ...

str(Pharma_TempF_Data$Fiscal_Year)

##  num [1:7827] 2000 2001 2002 2003 2004 ...
```

Merge Datasets Together:

```
# merge two data frames by ID and Year
CEO_Data <- left_join(Pharma_TempF_Data, Execucomp,by=c("Company_ID","Fiscal_
Year")) %>%
  group_by(Company_ID, Fiscal_Year) %>% #to avoid duplicates
  filter(rank(Company_ID, ties.method = "first") == 1) #to avoid duplicates

P_CEO_Data <- pdata.frame(CEO_Data, index=c("Company_ID", "Fiscal_Year")) #Cr
eate Panel Data
```

---

2. Creating Strategic Change Variables

STRATEGIC CHANGE:

```
P_CEO_Data$"adv_intens" <- as.numeric(P_CEO_Data$Advertising_Expense / P_CEO_
Data$SalesTurnover)
P_CEO_Data$"RD_intens" <- as.numeric(P_CEO_Data$RD_Expense / P_CEO_Data$Sales
Turnover)
P_CEO_Data$"plant_equip" <- as.numeric(P_CEO_Data$PPE_Total_Net / P_CEO_Data$
PPE_Total_Gross)
P_CEO_Data$"nonprod_overhead" <- as.numeric(P_CEO_Data$SGA_Expense / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"invent_lev" <- as.numeric(P_CEO_Data$Inventories_Total / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"fin_leverage" <- as.numeric(P_CEO_Data$Liabilities_Total / P_CEO_
Data$Equity_Total)

P_CEO_Data$"adv_intens_diff" <- as.numeric(P_CEO_Data$adv_intens - plm::lag(P
_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"RD_intens_diff" <- as.numeric(P_CEO_Data$RD_intens - plm::lag(P_C
EO_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"plant_equip_diff" <- as.numeric(P_CEO_Data$plant_equip - plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"nonprod_overhead_diff" <- as.numeric(P_CEO_Data$nonprod_overhead
- plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL
))
P_CEO_Data$"invent_lev_diff" <- as.numeric(P_CEO_Data$invent_lev - plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"fin_leverage_diff" <- as.numeric(P_CEO_Data$fin_leverage - plm::l
ag(P_CEO_Data$fin_leverage , order_by = NULL))

P_CEO_Data$"pct_adv_intens_diff" <- as.numeric((P_CEO_Data$adv_intens - plm::
lag(P_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_
CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_RD_intens_diff" <- as.numeric((P_CEO_Data$RD_intens - plm::la
g(P_CEO_Data$RD_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_CEO
_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_plant_equip_diff" <- as.numeric((P_CEO_Data$plant_equip - plm
::lag(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))/plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_nonprod_overhead_diff" <- as.numeric((P_CEO_Data$nonprod_over
head - plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by =
NULL))/lead(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NUL
L))
P_CEO_Data$"pct_invent_lev_diff" <- as.numeric((P_CEO_Data$invent_lev - plm::
lag(P_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))/plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_fin_leverage_diff" <- as.numeric((P_CEO_Data$fin_leverage - p
lm::lag(P_CEO_Data$fin_leverage , order_by = NULL))/plm::lag(P_CEO_Data$fin_l
everage , order_by = NULL))
```

Replace Inf. and NAN values:

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA
```

Standardizing -> I standardize the absolute values (mean=0, standard deviation=1)

```
P_CEO_Data$"stand_adv" <- (P_CEO_Data$pct_adv_intens_diff - mean(na.omit(P_CE
O_Data$pct_adv_intens_diff))) / sd(na.omit(P_CEO_Data$pct_adv_intens_diff))
P_CEO_Data$"stand_RD" <- (P_CEO_Data$pct_RD_intens_diff - mean(na.omit(P_CEO_
Data$pct_RD_intens_diff))) / sd(na.omit(P_CEO_Data$pct_RD_intens_diff))
P_CEO_Data$"stand_plant" <- (P_CEO_Data$pct_plant_equip_diff - mean(na.omit(P
_CEO_Data$pct_plant_equip_diff))) / sd(na.omit(P_CEO_Data$pct_plant_equip_dif
f))
P_CEO_Data$"stand_nonprod" <- (P_CEO_Data$pct_nonprod_overhead_diff - mean(na
.omit(P_CEO_Data$pct_nonprod_overhead_diff))) / sd(na.omit(P_CEO_Data$pct_non
prod_overhead_diff))
P_CEO_Data$"stand_invent" <- (P_CEO_Data$pct_invent_lev_diff - mean(na.omit(P
_CEO_Data$pct_invent_lev_diff))) / sd(na.omit(P_CEO_Data$pct_invent_lev_diff)
)
P_CEO_Data$"stand_fin" <- (P_CEO_Data$pct_fin_leverage_diff - mean(na.omit(P_
CEO_Data$pct_fin_leverage_diff))) / sd(na.omit(P_CEO_Data$pct_fin_leverage_di
ff))
```

Check MEAN & SD

```
mean(P_CEO_Data$stand_adv,na.rm=TRUE)

## [1] 0.00000000000000002594323

mean(P_CEO_Data$stand_RD,na.rm=TRUE)

## [1] 0.00000000000000002487215

mean(P_CEO_Data$stand_plant,na.rm=TRUE)

## [1] -0.00000000000000004218672

mean(P_CEO_Data$stand_nonprod,na.rm=TRUE)

## [1] 0.00000000000000007887655

mean(P_CEO_Data$stand_invent,na.rm=TRUE)

## [1] -0.00000000000000002756174

mean(P_CEO_Data$stand_fin,na.rm=TRUE)

## [1] 0.00000000000000002571993

sd(na.omit(P_CEO_Data$stand_adv))

## [1] 1

sd(na.omit(P_CEO_Data$stand_RD))

## [1] 1

sd(na.omit(P_CEO_Data$stand_plant))

## [1] 1

sd(na.omit(P_CEO_Data$stand_nonprod))

## [1] 1
```

```
sd(na.omit(P_CEO_Data$stand_invent))

## [1] 1

sd(na.omit(P_CEO_Data$stand_fin))

## [1] 1
```

Check nr. of NA´s

```
table(is.na(P_CEO_Data$"stand_adv"))

##
## FALSE  TRUE
##  1629  6198

table(is.na(P_CEO_Data$"stand_RD"))

##
## FALSE  TRUE
##  4942  2885

table(is.na(P_CEO_Data$"stand_plant"))

##
## FALSE  TRUE
##  6144  1683

table(is.na(P_CEO_Data$"stand_nonprod"))

##
## FALSE  TRUE
##  3296  4531

table(is.na(P_CEO_Data$"stand_invent"))

##
## FALSE  TRUE
##  4160  3667

table(is.na(P_CEO_Data$"stand_fin"))

##
## FALSE  TRUE
##  6646  1181
```

Standardized Advertising has a lot of NA´s! Since there are too many missing observations, I will create a robustness check, where I omit “stand_adv” in developing the strategic change variable. (-> see “robustness check”)

To create the SC variable I need the absolute values

```
P_CEO_Data$"abs_stand_adv" <- abs(P_CEO_Data$stand_adv)
P_CEO_Data$"abs_stand_RD" <- abs(P_CEO_Data$stand_RD)
P_CEO_Data$"abs_stand_plant" <- abs(P_CEO_Data$stand_plant)
P_CEO_Data$"abs_stand_nonprod" <- abs(P_CEO_Data$stand_nonprod)
```

```
P_CEO_Data$"abs_stand_invent" <- abs(P_CEO_Data$stand_invent)
P_CEO_Data$"abs_stand_fin" <- abs(P_CEO_Data$stand_fin)
```

Now I can finally create the Strategic change variable:

```
P_CEO_Data$strat_change <- (P_CEO_Data$"abs_stand_adv" + P_CEO_Data$"abs_stan
d_RD" + P_CEO_Data$"abs_stand_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO
_Data$"abs_stand_invent" + P_CEO_Data$"abs_stand_fin") / 6

P_CEO_Data$strat_change2 <- (P_CEO_Data$"abs_stand_RD" + P_CEO_Data$"abs_stan
d_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO_Data$"abs_stand_invent" + P
_CEO_Data$"abs_stand_fin") / 5 #robustness check
```

I compare both strat_change variables and see, that omitting the “stand_adv” variable saves me from a lot additional NA´s (-> but I still have 17K observations)

```
table(is.na(P_CEO_Data$"strat_change"))

##
## FALSE  TRUE
##  1134  6693

table(is.na(P_CEO_Data$"strat_change2")) #for robustness check

##
## FALSE  TRUE
##  2665  5162
```

Assumption check for normal distribution of the data:

I perform the Shapiro-Wilk normality test to check whether the dependent variables follow a normal distribution or not.

H0: he dependent variable follows the normal distribution H1: the dependent variable does not follow a normal distribution If the p value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution.

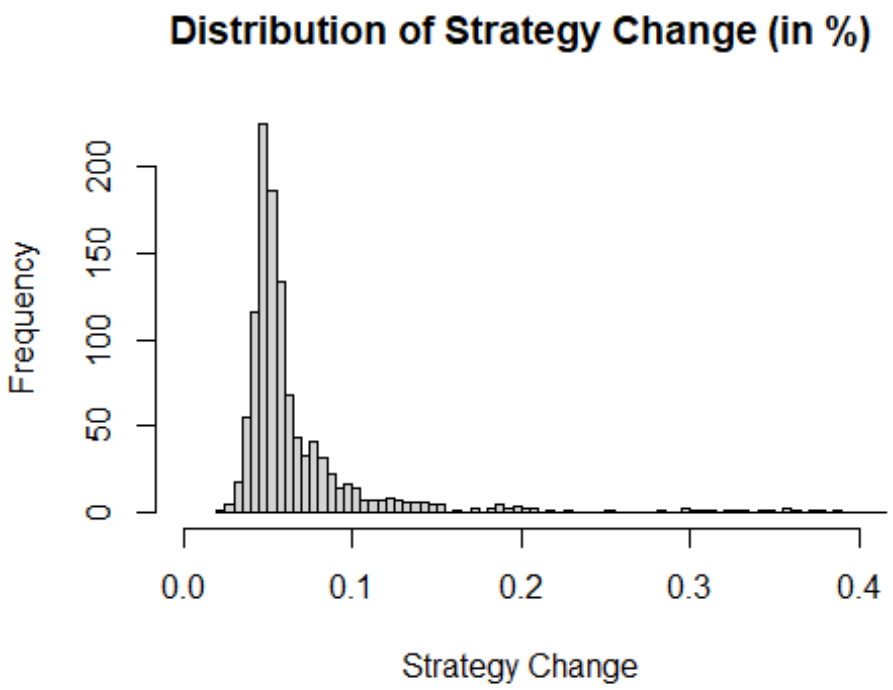
```
#saphiroSC <- shapiro.test(P_CEO_Data$strat_change)
#saphiroSC # see result of strat_change test

#saphiroAI <- shapiro.test(P_CEO_Data$adv_intens)
#saphiroAI # see result of performance test

#saphiroRD <- shapiro.test(P_CEO_Data$RD_intens)
#saphiroRD # see result of performance test

#saphiroPE <- shapiro.test(P_CEO_Data$plant_equip)
#saphiroPE # see result of performance test

#saphiroNPO <- shapiro.test(P_CEO_Data$nonprod_overhead)
#saphiroNPO # see result of performance test

#saphiroIL <- shapiro.test(P_CEO_Data$invent_lev)
#saphiroIL # see result of performance test
```

```
#saphiroFL <- shapiro.test(P_CEO_Data$fin_leverage)
#saphiroFL # see result of performance test
```

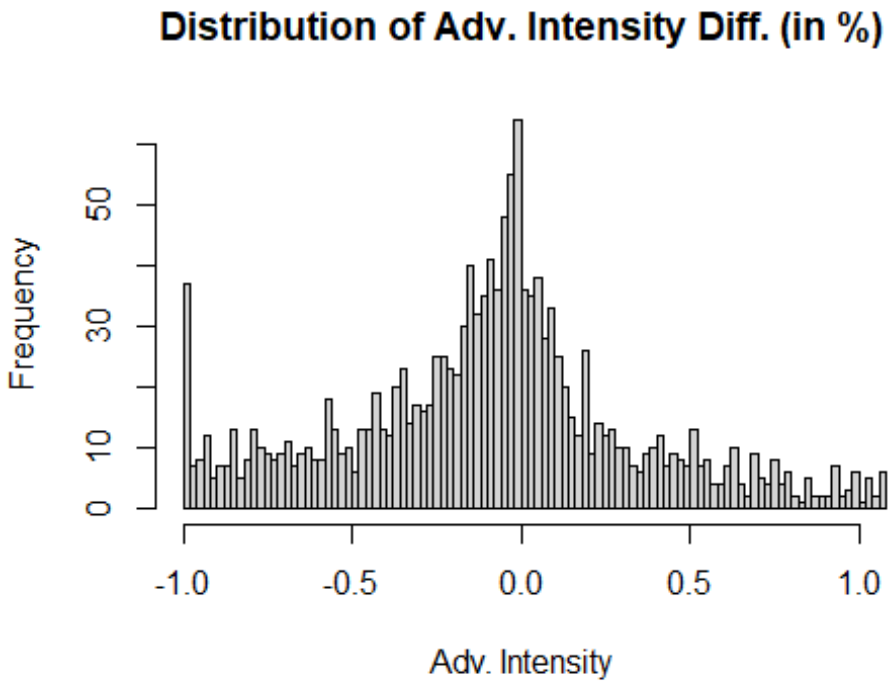
cannot do it because I have too many observations -> max. 5000 observations

In the Histogram below, it can be observed that the variables do not always follow a normal distribution, but almost every time it approaches a normal distribution. In

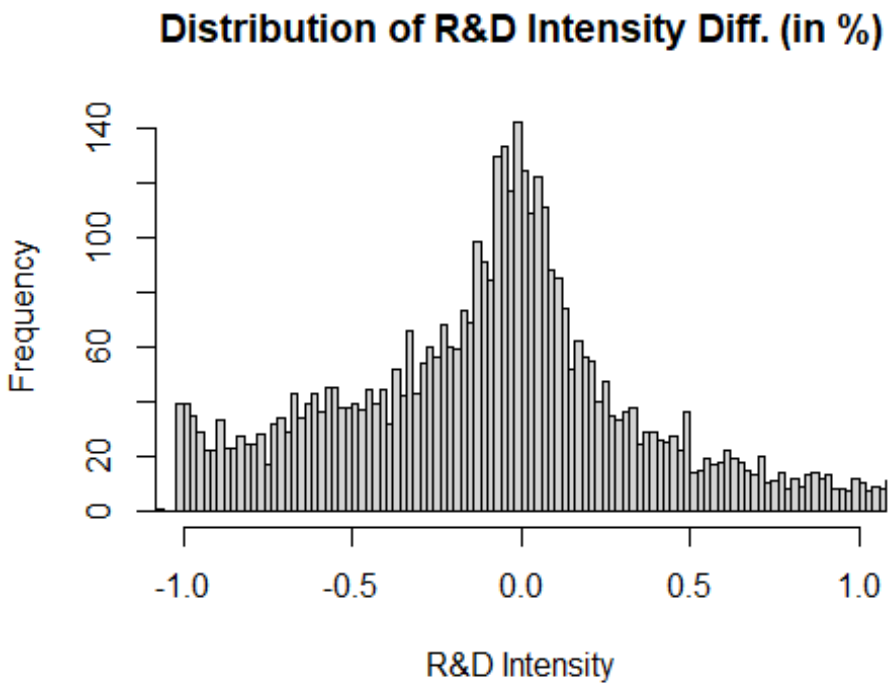
```
hist(P_CEO_Data$strat_change , breaks =(1000), main="Distribution of Strategy
Change (in %)", xlab="Strategy Change", xlim = c(0,0.4))
```



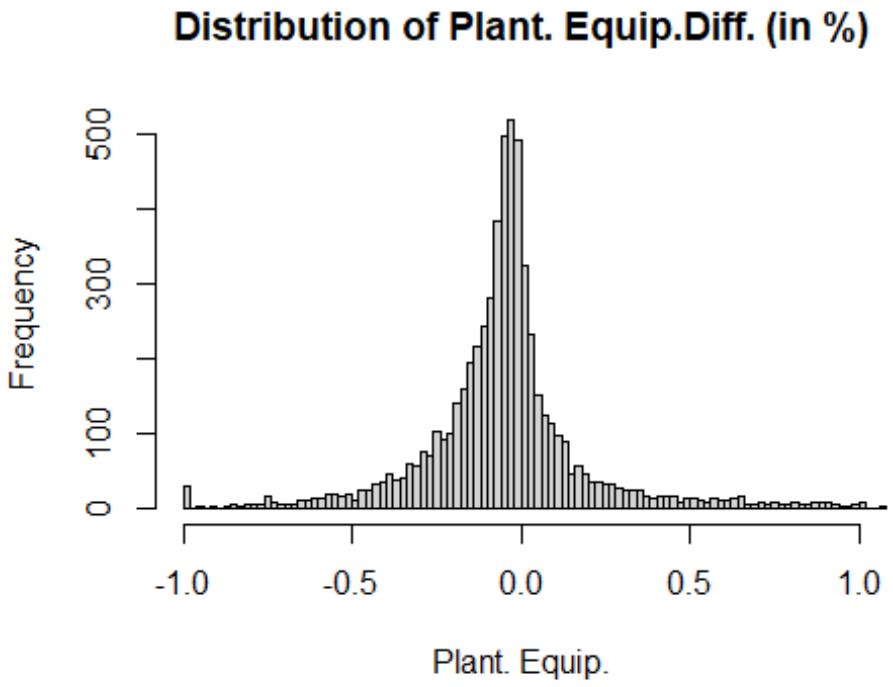

```
hist(P_CEO_Data$pct_adv_intens_diff , breaks =(40000), main="Distribution of
Adv. Intensity Diff. (in %)", xlab="Adv. Intensity", xlim = c(-1,1))
```



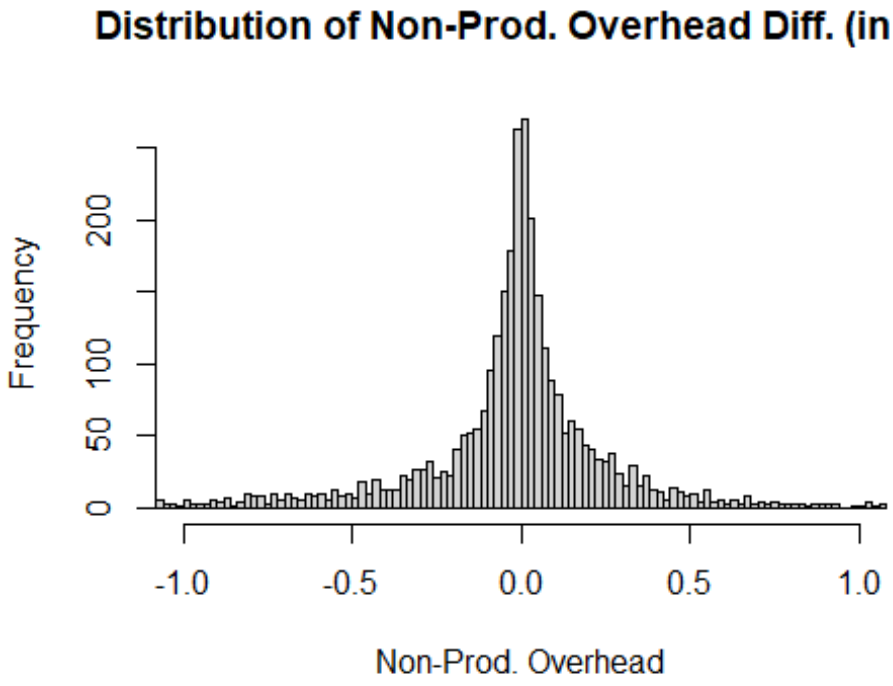

```
hist(P_CEO_Data$pct_RD_intens_diff , breaks =(250000), main="Distribution of
R&D Intensity Diff. (in %)", xlab="R&D Intensity", xlim = c(-1,1))
```



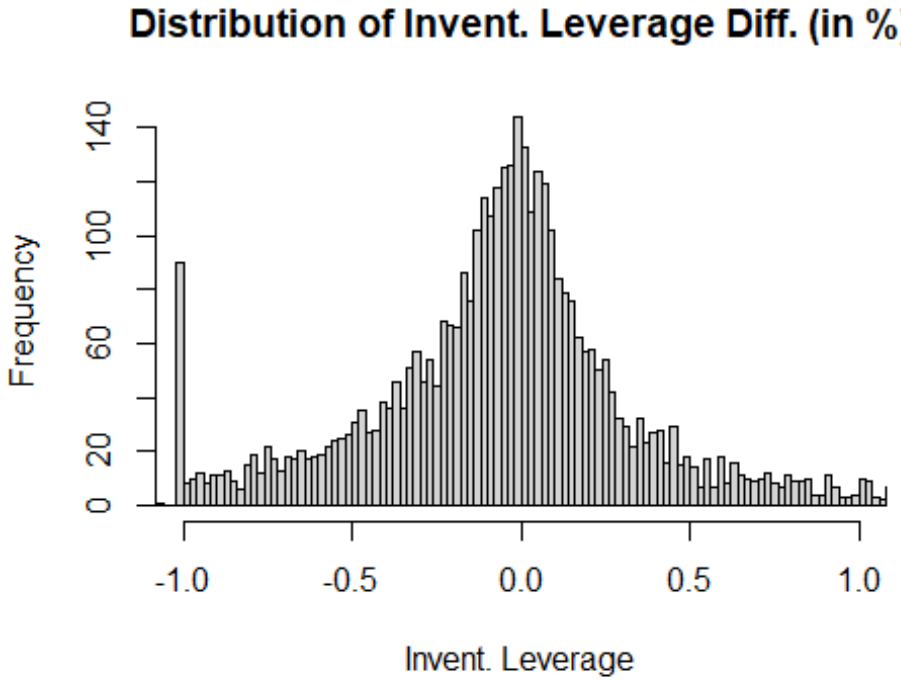

```
hist(P_CEO_Data$pct_plant_equip_diff , breaks =(5000), main="Distribution of
Plant. Equip.Diff. (in %)", xlab="Plant. Equip.", xlim = c(-1,1))
```



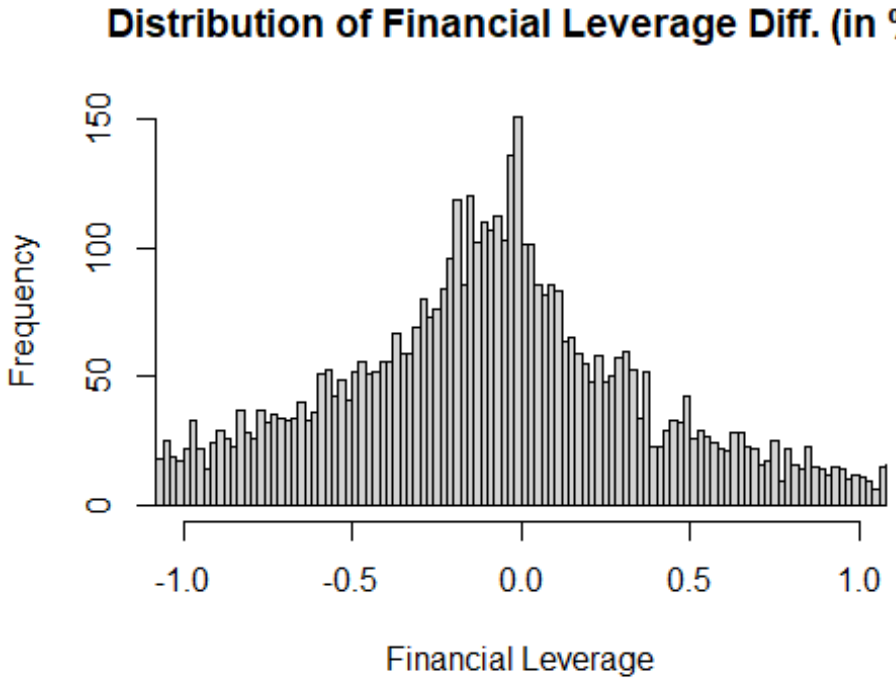

```
#par(mfrow=c(2,2)) # init 4 charts in 1 panel

hist(P_CEO_Data$pct_nonprod_overhead_diff , breaks =(50000), main="Distributi
on of Non-Prod. Overhead Diff. (in %)", xlab="Non-Prod. Overhead", xlim = c(-
1,1))
```



```
hist(P_CEO_Data$pct_invent_lev_diff , breaks =(20000), main="Distribution of
Invent. Leverage Diff. (in %)", xlab="Invent. Leverage", xlim = c(-1,1))
```




```
hist(P_CEO_Data$pct_fin_leverage_diff , breaks =(50000), main="Distribution o
f Financial Leverage Diff. (in %)", xlab="Financial Leverage", xlim = c(-1,1)
)
```



I use the positive and negative median of the strategy changes (=differences) to determine if a strategy change is small or big

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$pct_adv_intens_diff, ifelse(P_CEO_Data$pct_adv_intens_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2465952  0.3758354
```

```
tapply(P_CEO_Data$pct_RD_intens_diff, ifelse(P_CEO_Data$pct_RD_intens_diff >
0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2982761  0.3519554
```

```
tapply(P_CEO_Data$pct_plant_equip_diff, ifelse(P_CEO_Data$pct_plant_equip_dif
f > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.0920045  0.1110405
```

```
tapply(P_CEO_Data$pct_nonprod_overhead_diff, ifelse(P_CEO_Data$pct_nonprod_ov
erhead_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1142313  0.0932076
```

```
tapply(P_CEO_Data$pct_invent_lev_diff, ifelse(P_CEO_Data$pct_invent_lev_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2112387  0.2100990
```

```
tapply(P_CEO_Data$pct_fin_leverage_diff, ifelse(P_CEO_Data$pct_fin_leverage_d
iff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.3880235  0.5415713
```

```
#also using the absolute (not standardized values) would be good
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 1,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ 1))
```

Big Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Positive Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_adv_change = case_when (
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Positive Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_adv_change = case_when (
                                pct_adv_intens_diff <= 0 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Negative Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0))
```

Small Negative Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_adv_change = case_when (
                                pct_adv_intens_diff >= 0 ~ 0,
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1))
```

Big R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff > -0.2982761 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Positive R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_rd_change = case_when (
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small Positive R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_rd_change = case_when (
                                pct_RD_intens_diff <= 0 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Negative R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0))
```

Small Negative R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_rd_change = case_when (
                                P_CEO_Data$pct_RD_intens_diff >= 0 ~ 0,
                                P_CEO_Data$pct_RD_intens_diff <= -0.2982761 ~ 0
,
                                P_CEO_Data$pct_RD_intens_diff > -0.2982761 ~ 1)
)
```

Big Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
```

```
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Positive Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Positive Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Negative Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0))
```

Small Negative Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
1))
```

Big Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0,
                                P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
```

```
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Positive Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Positive Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff <= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Negative Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0))
```

Small Negative Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1))
```

Big Inventory Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_invent_change = case_when (
                              P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                              P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                              P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
,
```

```
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Positive Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Positive Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Negative Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
))
```

Small Negative Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
))
```

Big Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
```

```
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Positive Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Positive Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Negative Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0))
```

Small Negative Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1))
```

Continuous Variables:

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median

##   positive
## 0.05379924

tapply(P_CEO_Data$abs_stand_adv, ifelse(P_CEO_Data$abs_stand_adv > 0, 'positi
ve', 'negative'), median) # median

##   positive
## 0.07193945

tapply(P_CEO_Data$abs_stand_RD, ifelse(P_CEO_Data$abs_stand_RD > 0, 'positive
', 'negative'), median) # median

##   positive
## 0.03553555

tapply(P_CEO_Data$abs_stand_plant, ifelse(P_CEO_Data$abs_stand_plant > 0, 'po
sitive', 'negative'), median) # median

##   positive
## 0.08998155

tapply(P_CEO_Data$abs_stand_nonprod, ifelse(P_CEO_Data$abs_stand_nonprod > 0,
'positive', 'negative'), median) # median

##   positive
## 0.04249124

tapply(P_CEO_Data$abs_stand_invent, ifelse(P_CEO_Data$abs_stand_invent > 0, '
positive', 'negative'), median) # median

##   positive
## 0.07927686

tapply(P_CEO_Data$abs_stand_fin, ifelse(P_CEO_Data$abs_stand_fin > 0, 'positi
ve', 'negative'), median) # median

##   positive
## 0.02525311
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ strat_change,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ strat_change))
```

Big Adv. Change:

```
P_CEO_Data$"big_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv >= 0.07193945,
P_CEO_Data$abs_stand_adv, 0)
```

Small Adv. Change

```
P_CEO_Data$"small_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv <= 0.0719394
5, P_CEO_Data$abs_stand_adv, 0)
```

Big R&D Change:

```
P_CEO_Data$"big_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD >= 0.03553555, P
_CEO_Data$abs_stand_RD, 0)
```

Small R&D Change

```
P_CEO_Data$"small_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD <= 0.03553555,
P_CEO_Data$abs_stand_RD, 0)
```

Big Plant. Change:

```
P_CEO_Data$"big_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant >= 0.08998
155, P_CEO_Data$abs_stand_plant, 0)
```

Small Plant Change

```
P_CEO_Data$"small_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant <= 0.089
98155, P_CEO_Data$abs_stand_plant, 0)
```

Big Nonprod Change:

```
P_CEO_Data$"big_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod >= 0.0
4249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Small Nonprod Change

```
P_CEO_Data$"small_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod <= 0
.04249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Big invent Change:

```
P_CEO_Data$"big_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent >= 0.079
27686, P_CEO_Data$abs_stand_invent, 0)
```

Small invent. Change

```
P_CEO_Data$"small_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent <= 0.0
7927686, P_CEO_Data$abs_stand_invent, 0)
```

Big fin Change:

```
P_CEO_Data$"big_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin >= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

Small fin. Change

```
P_CEO_Data$"small_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin <= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

---

4. Creating PF Variables

PerformanceROA = Return on Sales: net income / SalesTurnover (=total revenue) (To not change the code I will keep the "ROA" name, but it is the ROS)

```
P_CEO_Data$"ROA_Performance" <- P_CEO_Data$Net_Income

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n   mean      sd median trimmed   mad    min   max range skew
## X1    1 7414 243.28 1428.88  -3.95    -1.9 18.43 -16265 22003 38268 6.71
##    kurtosis    se
## X1    64.81 16.59

#eliminating Inf & NAN
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.nan)] <- NA
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.infinite)] <- NA

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n   mean      sd median trimmed   mad    min   max range skew
## X1    1 7414 243.28 1428.88  -3.95    -1.9 18.43 -16265 22003 38268 6.71
##    kurtosis    se
## X1    64.81 16.59

P_CEO_Data <- P_CEO_Data %>%
    group_by(Company_ID) %>%
     mutate(ROA_PerformanceT_1 = dplyr::lag(ROA_Performance, n = 1, default = NA))

P_CEO_Data <- P_CEO_Data %>%
  group_by(Company_ID) %>%
    mutate(Strat_ChangeT.1 = dplyr::lead(strat_change, n = 1, default = NA))

class(P_CEO_Data) # what type of dataset is it

## [1] "grouped_df" "tbl_df"     "tbl"        "data.frame"

P_CEO_Data <- pdata.frame(P_CEO_Data, index=c("Company_ID", "Fiscal_Year")) # go back to Panel Data
class(P_CEO_Data) # what type of dataset is it

## [1] "pdata.frame" "data.frame"
```

ASPIRED PERFORMANCE FEEDBACK:

HAit = α * Pit + (1 - α) * HAit-1

Creating Variable fur HA

```
P_CEO_Data$asp_perf_fb_0 <- P_CEO_Data$ROA_PerformanceT_1
P_CEO_Data$asp_perf_fb_1 <- (0.1*P_CEO_Data$ROA_Performance)+(0.9*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_2 <- (0.2*P_CEO_Data$ROA_Performance)+(0.8*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_3 <- (0.3*P_CEO_Data$ROA_Performance)+(0.7*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_4 <- (0.4*P_CEO_Data$ROA_Performance)+(0.6*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_5 <- (0.5*P_CEO_Data$ROA_Performance)+(0.5*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_6 <- (0.6*P_CEO_Data$ROA_Performance)+(0.4*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_7 <- (0.7*P_CEO_Data$ROA_Performance)+(0.3*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_8 <- (0.8*P_CEO_Data$ROA_Performance)+(0.2*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_9 <- (0.9*P_CEO_Data$ROA_Performance)+(0.1*P_CEO_Data$
ROA_PerformanceT_1)
```

Check the best Alpha before continuing!

```
αModel0 <- lm(strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
αModel1 <- lm(strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
αModel2 <- lm(strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
αModel3 <- lm(strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
αModel4 <- lm(strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
αModel5 <- lm(strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
αModel6 <- lm(strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
αModel7 <- lm(strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
αModel8 <- lm(strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
αModel9 <- lm(strat_change ~ asp_perf_fb_9, data = P_CEO_Data)

summary(αModel0)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0808 -0.0301 -0.0232 -0.0042  3.5634
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079094913  0.004233757  18.682 <0.0000000000000002 ***
## asp_perf_fb_0 -0.000003212  0.000001664  -1.931              0.0538 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003282,   Adjusted R-squared:  0.002401
## F-statistic: 3.727 on 1 and 1132 DF,  p-value: 0.05379
```

```
summary(αModel1)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0781 -0.0301 -0.0231 -0.0040  3.5633
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079188103  0.004239337  18.679 <0.0000000000000002 ***
## asp_perf_fb_1 -0.000003332  0.000001687  -1.975              0.0485 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003434,   Adjusted R-squared:  0.002553
## F-statistic:   3.9 on 1 and 1132 DF,  p-value: 0.04852
```

```
summary(αModel2)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0748 -0.0302 -0.0230 -0.0039  3.5632
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079267503  0.004243986  18.678 <0.0000000000000002 ***
## asp_perf_fb_2 -0.000003430  0.000001704  -2.013              0.0444 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003565,   Adjusted R-squared:  0.002685
## F-statistic:  4.05 on 1 and 1132 DF,  p-value: 0.0444
```

```
summary(αModel3)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0709 -0.0303 -0.0231 -0.0040  3.5631
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079330254  0.004247533  18.677 <0.0000000000000002 ***
## asp_perf_fb_3 -0.000003502  0.000001715  -2.043              0.0413 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003672,   Adjusted R-squared:  0.002792
## F-statistic: 4.172 on 1 and 1132 DF,  p-value: 0.04132
```

```
summary(αModel4)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0665 -0.0303 -0.0231 -0.0038  3.5631
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079374142  0.004249851  18.677 <0.0000000000000002 ***
## asp_perf_fb_4 -0.000003547  0.000001718  -2.064              0.0392 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.00375,    Adjusted R-squared:  0.00287
## F-statistic: 4.261 on 1 and 1132 DF,  p-value: 0.03921
```

```
summary(αModel5)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0616 -0.0303 -0.0230 -0.0038  3.5631
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079397830  0.004250869  18.678 <0.0000000000000002 ***
## asp_perf_fb_5 -0.000003562  0.000001715  -2.077               0.038 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003798,   Adjusted R-squared:  0.002918
## F-statistic: 4.315 on 1 and 1132 DF,  p-value: 0.03799
```

```
summary(αModel6)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0574 -0.0303 -0.0231 -0.0038  3.5631
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079400982  0.004250580  18.680 <0.0000000000000002 ***
## asp_perf_fb_6 -0.000003547  0.000001704  -2.082              0.0376 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003813,   Adjusted R-squared:  0.002933
## F-statistic: 4.333 on 1 and 1132 DF,  p-value: 0.0376
```

```
summary(αModel7)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0610 -0.0303 -0.0230 -0.0041  3.5631
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079384273  0.004249038  18.683 <0.0000000000000002 ***
## asp_perf_fb_7 -0.000003504  0.000001686  -2.077               0.038 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003798,   Adjusted R-squared:  0.002918
## F-statistic: 4.316 on 1 and 1132 DF,  p-value: 0.03798
```

```
summary(αModel8)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0659 -0.0302 -0.0230 -0.0040  3.5632
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079349275  0.004246352  18.686 <0.0000000000000002 ***
## asp_perf_fb_8 -0.000003435  0.000001663  -2.065              0.0391 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003754,   Adjusted R-squared:  0.002874
## F-statistic: 4.266 on 1 and 1132 DF,  p-value: 0.03912

summary(αModel9)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_9, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0702 -0.0302 -0.0231 -0.0041  3.5632
##
## Coefficients:
##                   Estimate   Std. Error t value            Pr(>|t|)
## (Intercept)    0.079298250  0.004242672  18.691 <0.0000000000000002 ***
## asp_perf_fb_9 -0.000003344  0.000001634  -2.046               0.041 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1375 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.003685,   Adjusted R-squared:  0.002805
## F-statistic: 4.187 on 1 and 1132 DF,  p-value: 0.04098
```

α=0.6 gives the best Adj. R2 results

```
P_CEO_Data$"neg_perf" <- ifelse(P_CEO_Data$ROA_Performance < 0, 1, 0)
```

1 = we have negative performance; 0 = we have not a negative performance (= we have a positive performance)

```
P_CEO_Data$"pos_perf" <- ifelse(P_CEO_Data$ROA_Performance > 0, 1, 0)
```

1 = we have positive performance; 0 = we have not a positive performance (= we have a negative performance)

```
P_CEO_Data <- P_CEO_Data %>% mutate(Performance_below_aspiration = case_when
(
                        asp_perf_fb_6 >= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_6 < ROA_Performance ~ 0))
```

```
P_CEO_Data <- P_CEO_Data %>% mutate(Performance_above_aspiration = case_when
(
                         asp_perf_fb_6 <= ROA_Performance ~ ROA_Performance,
                         asp_perf_fb_6 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_AboAsp = case_when (
                        (Performance_above_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                        (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                        (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_AboAsp = case_when (
                        (Performance_above_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                        (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                        (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$PosPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$PosPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$NegPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$NegPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
```

To calculate the PF I create the % difference between the performance and the aspired performance of a company

```
P_CEO_Data$"pct_PerfFB" <- (P_CEO_Data$"ROA_Performance" - P_CEO_Data$"asp_pe
rf_fb_0") /abs(P_CEO_Data$"asp_perf_fb_0")
#eliminating Inf & NAN
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.nan)] <- NA
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.infinite)] <- NA

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean    sd median trimmed  mad     min    max  range   skew
## X1    1 6660 -1.55 50.57  -0.04   -0.14 0.79 -3369.4 1556.5 4925.9 -41.78
##    kurtosis   se
## X1     3113 0.62
```

```
#winsorize to keep observations but make extreme observations not so extreme
P_CEO_Data$pct_PerfFB <- DescTools::Winsorize(P_CEO_Data$pct_PerfFB, minval =
NULL, maxval = NULL, probs = c(0.001, 0.999),
          na.rm = TRUE, type = 7)

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n mean    sd median trimmed  mad     min    max range   skew
## X1    1 6660 -1.2 15.92  -0.04   -0.14 0.79 -349.51 106.29 455.8 -15.58
##    kurtosis  se
## X1   321.43 0.2

P_CEO_Data$"pct_neg_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB < 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have negative performance feedback difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

```
P_CEO_Data$"pct_pos_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB > 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

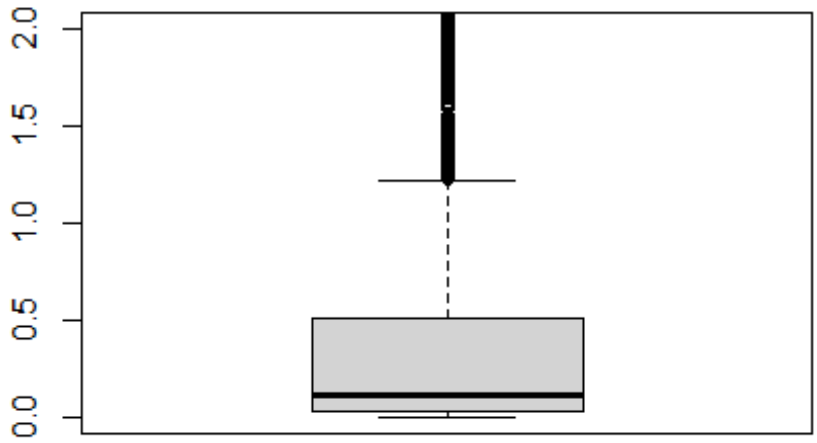
```
#Creating additional Binary Variables
P_CEO_Data <- P_CEO_Data %>% mutate(BV_Performance_above_aspiration = case_wh
en (
                        asp_perf_fb_0 <= ROA_Performance ~ 1,
                        asp_perf_fb_0 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$BV_PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_AboAsp, k =
```

```
1, default = NA, order_by = NULL)
P_CEO_Data$BV_PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_BelAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_BelAsp, k =
1, default = NA, order_by = NULL)
```

5. Control Variables

Firm Size: "log(Employees)" -> in K

```
boxplot(P_CEO_Data$Employees,data=P_CEO_Data, ylim = c(0,2))
```

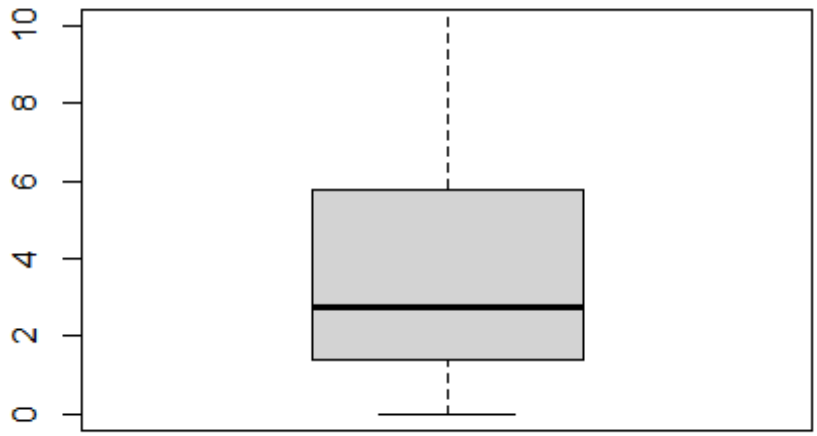


Some companies have 0 employees, so to do log(Emloyees) I need to eliminate them -> log(-1) returns NaN and log(0) return Inf

```
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6727 5.05 17.41   0.11    0.49 0.15   0 135.7 135.7  4.5    21.38
0.21

P_CEO_Data$Employees[P_CEO_Data$Employees == 0.000] <- NA
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21
```

Financial Slack

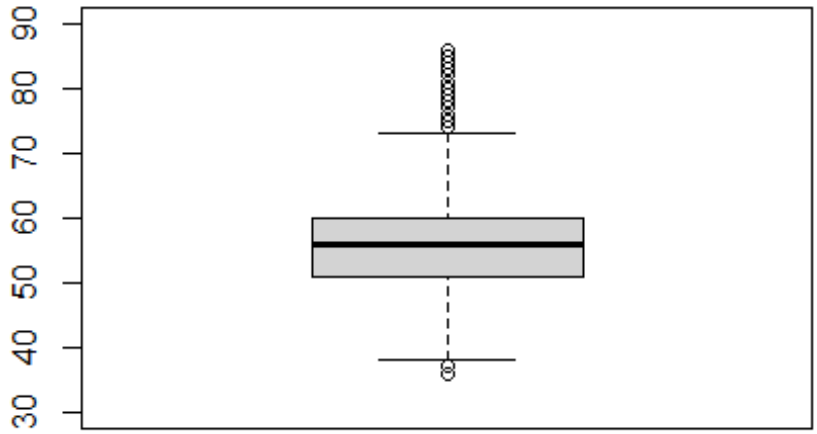
```
P_CEO_Data$"Financial_Slack" <- as.numeric(P_CEO_Data$Current.Assets...Total
/ P_CEO_Data$Current.Liabilities...Total)

boxplot(P_CEO_Data$Financial_Slack,data=P_CEO_Data, ylim = c(0,10))
```




```
P_CEO_Data$Financial_Slack[P_CEO_Data$Financial_Slack == 0.00000000000] <- NA

P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.nan)] <- NA
P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.infinite)] <
- NA
```

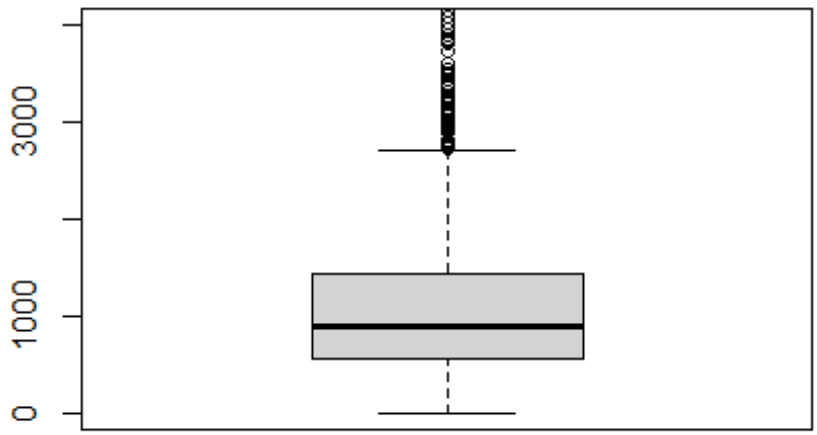
CEO Age -> “Age”

```
boxplot(P_CEO_Data$Age,data=P_CEO_Data, ylim = c(30,90))
```



Total compensation of the CEO -> Total_Compensation (in K)

```
boxplot(P_CEO_Data$Total_Compensation,data=P_CEO_Data, ylim = c(0,4000))
```




```
psych::describe(P_CEO_Data$Total_Compensation)
```

```
##    vars    n    mean     sd median trimmed    mad min    max  range skew
## X1    1 1220 1128.86 831.25 884.96  989.54 570.74   0 6650.1 6650.1 2.07
```

```
##    kurtosis   se
## X1     6.22 23.8

P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.000] <- NA
P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.001] <- NA
psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81
```

6. Additional Datasets

```
# Deviding in profitable and non-profitable companies:
Data_PosPerf<- P_CEO_Data[P_CEO_Data$"pos_perf" != 0, ]
Data_NegPerf<- P_CEO_Data[P_CEO_Data$"neg_perf" != 0, ]

#Deviding into above and below aspiration
Data_PosPerf_AboAsp<- Data_PosPerf[Data_PosPerf$Performance_above_aspiration
!= 0, ]
Data_PosPerf_BelAsp<- Data_PosPerf[Data_PosPerf$Performance_below_aspiration
!= 0, ]
Data_NegPerf_AboAsp<- Data_NegPerf[Data_NegPerf$Performance_above_aspiration
!= 0, ]
Data_NegPerf_BelAsp<- Data_NegPerf[Data_NegPerf$Performance_below_aspiration
!= 0, ]

#eliminating Inf & NAN
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.nan)] <- NA
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.infinite)] <- NA

Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.nan)] <- NA
Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.infinite)] <- NA

Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.nan)] <- NA
Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.infinite)] <- NA

Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.nan)] <- NA
Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.infinite)] <- NA
```

EXPORT dataset to Excel for final check:

```
#library(writexl)
#write_xlsx(P_CEO_Data,"data/Merged.xlsx")
```

7. Descriptive Statistics

Assessing the impact of the Perf.FB of both types of companies depending on their profitability level:

```
#I used this part to find out the real descriptive statistics by eliminating
the 0 values i inserted for if the numbers where part of the opposite categor
y. This part should not be run!
#P_CEO_Data$pct_pos_perfFB[P_CEO_Data$pct_pos_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_pos_perfFB)
```

```
#P_CEO_Data$pct_neg_perfFB[P_CEO_Data$pct_neg_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_neg_perfFB)

psych::describe(P_CEO_Data$strat_change)

##    vars    n mean   sd median trimmed  mad  min  max range  skew kurtosis
se
## X1    1 1134 0.08 0.14   0.05    0.06 0.01 0.02 3.64  3.62 17.69   413.14
0

psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21

psych::describe(P_CEO_Data$Financial_Slack)

##    vars    n mean    sd median trimmed  mad min max range skew kurtosis
se
## X1    1 7362 5.26 13.12   2.76    3.59 2.53   0 812   812   37  2076.74 0.
15

psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81

psych::describe(P_CEO_Data$Age)

##    vars    n  mean   sd median trimmed  mad min max range skew kurtosis
se
## X1    1 1178 55.98 7.34     56   55.87 7.41  36  86    50 0.27     0.68 0.
21

psych::describe(P_CEO_Data$pct_pos_perfFB)

##    vars    n mean   sd median trimmed mad min    max  range  skew kurtosis
se
## X1    1 6660 0.75 4.64      0    0.19   0   0 106.29 106.29 16.91    339.1
0.06

psych::describe(P_CEO_Data$pct_neg_perfFB)

##    vars    n  mean    sd median trimmed  mad     min max  range   skew kur
tosis
## X1    1 6660 -1.95 15.13  -0.04   -0.33 0.05 -349.51   0 349.51 -18.52   3
87.52
##      se
## X1 0.19

psych::describe(P_CEO_Data$pos_perf)
```

```
##    vars    n mean   sd median trimmed mad min max range skew kurtosis   se
## X1    1 7414 0.33 0.47      0    0.29   0   0   1     1 0.72    -1.49 0.01

psych::describe(P_CEO_Data$neg_perf)

##    vars    n mean   sd median trimmed mad min max range  skew kurtosis   s
e
## X1    1 7414 0.67 0.47      1    0.71   0   0   1     1 -0.71    -1.49 0.0
1

psych::describe(P_CEO_Data$Present_Focus)

##    vars   n mean   sd median trimmed  mad  min   max range skew kurtosis
se
## X1    1 365  6.9 1.65   6.66    6.78 1.42 3.49 14.04 10.55 0.83     1.44 0
.09

psych::describe(P_CEO_Data$Future_Focus)

##    vars   n mean   sd median trimmed  mad  min  max range skew kurtosis
se
## X1    1 365 1.82 0.52   1.82    1.81 0.49 0.49 3.42  2.93 0.23     0.14 0.
03

psych::describe(P_CEO_Data$Prevention)

##    vars   n mean  sd median trimmed mad min max range skew kurtosis   se
## X1    1 368 0.16 0.2    0.1    0.12 0.1   0 1.5   1.5 2.96     11.4 0.01

psych::describe(P_CEO_Data$Promotion)

##    vars   n mean   sd median trimmed  mad min  max range skew kurtosis   s
e
## X1    1 368 0.48 0.21   0.46    0.46 0.19   0 1.26  1.26 0.76     1.09 0.0
1
```

Variance Inflation Factors (VIF)

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

PLM1 <- lm(strat_change ~  pct_pos_perfFB*pos_perf + pct_neg_perfFB*pos_perf
+ log(Financial_Slack) +  log(Employees) + Age + Total_Compensation ,data=P_C
EO_Data)

PLM2 <- lm(strat_change ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotio
n + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) + log
(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

PLM3 <- lm(strat_change ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Pres
ent_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus + Age +
Total_Compensation ,data=P_CEO_Data)

PLM4 <- lm(strat_change ~  pct_pos_perfFB  + pct_neg_perfFB + neg_perf + Prom
otion + Prevention + Present_Focus + Future_Focus+ log(Financial_Slack) +  lo
g(Employees) + Age + Total_Compensation ,data=P_CEO_Data)
```

```
regclass::VIF(PLM1)
```

```
##          pct_pos_perfFB                pos_perf          pct_neg_perfFB
##            4333.926178                1.811858                1.125563
##    log(Financial_Slack)          log(Employees)                     Age
##                1.360176                2.476058                1.040491
##      Total_Compensation pct_pos_perfFB:pos_perf pos_perf:pct_neg_perfFB
##                1.866570             4340.436930                1.090136
```

```
regclass::VIF(PLM2)
```

```
##                     pct_pos_perfFB                           Promotion
##                          37.153864                            1.467789
##                     pct_neg_perfFB                log(Prevention + 1)
##                        1239.853670                            1.506338
##                     log(Employees)                                 Age
##                          4.504996                            1.271506
##                 Total_Compensation           pct_pos_perfFB:Promotion
##                          4.771188                           37.715656
##           Promotion:pct_neg_perfFB pct_pos_perfFB:log(Prevention + 1)
##                        2838.385511                            4.361804
## pct_neg_perfFB:log(Prevention + 1)
##                         369.265739
```

```
regclass::VIF(PLM3)
```

```
##               pct_pos_perfFB                Present_Focus
##                   209.715457                     1.415739
##               pct_neg_perfFB                Future_Focus
##                  3086.618634                     1.267178
##                          Age           Total_Compensation
##                     1.121028                     1.163203
## pct_pos_perfFB:Present_Focus Present_Focus:pct_neg_perfFB
##                   185.454150                  1181.963868
##  pct_pos_perfFB:Future_Focus  pct_neg_perfFB:Future_Focus
##                    23.269250                   566.127935
```

```
regclass::VIF(PLM4)
```

```
##       pct_pos_perfFB       pct_neg_perfFB             neg_perf
##             1.686725             1.324086             1.660252
##            Promotion           Prevention        Present_Focus
##             1.109373             1.690140             1.308987
##         Future_Focus log(Financial_Slack)       log(Employees)
##             1.665746             3.068354             7.063398
##                  Age   Total_Compensation
##             1.273615             5.900998
```

Correlation Matrix

```
# Select columns of interest
Correlation_Data <- P_CEO_Data %>%
  select(strat_change, Employees, Financial_Slack,Total_Compensation, Age, pc
t_pos_perfFB,  pct_neg_perfFB, pos_perf, neg_perf, Present_Focus,Future_Focus
, Prevention, Promotion)
```

```
psych::describe(Correlation_Data)
```

```
##                     vars    n    mean     sd median trimmed    mad     min
## strat_change           1 1134    0.08   0.14   0.05    0.06   0.01    0.02
## Employees              2 6640    5.11  17.52   0.11    0.51   0.15    0.00
## Financial_Slack        3 7362    5.26  13.12   2.76    3.59   2.53    0.00
## Total_Compensation     4 1212 1136.31 828.90 893.51  994.90 572.11  100.00
## Age                    5 1178   55.98   7.34  56.00   55.87   7.41   36.00
## pct_pos_perfFB         6 6660    0.75   4.64   0.00    0.19   0.00    0.00
## pct_neg_perfFB         7 6660   -1.95  15.13  -0.04   -0.33   0.05 -349.51
## pos_perf               8 7414    0.33   0.47   0.00    0.29   0.00    0.00
## neg_perf               9 7414    0.67   0.47   1.00    0.71   0.00    0.00
## Present_Focus         10  365    6.90   1.65   6.66    6.78   1.42    3.49
## Future_Focus          11  365    1.82   0.52   1.82    1.81   0.49    0.49
## Prevention            12  368    0.16   0.20   0.10    0.12   0.10    0.00
## Promotion             13  368    0.48   0.21   0.46    0.46   0.19    0.00
##                        max   range   skew kurtosis    se
## strat_change          3.64    3.62  17.69   413.14  0.00
## Employees           135.70  135.70   4.46    21.05  0.21
## Financial_Slack     812.00  812.00  37.00  2076.74  0.15
## Total_Compensation 6650.10 6550.10   2.09     6.29 23.81
## Age                  86.00   50.00   0.27     0.68  0.21
## pct_pos_perfFB      106.29  106.29  16.91   339.10  0.06
## pct_neg_perfFB        0.00  349.51 -18.52   387.52  0.19
## pos_perf              1.00    1.00   0.72    -1.49  0.01
## neg_perf              1.00    1.00  -0.71    -1.49  0.01
## Present_Focus        14.04   10.55   0.83     1.44  0.09
## Future_Focus          3.42    2.93   0.23     0.14  0.03
## Prevention            1.50    1.50   2.96    11.40  0.01
## Promotion             1.26    1.26   0.76     1.09  0.01
```

```
library(Hmisc)
Correlation_Matrix <- rcorr(as.matrix(Correlation_Data))
Correlation_Matrix
```

```
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change               1.00     -0.08            0.00              -0.
06
## Employees                 -0.08      1.00           -0.13               0.
60
## Financial_Slack            0.00     -0.13            1.00              -0.
22
## Total_Compensation        -0.06      0.60           -0.22               1.
00
## Age                       -0.03      0.12           -0.11               0.
19
## pct_pos_perfFB            -0.02      0.01           -0.01              -0.
03
## pct_neg_perfFB             0.01      0.03           -0.03               0.
06
## pos_perf                  -0.14      0.35           -0.08               0.
28
```

```
## neg_perf                   0.14     -0.35            0.08              -0.
28
## Present_Focus             -0.03      0.15           -0.17               0.
06
## Future_Focus               0.18     -0.12            0.08               0.
06
## Prevention                 0.10     -0.14            0.19              -0.
01
## Promotion                 -0.08      0.01           -0.06              -0.
17
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       -0.03          -0.02           0.01    -0.14     0.14
## Employees           0.12           0.01           0.03     0.35    -0.35
## Financial_Slack    -0.11          -0.01          -0.03    -0.08     0.08
## Total_Compensation  0.19          -0.03           0.06     0.28    -0.28
## Age                 1.00          -0.01          -0.01     0.16    -0.16
## pct_pos_perfFB     -0.01           1.00           0.02     0.19    -0.19
## pct_neg_perfFB     -0.01           0.02           1.00     0.09    -0.09
## pos_perf            0.16           0.19           0.09     1.00    -1.00
## neg_perf           -0.16          -0.19          -0.09    -1.00     1.00
## Present_Focus       0.22           0.00          -0.08    -0.07     0.07
## Future_Focus        0.11           0.04          -0.14    -0.17     0.17
## Prevention          0.16          -0.06           0.01    -0.24     0.24
## Promotion           0.03           0.13           0.00     0.17    -0.17
##                   Present_Focus Future_Focus Prevention Promotion
## strat_change              -0.03         0.18       0.10     -0.08
## Employees                  0.15        -0.12      -0.14      0.01
## Financial_Slack           -0.17         0.08       0.19     -0.06
## Total_Compensation         0.06         0.06      -0.01     -0.17
## Age                        0.22         0.11       0.16      0.03
## pct_pos_perfFB             0.00         0.04      -0.06      0.13
## pct_neg_perfFB            -0.08        -0.14       0.01      0.00
## pos_perf                  -0.07        -0.17      -0.24      0.17
## neg_perf                   0.07         0.17       0.24     -0.17
## Present_Focus              1.00         0.24      -0.07     -0.17
## Future_Focus               0.24         1.00       0.06     -0.03
## Prevention                -0.07         0.06       1.00     -0.10
## Promotion                 -0.17        -0.03      -0.10      1.00
##
## n
##                   strat_change Employees Financial_Slack Total_Compensati
on
## strat_change              1134      1118            1134                4
07
## Employees                 1118      6640            6608               12
00
## Financial_Slack           1134      6608            7362               12
07
## Total_Compensation         407      1200            1207               12
12
## Age                        386      1167            1173               11
70
## pct_pos_perfFB            1134      6262            6610               11
97
```

```
## pct_neg_perfFB             1134      6262            6610               11
97
## pos_perf                   1134      6629            7338               12
05
## neg_perf                   1134      6629            7338               12
05
## Present_Focus               123       365             365                1
97
## Future_Focus                123       365             365                1
97
## Prevention                  123       368             368                1
97
## Promotion                   123       368             368                1
97
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change         386           1134           1134     1134     1134
## Employees           1167           6262           6262     6629     6629
## Financial_Slack     1173           6610           6610     7338     7338
## Total_Compensation  1170           1197           1197     1205     1205
## Age                 1178           1163           1163     1171     1171
## pct_pos_perfFB      1163           6660           6660     6660     6660
## pct_neg_perfFB      1163           6660           6660     6660     6660
## pos_perf            1171           6660           6660     7414     7414
## neg_perf            1171           6660           6660     7414     7414
## Present_Focus        198            364            364      365      365
## Future_Focus         198            364            364      365      365
## Prevention           198            366            366      368      368
## Promotion            198            366            366      368      368
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change                 123          123        123       123
## Employees                    365          365        368       368
## Financial_Slack              365          365        368       368
## Total_Compensation           197          197        197       197
## Age                          198          198        198       198
## pct_pos_perfFB               364          364        366       366
## pct_neg_perfFB               364          364        366       366
## pos_perf                     365          365        368       368
## neg_perf                     365          365        368       368
## Present_Focus                365          365        365       365
## Future_Focus                 365          365        365       365
## Prevention                   365          365        368       368
## Promotion                    365          365        368       368
##
## P
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change                     0.0065    0.8811          0.2557
## Employees          0.0065                  0.0000          0.0000
## Financial_Slack    0.8811       0.0000                     0.0000
## Total_Compensation 0.2557       0.0000    0.0000
## Age                0.5522       0.0000    0.0000          0.0000
## pct_pos_perfFB     0.6094       0.6696    0.4834          0.2790
## pct_neg_perfFB     0.8073       0.0222    0.0287          0.0404
## pos_perf           0.0000       0.0000    0.0000          0.0000
```

```
## neg_perf           0.0000       0.0000    0.0000          0.0000
## Present_Focus      0.7207       0.0044    0.0009          0.3651
## Future_Focus       0.0466       0.0258    0.1059          0.4107
## Prevention         0.2890       0.0059    0.0002          0.9299
## Promotion          0.3814       0.9014    0.2742          0.0153
##                    Age    pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       0.5522 0.6094         0.8073         0.0000   0.0000
## Employees          0.0000 0.6696         0.0222         0.0000   0.0000
## Financial_Slack    0.0000 0.4834         0.0287         0.0000   0.0000
## Total_Compensation 0.0000 0.2790         0.0404         0.0000   0.0000
## Age                       0.7361         0.8148         0.0000   0.0000
## pct_pos_perfFB     0.7361                0.0878         0.0000   0.0000
## pct_neg_perfFB     0.8148 0.0878                        0.0000   0.0000
## pos_perf           0.0000 0.0000         0.0000                  0.0000
## neg_perf           0.0000 0.0000         0.0000         0.0000
## Present_Focus      0.0017 0.9498         0.1398         0.2086   0.2086
## Future_Focus       0.1406 0.4805         0.0086         0.0009   0.0009
## Prevention         0.0288 0.2789         0.7903         0.0000   0.0000
## Promotion          0.6370 0.0133         0.9313         0.0015   0.0015
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change       0.7207        0.0466       0.2890     0.3814
## Employees          0.0044        0.0258       0.0059     0.9014
## Financial_Slack    0.0009        0.1059       0.0002     0.2742
## Total_Compensation 0.3651        0.4107       0.9299     0.0153
## Age                0.0017        0.1406       0.0288     0.6370
## pct_pos_perfFB     0.9498        0.4805       0.2789     0.0133
## pct_neg_perfFB     0.1398        0.0086       0.7903     0.9313
## pos_perf           0.2086        0.0009       0.0000     0.0015
## neg_perf           0.2086        0.0009       0.0000     0.0015
## Present_Focus                    0.0000       0.1619     0.0009
## Future_Focus       0.0000                     0.2878     0.5464
## Prevention         0.1619        0.2878                  0.0457
## Promotion          0.0009        0.5464       0.0457
```

```
#Check 2nd method for correlations and it gives the same results! :D
cor.mat <- Correlation_Data %>% cor_mat()
# Significance levels
cor.mat %>% cor_get_pval()
```

```
## # A tibble: 13 x 14
##    rowname      strat_change Employees Financial_Slack Total_Compensat~
Age
##    <chr>               <dbl>     <dbl>           <dbl>            <dbl>
<dbl>
##  1 strat_change   0          6.46e-  3       8.81e- 1        2.56e-  1 5.
52e- 1
##  2 Employees      0.00646    0               9.04e-26        5.28e-118 7.
12e- 5
##  3 Financial_S~   0.881      9.04e- 26       0               1.13e- 14 8.
25e- 5
##  4 Total_Compe~   0.256      5.28e-118       1.13e-14        0         1.
08e-10
##  5 Age            0.552      7.12e-  5       8.25e- 5        1.08e- 10 0
##  6 pct_pos_per~   0.609      6.7 e-  1       4.83e- 1        2.79e-  1 7.
```

```
36e- 1
##  7 pct_neg_per~   0.807      2.22e-  2        2.87e- 2        4.04e-  2 8.
15e- 1
##  8 pos_perf       0.00000162 2.09e-191        5.47e-11        1.72e- 22 2.
25e- 8
##  9 neg_perf       0.00000162 2.09e-191        5.47e-11        1.72e- 22 2.
25e- 8
## 10 Present_Foc~   0.721      4.42e-  3        9.1 e- 4        3.65e-  1 1.
66e- 3
## 11 Future_Focus   0.0466     2.58e-  2        1.06e- 1        4.11e-  1 1.
41e- 1
## 12 Prevention     0.289      5.93e-  3        2.1 e- 4        9.3 e-  1 2.
88e- 2
## 13 Promotion      0.381      9.01e-  1        2.74e- 1        1.53e-  2 6.
37e- 1
## # ... with 8 more variables: pct_pos_perfFB <dbl>, pct_neg_perfFB <dbl>,
## #   pos_perf <dbl>, neg_perf <dbl>, Present_Focus <dbl>, Future_Focus <dbl
>,
## #   Prevention <dbl>, Promotion <dbl>

# Visualize
# Gather/collapse correlation matrix into long format
cor.mat %>% cor_gather()

## # A tibble: 169 x 4
##    var1               var2             cor          p
##    <chr>              <chr>          <dbl>      <dbl>
##  1 strat_change       strat_change  1      0
##  2 Employees          strat_change -0.081  0.00646
##  3 Financial_Slack    strat_change -0.0044 0.881
##  4 Total_Compensation strat_change -0.056  0.256
##  5 Age                strat_change -0.03   0.552
##  6 pct_pos_perfFB     strat_change -0.015  0.609
##  7 pct_neg_perfFB     strat_change  0.0073 0.807
##  8 pos_perf           strat_change -0.14   0.00000162
##  9 neg_perf           strat_change  0.14   0.00000162
## 10 Present_Focus      strat_change -0.033  0.721
## # ... with 159 more rows
```

8. Statistical Models:

Since I have panel data I use the random/fixed model

```
**PROFITABILITY INTERACTION**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
```

```
ction model vs. split sample model!

phtest(FLM_SC, RLM_SC) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf + pct_neg_perfF
B *  ...
## chisq = 22.108, df = 9, p-value = 0.008544
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf +
##     pct_neg_perfFB * pos_perf + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 46, T = 1-25, N = 352
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.72710826 -0.02489709 -0.00030608  0.02244063  2.72053284
##
## Coefficients:
##                             Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -0.101083009  0.079191336 -1.2764  0.20280
## pos_perf                -0.085706204  0.035060786 -2.4445  0.01509 *
## pct_neg_perfFB           0.000633466  0.002313960  0.2738  0.78446
## Financial_Slack         -0.002104832  0.007023145 -0.2997  0.76462
## log(Employees)          -0.067470987  0.028113043 -2.4000  0.01701 *
## Age                      0.000040067  0.002452628  0.0163  0.98698
## Total_Compensation      -0.000020809  0.000015924 -1.3067  0.19231
## pct_pos_perfFB:pos_perf  0.100586316  0.079230316  1.2695  0.20524
## pos_perf:pct_neg_perfFB  0.011614828  0.050428012  0.2303  0.81800
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.461
## Residual Sum of Squares: 9.8808
## R-Squared:      0.055441
## Adj. R-Squared: -0.1163
## F-statistic: 1.93693 on 9 and 297 DF, p-value: 0.046598
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC
## BP = 8.1934, df = 9, p-value = 0.5148

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_AI, RLM_AI) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 22.322, df = 9, p-value = 0.007913
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 54, T = 1-26, N = 435
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -77.57984  -2.20223   0.10362   2.37693 366.67456
##
## Coefficients:
##                          Estimate Std. Error t-value Pr(>|t|)
## pct_pos_perfFB         -8.7964366  8.5189187 -1.0326  0.30247
## pos_perf               -8.2816793  3.6621313 -2.2614  0.02431 *
```

```
## pct_neg_perfFB           0.0582983  0.2651668  0.2199  0.82610
## Financial_Slack         -0.5060714  0.6797108 -0.7445  0.45702
## log(Employees)          -4.1245964  2.5105028 -1.6429  0.10124
## Age                      0.0113381  0.2430132  0.0467  0.96281
## Total_Compensation      -0.0017131  0.0016884 -1.0146  0.31096
## pct_pos_perfFB:pos_perf  8.7168229  8.5216543  1.0229  0.30702
## pos_perf:pct_neg_perfFB  3.5295481  5.3816046  0.6559  0.51232
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173430
## Residual Sum of Squares: 167540
## R-Squared:      0.033966
## Adj. R-Squared: -0.12704
## F-statistic: 1.45331 on 9 and 372 DF, p-value: 0.16372
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI
## BP = 8.6668, df = 9, p-value = 0.4686

#coeftest(FLM_AI,vcov=vcovHC(FLM_AI,type="HC0",cluster="group"))

FLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
eg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compens
ation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable ->
interaction model vs. split sample model!

phtest(FLM_RD, RLM_RD) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * pos_perf + pct_neg
_perfFB *  ...
## chisq = 17.009, df = 9, p-value = 0.04857
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
```

```
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 90, T = 1-28, N = 1048
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -3.727962 -0.341112 -0.099874  0.115256 26.317338
##
## Coefficients:
##                              Estimate   Std. Error t-value    Pr(>|t|)
## pct_pos_perfFB           1.258338314  0.358700436  3.5080   0.0004726 ***
## pos_perf                 0.768079570  0.165719511  4.6348 0.000004072 ***
## pct_neg_perfFB          -0.006018551  0.015825207 -0.3803   0.7037973
## Financial_Slack          0.029352088  0.016734891  1.7539   0.0797626 .
## log(Employees)           0.111598452  0.095146487  1.1729   0.2411254
## Age                     -0.002002450  0.011339601 -0.1766   0.8598688
## Total_Compensation      -0.000033925  0.000097405 -0.3483   0.7277006
## pct_pos_perfFB:pos_perf -1.261633370  0.358761350 -3.5166   0.0004577 ***
## pos_perf:pct_neg_perfFB  0.299596384  0.301567816  0.9935   0.3207377
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2542.7
## Residual Sum of Squares: 2456.7
## R-Squared:      0.033819
## Adj. R-Squared: -0.065955
## F-statistic: 3.69084 on 9 and 949 DF, p-value: 0.00014648
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD
## BP = 19.038, df = 9, p-value = 0.02487

coeftest(FLM_RD,vcov=vcovHC(FLM_RD,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           1.258338314  0.857771364  1.4670  0.14271
## pos_perf                 0.768079570  0.350578758  2.1909  0.02870 *
## pct_neg_perfFB          -0.006018551  0.009876378 -0.6094  0.54241
## Financial_Slack          0.029352088  0.024401592  1.2029  0.22932
## log(Employees)           0.111598452  0.162957444  0.6848  0.49362
## Age                     -0.002002450  0.010738925 -0.1865  0.85212
## Total_Compensation      -0.000033925  0.000058719 -0.5777  0.56357
```

```
## pct_pos_perfFB:pos_perf -1.261633370  0.857759529 -1.4708  0.14166
## pos_perf:pct_neg_perfFB  0.299596384  0.165217312  1.8133  0.07009 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model
```

```
RLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_PE, RLM_PE) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 8.0995, df = 9, p-value = 0.5242
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(RLM_PE)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1087
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1083  0.3292     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.015722 -0.094781 -0.025220  0.033258  4.989348
##
## Coefficients:
##                             Estimate   Std. Error z-value    Pr(>|z|)
## (Intercept)              0.055142959  0.080919130  0.6815     0.49558
## pct_pos_perfFB          -0.070804257  0.070307415 -1.0071     0.31390
## pos_perf                 0.048456302  0.028339990  1.7098     0.08730 .
```

```
## pct_neg_perfFB          -0.001499202  0.003013582 -0.4975     0.61885
## Financial_Slack         -0.000884034  0.002989987 -0.2957     0.76749
## log(Employees)          -0.031733122  0.006962887 -4.5575 0.000005177 ***
## Age                     -0.001254431  0.001401233 -0.8952     0.37066
## Total_Compensation       0.000030159  0.000015559  1.9384     0.05258 .
## pct_pos_perfFB:pos_perf  0.072971510  0.070317242  1.0377     0.29939
## pos_perf:pct_neg_perfFB  0.073469044  0.057141729  1.2857     0.19854
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    118.58
## Residual Sum of Squares: 115.1
## R-Squared:      0.029377
## Adj. R-Squared: 0.021266
## Chisq: 32.5966 on 9 DF, p-value: 0.00015696
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_PE)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_PE
## BP = 31.011, df = 9, p-value = 0.0002948

coeftest(RLM_PE,vcov=vcovHC(RLM_PE,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                             Estimate   Std. Error t value Pr(>|t|)
## (Intercept)              0.055142959  0.087574925  0.6297 0.529047
## pct_pos_perfFB          -0.070804257  0.075762236 -0.9346 0.350225
## pos_perf                 0.048456302  0.028913842  1.6759 0.094051 .
## pct_neg_perfFB          -0.001499202  0.002806746 -0.5341 0.593353
## Financial_Slack         -0.000884034  0.003655480 -0.2418 0.808952
## log(Employees)          -0.031733122  0.010674554 -2.9728 0.003017 **
## Age                     -0.001254431  0.001526682 -0.8217 0.411446
## Total_Compensation       0.000030159  0.000012202  2.4717 0.013601 *
## pct_pos_perfFB:pos_perf  0.072971510  0.076191349  0.9577 0.338409
## pos_perf:pct_neg_perfFB  0.073469044  0.029614759  2.4808 0.013260 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!

FLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary var
iable -> interaction model

RLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
```

```
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary var
iable -> interaction model vs. split sample model!

phtest(FLM_NPO, RLM_NPO) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * pos_perf +
...
## chisq = 52.834, df = 9, p-value = 0.00000003142
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 83, T = 1-26, N = 879
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -17.1659669  -0.1042473  -0.0020144   0.1221873   5.1952609
##
## Coefficients:
##                              Estimate   Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB           0.875089152  0.210905984  4.1492 0.00003700 ***
## pos_perf                 0.455281603  0.095020559  4.7914 0.00000198 ***
## pct_neg_perfFB          -0.030442921  0.009121737 -3.3374  0.0008854 ***
## Financial_Slack          0.043295179  0.013785068  3.1407  0.0017483 **
## log(Employees)           0.152895703  0.059223429  2.5817  0.0100119 *
## Age                      0.008075225  0.006405791  1.2606  0.2078218
## Total_Compensation      -0.000025210  0.000051673 -0.4879  0.6257787
## pct_pos_perfFB:pos_perf -0.874839641  0.210953786 -4.1471 0.00003734 ***
## pos_perf:pct_neg_perfFB -0.009013278  0.154991122 -0.0582  0.9536411
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    545.24
## Residual Sum of Squares: 510.27
## R-Squared:      0.064149
## Adj. R-Squared: -0.044062
## F-statistic: 5.99401 on 9 and 787 DF, p-value: 0.000000037841
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO
## BP = 27.615, df = 9, p-value = 0.001106

coeftest(FLM_NPO,vcov=vcovHC(FLM_NPO,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value             Pr(>
|t|)
## pct_pos_perfFB           0.875089152  0.283611578  3.0855             0.00
2103
## pos_perf                 0.455281603  0.108708739  4.1881 0.00003131199628
5893
## pct_neg_perfFB          -0.030442921  0.003820495 -7.9683 0.00000000000000
5638
## Financial_Slack          0.043295179  0.020282991  2.1346             0.03
3106
## log(Employees)           0.152895703  0.080305769  1.9039             0.05
7285
## Age                      0.008075225  0.005326528  1.5160             0.12
9911
## Total_Compensation      -0.000025210  0.000019135 -1.3175             0.18
8059
## pct_pos_perfFB:pos_perf -0.874839641  0.283453789 -3.0864             0.00
2097
## pos_perf:pct_neg_perfFB -0.009013278  0.063025003 -0.1430             0.88
6318
##
## pct_pos_perfFB          **
## pos_perf                ***
## pct_neg_perfFB          ***
## Financial_Slack         *
## log(Employees)          .
## Age
## Total_Compensation
## pct_pos_perfFB:pos_perf **
## pos_perf:pct_neg_perfFB
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -
> interaction model

RLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!
```

```
phtest(FLM_IL, RLM_IL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 17.551, df = 9, p-value = 0.04075
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_IL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 89, T = 1-27, N = 1011
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -6.786992 -0.206205 -0.036746  0.129460 31.481634
##
## Coefficients:
##                              Estimate   Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB           1.436071694  0.330322748  4.3475 0.00001532 ***
## pos_perf                 0.330197291  0.145123461  2.2753    0.02312 *
## pct_neg_perfFB          -0.007827667  0.013526846 -0.5787    0.56295
## Financial_Slack          0.062213662  0.015211419  4.0899 0.00004696 ***
## log(Employees)           0.026540607  0.085797156  0.3093    0.75713
## Age                      0.005648705  0.009815500  0.5755    0.56510
## Total_Compensation      -0.000032829  0.000081156 -0.4045    0.68593
## pct_pos_perfFB:pos_perf -1.436778712  0.330398403 -4.3486 0.00001524 ***
## pos_perf:pct_neg_perfFB  0.030326796  0.249305087  0.1216    0.90321
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1749.2
## Residual Sum of Squares: 1680.3
## R-Squared:      0.039392
## Adj. R-Squared: -0.062666
## F-statistic: 4.15997 on 9 and 913 DF, p-value: 0.000028193
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_IL)

##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_IL
## BP = 33.263, df = 9, p-value = 0.0001202

coeftest(FLM_IL,vcov=vcovHC(FLM_IL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           1.436071694  1.361811438  1.0545  0.29192
## pos_perf                 0.330197291  0.200270257  1.6488  0.09954 .
## pct_neg_perfFB          -0.007827667  0.011282465 -0.6938  0.48799
## Financial_Slack          0.062213662  0.031005639  2.0065  0.04509 *
## log(Employees)           0.026540607  0.057744573  0.4596  0.64590
## Age                      0.005648705  0.006293895  0.8975  0.36969
## Total_Compensation      -0.000032829  0.000023259 -1.4114  0.15845
## pct_pos_perfFB:pos_perf -1.436778712  1.361826542 -1.0550  0.29169
## pos_perf:pct_neg_perfFB  0.030326796  0.070564715  0.4298  0.66746
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!

phtest(FLM_FL, RLM_FL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 32.179, df = 9, p-value = 0.0001854
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1085
##
## Residuals:
```

```
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -6.14895 -0.43770 -0.11191  0.16481 19.63470
##
## Coefficients:
##                              Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.529973667  0.340576537  1.5561 0.120004
## pos_perf                 0.137046500  0.155668789  0.8804 0.378873
## pct_neg_perfFB           0.013825862  0.015058898  0.9181 0.358781
## Financial_Slack          0.025312583  0.013060765  1.9381 0.052901 .
## log(Employees)          -0.251814205  0.088997156 -2.8295 0.004757 **
## Age                      0.017167457  0.011360143  1.5112 0.131058
## Total_Compensation      -0.000045355  0.000090793 -0.4995 0.617506
## pct_pos_perfFB:pos_perf -0.538120272  0.340634874 -1.5798 0.114484
## pos_perf:pct_neg_perfFB  0.227415336  0.282233351  0.8058 0.420570
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2374.6
## Residual Sum of Squares: 2317.4
## R-Squared:      0.024088
## Adj. R-Squared: -0.07509
## F-statistic: 2.69868 on 9 and 984 DF, p-value: 0.0041792
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL
## BP = 20.306, df = 9, p-value = 0.01612

coeftest(FLM_FL,vcov=vcovHC(FLM_FL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           0.529973667  0.591860614  0.8954  0.37077
## pos_perf                 0.137046500  0.117933814  1.1621  0.24549
## pct_neg_perfFB           0.013825862  0.007939453  1.7414  0.08192 .
## Financial_Slack          0.025312583  0.019713195  1.2840  0.19943
## log(Employees)          -0.251814205  0.119416318 -2.1087  0.03522 *
## Age                      0.017167457  0.011402305  1.5056  0.13249
## Total_Compensation      -0.000045355  0.000043884 -1.0335  0.30161
## pct_pos_perfFB:pos_perf -0.538120272  0.592337552 -0.9085  0.36385
## pos_perf:pct_neg_perfFB  0.227415336  0.201766306  1.1271  0.25997
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**TEMPORAL FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data
=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction
model

RLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Total_Compensation,data=P_CEO_
Data, model = "random") # pos_perf is a binary variable -> interaction model
vs. split sample model!

#For Random Model I need to eliminate one CV (Age), since my dataset is not b
ig enough and I would get the error: Error in swar_Between_check(estm[[2L]],
method) : model not estimable: 16 coefficient(s) (incl. intercept) to be esti
mated for the between model but only 13 individual(s)

phtest(FLM_SC3, RLM_SC3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus + pct_neg_
perfFB *  ...
## chisq = 81.909, df = 11, p-value = 0.0000000000006301
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus +
##     pct_neg_perfFB * Present_Focus + pct_pos_perfFB * Future_Focus +
##     pct_neg_perfFB * Future_Focus + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.8888734 -0.0895102  0.0009009  0.1084858  1.4908163
##
## Coefficients:
##                                Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB               -0.00391531  0.27841201 -0.0141 0.988831
## Present_Focus                -0.01320827  0.04175711 -0.3163 0.752963
## pct_neg_perfFB               -0.28866371  0.23849323 -1.2104 0.231315
## Future_Focus                 -0.21434729  0.12986780 -1.6505 0.104540
## Financial_Slack              -0.09772967  0.04897075 -1.9957 0.050931 .
## log(Employees)               -0.57239353  0.18028922 -3.1749 0.002456 **
## Age                          -0.00497616  0.01084263 -0.4589 0.648083
```

```
## Total_Compensation           -0.00078965  0.00028289 -2.7914 0.007203 **
## pct_pos_perfFB:Present_Focus -0.00420498  0.03634317 -0.1157 0.908310
## Present_Focus:pct_neg_perfFB  0.02588183  0.02054192  1.2600 0.213007
## pct_pos_perfFB:Future_Focus   0.01334619  0.02068406  0.6452 0.521454
## pct_neg_perfFB:Future_Focus   0.03856484  0.03962117  0.9733 0.334646
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.3004
## R-Squared:      0.48341
## Adj. R-Squared: 0.25798
## F-statistic: 4.28889 on 12 and 55 DF, p-value: 0.000090925
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC3) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC3
## BP = 12.578, df = 12, p-value = 0.4004

#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_AI3, RLM_AI3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Present_Focus +
...
```

```
## chisq = 40.172, df = 12, p-value = 0.00006733
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -106.428  -12.311    0.000   12.499  217.929
##
## Coefficients:
##                                Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                -7.888402  25.156202 -0.3136 0.7547750
## Present_Focus                  0.884027   4.338090  0.2038 0.8391148
## pct_neg_perfFB               -29.597831  27.397376 -1.0803 0.2837095
## Future_Focus                 -25.318597  13.314728 -1.9015 0.0613464 .
## Financial_Slack              -13.450084   5.088993 -2.6430 0.0101331 *
## log(Employees)               -68.610683  19.482800 -3.5216 0.0007595 ***
## Age                           -1.237202   1.180635 -1.0479 0.2982839
## Total_Compensation            -0.074560   0.031482 -2.3683 0.0206340 *
## pct_pos_perfFB:Present_Focus   0.529782   3.072029  0.1725 0.8635788
## Present_Focus:pct_neg_perfFB   2.720110   2.364992  1.1502 0.2539938
## pct_pos_perfFB:Future_Focus    1.140881   2.302622  0.4955 0.6218200
## pct_neg_perfFB:Future_Focus    3.762972   4.581104  0.8214 0.4142007
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 99334
## R-Squared:      0.42679
## Adj. R-Squared: 0.21388
## F-statistic: 4.34321 on 12 and 70 DF, p-value: 0.000039405
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI3
## BP = 13.415, df = 12, p-value = 0.3396
```

```
#coeftest(FLM_AI3,vcov=vcovHC(FLM_AI3,type="HC0",cluster="group"))

FLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_RD3, RLM_RD3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Present_Focus +  .
..
## chisq = 51.493, df = 12, p-value = 0.0000007622
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.587409 -0.162156 -0.024652  0.114284  5.380079
##
## Coefficients:
##                                 Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB               -0.00852685  0.04396181 -0.1940 0.846466
## Present_Focus                -0.03665447  0.03501301 -1.0469 0.296816
## pct_neg_perfFB               -0.15805079  0.34292108 -0.4609 0.645532
## Future_Focus                  0.18763324  0.13060811  1.4366 0.152883
## Financial_Slack              -0.03966548  0.03253213 -1.2193 0.224630
## log(Employees)                0.43832621  0.16468036  2.6617 0.008611 **
## Age                          -0.00758721  0.01228628 -0.6175 0.537806
## Total_Compensation            0.00007273  0.00013903  0.5231 0.601660
## pct_pos_perfFB:Present_Focus -0.00591986  0.00675654 -0.8762 0.382322
## Present_Focus:pct_neg_perfFB  0.01207638  0.03010394  0.4012 0.688869
## pct_pos_perfFB:Future_Focus   0.02226593  0.01938937  1.1484 0.252625
## pct_neg_perfFB:Future_Focus   0.03733449  0.05652747  0.6605 0.509954
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 49.611
## R-Squared:      0.13481
## Adj. R-Squared: -0.070108
## F-statistic: 1.9736 on 12 and 152 DF, p-value: 0.030202
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD3
## BP = 4.9188, df = 12, p-value = 0.9606
```

```
FLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model

RLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> int
eraction model vs. split sample model!

phtest(FLM_PE3, RLM_PE3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 33.414, df = 12, p-value = 0.000834
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
```

```
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.6162331 -0.0474634  0.0010769  0.0484963  1.2066662
##
## Coefficients:
##                                  Estimate   Std. Error t-value     Pr(>|t|
)
## pct_pos_perfFB               -0.010881020  0.014786016 -0.7359      0.4629
3
## Present_Focus                 0.012265811  0.011776198  1.0416      0.2992
6
## pct_neg_perfFB                0.023001367  0.115337304  0.1994      0.8422
0
## Future_Focus                 -0.089683774  0.043928439 -2.0416      0.0429
2 *
## Financial_Slack              -0.007633073  0.010941783 -0.6976      0.4864
9
## log(Employees)               -0.284290925  0.055388222 -5.1327 0.000000860
9 ***
## Age                           0.001203725  0.004132339  0.2913      0.7712
2
## Total_Compensation           -0.000083391  0.000046762 -1.7833      0.0765
4 .
## pct_pos_perfFB:Present_Focus  0.002351414  0.002272481  1.0347      0.3024
4
## Present_Focus:pct_neg_perfFB -0.000404055  0.010125090 -0.0399      0.9682
2
## pct_pos_perfFB:Future_Focus  -0.002321035  0.006521378 -0.3559      0.7224
0
## pct_neg_perfFB:Future_Focus  -0.008594855  0.019012323 -0.4521      0.6518
6
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.6122
## R-Squared:      0.19834
## Adj. R-Squared: 0.0084754
## F-statistic: 3.13392 on 12 and 152 DF, p-value: 0.00052654
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE3
## BP = 24.563, df = 12, p-value = 0.01704

coeftest(FLM_PE3,vcov=vcovHC(FLM_PE3,type="HC0",cluster="group"))
```

```
##
## t test of coefficients:
##
##                                    Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB                -0.010881020  0.004241560 -2.5653  0.01128 *
## Present_Focus                  0.012265811  0.007549557  1.6247  0.10630
## pct_neg_perfFB                 0.023001367  0.061380720  0.3747  0.70838
## Future_Focus                  -0.089683774  0.059970016 -1.4955  0.13686
## Financial_Slack               -0.007633073  0.011534238 -0.6618  0.50912
## log(Employees)                -0.284290925  0.111820936 -2.5424  0.01201 *
## Age                            0.001203725  0.002189363  0.5498  0.58326
## Total_Compensation            -0.000083391  0.000046730 -1.7845  0.07633 .
## pct_pos_perfFB:Present_Focus   0.002351414  0.000857561  2.7420  0.00684 **
## Present_Focus:pct_neg_perfFB -0.000404055  0.005279328 -0.0765  0.93909
## pct_pos_perfFB:Future_Focus   -0.002321035  0.002000620 -1.1602  0.24780
## pct_neg_perfFB:Future_Focus   -0.008594855  0.009247480 -0.9294  0.35414
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# do it if I have heteroscedasticity!!!!

FLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Presen
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model

RLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Presen
t_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_ne
g_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!

phtest(FLM_NPO3, RLM_NPO3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Present_Foc
us +  ...
## chisq = 29.62, df = 12, p-value = 0.003184
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
```

```
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.8633576 -0.0643814 -0.0063035  0.0790130  0.5424838
##
## Coefficients:
##                                    Estimate   Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB                -0.017558640  0.014665056 -1.1973    0.23361
## Present_Focus                 -0.000211017  0.012096211 -0.0174    0.98611
## pct_neg_perfFB                 0.116846911  0.124947223  0.9352    0.35163
## Future_Focus                   0.026904681  0.048941764  0.5497    0.58355
## Financial_Slack                0.008924918  0.011697507  0.7630    0.44701
## log(Employees)                 0.291199608  0.072231778  4.0315 0.00009907
***
## Age                            0.003412477  0.004729261  0.7216    0.47200
## Total_Compensation             0.000127609  0.000078111  1.6337    0.10501
## pct_pos_perfFB:Present_Focus -0.001679640  0.002408587 -0.6974    0.48696
## Present_Focus:pct_neg_perfFB -0.008984090  0.010823470 -0.8301    0.40820
## pct_pos_perfFB:Future_Focus    0.014045029  0.006718743  2.0904    0.03875
*
## pct_neg_perfFB:Future_Focus  -0.019930046  0.020998257 -0.9491    0.34451
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.8558
## R-Squared:      0.26534
## Adj. R-Squared: 0.045567
## F-statistic: 3.52141 on 12 and 117 DF, p-value: 0.00018092
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_NPO3)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_NPO3
## BP = 20.946, df = 12, p-value = 0.05117

FLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!
```

```
phtest(FLM_IL3, RLM_IL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 13.168, df = 12, p-value = 0.357
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_IL3)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1875  0.4331     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.145033 -0.158166 -0.025633  0.078244  3.345620
##
## Coefficients:
##                                    Estimate   Std. Error z-value Pr(>|z|)
## (Intercept)                     0.461149838  0.335347674  1.3751 0.169088
## pct_pos_perfFB                 -0.003859114  0.029463748 -0.1310 0.895792
## Present_Focus                   0.015400147  0.020213642  0.7619 0.446138
## pct_neg_perfFB                 -0.318801193  0.225546570 -1.4135 0.157520
## Future_Focus                   -0.073118414  0.066347349 -1.1021 0.270438
## Financial_Slack                 0.013571863  0.017043429  0.7963 0.425852
## log(Employees)                 -0.045538256  0.020676693 -2.2024 0.027637 *
## Age                            -0.008985093  0.005478931 -1.6399 0.101019
## Total_Compensation              0.000172916  0.000063136  2.7388 0.006167 **
## pct_pos_perfFB:Present_Focus   -0.004490488  0.004716960 -0.9520 0.341103
## Present_Focus:pct_neg_perfFB    0.025770820  0.019922250  1.2936 0.195814
## pct_pos_perfFB:Future_Focus     0.016164102  0.013470708  1.1999 0.230161
## pct_neg_perfFB:Future_Focus     0.052934815  0.037200231  1.4230 0.154745
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 31.869
## R-Squared:      0.083016
## Adj. R-Squared: 0.020494
## Chisq: 15.9335 on 12 DF, p-value: 0.1943
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL3)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL3
## BP = 12.388, df = 12, p-value = 0.415

#coeftest(RLM_IL3,vcov=vcovHC(RLM_IL3,type="HC0",cluster="group"))

FLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model

RLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> in
teraction model vs. split sample model!

phtest(FLM_FL3, RLM_FL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 95.027, df = 12, p-value = 0.000000000000005214
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
```

```
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -4.505876 -0.347136 -0.022117  0.199613 16.263804
##
## Coefficients:
##                                 Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB                0.00515744  0.13066336  0.0395 0.968566
## Present_Focus                -0.10752717  0.10406573 -1.0333 0.303122
## pct_neg_perfFB                1.01723858  1.01923057  0.9980 0.319843
## Future_Focus                 -0.00342982  0.38819364 -0.0088 0.992962
## Financial_Slack               0.34560588  0.09669205  3.5743 0.000471 ***
## log(Employees)               -0.29202404  0.48946323 -0.5966 0.551648
## Age                           0.04303801  0.03651730  1.1786 0.240413
## Total_Compensation           -0.00037712  0.00041324 -0.9126 0.362894
## pct_pos_perfFB:Present_Focus  0.00972699  0.02008181  0.4844 0.628822
## Present_Focus:pct_neg_perfFB -0.08278133  0.08947496 -0.9252 0.356334
## pct_pos_perfFB:Future_Focus  -0.04808599  0.05762912 -0.8344 0.405363
## pct_neg_perfFB:Future_Focus  -0.16531438  0.16801104 -0.9839 0.326704
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    506.04
## Residual Sum of Squares: 438.26
## R-Squared:      0.13393
## Adj. R-Squared: -0.071194
## F-statistic: 1.95876 on 12 and 152 DF, p-value: 0.031695
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL3
## BP = 11.356, df = 12, p-value = 0.4986

**REGULATORY FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,da
ta=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interacti
on model
RLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Data, mod
el = "random") # pos_perf is a binary variable -> interaction model vs. split
sample model!
```

```
phtest(FLM_SC2, RLM_SC2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Promotion + pct_neg_perf
FB *  ...
## chisq = 65.327, df = 11, p-value = 0.0000000009351
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Promotion +
##     pct_neg_perfFB * Promotion + pct_pos_perfFB * log(Prevention +
##     1) + pct_neg_perfFB * log(Prevention + 1) + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.5240856 -0.0657455  0.0046561  0.0735836  0.8790842
##
## Coefficients:
##                                      Estimate  Std. Error t-value
## pct_pos_perfFB                     0.01950460  0.09026790  0.2161
## Promotion                          0.33445252  0.24075799  1.3892
## pct_neg_perfFB                    -0.83286888  0.12900826 -6.4559
## log(Prevention + 1)               -0.45601595  0.49612175 -0.9192
## Financial_Slack                    0.02558266  0.04409711  0.5801
## log(Employees)                    -0.53106177  0.14339032 -3.7036
## Age                               -0.00390519  0.00839153 -0.4654
## Total_Compensation                -0.00049776  0.00020776 -2.3958
## pct_pos_perfFB:Promotion          -0.06472147  0.10420394 -0.6211
## Promotion:pct_neg_perfFB           2.20624564  0.33550149  6.5760
## pct_pos_perfFB:log(Prevention + 1)  0.21450702  0.30565949  0.7018
## pct_neg_perfFB:log(Prevention + 1) -4.64376421  0.69787321 -6.6542
##                                        Pr(>|t|)
## pct_pos_perfFB                        0.8297290
## Promotion                             0.1703817
## pct_neg_perfFB                   0.00000002926 ***
## log(Prevention + 1)                   0.3620249
## Financial_Slack                       0.5641870
## log(Employees)                        0.0004942 ***
## Age                                   0.6435015
## Total_Compensation                    0.0200134 *
## pct_pos_perfFB:Promotion              0.5370970
## Promotion:pct_neg_perfFB         0.00000001864 ***
```

```
## pct_pos_perfFB:log(Prevention + 1)     0.4857729
## pct_neg_perfFB:log(Prevention + 1) 0.00000001389 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 3.1436
## R-Squared:      0.69362
## Adj. R-Squared: 0.55992
## F-statistic: 10.3762 on 12 and 55 DF, p-value: 0.00000000028327
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC2) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC2
## BP = 61.862, df = 12, p-value = 0.00000001031

coeftest(FLM_SC2,vcov=vcovHC(FLM_SC2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                      0.01950460  0.02946802  0.6619 0.51080
5
## Promotion                           0.33445252  0.18605096  1.7976 0.07772
4 .
## pct_neg_perfFB                     -0.83286888  0.34980245 -2.3810 0.02075
7 *
## log(Prevention + 1)                -0.45601595  0.47957067 -0.9509 0.34582
3
## Financial_Slack                     0.02558266  0.03998297  0.6398 0.52493
4
## log(Employees)                     -0.53106177  0.19581297 -2.7121 0.00890
6 **
## Age                                -0.00390519  0.00388535 -1.0051 0.31924
7
## Total_Compensation                 -0.00049776  0.00022034 -2.2590 0.02786
7 *
## pct_pos_perfFB:Promotion           -0.06472147  0.03904724 -1.6575 0.10310
9
## Promotion:pct_neg_perfFB            2.20624564  0.92155157  2.3941 0.02010
0 *
## pct_pos_perfFB:log(Prevention + 1)  0.21450702  0.18107861  1.1846 0.24126
```

```
7
## pct_neg_perfFB:log(Prevention + 1) -4.64376421  1.91263918 -2.4279 0.01848
5 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_AI2, RLM_AI2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 135.25, df = 11, p-value < 0.00000000000000022
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -89.66991 -13.01103   0.19575  11.67265 176.72477
##
## Coefficients:
##                                       Estimate  Std. Error t-value   Pr(>|
t|)
```

```
## pct_pos_perfFB                          -3.194874    9.567357 -0.3339  0.7394
271
## Promotion                               -6.443605   27.671030 -0.2329  0.8165
461
## pct_neg_perfFB                         -49.502387   12.240610 -4.0441  0.0001
333
## log(Prevention + 1)                     -7.167434   60.595838 -0.1183  0.9061
825
## Financial_Slack                         -5.281135    5.194173 -1.0167  0.3127
775
## log(Employees)                         -64.413296   18.306046 -3.5187  0.0007
666
## Age                                     -1.048971    1.073537 -0.9771  0.3318
765
## Total_Compensation                      -0.078716    0.026950 -2.9208  0.0046
956
## pct_pos_perfFB:Promotion                 4.484730   11.863463  0.3780  0.7065
532
## Promotion:pct_neg_perfFB               130.931353   31.005182  4.2229 0.00007
135
## pct_pos_perfFB:log(Prevention + 1)       6.125521   33.664783  0.1820  0.8561
429
## pct_neg_perfFB:log(Prevention + 1) -276.587141   63.496485 -4.3559 0.00004
442
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB                       ***
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                       ***
## Age
## Total_Compensation                   **
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB             ***
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 80496
## R-Squared:      0.53549
## Adj. R-Squared: 0.36296
## F-statistic: 6.72466 on 12 and 70 DF, p-value: 0.0000000726
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI2)
```

```
##
##  studentized Breusch-Pagan test
```

```
##
## data:  FLM_AI2
## BP = 31.156, df = 12, p-value = 0.001865

coeftest(FLM_AI2,vcov=vcovHC(FLM_AI2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                        Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                       -3.194874    6.701803 -0.4767  0.6350
5
## Promotion                            -6.443605   19.200145 -0.3356  0.7381
7
## pct_neg_perfFB                      -49.502387   35.098449 -1.4104  0.1628
5
## log(Prevention + 1)                  -7.167434   39.534569 -0.1813  0.8566
6
## Financial_Slack                      -5.281135    6.511659 -0.8110  0.4201
0
## log(Employees)                      -64.413296   29.863199 -2.1569  0.0344
5 *
## Age                                  -1.048971    0.583882 -1.7965  0.0767
2 .
## Total_Compensation                   -0.078716    0.046273 -1.7011  0.0933
6 .
## pct_pos_perfFB:Promotion              4.484730   11.361349  0.3947  0.6942
4
## Promotion:pct_neg_perfFB            130.931353   92.335434  1.4180  0.1606
3
## pct_pos_perfFB:log(Prevention + 1)    6.125521   17.962565  0.3410  0.7341
1
## pct_neg_perfFB:log(Prevention + 1) -276.587141  191.659587 -1.4431  0.1534
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!

FLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model
RLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Dat
a, model = "random") # pos_perf is a binary variable -> interaction model vs.
split sample model!

phtest(FLM_RD2, RLM_RD2) #H0: I should use the random effect panel model

##
##  Hausman Test
```

```
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 33.276, df = 11, p-value = 0.0004746
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.577262 -0.161700 -0.031149  0.140291  5.257061
##
## Coefficients:
##                                      Estimate  Std. Error t-value Pr(>|t|
)
## pct_pos_perfFB                     -0.03306844  0.04295998 -0.7698 0.44264
3
## Promotion                          -0.55170927  0.28296506 -1.9497 0.05304
7 .
## pct_neg_perfFB                     -0.00723376  0.08473344 -0.0854 0.93207
9
## log(Prevention + 1)                 0.22422642  0.66104809  0.3392 0.73492
8
## Financial_Slack                    -0.04985546  0.03408970 -1.4625 0.14567
5
## log(Employees)                      0.49591441  0.17025189  2.9128 0.00412
2 **
## Age                                -0.00684160  0.01232571 -0.5551 0.57966
4
## Total_Compensation                  0.00010409  0.00013888  0.7495 0.45472
7
## pct_pos_perfFB:Promotion            0.04634414  0.04871356  0.9514 0.34293
2
## Promotion:pct_neg_perfFB            0.01437534  0.17856831  0.0805 0.93594
3
## pct_pos_perfFB:log(Prevention + 1) -0.07320282  0.13030650 -0.5618 0.57509
7
## pct_neg_perfFB:log(Prevention + 1)  0.20164078  0.34997342  0.5762 0.56535
9
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
```

```
## Residual Sum of Squares: 48.688
## R-Squared:      0.15091
## Adj. R-Squared: -0.05019
## F-statistic: 2.25126 on 12 and 152 DF, p-value: 0.011962
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD2
## BP = 15.218, df = 12, p-value = 0.2297

#coeftest(FLM_RD2,vcov=vcovHC(FLM_RD2,type="HC0",cluster="group"))

FLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_PE2, RLM_PE2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 67.406, df = 11, p-value = 0.0000000003791
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.6219082 -0.0582684  0.0035611  0.0448641  1.1854827
```

```
##
## Coefficients:
##                                       Estimate    Std. Error t-value
## pct_pos_perfFB                      0.0086219868  0.0146893084  0.5870
## Promotion                          -0.0402768068  0.0967542672 -0.4163
## pct_neg_perfFB                     -0.0233193216  0.0289729117 -0.8049
## log(Prevention + 1)                -0.3498072292  0.2260322275 -1.5476
## Financial_Slack                    -0.0031986500  0.0116562923 -0.2744
## log(Employees)                     -0.2445045207  0.0582142429 -4.2001
## Age                                -0.0000044864  0.0042145312 -0.0011
## Total_Compensation                 -0.0000912317  0.0000474876 -1.9212
## pct_pos_perfFB:Promotion           -0.0109808249  0.0166566312 -0.6592
## Promotion:pct_neg_perfFB            0.0594967273  0.0610578774  0.9744
## pct_pos_perfFB:log(Prevention + 1)  0.0009979223  0.0445557120  0.0224
## pct_neg_perfFB:log(Prevention + 1) -0.1164673719  0.1196664387 -0.9733
##                                       Pr(>|t|)
## pct_pos_perfFB                         0.55810
## Promotion                              0.67779
## pct_neg_perfFB                         0.42215
## log(Prevention + 1)                    0.12380
## Financial_Slack                        0.78414
## log(Employees)                      0.00004529 ***
## Age                                    0.99915
## Total_Compensation                     0.05658 .
## pct_pos_perfFB:Promotion               0.51074
## Promotion:pct_neg_perfFB               0.33139
## pct_pos_perfFB:log(Prevention + 1)     0.98216
## pct_neg_perfFB:log(Prevention + 1)     0.33197
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.6924
## R-Squared:      0.18688
## Adj. R-Squared: -0.0056971
## F-statistic: 2.91125 on 12 and 152 DF, p-value: 0.0011768
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE2
## BP = 23.887, df = 12, p-value = 0.02107

coeftest(FLM_PE2,vcov=vcovHC(FLM_PE2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                       Estimate    Std. Error t value Pr(
```

```
>|t|)
## pct_pos_perfFB                       0.0086219868  0.0070743564  1.2188  0.
22482
## Promotion                           -0.0402768068  0.0954788762 -0.4218  0.
67374
## pct_neg_perfFB                      -0.0233193216  0.0274435023 -0.8497  0.
39682
## log(Prevention + 1)                 -0.3498072292  0.3230509190 -1.0828  0.
28060
## Financial_Slack                     -0.0031986500  0.0128658604 -0.2486  0.
80399
## log(Employees)                      -0.2445045207  0.1079211355 -2.2656  0.
02489
## Age                                 -0.0000044864  0.0027181955 -0.0017  0.
99869
## Total_Compensation                  -0.0000912317  0.0000531154 -1.7176  0.
08790
## pct_pos_perfFB:Promotion            -0.0109808249  0.0074465591 -1.4746  0.
14238
## Promotion:pct_neg_perfFB             0.0594967273  0.0654007560  0.9097  0.
36441
## pct_pos_perfFB:log(Prevention + 1)  0.0009979223  0.0329940543  0.0302  0.
97591
## pct_neg_perfFB:log(Prevention + 1) -0.1164673719  0.1200108918 -0.9705  0.
33335
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      *
## Age
## Total_Compensation                  .
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Co
mpensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variabl
e -> interaction model
RLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P
_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction m
odel vs. split sample model!

phtest(FLM_NPO2, RLM_NPO2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Promotion +
...
## chisq = 640.97, df = 11, p-value < 0.00000000000000022
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.788702 -0.050341  0.003644  0.067849  0.465625
##
## Coefficients:
##                                      Estimate   Std. Error t-value Pr(>|
t|)
## pct_pos_perfFB                     -0.006385985  0.016043810 -0.3980  0.69
133
## Promotion                          -0.104948362  0.113654672 -0.9234  0.35
770
## pct_neg_perfFB                      0.129625558  0.063256789  2.0492  0.04
268
## log(Prevention + 1)                -0.236929843  0.258224255 -0.9175  0.36
075
## Financial_Slack                     0.011165383  0.012683869  0.8803  0.38
051
## log(Employees)                      0.313228509  0.072520377  4.3192 0.000
033
## Age                                 0.004476429  0.004804915  0.9316  0.35
344
## Total_Compensation                  0.000091826  0.000078546  1.1691  0.24
475
## pct_pos_perfFB:Promotion            0.007048153  0.018272012  0.3857  0.70
039
## Promotion:pct_neg_perfFB           -0.324891900  0.162328766 -2.0014  0.04
766
## pct_pos_perfFB:log(Prevention + 1)  0.029677748  0.045898726  0.6466  0.51
916
## pct_neg_perfFB:log(Prevention + 1)  0.619705049  0.338143448  1.8327  0.06
939
##
```

```
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB                      *
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      ***
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB            *
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1) .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.8695
## R-Squared:      0.26273
## Adj. R-Squared: 0.042184
## F-statistic: 3.47453 on 12 and 117 DF, p-value: 0.00021257
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO2
## BP = 62.687, df = 12, p-value = 0.000000007277

coeftest(FLM_NPO2,vcov=vcovHC(FLM_NPO2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate   Std. Error t value Pr(>|
t|)
## pct_pos_perfFB                     -0.006385985  0.008999103 -0.7096  0.47
935
## Promotion                          -0.104948362  0.083217260 -1.2611  0.20
977
## pct_neg_perfFB                      0.129625558  0.132564446  0.9778  0.33
018
## log(Prevention + 1)                -0.236929843  0.242005913 -0.9790  0.32
959
## Financial_Slack                     0.011165383  0.025276959  0.4417  0.65
951
## log(Employees)                      0.313228509  0.151013999  2.0742  0.04
026 *
## Age                                 0.004476429  0.003279210  1.3651  0.17
484
## Total_Compensation                  0.000091826  0.000090507  1.0146  0.31
```

```
240
## pct_pos_perfFB:Promotion            0.007048153  0.010690918  0.6593  0.51
102
## Promotion:pct_neg_perfFB           -0.324891900  0.349675503 -0.9291  0.35
474
## pct_pos_perfFB:log(Prevention + 1)  0.029677748  0.031586071  0.9396  0.34
937
## pct_neg_perfFB:log(Prevention + 1)  0.619705049  0.728224109  0.8510  0.39
652
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_IL2, RLM_IL2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 9.8483, df = 11, p-value = 0.5441
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_IL2)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1944  0.4409     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
```

```
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.046004 -0.145958 -0.040864  0.055650  3.356272
##
## Coefficients:
##                                     Estimate   Std. Error z-value Pr(>|
z|)
## (Intercept)                          0.348843347  0.331195327  1.0533  0.29
221
## pct_pos_perfFB                      -0.009974731  0.029252046 -0.3410  0.73
311
## Promotion                           -0.146961739  0.166489499 -0.8827  0.37
739
## pct_neg_perfFB                      -0.011736435  0.059412355 -0.1975  0.84
340
## log(Prevention + 1)                 -0.373914719  0.353309856 -1.0583  0.28
991
## Financial_Slack                      0.035900779  0.017094140  2.1002  0.03
571 *
## Total_Compensation                   0.000098020  0.000057286  1.7111  0.08
707 .
## Age                                 -0.006399288  0.005464540 -1.1711  0.24
158
## pct_pos_perfFB:Promotion             0.010955167  0.033140185  0.3306  0.74
097
## Promotion:pct_neg_perfFB            -0.013758367  0.123148060 -0.1117  0.91
104
## pct_pos_perfFB:log(Prevention + 1)   0.018533016  0.090331800  0.2052  0.83
744
## pct_neg_perfFB:log(Prevention + 1)   0.181261735  0.236143189  0.7676  0.44
273
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 33.08
## R-Squared:      0.048152
## Adj. R-Squared: -0.011003
## Chisq: 8.95403 on 11 DF, p-value: 0.62614
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL2)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL2
## BP = 6.1813, df = 11, p-value = 0.861

FLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
```

```
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_FL2, RLM_FL2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Promotion +  ..
.
## chisq = 27.494, df = 11, p-value = 0.003867
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -4.529812 -0.322939 -0.030152  0.173226 16.123250
##
## Coefficients:
##                                    Estimate  Std. Error t-value  Pr(>|t
|)
## pct_pos_perfFB                   0.11753695  0.12800525  0.9182 0.35995
86
## Promotion                        0.16148469  0.84313390  0.1915 0.84836
67
## pct_neg_perfFB                   0.05365942  0.25247511  0.2125 0.83197
56
## log(Prevention + 1)              1.85656034  1.96968505  0.9426 0.34739
81
## Financial_Slack                  0.39351359  0.10157501  3.8741 0.00015
87
## log(Employees)                  -0.33477518  0.50728927 -0.6599 0.51029
78
## Age                              0.04711260  0.03672618  1.2828 0.20151
23
## Total_Compensation              -0.00057233  0.00041381 -1.3831 0.16867
```

```
41
## pct_pos_perfFB:Promotion           -0.18387191  0.14514885 -1.2668 0.20717
10
## Promotion:pct_neg_perfFB           -0.04448260  0.53206921 -0.0836 0.93348
21
## pct_pos_perfFB:log(Prevention + 1)  0.02909368  0.38826640  0.0749 0.94036
71
## pct_neg_perfFB:log(Prevention + 1) -0.25876933  1.04279464 -0.2481 0.80435
34
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack                    ***
## log(Employees)
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    506.04
## Residual Sum of Squares: 432.26
## R-Squared:      0.14579
## Adj. R-Squared: -0.056524
## F-statistic: 2.16184 on 12 and 152 DF, p-value: 0.016189
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL2
## BP = 12.647, df = 12, p-value = 0.3952
```

10.310.3 Omit Adv. Intensity

1. Loading & Merging Datasets

```
Pharma_TempF_Data <- read_xlsx("data/Compustat_TempFoc_V2.xlsx")
```

```
Execucomp <- read_xlsx("data/Execucomp_SIC_2000_3999.xlsx")

colnames(Pharma_TempF_Data) <- c("Company_ID",  "Data_Date",    "Fiscal_Year"
,  "Industry Format",  "Level of Consolidation - Company Annual Descriptor",
"Population Source",    "Data Format",  "Ticker Symbol",    "CUSIP",    "Comp
any Name", "ISO_Currency_Code",    "Current Assets - Total",   "Acquisitions"
, "Assets_Total", "Equity_Total", "Cash", "Long-Term Debt - Total",   "Divide
nds Common/Ordinary",    "Dividends - Preferred/Preference", "Dividends - Tot
al",    "EBIT", "Earnings Before Interest", "Employees",    "Inventories_Tota
l",    "Current Liabilities - Total",  "Liabilities and Stockholders Equity -
Total",  "Liabilities_Total",    "Net_Income",   "PPE_Total_Gross",  "Propert
y, Plant, and Equipment - Buildings (Net)", "PPE_Total_Net",    "Retained Ear
nings",    "Revenue - Total",  "SalesTurnover",    "Stockholders Equity - Par
ent", "Stockholders Equity - Total",  "Interest Expense - Total (Financial Se
rvices)",    "Deferred Taxes (Balance Sheet)",   "Income Taxes - Deferred",
"Income Taxes Paid",    "Income Taxes - Total", "Working Capital (Balance She
et)",  "Advertising_Expense",  "Interest and Related Expense - Total", "RD_Ex
pense",   "Research & Development - Prior",   "SGA_Expense",  "Active/Inactiv
e Status Marker",    "Market_Value_Total_Fiscal",    "Company Legal Name",
"North American Industry Classification Code",  "Standard_Industry_Classifica
tion_Code", "Prevention", "Promotion", "Company Initial Public Offering Date"
, "Past_Focus", "Present_Focus", "Future_Focus")

names(Execucomp)[names(Execucomp) == 'Fiscal Year'] <- 'Fiscal_Year'
names(Execucomp)[names(Execucomp) == 'Company ID Number'] <- 'Company_ID'
names(Execucomp)[names(Execucomp) == 'Total Current Compensation (Salary + Bo
nus)'] <- 'Total_Compensation'
names(Execucomp)[names(Execucomp) == "Executive's Age"] <- 'Age'
names(Execucomp)[names(Execucomp) == "Annual CEO Flag"] <- 'Job'
names(Execucomp)[names(Execucomp) == "Company Name"] <- 'C_Name'

# Removing companies listed in CAD
Pharma_TempF_Data<- Pharma_TempF_Data[Pharma_TempF_Data$ISO_Currency_Code ==
"USD", ]

# Removing all non-CEO executives
Execucomp$"CEO" <- ifelse(Execucomp$Job == "CEO", 1, 0)
Execucomp<- Execucomp[Execucomp$"CEO" == 1, ]

table(is.na(Pharma_TempF_Data$"Fiscal_Year")) # Eliminate 10 NA´s in the Fisc
al Years

##
## FALSE  TRUE
##  7827    10

Pharma_TempF_Data <- Pharma_TempF_Data %>% drop_na(Fiscal_Year)

str(Execucomp$Company_ID)

##  chr [1:20468] "001013" "001013" "001013" "001013" "001013" "001013" ...

str(Execucomp$Fiscal_Year)

##  num [1:20468] 1993 1994 1995 1996 1997 ...
```

```
str(Pharma_TempF_Data$Company_ID)

##  chr [1:7827] "148293" "148293" "148293" "148293" "148293" "148293" ...

str(Pharma_TempF_Data$Fiscal_Year)

##  num [1:7827] 2000 2001 2002 2003 2004 ...
```

Merge Datasets Together:

```
# merge two data frames by ID and Year
CEO_Data <- left_join(Pharma_TempF_Data, Execucomp,by=c("Company_ID","Fiscal_
Year")) %>%
  group_by(Company_ID, Fiscal_Year) %>% #to avoid duplicates
  filter(rank(Company_ID, ties.method = "first") == 1) #to avoid duplicates

P_CEO_Data <- pdata.frame(CEO_Data, index=c("Company_ID", "Fiscal_Year")) #Cr
eate Panel Data
```

---

2. Creating Strategic Change Variables

STRATEGIC CHANGE:

```
P_CEO_Data$"adv_intens" <- as.numeric(P_CEO_Data$Advertising_Expense / P_CEO_
Data$SalesTurnover)
P_CEO_Data$"RD_intens" <- as.numeric(P_CEO_Data$RD_Expense / P_CEO_Data$Sales
Turnover)
P_CEO_Data$"plant_equip" <- as.numeric(P_CEO_Data$PPE_Total_Net / P_CEO_Data$
PPE_Total_Gross)
P_CEO_Data$"nonprod_overhead" <- as.numeric(P_CEO_Data$SGA_Expense / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"invent_lev" <- as.numeric(P_CEO_Data$Inventories_Total / P_CEO_Da
ta$SalesTurnover)
P_CEO_Data$"fin_leverage" <- as.numeric(P_CEO_Data$Liabilities_Total / P_CEO_
Data$Equity_Total)

P_CEO_Data$"adv_intens_diff" <- as.numeric(P_CEO_Data$adv_intens - plm::lag(P
_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"RD_intens_diff" <- as.numeric(P_CEO_Data$RD_intens - plm::lag(P_C
EO_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"plant_equip_diff" <- as.numeric(P_CEO_Data$plant_equip - plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"nonprod_overhead_diff" <- as.numeric(P_CEO_Data$nonprod_overhead
- plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL
))
P_CEO_Data$"invent_lev_diff" <- as.numeric(P_CEO_Data$invent_lev - plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"fin_leverage_diff" <- as.numeric(P_CEO_Data$fin_leverage - plm::l
ag(P_CEO_Data$fin_leverage , order_by = NULL))

P_CEO_Data$"pct_adv_intens_diff" <- as.numeric((P_CEO_Data$adv_intens - plm::
lag(P_CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_
CEO_Data$adv_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_RD_intens_diff" <- as.numeric((P_CEO_Data$RD_intens - plm::la
g(P_CEO_Data$RD_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_CEO
```

```
_Data$RD_intens, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_plant_equip_diff" <- as.numeric((P_CEO_Data$plant_equip - plm
::lag(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))/plm::lag
(P_CEO_Data$plant_equip, k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_nonprod_overhead_diff" <- as.numeric((P_CEO_Data$nonprod_over
head - plm::lag(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by =
NULL))/lead(P_CEO_Data$nonprod_overhead , k = 1, default = NA, order_by = NUL
L))
P_CEO_Data$"pct_invent_lev_diff" <- as.numeric((P_CEO_Data$invent_lev - plm::
lag(P_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))/plm::lag(P
_CEO_Data$invent_lev , k = 1, default = NA, order_by = NULL))
P_CEO_Data$"pct_fin_leverage_diff" <- as.numeric((P_CEO_Data$fin_leverage - p
lm::lag(P_CEO_Data$fin_leverage , order_by = NULL))/plm::lag(P_CEO_Data$fin_l
everage , order_by = NULL))
```

Replace Inf. and NAN values:

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA
```

Standardizing -> I standardize the absolute values (mean=0, standard deviation=1)

```
P_CEO_Data$"stand_adv" <- (P_CEO_Data$pct_adv_intens_diff - mean(na.omit(P_CE
O_Data$pct_adv_intens_diff))) / sd(na.omit(P_CEO_Data$pct_adv_intens_diff))
P_CEO_Data$"stand_RD" <- (P_CEO_Data$pct_RD_intens_diff - mean(na.omit(P_CEO_
Data$pct_RD_intens_diff))) / sd(na.omit(P_CEO_Data$pct_RD_intens_diff))
P_CEO_Data$"stand_plant" <- (P_CEO_Data$pct_plant_equip_diff - mean(na.omit(P
_CEO_Data$pct_plant_equip_diff))) / sd(na.omit(P_CEO_Data$pct_plant_equip_dif
f))
P_CEO_Data$"stand_nonprod" <- (P_CEO_Data$pct_nonprod_overhead_diff - mean(na
.omit(P_CEO_Data$pct_nonprod_overhead_diff))) / sd(na.omit(P_CEO_Data$pct_non
prod_overhead_diff))
P_CEO_Data$"stand_invent" <- (P_CEO_Data$pct_invent_lev_diff - mean(na.omit(P
_CEO_Data$pct_invent_lev_diff))) / sd(na.omit(P_CEO_Data$pct_invent_lev_diff)
)
P_CEO_Data$"stand_fin" <- (P_CEO_Data$pct_fin_leverage_diff - mean(na.omit(P_
CEO_Data$pct_fin_leverage_diff))) / sd(na.omit(P_CEO_Data$pct_fin_leverage_di
ff))
```

Check MEAN & SD

```
mean(P_CEO_Data$stand_adv,na.rm=TRUE)

## [1] 0.00000000000000002594323

mean(P_CEO_Data$stand_RD,na.rm=TRUE)

## [1] 0.00000000000000002487215

mean(P_CEO_Data$stand_plant,na.rm=TRUE)

## [1] -0.00000000000000004218672

mean(P_CEO_Data$stand_nonprod,na.rm=TRUE)

## [1] 0.00000000000000007887655
```

```
mean(P_CEO_Data$stand_invent,na.rm=TRUE)

## [1] -0.000000000000000002756174

mean(P_CEO_Data$stand_fin,na.rm=TRUE)

## [1] 0.000000000000000002571993

sd(na.omit(P_CEO_Data$stand_adv))

## [1] 1

sd(na.omit(P_CEO_Data$stand_RD))

## [1] 1

sd(na.omit(P_CEO_Data$stand_plant))

## [1] 1

sd(na.omit(P_CEO_Data$stand_nonprod))

## [1] 1

sd(na.omit(P_CEO_Data$stand_invent))

## [1] 1

sd(na.omit(P_CEO_Data$stand_fin))

## [1] 1
```

Check nr. of NA´s

```
table(is.na(P_CEO_Data$"stand_adv"))

##
## FALSE  TRUE
##  1629  6198

table(is.na(P_CEO_Data$"stand_RD"))

##
## FALSE  TRUE
##  4942  2885

table(is.na(P_CEO_Data$"stand_plant"))

##
## FALSE  TRUE
##  6144  1683

table(is.na(P_CEO_Data$"stand_nonprod"))

##
## FALSE  TRUE
##  3296  4531

table(is.na(P_CEO_Data$"stand_invent"))
```

```
##
## FALSE  TRUE
##  4160  3667

table(is.na(P_CEO_Data$"stand_fin"))

##
## FALSE  TRUE
##  6646  1181
```

Standardized Advertising has a lot of NA´s! Since there are too many missing observations, I will create a robustness check, where I omit “stand_adv” in developing the strategic change variable. (-> see “robustness check”)

To create the SC variable I need the absolute values

```
P_CEO_Data$"abs_stand_adv" <- abs(P_CEO_Data$stand_adv)
P_CEO_Data$"abs_stand_RD" <- abs(P_CEO_Data$stand_RD)
P_CEO_Data$"abs_stand_plant" <- abs(P_CEO_Data$stand_plant)
P_CEO_Data$"abs_stand_nonprod" <- abs(P_CEO_Data$stand_nonprod)
P_CEO_Data$"abs_stand_invent" <- abs(P_CEO_Data$stand_invent)
P_CEO_Data$"abs_stand_fin" <- abs(P_CEO_Data$stand_fin)
```

Now I can finally create the Strategic change variable:

```
P_CEO_Data$strat_change <- (P_CEO_Data$"abs_stand_adv" + P_CEO_Data$"abs_stan
d_RD" + P_CEO_Data$"abs_stand_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO
_Data$"abs_stand_invent" + P_CEO_Data$"abs_stand_fin") / 6

P_CEO_Data$strat_change2 <- (P_CEO_Data$"abs_stand_RD" + P_CEO_Data$"abs_stan
d_plant" + P_CEO_Data$"abs_stand_nonprod" + P_CEO_Data$"abs_stand_invent" + P
_CEO_Data$"abs_stand_fin") / 5 #robustness check
```

I compare both strat_change variables and see, that omitting the “stand_adv” variable saves me from a lot additional NA´s (-> but I still have 17K observations)

```
table(is.na(P_CEO_Data$"strat_change"))

##
## FALSE  TRUE
##  1134  6693

table(is.na(P_CEO_Data$"strat_change2")) #for robustness check

##
## FALSE  TRUE
##  2665  5162
```

Assumption check for normal distribution of the data:

I perform the Shapiro-Wilk normality test to check whether the dependent variables follow a normal distribution or not.

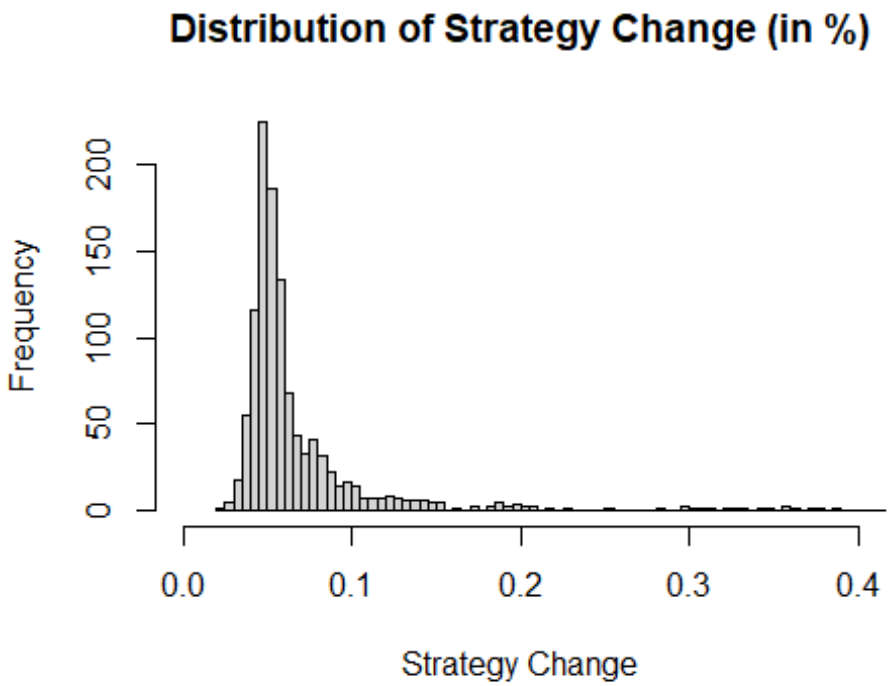
H0: he dependent variable follows the normal distribution H1: the dependent variable does not follow a normal distribution If the p value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution.

```
#saphiroSC <- shapiro.test(P_CEO_Data$strat_change)
#saphiroSC # see result of strat_change test

#saphiroAI <- shapiro.test(P_CEO_Data$adv_intens)
#saphiroAI # see result of performance test

#saphiroRD <- shapiro.test(P_CEO_Data$RD_intens)
#saphiroRD # see result of performance test

#saphiroPE <- shapiro.test(P_CEO_Data$plant_equip)
#saphiroPE # see result of performance test

#saphiroNPO <- shapiro.test(P_CEO_Data$nonprod_overhead)
#saphiroNPO # see result of performance test

#saphiroIL <- shapiro.test(P_CEO_Data$invent_lev)
#saphiroIL # see result of performance test

#saphiroFL <- shapiro.test(P_CEO_Data$fin_leverage)
#saphiroFL # see result of performance test
```

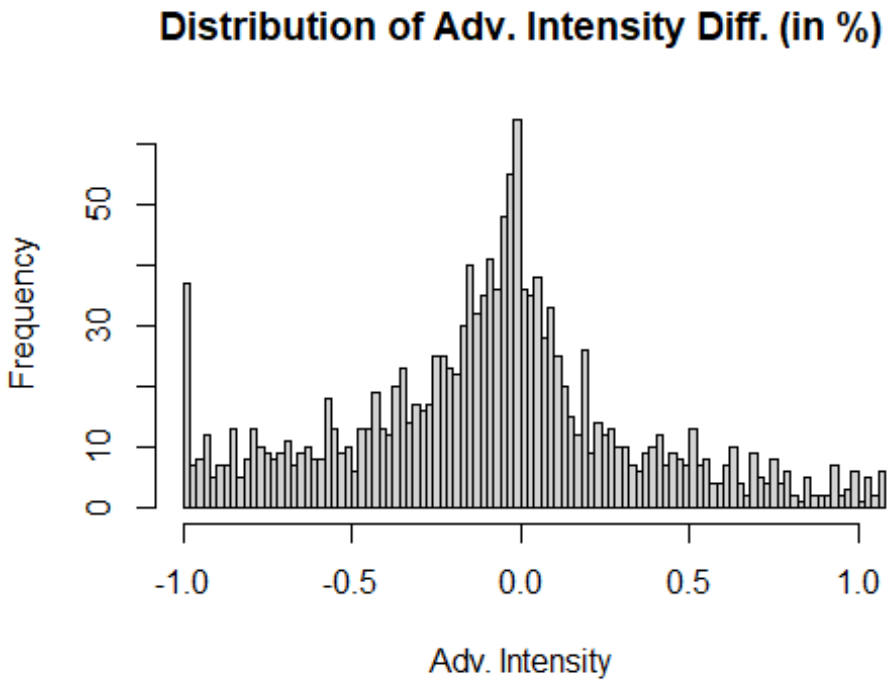
cannot do it because I have too many observations -> max. 5000 observations

In the Histogram below, it can be observed that the variables do not always follow a normal distribution, but almost every time it approaches a normal distribution. In

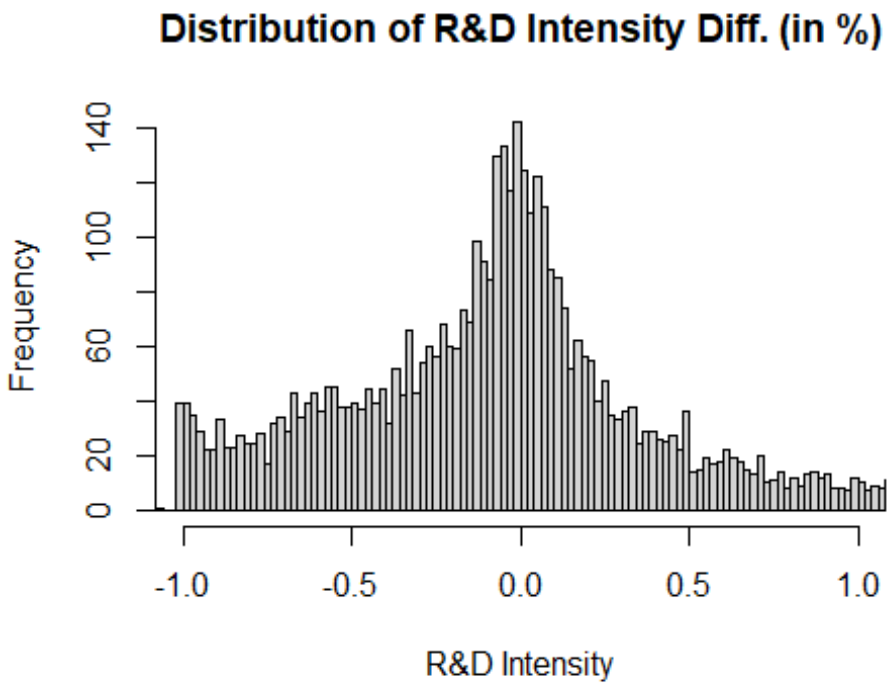
```
hist(P_CEO_Data$strat_change , breaks =(1000), main="Distribution of Strategy
Change (in %)", xlab="Strategy Change", xlim = c(0,0.4))
```



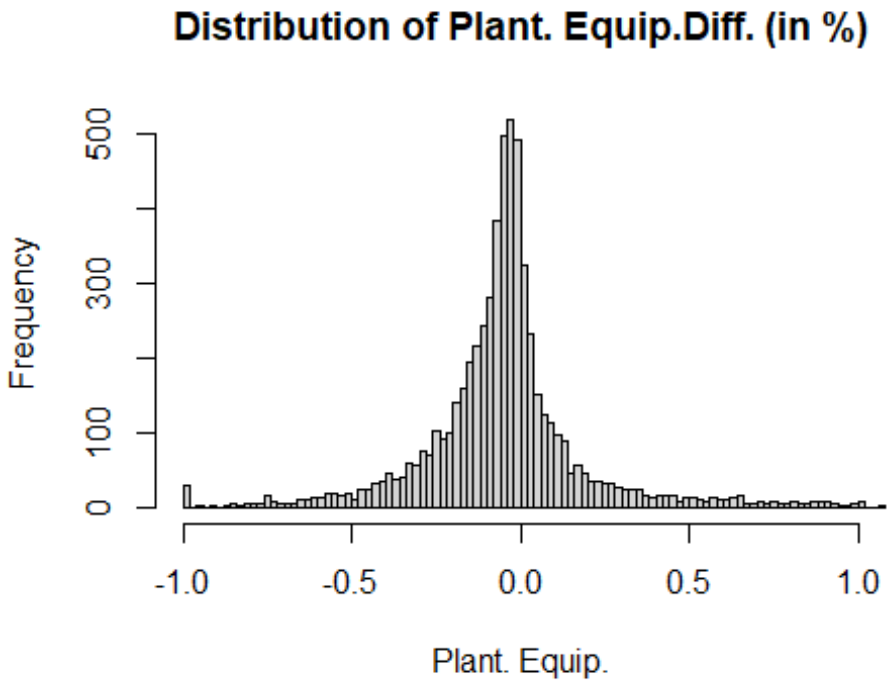

```
hist(P_CEO_Data$pct_adv_intens_diff , breaks =(40000), main="Distribution of
Adv. Intensity Diff. (in %)", xlab="Adv. Intensity", xlim = c(-1,1))
```



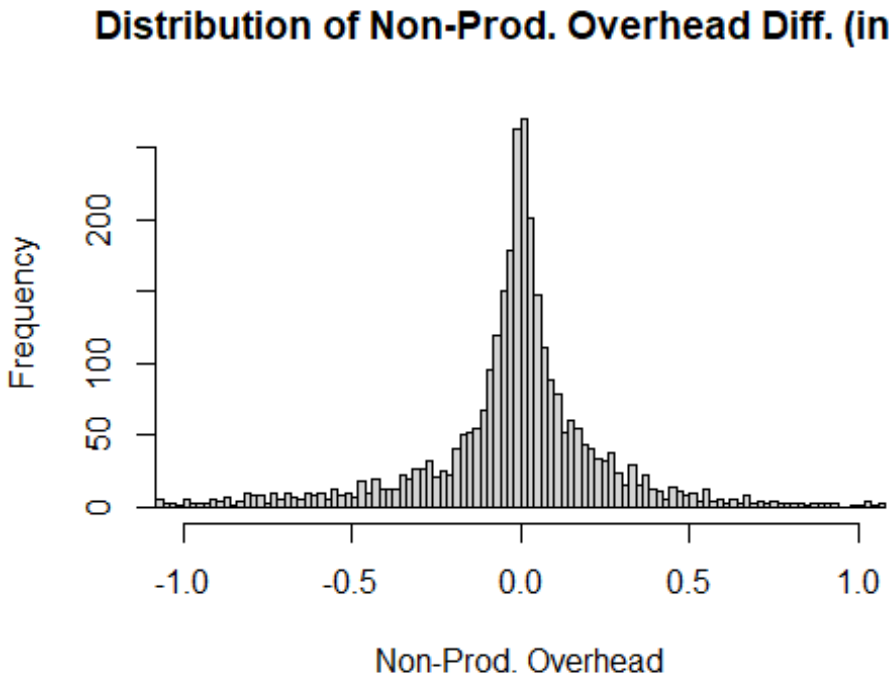

```
hist(P_CEO_Data$pct_RD_intens_diff , breaks =(250000), main="Distribution of
R&D Intensity Diff. (in %)", xlab="R&D Intensity", xlim = c(-1,1))
```



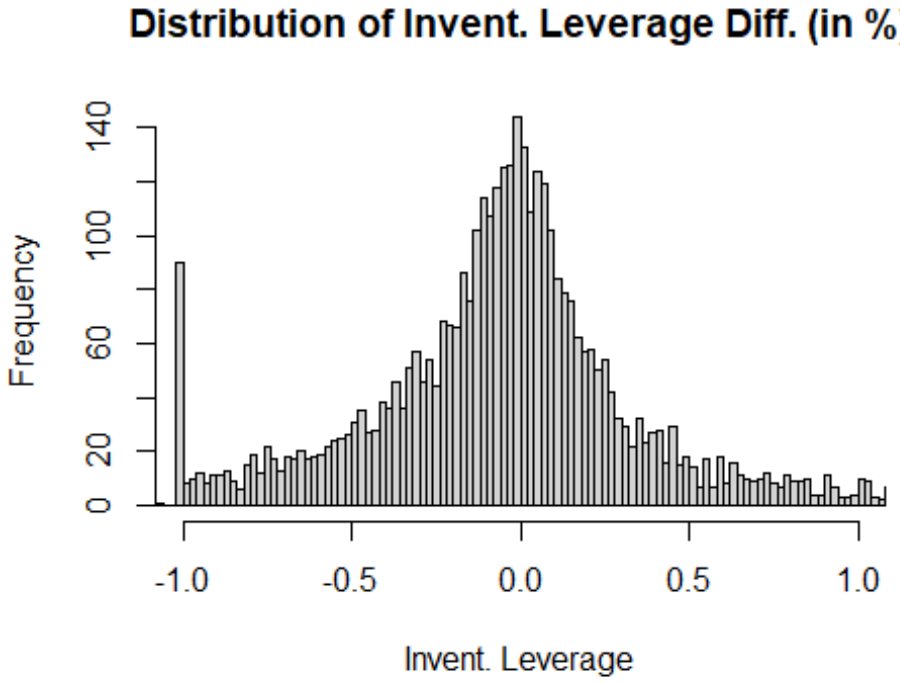

```
hist(P_CEO_Data$pct_plant_equip_diff , breaks =(5000), main="Distribution of
Plant. Equip.Diff. (in %)", xlab="Plant. Equip.", xlim = c(-1,1))
```



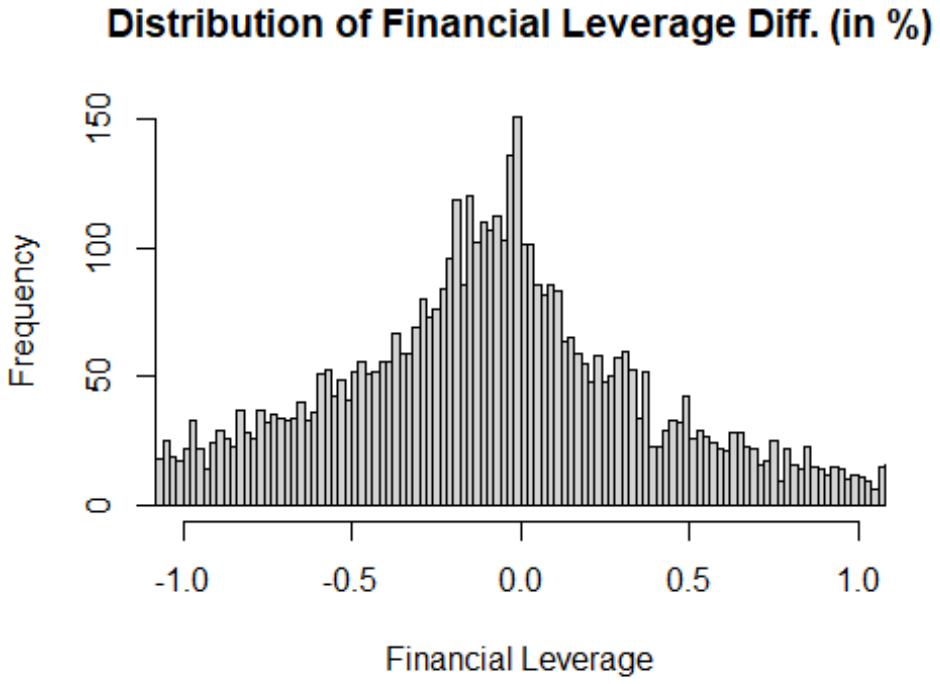

```
#par(mfrow=c(2,2)) # init 4 charts in 1 panel

hist(P_CEO_Data$pct_nonprod_overhead_diff , breaks =(50000), main="Distributi
on of Non-Prod. Overhead Diff. (in %)", xlab="Non-Prod. Overhead", xlim = c(-
1,1))
```



```
hist(P_CEO_Data$pct_invent_lev_diff , breaks =(20000), main="Distribution of
Invent. Leverage Diff. (in %)", xlab="Invent. Leverage", xlim = c(-1,1))
```




```
hist(P_CEO_Data$pct_fin_leverage_diff , breaks =(50000), main="Distribution o
f Financial Leverage Diff. (in %)", xlab="Financial Leverage", xlim = c(-1,1)
)
```



I use the positive and negative median of the strategy changes (=differences) to determine if a strategy change is small or big

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$pct_adv_intens_diff, ifelse(P_CEO_Data$pct_adv_intens_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2465952  0.3758354
```

```
tapply(P_CEO_Data$pct_RD_intens_diff, ifelse(P_CEO_Data$pct_RD_intens_diff >
0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2982761  0.3519554
```

```
tapply(P_CEO_Data$pct_plant_equip_diff, ifelse(P_CEO_Data$pct_plant_equip_dif
f > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.0920045  0.1110405
```

```
tapply(P_CEO_Data$pct_nonprod_overhead_diff, ifelse(P_CEO_Data$pct_nonprod_ov
erhead_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1142313  0.0932076
```

```
tapply(P_CEO_Data$pct_invent_lev_diff, ifelse(P_CEO_Data$pct_invent_lev_diff
> 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2112387  0.2100990
```

```
tapply(P_CEO_Data$pct_fin_leverage_diff, ifelse(P_CEO_Data$pct_fin_leverage_d
iff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.3880235  0.5415713
```

```
#also using the absolute (not standardized values) would be good
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 1,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ 1))
```

Big Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Positive Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_adv_change = case_when (
                                pct_adv_intens_diff >= 0.3758354 ~ 1,
                                pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Positive Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_adv_change = case_when (
                                pct_adv_intens_diff <= 0 ~ 0,
                                pct_adv_intens_diff >= 0.3758354 ~ 0,
                                pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Negative Adv. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_adv_change = case_when (
                                pct_adv_intens_diff <= -0.2465952 ~ 1,
                                pct_adv_intens_diff > -0.2465952 ~ 0))
```

Small Negative Adv. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_adv_change = case_when (
                                pct_adv_intens_diff >= 0 ~ 0,
                                pct_adv_intens_diff <= -0.2465952 ~ 0,
                                pct_adv_intens_diff > -0.2465952 ~ 1))
```

Big R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff > -0.2982761 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Positive R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_rd_change = case_when (
                                pct_RD_intens_diff >= 0.3519554 ~ 1,
                                pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small Positive R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_rd_change = case_when (
                                pct_RD_intens_diff <= 0 ~ 0,
                                pct_RD_intens_diff >= 0.3519554 ~ 0,
                                pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Negative R&D. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_rd_change = case_when (
                                pct_RD_intens_diff <= -0.2982761 ~ 1,
                                pct_RD_intens_diff > -0.2982761 ~ 0))
```

Small Negative R&D. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_rd_change = case_when (
                                P_CEO_Data$pct_RD_intens_diff >= 0 ~ 0,
                                P_CEO_Data$pct_RD_intens_diff <= -0.2982761 ~ 0
,
                                P_CEO_Data$pct_RD_intens_diff > -0.2982761 ~ 1)
)
```

Big Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
```

```
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Positive Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
1,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
0))
```

Small Positive Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff >= 0.1110405  ~
0,
                                P_CEO_Data$pct_plant_equip_diff < 0.1110405  ~
1))
```

Big Negative Plant Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
1,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
0))
```

Small Negative Plant Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_plant_change = case_when (
                                P_CEO_Data$pct_plant_equip_diff >= 0 ~ 0,
                                P_CEO_Data$pct_plant_equip_diff <= -0.0920045 ~
0,
                                P_CEO_Data$pct_plant_equip_diff > -0.0920045 ~
1))
```

Big Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                                P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0,
                                P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_nonprod_change = case_when (
                                P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
```

```
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Positive Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 0))
```

Small Positive Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff <= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0.09320
76  ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff < 0.093207
6  ~ 1))
```

Big Negative Non-Prod. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_nonprod_change = case_when (
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 1,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 0))
```

Small Negative Non-Prod. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_nonprod_change = case_when
(
                              P_CEO_Data$pct_nonprod_overhead_diff >= 0 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff <= -0.1142
313 ~ 0,
                              P_CEO_Data$pct_nonprod_overhead_diff > -0.11423
13 ~ 1))
```

Big Inventory Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_invent_change = case_when (
                              P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                              P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                              P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
,
```

```
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Positive Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 1
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 0)
)
```

Small Positive Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff >= 0.2100990 ~ 0
,
                                P_CEO_Data$pct_invent_lev_diff < 0.2100990 ~ 1)
)
```

Big Negative Invent. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
1,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 0
))
```

Small Negative Invent. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_invent_change = case_when (
                                P_CEO_Data$pct_invent_lev_diff >= 0 ~ 0,
                                P_CEO_Data$pct_invent_lev_diff <= -0.2112387 ~
0,
                                P_CEO_Data$pct_invent_lev_diff > -0.2112387 ~ 1
))
```

Big Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
```

```
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Positive Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
0))
```

Small Positive Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_pos_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff >= 0.5415713
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff < 0.5415713  ~
1))
```

Big Negative Fin. Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_big_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 1,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
0))
```

Small Negative Fin. Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( BV_small_neg_fin_change = case_when (
                                P_CEO_Data$pct_fin_leverage_diff >= 0 ~ 0,
                                P_CEO_Data$pct_fin_leverage_diff <= -0.3880235
~ 0,
                                P_CEO_Data$pct_fin_leverage_diff > -0.3880235 ~
1))
```

Continuous Variables:

```
tapply(P_CEO_Data$strat_change, ifelse(P_CEO_Data$strat_change > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.05379924
```

```
tapply(P_CEO_Data$abs_stand_adv, ifelse(P_CEO_Data$abs_stand_adv > 0, 'positi
ve', 'negative'), median) # median
```

```
##   positive
## 0.07193945
```

```
tapply(P_CEO_Data$abs_stand_RD, ifelse(P_CEO_Data$abs_stand_RD > 0, 'positive
', 'negative'), median) # median
```

```
##   positive
## 0.03553555
```

```
tapply(P_CEO_Data$abs_stand_plant, ifelse(P_CEO_Data$abs_stand_plant > 0, 'po
sitive', 'negative'), median) # median
```

```
##   positive
## 0.08998155
```

```
tapply(P_CEO_Data$abs_stand_nonprod, ifelse(P_CEO_Data$abs_stand_nonprod > 0,
'positive', 'negative'), median) # median
```

```
##   positive
## 0.04249124
```

```
tapply(P_CEO_Data$abs_stand_invent, ifelse(P_CEO_Data$abs_stand_invent > 0, '
positive', 'negative'), median) # median
```

```
##   positive
## 0.07927686
```

```
tapply(P_CEO_Data$abs_stand_fin, ifelse(P_CEO_Data$abs_stand_fin > 0, 'positi
ve', 'negative'), median) # median
```

```
##   positive
## 0.02525311
```

Big Strategic Change:

```
P_CEO_Data <- P_CEO_Data %>% mutate( big_strat_change = case_when (
                                strat_change >= 0.05379924 ~ strat_change,
                                strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_CEO_Data <- P_CEO_Data %>% mutate( small_strat_change = case_when (
                                strat_change >= 0.05379924 ~ 0,
                                strat_change < 0.05379924 ~ strat_change))
```

Big Adv. Change:

```
P_CEO_Data$"big_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv >= 0.07193945,
P_CEO_Data$abs_stand_adv, 0)
```

Small Adv. Change

```
P_CEO_Data$"small_adv_change" <- ifelse(P_CEO_Data$abs_stand_adv <= 0.0719394
5, P_CEO_Data$abs_stand_adv, 0)
```

Big R&D Change:

```
P_CEO_Data$"big_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD >= 0.03553555, P
_CEO_Data$abs_stand_RD, 0)
```

Small R&D Change

```
P_CEO_Data$"small_RD_change" <- ifelse(P_CEO_Data$abs_stand_RD <= 0.03553555,
P_CEO_Data$abs_stand_RD, 0)
```

Big Plant. Change:

```
P_CEO_Data$"big_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant >= 0.08998
155, P_CEO_Data$abs_stand_plant, 0)
```

Small Plant Change

```
P_CEO_Data$"small_plant_change" <- ifelse(P_CEO_Data$abs_stand_plant <= 0.089
98155, P_CEO_Data$abs_stand_plant, 0)
```

Big Nonprod Change:

```
P_CEO_Data$"big_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod >= 0.0
4249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Small Nonprod Change

```
P_CEO_Data$"small_nonprod_change" <- ifelse(P_CEO_Data$abs_stand_nonprod <= 0
.04249124, P_CEO_Data$abs_stand_nonprod, 0)
```

Big invent Change:

```
P_CEO_Data$"big_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent >= 0.079
27686, P_CEO_Data$abs_stand_invent, 0)
```

Small invent. Change

```
P_CEO_Data$"small_invent_change" <- ifelse(P_CEO_Data$abs_stand_invent <= 0.0
7927686, P_CEO_Data$abs_stand_invent, 0)
```

Big fin Change:

```
P_CEO_Data$"big_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin >= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

Small fin. Change

```
P_CEO_Data$"small_fin_change" <- ifelse(P_CEO_Data$abs_stand_fin <= 0.02525311, P_CEO_Data$abs_stand_fin, 0)
```

---

5. Creating PF Variables

PerformanceROA = Return on Assets: net income / total assets (-> as %)

```
P_CEO_Data$"ROA_Performance" <- P_CEO_Data$Net_Income / P_CEO_Data$Assets_Total

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n mean  sd median trimmed  mad  min  max range skew kurtosis  se
## X1    1 7408 -Inf NaN  -0.21   -0.32 0.43 -Inf 1162   Inf  NaN      NaN NaN

#eliminating Inf & NAN
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.nan)] <- NA
P_CEO_Data$ROA_Performance[sapply(P_CEO_Data$ROA_Performance, is.infinite)] <- NA

psych::describe(P_CEO_Data$ROA_Performance)

##    vars    n  mean     sd median trimmed  mad       min  max    range   skew
## X1    1 7372 -7.36 324.32   -0.2   -0.31 0.43 -25884.81 1162 27046.81 -71.44
##    kurtosis   se
## X1  5547.14 3.78

P_CEO_Data <- P_CEO_Data %>%
    group_by(Company_ID) %>%
     mutate(ROA_PerformanceT_1 = dplyr::lag(ROA_Performance, n = 1, default = NA))

P_CEO_Data <- P_CEO_Data %>%
  group_by(Company_ID) %>%
    mutate(Strat_ChangeT.1 = dplyr::lead(strat_change, n = 1, default = NA))

class(P_CEO_Data) # what type of dataset is it

## [1] "grouped_df" "tbl_df"     "tbl"        "data.frame"

P_CEO_Data <- pdata.frame(P_CEO_Data, index=c("Company_ID", "Fiscal_Year")) # go back to Panel Data
class(P_CEO_Data) # what type of dataset is it
```

```
## [1] "pdata.frame" "data.frame"
```

ASPIRED PERFORMANCE FEEDBACK:

HAit = α * Pit + (1 - α) * HAit-1

Creating Variable fur HA

```
P_CEO_Data$asp_perf_fb_0 <- P_CEO_Data$ROA_PerformanceT_1
P_CEO_Data$asp_perf_fb_1 <- (0.1*P_CEO_Data$ROA_Performance)+(0.9*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_2 <- (0.2*P_CEO_Data$ROA_Performance)+(0.8*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_3 <- (0.3*P_CEO_Data$ROA_Performance)+(0.7*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_4 <- (0.4*P_CEO_Data$ROA_Performance)+(0.6*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_5 <- (0.5*P_CEO_Data$ROA_Performance)+(0.5*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_6 <- (0.6*P_CEO_Data$ROA_Performance)+(0.4*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_7 <- (0.7*P_CEO_Data$ROA_Performance)+(0.3*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_8 <- (0.8*P_CEO_Data$ROA_Performance)+(0.2*P_CEO_Data$
ROA_PerformanceT_1)
P_CEO_Data$asp_perf_fb_9 <- (0.9*P_CEO_Data$ROA_Performance)+(0.1*P_CEO_Data$
ROA_PerformanceT_1)
```

Check the best Alpha before continuing!

```
αModel0 <- lm(strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
αModel1 <- lm(strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
αModel2 <- lm(strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
αModel3 <- lm(strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
αModel4 <- lm(strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
αModel5 <- lm(strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
αModel6 <- lm(strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
αModel7 <- lm(strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
αModel8 <- lm(strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
αModel9 <- lm(strat_change ~ asp_perf_fb_9, data = P_CEO_Data)

summary(αModel0)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_0, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3141 -0.0272 -0.0211 -0.0078  3.5633
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074818   0.004098  18.256 < 0.0000000000000002 ***
## asp_perf_fb_0 -0.013056   0.003324  -3.927            0.0000911 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01344,    Adjusted R-squared:  0.01257
## F-statistic: 15.42 on 1 and 1132 DF,  p-value: 0.00009106
```

```
summary(αModel1)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3088 -0.0271 -0.0209 -0.0080  3.5637
##
## Coefficients:
##               Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074738   0.004099  18.235 < 0.0000000000000002 ***
## asp_perf_fb_1 -0.013477   0.003372  -3.997            0.0000682 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01392,    Adjusted R-squared:  0.01305
## F-statistic: 15.98 on 1 and 1132 DF,  p-value: 0.00006824
```

```
summary(αModel2)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_2, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2987 -0.0270 -0.0209 -0.0077  3.5642
##
## Coefficients:
##               Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074682   0.004099  18.220 < 0.0000000000000002 ***
## asp_perf_fb_2 -0.013752   0.003400  -4.044             0.000056 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01424,    Adjusted R-squared:  0.01337
## F-statistic: 16.36 on 1 and 1132 DF,  p-value: 0.00005599
```

```
summary(αModel3)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_3, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2838 -0.0269 -0.0207 -0.0077  3.5647
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074652   0.004099  18.211 < 0.0000000000000002 ***
## asp_perf_fb_3 -0.013863   0.003409  -4.067            0.0000509 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1367 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.0144, Adjusted R-squared:  0.01353
## F-statistic: 16.54 on 1 and 1132 DF,  p-value: 0.00005089

summary(αModel4)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_4, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2647 -0.0270 -0.0206 -0.0078  3.5652
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074650   0.004099  18.210 < 0.0000000000000002 ***
## asp_perf_fb_4 -0.013804   0.003396  -4.064            0.0000515 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1367 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01438,    Adjusted R-squared:  0.01351
## F-statistic: 16.52 on 1 and 1132 DF,  p-value: 0.0000515

summary(αModel5)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_5, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2422 -0.0270 -0.0207 -0.0077  3.5657
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074676   0.004099  18.216 < 0.0000000000000002 ***
```

```
## asp_perf_fb_5 -0.013579   0.003364  -4.037            0.0000579 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01419,    Adjusted R-squared:  0.01332
## F-statistic: 16.29 on 1 and 1132 DF,  p-value: 0.00005787

summary(αModel6)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_6, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2330 -0.0270 -0.0207 -0.0078  3.5662
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074727   0.004099  18.229 < 0.0000000000000002 ***
## asp_perf_fb_6 -0.013206   0.003313  -3.986            0.0000715 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01384,    Adjusted R-squared:  0.01297
## F-statistic: 15.89 on 1 and 1132 DF,  p-value: 0.0000715

summary(αModel7)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_7, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2316 -0.0271 -0.0208 -0.0077  3.5666
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074799   0.004099  18.247 < 0.0000000000000002 ***
## asp_perf_fb_7 -0.012711   0.003246  -3.915            0.0000957 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1368 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01336,    Adjusted R-squared:  0.01249
## F-statistic: 15.33 on 1 and 1132 DF,  p-value: 0.00009566

summary(αModel8)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_8, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2318 -0.0271 -0.0209 -0.0077  3.5670
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074887   0.004099  18.270 < 0.0000000000000002 ***
## asp_perf_fb_8 -0.012124   0.003167  -3.828             0.000136 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1369 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01278,    Adjusted R-squared:  0.01191
## F-statistic: 14.66 on 1 and 1132 DF,  p-value: 0.0001361

summary(αModel9)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_9, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2437 -0.0273 -0.0210 -0.0079  3.5674
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.074988   0.004099  18.295 < 0.0000000000000002 ***
## asp_perf_fb_9 -0.011474   0.003077  -3.729             0.000202 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1369 on 1132 degrees of freedom
##   (6693 observations deleted due to missingness)
## Multiple R-squared:  0.01213,    Adjusted R-squared:  0.01126
## F-statistic:  13.9 on 1 and 1132 DF,  p-value: 0.0002022
```

α=0.3 gives the best Adj. R2 results

```
P_CEO_Data$"neg_perf" <- ifelse(P_CEO_Data$ROA_Performance < 0, 1, 0)
```

1 = we have negative performance; 0 = we have not a negative performance (= we have a positive performance)

```
P_CEO_Data$"pos_perf" <- ifelse(P_CEO_Data$ROA_Performance > 0, 1, 0)
```

1 = we have positive performance; 0 = we have not a positive performance (= we have a negative performance)

```
P_CEO_Data <- P_CEO_Data %>% mutate(Performance_below_aspiration = case_when
(
                         asp_perf_fb_3 >= ROA_Performance ~ ROA_Performance,
                         asp_perf_fb_3 < ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(Performance_above_aspiration = case_when
(
                         asp_perf_fb_3 <= ROA_Performance ~ ROA_Performance,
                         asp_perf_fb_3 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_AboAsp = case_when (
                        (Performance_above_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                        (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( PosPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                        (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_AboAsp = case_when (
                        (Performance_above_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                        (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate( NegPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                        (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$PosPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$PosPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$NegPerf_AboAsp, k = 1, de
fault = NA, order_by = NULL)
P_CEO_Data$NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$NegPerf_BelAsp, k = 1, de
fault = NA, order_by = NULL)
```

To calculate the PF I create the % difference between the performance and the aspired performance of a company

```
P_CEO_Data$"pct_PerfFB" <- (P_CEO_Data$"ROA_Performance" - P_CEO_Data$"asp_pe
rf_fb_3") /abs(P_CEO_Data$"asp_perf_fb_3")
#eliminating Inf & NAN
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.nan)] <- NA
P_CEO_Data$pct_PerfFB[sapply(P_CEO_Data$pct_PerfFB, is.infinite)] <- NA

psych::describe(P_CEO_Data$pct_PerfFB)
```

```
##    vars    n  mean   sd median trimmed  mad     min    max  range   skew
## X1    1 6617 -0.22 8.55  -0.01   -0.04 0.65 -389.52 200.64 590.16 -16.48
##    kurtosis   se
## X1   903.89 0.11

#winsorize to keep observations but make extreme observations not so extreme
P_CEO_Data$pct_PerfFB <- DescTools::Winsorize(P_CEO_Data$pct_PerfFB, minval =
NULL, maxval = NULL, probs = c(0.001, 0.999),
          na.rm = TRUE, type = 7)

psych::describe(P_CEO_Data$pct_PerfFB)

##    vars    n  mean   sd median trimmed  mad    min   max  range skew kurto
sis
## X1    1 6617 -0.18 4.39  -0.01   -0.04 0.65 -70.34 47.49 117.83 -5.3   128
.56
##      se
## X1 0.05

P_CEO_Data$"pct_neg_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB < 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have negative performance feedback difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

```
P_CEO_Data$"pct_pos_perfFB" <- ifelse(P_CEO_Data$pct_PerfFB > 0, P_CEO_Data$p
ct_PerfFB, 0)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

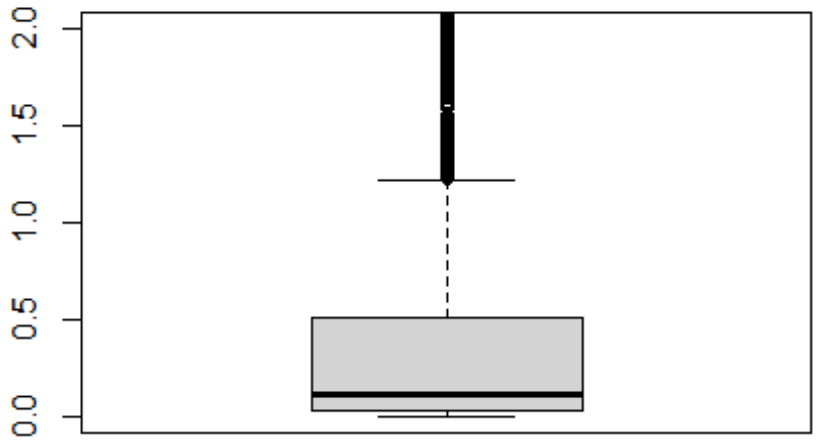
```
#Creating additional Binary Variables
P_CEO_Data <- P_CEO_Data %>% mutate(BV_Performance_above_aspiration = case_wh
en (
                        asp_perf_fb_1 <= ROA_Performance ~ 1,
                        asp_perf_fb_1 > ROA_Performance ~ 0))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))
```

```
P_CEO_Data <- P_CEO_Data %>% mutate(BV_NegPerf_BelAsp = case_when (
                        (Performance_below_aspiration != 0 & neg_perf == 1) ~
1,
                        (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_CEO_Data$BV_PosPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_PosPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_PosPerf_BelAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_AboAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_AboAsp, k =
1, default = NA, order_by = NULL)
P_CEO_Data$BV_NegPerf_BelAspT_1 <- plm::lag(P_CEO_Data$BV_NegPerf_BelAsp, k =
1, default = NA, order_by = NULL)
```

6. Control Variables

Firm Size: “log(Employees)” -> in K

```
boxplot(P_CEO_Data$Employees,data=P_CEO_Data, ylim = c(0,2))
```



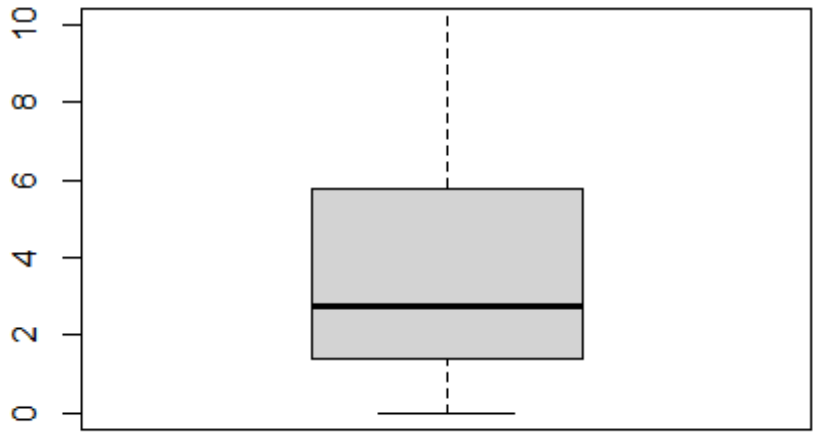
Some companies have 0 employees, so to do log(Emloyees) I need to eliminate them -> log(-1) returns NaN and log(0) return Inf

```
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6727 5.05 17.41   0.11    0.49 0.15   0 135.7 135.7  4.5    21.38
0.21
```

```
P_CEO_Data$Employees[P_CEO_Data$Employees == 0.000] <- NA
psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21
```

Financial Slack

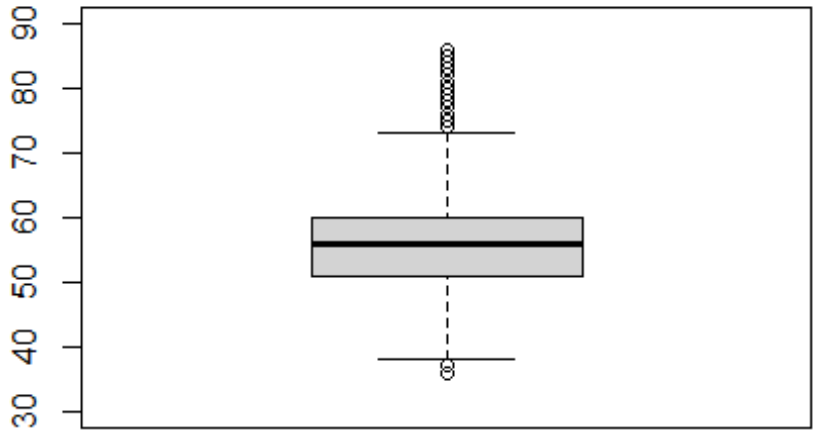
```
P_CEO_Data$"Financial_Slack" <- as.numeric(P_CEO_Data$Current.Assets...Total
/ P_CEO_Data$Current.Liabilities...Total)

boxplot(P_CEO_Data$Financial_Slack,data=P_CEO_Data, ylim = c(0,10))
```




```
P_CEO_Data$Financial_Slack[P_CEO_Data$Financial_Slack == 0.00000000000] <- NA

P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.nan)] <- NA
P_CEO_Data$Financial_Slack[sapply(P_CEO_Data$Financial_Slack, is.infinite)] <
- NA
```

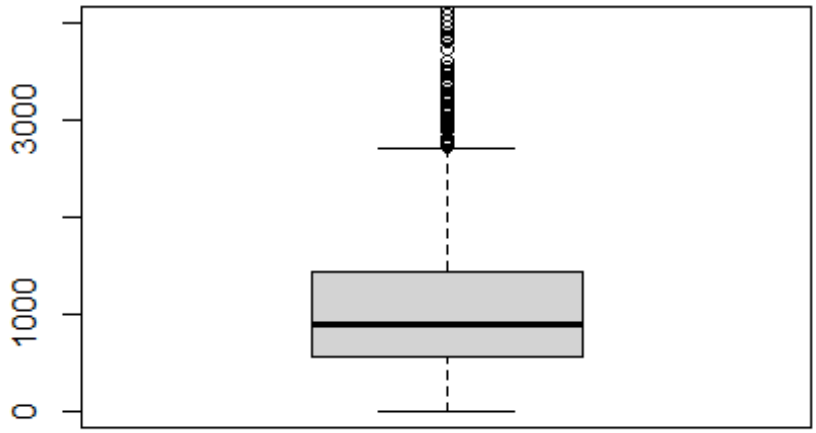
CEO Age -> “Age”

```
boxplot(P_CEO_Data$Age,data=P_CEO_Data, ylim = c(30,90))
```



Total compensation of the CEO -> Total_Compensation (in K)

```
boxplot(P_CEO_Data$Total_Compensation,data=P_CEO_Data, ylim = c(0,4000))
```




```
psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean     sd median trimmed    mad min    max  range skew
## X1    1 1220 1128.86 831.25 884.96  989.54 570.74   0 6650.1 6650.1 2.07
```

```
##    kurtosis   se
## X1     6.22 23.8

P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.000] <- NA
P_CEO_Data$Total_Compensation[P_CEO_Data$Total_Compensation == 0.001] <- NA
psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81
```

7. Additional Datasets

```
# Deviding in profitable and non-profitable companies:
Data_PosPerf<- P_CEO_Data[P_CEO_Data$"pos_perf" != 0, ]
Data_NegPerf<- P_CEO_Data[P_CEO_Data$"neg_perf" != 0, ]

#Deviding into above and below aspiration
Data_PosPerf_AboAsp<- Data_PosPerf[Data_PosPerf$Performance_above_aspiration
!= 0, ]
Data_PosPerf_BelAsp<- Data_PosPerf[Data_PosPerf$Performance_below_aspiration
!= 0, ]
Data_NegPerf_AboAsp<- Data_NegPerf[Data_NegPerf$Performance_above_aspiration
!= 0, ]
Data_NegPerf_BelAsp<- Data_NegPerf[Data_NegPerf$Performance_below_aspiration
!= 0, ]

#eliminating Inf & NAN
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.nan)] <- NA
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.infinite)] <- NA

Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.nan)] <- NA
Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.infinite)] <- NA

Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.nan)] <- NA
Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.infinite)] <- NA

Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.nan)] <- NA
Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.infinite)] <- NA
```

EXPORT dataset to Excel for final check:

```
#library(writexl)
#write_xlsx(P_CEO_Data,"data/Merged.xlsx")
```

8. Descriptive Statistics

Assessing the impact of the Perf.FB of both types of companies depending on their profitability level:

```
#I used this part to find out the real descriptive statistics by eliminating
the 0 values i inserted for if the numbers where part of the opposite categor
y. This part should not be run!
#P_CEO_Data$pct_pos_perfFB[P_CEO_Data$pct_pos_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_pos_perfFB)
```

```
#P_CEO_Data$pct_neg_perfFB[P_CEO_Data$pct_neg_perfFB == 0] <- NA
#psych::describe(P_CEO_Data$pct_neg_perfFB)

psych::describe(P_CEO_Data$strat_change)

##    vars    n mean   sd median trimmed  mad  min  max range  skew kurtosis
se
## X1    1 1134 0.08 0.14   0.05    0.06 0.01 0.02 3.64  3.62 17.69   413.14
0

psych::describe(P_CEO_Data$Employees)

##    vars    n mean    sd median trimmed  mad min   max range skew kurtosis
se
## X1    1 6640 5.11 17.52   0.11    0.51 0.15   0 135.7 135.7 4.46    21.05
0.21

psych::describe(P_CEO_Data$Financial_Slack)

##    vars    n mean    sd median trimmed  mad min max range skew kurtosis
se
## X1    1 7362 5.26 13.12   2.76    3.59 2.53   0 812   812   37  2076.74 0.
15

psych::describe(P_CEO_Data$Total_Compensation)

##    vars    n    mean    sd median trimmed    mad min    max  range skew
## X1    1 1212 1136.31 828.9 893.51   994.9 572.11 100 6650.1 6550.1 2.09
##    kurtosis    se
## X1     6.29 23.81

psych::describe(P_CEO_Data$Age)

##    vars    n  mean   sd median trimmed  mad min max range skew kurtosis
se
## X1    1 1178 55.98 7.34     56   55.87 7.41  36  86    50 0.27     0.68 0.
21

psych::describe(P_CEO_Data$pct_pos_perfFB)

##    vars    n mean   sd median trimmed mad min   max range  skew kurtosis
se
## X1    1 6617 0.52 2.44      0    0.17   0   0 47.49 47.49 13.45   218.84 0
.03

psych::describe(P_CEO_Data$pct_neg_perfFB)

##    vars    n mean   sd median trimmed  mad    min max range   skew kurtosi
s
## X1    1 6617 -0.7 3.54  -0.01   -0.21 0.02 -70.34   0 70.34 -14.32   244.0
5
##      se
## X1 0.04

psych::describe(P_CEO_Data$pos_perf)
```

```
##    vars    n mean   sd median trimmed mad min max range skew kurtosis   se
## X1    1 7372 0.33 0.47      0    0.29   0   0   1     1 0.71     -1.5 0.01

psych::describe(P_CEO_Data$neg_perf)

##    vars    n mean   sd median trimmed mad min max range  skew kurtosis   s
e
## X1    1 7372 0.67 0.47      1    0.71   0   0   1     1 -0.71     -1.5 0.0
1

psych::describe(P_CEO_Data$Present_Focus)

##    vars   n mean   sd median trimmed  mad  min   max range skew kurtosis
se
## X1    1 365  6.9 1.65   6.66    6.78 1.42 3.49 14.04 10.55 0.83     1.44 0
.09

psych::describe(P_CEO_Data$Future_Focus)

##    vars   n mean   sd median trimmed  mad  min  max range skew kurtosis
se
## X1    1 365 1.82 0.52   1.82    1.81 0.49 0.49 3.42  2.93 0.23     0.14 0.
03

psych::describe(P_CEO_Data$Prevention)

##    vars   n mean  sd median trimmed mad min max range skew kurtosis   se
## X1    1 368 0.16 0.2    0.1    0.12 0.1   0 1.5   1.5 2.96     11.4 0.01

psych::describe(P_CEO_Data$Promotion)

##    vars   n mean   sd median trimmed  mad min  max range skew kurtosis   s
e
## X1    1 368 0.48 0.21   0.46    0.46 0.19   0 1.26  1.26 0.76     1.09 0.0
1
```

Variance Inflation Factors (VIF)

```
P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

PLM1 <- lm(strat_change ~  pct_pos_perfFB*pos_perf + pct_neg_perfFB*pos_perf
+ log(Financial_Slack) +  log(Employees) + Age + Total_Compensation ,data=P_C
EO_Data)

PLM2 <- lm(strat_change ~  pct_pos_perfFB*Promotion + pct_neg_perfFB*Promotio
n + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prevention+1) + log
(Employees) + Age + Total_Compensation ,data=P_CEO_Data)

PLM3 <- lm(strat_change ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Pres
ent_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus + Age +
Total_Compensation ,data=P_CEO_Data)

PLM4 <- lm(strat_change ~  pct_pos_perfFB  + pct_neg_perfFB + neg_perf + Prom
otion + Prevention + Present_Focus + Future_Focus+ log(Financial_Slack) +  lo
g(Employees) + Age + Total_Compensation ,data=P_CEO_Data)
```

```
regclass::VIF(PLM1)
```

```
##          pct_pos_perfFB                pos_perf          pct_neg_perfFB
##              950.348021                1.981961                1.157123
##    log(Financial_Slack)          log(Employees)                     Age
##                1.374431                2.566101                1.051958
##      Total_Compensation pct_pos_perfFB:pos_perf pos_perf:pct_neg_perfFB
##                1.864680              954.091617                1.129905
```

```
regclass::VIF(PLM2)
```

```
##                     pct_pos_perfFB                          Promotion
##                         140.316967                           1.530835
##                     pct_neg_perfFB                log(Prevention + 1)
##                         101.436597                           1.624441
##                     log(Employees)                                Age
##                              3.020585                           1.299635
##                  Total_Compensation           pct_pos_perfFB:Promotion
##                              3.206056                          48.450106
##           Promotion:pct_neg_perfFB pct_pos_perfFB:log(Prevention + 1)
##                         105.489226                          44.990782
## pct_neg_perfFB:log(Prevention + 1)
##                              4.138853
```

```
regclass::VIF(PLM3)
```

```
##               pct_pos_perfFB                Present_Focus
##                   879.898898                     1.476171
##               pct_neg_perfFB                Future_Focus
##                  1434.672817                     1.601659
##                          Age           Total_Compensation
##                     1.113861                     1.148388
## pct_pos_perfFB:Present_Focus Present_Focus:pct_neg_perfFB
##                   221.589397                  1274.309369
##  pct_pos_perfFB:Future_Focus  pct_neg_perfFB:Future_Focus
##                   269.718968                    68.420831
```

```
regclass::VIF(PLM4)
```

```
##       pct_pos_perfFB       pct_neg_perfFB             neg_perf
##             1.195452             1.244667             1.707695
##            Promotion           Prevention        Present_Focus
##             1.136798             1.629929             1.217049
##         Future_Focus log(Financial_Slack)       log(Employees)
##             1.556941             2.861468             4.935448
##                  Age   Total_Compensation
##             1.272808             4.508843
```

Correlation Matrix

```
# Select columns of interest
Correlation_Data <- P_CEO_Data %>%
  select(strat_change, Employees, Financial_Slack,Total_Compensation, Age, pc
t_pos_perfFB,  pct_neg_perfFB, pos_perf, neg_perf, Present_Focus,Future_Focus
, Prevention, Promotion)
```

```
psych::describe(Correlation_Data)
```

```
##                     vars    n    mean     sd median trimmed    mad    min
## strat_change           1 1134    0.08   0.14   0.05    0.06   0.01   0.02
## Employees              2 6640    5.11  17.52   0.11    0.51   0.15   0.00
## Financial_Slack        3 7362    5.26  13.12   2.76    3.59   2.53   0.00
## Total_Compensation     4 1212 1136.31 828.90 893.51  994.90 572.11 100.00
## Age                    5 1178   55.98   7.34  56.00   55.87   7.41  36.00
## pct_pos_perfFB         6 6617    0.52   2.44   0.00    0.17   0.00   0.00
## pct_neg_perfFB         7 6617   -0.70   3.54  -0.01   -0.21   0.02 -70.34
## pos_perf               8 7372    0.33   0.47   0.00    0.29   0.00   0.00
## neg_perf               9 7372    0.67   0.47   1.00    0.71   0.00   0.00
## Present_Focus         10  365    6.90   1.65   6.66    6.78   1.42   3.49
## Future_Focus          11  365    1.82   0.52   1.82    1.81   0.49   0.49
## Prevention            12  368    0.16   0.20   0.10    0.12   0.10   0.00
## Promotion             13  368    0.48   0.21   0.46    0.46   0.19   0.00
##                        max   range   skew kurtosis    se
## strat_change          3.64    3.62  17.69   413.14  0.00
## Employees           135.70  135.70   4.46    21.05  0.21
## Financial_Slack     812.00  812.00  37.00  2076.74  0.15
## Total_Compensation 6650.10 6550.10   2.09     6.29 23.81
## Age                  86.00   50.00   0.27     0.68  0.21
## pct_pos_perfFB       47.49   47.49  13.45   218.84  0.03
## pct_neg_perfFB        0.00   70.34 -14.32   244.05  0.04
## pos_perf              1.00    1.00   0.71    -1.50  0.01
## neg_perf              1.00    1.00  -0.71    -1.50  0.01
## Present_Focus        14.04   10.55   0.83     1.44  0.09
## Future_Focus          3.42    2.93   0.23     0.14  0.03
## Prevention            1.50    1.50   2.96    11.40  0.01
## Promotion             1.26    1.26   0.76     1.09  0.01
```

```
library(Hmisc)
Correlation_Matrix <- rcorr(as.matrix(Correlation_Data))
Correlation_Matrix
```

```
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change               1.00     -0.08            0.00              -0.
06
## Employees                 -0.08      1.00           -0.13               0.
60
## Financial_Slack            0.00     -0.13            1.00              -0.
22
## Total_Compensation        -0.06      0.60           -0.22               1.
00
## Age                       -0.03      0.12           -0.11               0.
19
## pct_pos_perfFB             0.00     -0.01            0.00               0.
04
## pct_neg_perfFB             0.00      0.03            0.01               0.
06
## pos_perf                  -0.14      0.35           -0.08               0.
28
```

```
## neg_perf                   0.14     -0.35            0.08              -0.
28
## Present_Focus             -0.03      0.15           -0.17               0.
06
## Future_Focus               0.18     -0.12            0.08               0.
06
## Prevention                 0.10     -0.14            0.19              -0.
01
## Promotion                 -0.08      0.01           -0.06              -0.
17
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       -0.03           0.00           0.00    -0.14     0.14
## Employees           0.12          -0.01           0.03     0.35    -0.35
## Financial_Slack    -0.11           0.00           0.01    -0.08     0.08
## Total_Compensation  0.19           0.04           0.06     0.28    -0.28
## Age                 1.00          -0.02          -0.02     0.16    -0.16
## pct_pos_perfFB     -0.02           1.00           0.04     0.19    -0.19
## pct_neg_perfFB     -0.02           0.04           1.00     0.12    -0.12
## pos_perf            0.16           0.19           0.12     1.00    -1.00
## neg_perf           -0.16          -0.19          -0.12    -1.00     1.00
## Present_Focus       0.22          -0.01          -0.05    -0.07     0.07
## Future_Focus        0.11           0.00          -0.03    -0.17     0.17
## Prevention          0.16          -0.02           0.07    -0.24     0.24
## Promotion           0.03           0.06           0.06     0.17    -0.17
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change               -0.03         0.18       0.10     -0.08
## Employees                   0.15        -0.12      -0.14      0.01
## Financial_Slack            -0.17         0.08       0.19     -0.06
## Total_Compensation          0.06         0.06      -0.01     -0.17
## Age                         0.22         0.11       0.16      0.03
## pct_pos_perfFB             -0.01         0.00      -0.02      0.06
## pct_neg_perfFB             -0.05        -0.03       0.07      0.06
## pos_perf                   -0.07        -0.17      -0.24      0.17
## neg_perf                    0.07         0.17       0.24     -0.17
## Present_Focus               1.00         0.24      -0.07     -0.17
## Future_Focus                0.24         1.00       0.06     -0.03
## Prevention                 -0.07         0.06       1.00     -0.10
## Promotion                  -0.17        -0.03      -0.10      1.00
##
## n
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change               1134      1118            1134                4
07
## Employees                  1118      6640            6608               12
00
## Financial_Slack            1134      6608            7362               12
07
## Total_Compensation          407      1200            1207               12
12
## Age                         386      1167            1173               11
70
## pct_pos_perfFB             1134      6244            6594               11
97
```

```
## pct_neg_perfFB             1134      6244            6594               11
97
## pos_perf                   1134      6617            7338               12
05
## neg_perf                   1134      6617            7338               12
05
## Present_Focus               123       365             365                1
97
## Future_Focus                123       365             365                1
97
## Prevention                  123       368             368                1
97
## Promotion                   123       368             368                1
97
##                      Age pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change         386           1134           1134     1134     1134
## Employees           1167           6244           6244     6617     6617
## Financial_Slack     1173           6594           6594     7338     7338
## Total_Compensation  1170           1197           1197     1205     1205
## Age                 1178           1163           1163     1171     1171
## pct_pos_perfFB      1163           6617           6617     6617     6617
## pct_neg_perfFB      1163           6617           6617     6617     6617
## pos_perf            1171           6617           6617     7372     7372
## neg_perf            1171           6617           6617     7372     7372
## Present_Focus        198            364            364      365      365
## Future_Focus         198            364            364      365      365
## Prevention           198            366            366      368      368
## Promotion            198            366            366      368      368
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change                 123          123        123       123
## Employees                    365          365        368       368
## Financial_Slack              365          365        368       368
## Total_Compensation           197          197        197       197
## Age                          198          198        198       198
## pct_pos_perfFB               364          364        366       366
## pct_neg_perfFB               364          364        366       366
## pos_perf                     365          365        368       368
## neg_perf                     365          365        368       368
## Present_Focus                365          365        365       365
## Future_Focus                 365          365        365       365
## Prevention                   365          365        368       368
## Promotion                    365          365        368       368
##
## P
##                    strat_change Employees Financial_Slack Total_Compensati
on
## strat_change                     0.0065    0.8811          0.2557
## Employees          0.0065                 0.0000          0.0000
## Financial_Slack    0.8811       0.0000                    0.0000
## Total_Compensation 0.2557       0.0000    0.0000
## Age                0.5522       0.0000    0.0000          0.0000
## pct_pos_perfFB     0.8682       0.5580    0.8297          0.1876
## pct_neg_perfFB     0.9577       0.0115    0.3822          0.0535
## pos_perf           0.0000       0.0000    0.0000          0.0000
```

```
## neg_perf           0.0000       0.0000    0.0000          0.0000
## Present_Focus      0.7207       0.0044    0.0009          0.3651
## Future_Focus       0.0466       0.0258    0.1059          0.4107
## Prevention         0.2890       0.0059    0.0002          0.9299
## Promotion          0.3814       0.9014    0.2742          0.0153
##                    Age    pct_pos_perfFB pct_neg_perfFB pos_perf neg_perf
## strat_change       0.5522 0.8682         0.9577         0.0000   0.0000
## Employees          0.0000 0.5580         0.0115         0.0000   0.0000
## Financial_Slack    0.0000 0.8297         0.3822         0.0000   0.0000
## Total_Compensation 0.0000 0.1876         0.0535         0.0000   0.0000
## Age                       0.5023         0.4259         0.0000   0.0000
## pct_pos_perfFB     0.5023                0.0006         0.0000   0.0000
## pct_neg_perfFB     0.4259 0.0006                        0.0000   0.0000
## pos_perf           0.0000 0.0000         0.0000                  0.0000
## neg_perf           0.0000 0.0000         0.0000         0.0000
## Present_Focus      0.0017 0.8990         0.3558         0.2086   0.2086
## Future_Focus       0.1406 0.9575         0.5598         0.0009   0.0009
## Prevention         0.0288 0.6711         0.1965         0.0000   0.0000
## Promotion          0.6370 0.2916         0.2576         0.0015   0.0015
##                    Present_Focus Future_Focus Prevention Promotion
## strat_change       0.7207        0.0466       0.2890     0.3814
## Employees          0.0044        0.0258       0.0059     0.9014
## Financial_Slack    0.0009        0.1059       0.0002     0.2742
## Total_Compensation 0.3651        0.4107       0.9299     0.0153
## Age                0.0017        0.1406       0.0288     0.6370
## pct_pos_perfFB     0.8990        0.9575       0.6711     0.2916
## pct_neg_perfFB     0.3558        0.5598       0.1965     0.2576
## pos_perf           0.2086        0.0009       0.0000     0.0015
## neg_perf           0.2086        0.0009       0.0000     0.0015
## Present_Focus                    0.0000       0.1619     0.0009
## Future_Focus       0.0000                     0.2878     0.5464
## Prevention         0.1619        0.2878                  0.0457
## Promotion          0.0009        0.5464       0.0457
```

```
#Check 2nd method for correlations and it gives the same results! :D
cor.mat <- Correlation_Data %>% cor_mat()
# Significance levels
cor.mat %>% cor_get_pval()
```

```
## # A tibble: 13 x 14
##    rowname      strat_change Employees Financial_Slack Total_Compensat~
Age
##    <chr>               <dbl>     <dbl>           <dbl>            <dbl>
<dbl>
##  1 strat_change   0          6.46e-  3       8.81e- 1        2.56e-  1 5.
52e- 1
##  2 Employees      0.00646    0               9.04e-26        5.28e-118 7.
12e- 5
##  3 Financial_S~   0.881      9.04e- 26       0               1.13e- 14 8.
25e- 5
##  4 Total_Compe~   0.256      5.28e-118       1.13e-14        0         1.
08e-10
##  5 Age            0.552      7.12e-  5       8.25e- 5        1.08e- 10 0
##  6 pct_pos_per~   0.868      5.58e-  1       8.3 e- 1        1.88e-  1 5.
```

```
02e- 1
##  7 pct_neg_per~   0.958      1.15e-  2        3.82e- 1        5.35e-  2 4.
26e- 1
##  8 pos_perf       0.00000162 7.62e-191        5.47e-11        1.72e- 22 2.
25e- 8
##  9 neg_perf       0.00000162 7.62e-191        5.47e-11        1.72e- 22 2.
25e- 8
## 10 Present_Foc~   0.721      4.42e-  3        9.1 e- 4        3.65e-  1 1.
66e- 3
## 11 Future_Focus   0.0466     2.58e-  2        1.06e- 1        4.11e-  1 1.
41e- 1
## 12 Prevention     0.289      5.93e-  3        2.1 e- 4        9.3 e-  1 2.
88e- 2
## 13 Promotion      0.381      9.01e-  1        2.74e- 1        1.53e-  2 6.
37e- 1
## # ... with 8 more variables: pct_pos_perfFB <dbl>, pct_neg_perfFB <dbl>,
## #   pos_perf <dbl>, neg_perf <dbl>, Present_Focus <dbl>, Future_Focus <dbl
>,
## #   Prevention <dbl>, Promotion <dbl>
```

```
# Visualize
# Gather/collapse correlation matrix into long format
cor.mat %>% cor_gather()
```

```
## # A tibble: 169 x 4
##    var1              var2             cor          p
##    <chr>             <chr>          <dbl>      <dbl>
##  1 strat_change      strat_change  1      0
##  2 Employees         strat_change -0.081  0.00646
##  3 Financial_Slack   strat_change -0.0044 0.881
##  4 Total_Compensation strat_change -0.056  0.256
##  5 Age               strat_change -0.03   0.552
##  6 pct_pos_perfFB    strat_change -0.0049 0.868
##  7 pct_neg_perfFB    strat_change  0.0016 0.958
##  8 pos_perf          strat_change -0.14   0.00000162
##  9 neg_perf          strat_change  0.14   0.00000162
## 10 Present_Focus     strat_change -0.033  0.721
## # ... with 159 more rows
```

SD analysis:

```
sd(Data_PosPerf$strat_change, na.rm = TRUE)
```

```
## [1] 0.1374371
```

```
sd(Data_NegPerf$strat_change, na.rm = TRUE)
```

```
## [1] 0.1344077
```

```
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1844622
```

```
sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.03923201
```

```
sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1379102
```

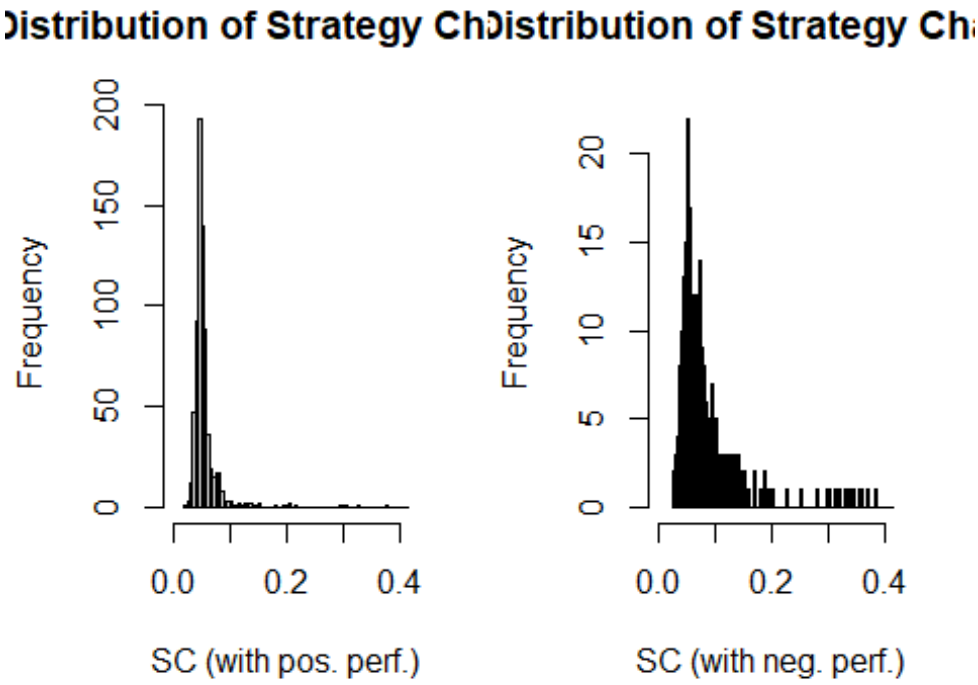
```
sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1324113
```

```
par(mfrow=c(1,2)) # init 2 charts in 1 panel
```

```
hist(Data_PosPerf$strat_change , breaks =(1000), main="Distribution of Strate
gy Change", xlab="SC (with pos. perf.)", xlim = c(0,0.4))
```

```
hist(Data_NegPerf$strat_change , breaks =(1000), main="Distribution of Strate
gy Change", xlab="SC (with neg. perf.)", xlim = c(0,0.4))
```




```
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1844622
```

```
sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.1379102
```

```
sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)
```

```
## [1] 0.03923201
```

```
sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)
```

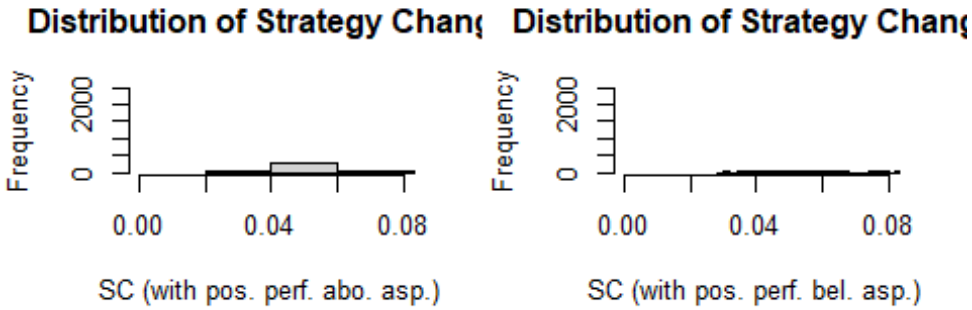
```
## [1] 0.1324113
```

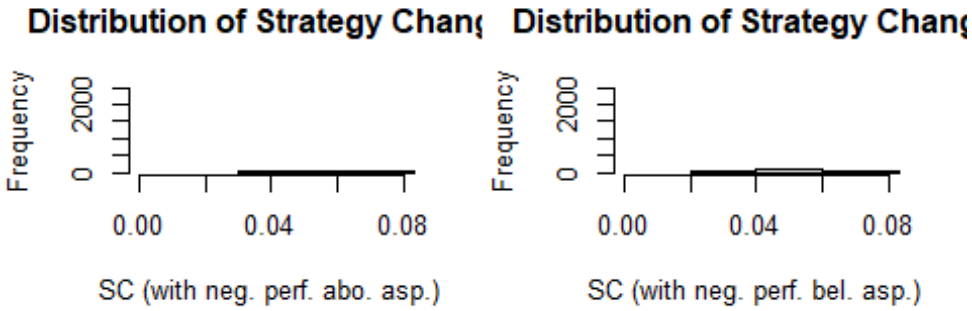
```
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.1844622

sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.03923201

sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.1379102

sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1324113
```

Here again I can see, that neg. perf. there tend to be a bigger strategic change than with a positive performance

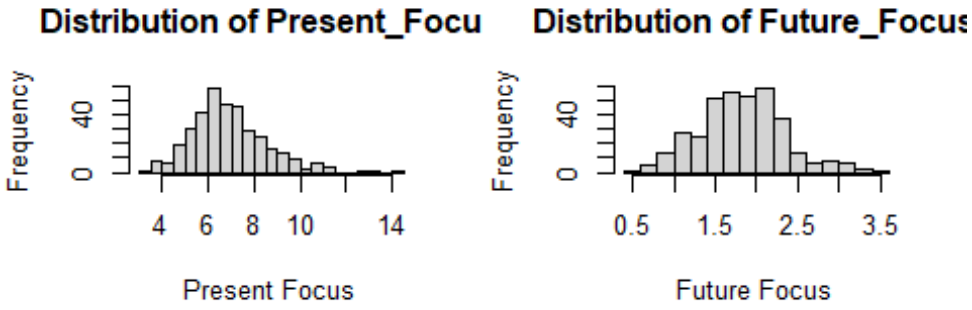
When comparing the implications of the aspiration level, I can see, that companies performing below asp. tend to change their strategy more if compared with companies performing above asp. level. This difference is the highest when the perf. fb. is negative.

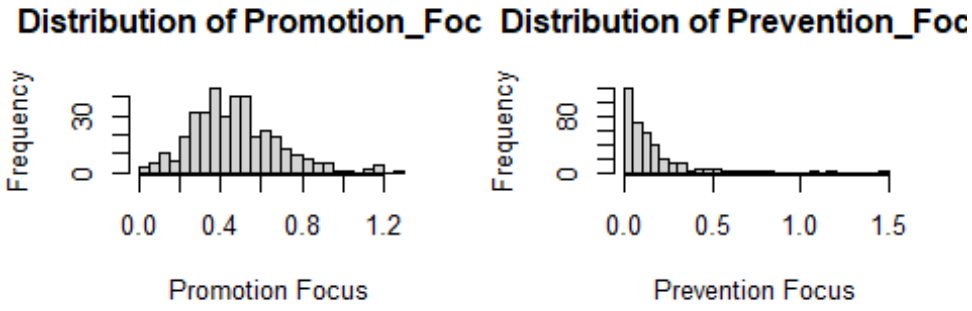
```
par(mfrow=c(2,2)) # init 2 charts in 1 panel

hist(Data_PosPerf_AboAsp$strat_change , breaks =(200), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_PosPerf_BelAsp$strat_change , breaks =(200), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_NegPerf_AboAsp$strat_change , breaks =(400), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_NegPerf_BelAsp$strat_change , breaks =(100), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))
```






```
par(mfrow=c(2,2)) # init 2 charts in 1 panel

hist(P_CEO_Data$Present_Focus , breaks =(30), main="Distribution of Present_F
ocus", xlab="Present Focus")

hist(P_CEO_Data$Future_Focus , breaks =(20), main="Distribution of Future_Foc
us", xlab="Future Focus")

hist(P_CEO_Data$Promotion , breaks =(20), main="Distribution of Promotion_Foc
us", xlab="Promotion Focus")

hist(P_CEO_Data$Prevention , breaks =(50), main="Distribution of Prevention_F
ocus", xlab="Prevention Focus")
```





An analysis of SD´s might be interesting also for the values (changes) of the other SC dimensions

```
sd(Data_PosPerf$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 15.08337
```

```
sd(Data_NegPerf$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 28.45518
```

```
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 20.35779
```

```
sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 23.91172
```

```
sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 1.097935
```

```
sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 31.23616
```

```
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 20.35779
```

```
sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 1.097935

sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 23.91172

sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)

## [1] 31.23616

sd(Data_PosPerf$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.83996

sd(Data_NegPerf$pct_RD_intens_diff, na.rm = TRUE)

## [1] 86.59883

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.648907

sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 9.079246

sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 2.085544

sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 113.0635

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 1.648907

sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 2.085544

sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 9.079246

sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 113.0635

sd(Data_PosPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 0.4059812

sd(Data_NegPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 2.195989
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.4679371
```

```r
sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 1.11679
```

```r
sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.2884473
```

```r
sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 2.738927
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.4679371
```

```r
sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 0.2884473
```

```r
sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 1.11679
```

```r
sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)
```

```
## [1] 2.738927
```

```r
sd(Data_PosPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 3.281176
```

```r
sd(Data_NegPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 20.50173
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 4.316517
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 31.72392
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.2369319
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.952901
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 4.316517
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.2369319
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 31.72392
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.952901
```

```r
sd(Data_PosPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.605827
```

```r
sd(Data_NegPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 9.999944
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.7084382
```

```r
sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 5.268438
```

```r
sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.4087447
```

```r
sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 12.20013
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.7084382
```

```r
sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 0.4087447
```

```r
sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 5.268438
```

```r
sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 12.20013
```

```r
sd(Data_PosPerf$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 6.715135

sd(Data_NegPerf$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 21.68283

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 5.553035

sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 20.96586

sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 8.187118

sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 22.23035

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 5.553035

sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 8.187118

sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 20.96586

sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 22.23035
```

9. Statistical Models:

Since I have panel data I use the random/fixed model

```
**PROFITABILITY INTERACTION**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_SC, RLM_SC) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf + pct_neg_perfF
B *  ...
## chisq = 26.212, df = 9, p-value = 0.001886
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf +
##     pct_neg_perfFB * pos_perf + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 46, T = 1-25, N = 352
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.71946705 -0.02489157 -0.00025941  0.02304757  2.71611228
##
## Coefficients:
##                              Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -0.119123615  0.081658908 -1.4588 0.145678
## pos_perf                -0.098003708  0.036713208 -2.6694 0.008016 **
## pct_neg_perfFB           0.001616718  0.001947347  0.8302 0.407084
## Financial_Slack         -0.001500343  0.007102993 -0.2112 0.832855
## log(Employees)          -0.068693869  0.027977125 -2.4554 0.014647 *
## Age                      0.000208707  0.002492972  0.0837 0.933337
## Total_Compensation      -0.000020501  0.000015876 -1.2913 0.197589
## pct_pos_perfFB:pos_perf  0.119469904  0.081619955  1.4637 0.144324
## pos_perf:pct_neg_perfFB -0.009863381  0.052499985 -0.1879 0.851104
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.461
## Residual Sum of Squares: 9.8582
## R-Squared:      0.057598
## Adj. R-Squared: -0.11375
## F-statistic: 2.01691 on 9 and 297 DF, p-value: 0.037258
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC) # Breusch-Pagan test
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC
## BP = 9.3232, df = 9, p-value = 0.408
```

```
#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Null Hypothesis (H0): Homoscedasticity is present (the residuals are distributed with equal variance) Alternative Hypothesis (HA): Heteroscedasticity is present (the residuals are not distributed with equal variance)

If the p-value of the test is less than some significance level (i.e. α = .05) then we reject the null hypothesis and conclude that heteroscedasticity is present in the regression model.

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_AI, RLM_AI) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 19.789, df = 9, p-value = 0.01926
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 54, T = 1-26, N = 435
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -76.5372  -2.0318   0.1976   2.3814 366.4253
```

```
##
## Coefficients:
##                              Estimate  Std. Error t-value Pr(>|t|)
## pct_pos_perfFB          -11.0804665   8.8657312 -1.2498  0.21216
## pos_perf                 -9.6734826   3.8132199 -2.5368  0.01159 *
## pct_neg_perfFB            0.1659119   0.2214019  0.7494  0.45411
## Financial_Slack          -0.4029117   0.6852291 -0.5880  0.55689
## log(Employees)           -4.3346921   2.5185096 -1.7211  0.08606 .
## Age                       0.0284748   0.2462040  0.1157  0.90799
## Total_Compensation       -0.0016838   0.0016863 -0.9985  0.31867
## pct_pos_perfFB:pos_perf  11.1367236   8.8622246  1.2567  0.20967
## pos_perf:pct_neg_perfFB   0.9691823   5.4682542  0.1772  0.85942
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173430
## Residual Sum of Squares: 167420
## R-Squared:      0.034621
## Adj. R-Squared: -0.12628
## F-statistic: 1.48234 on 9 and 372 DF, p-value: 0.15247
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI
## BP = 9.8519, df = 9, p-value = 0.3626
```

```
#coeftest(FLM_AI,vcov=vcovHC(FLM_AI,type="HC0",cluster="group"))

FLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
eg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compens
ation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable ->
interaction model
RLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compen
sation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable ->
interaction model vs. split sample model!

phtest(FLM_RD, RLM_RD) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * pos_perf + pct_neg
_perfFB *  ...
## chisq = 19.736, df = 9, p-value = 0.01961
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 90, T = 1-28, N = 1048
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -3.70453 -0.34794 -0.10654  0.11519 26.28231
##
## Coefficients:
##                             Estimate   Std. Error t-value     Pr(>|t|)
## pct_pos_perfFB           1.364244885  0.356438607  3.8274    0.0001380 ***
## pos_perf                 0.853537807  0.167051877  5.1094 0.0000003906 ***
## pct_neg_perfFB          -0.014322179  0.011723937 -1.2216    0.2221553
## Financial_Slack          0.024126395  0.016726047  1.4424    0.1495070
## log(Employees)           0.112566070  0.094602930  1.1899    0.2343914
## Age                     -0.003098968  0.011376587 -0.2724    0.7853747
## Total_Compensation      -0.000025737  0.000097402 -0.2642    0.7916551
## pct_pos_perfFB:pos_perf -1.374490663  0.356579813 -3.8547    0.0001237 ***
## pos_perf:pct_neg_perfFB  0.430660589  0.298169111  1.4444    0.1489706
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2542.7
## Residual Sum of Squares: 2447.1
## R-Squared:      0.037585
## Adj. R-Squared: -0.0618
## F-statistic: 4.11795 on 9 and 949 DF, p-value: 0.000032448
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD
## BP = 18.457, df = 9, p-value = 0.03022
```

```
coeftest(FLM_RD,vcov=vcovHC(FLM_RD,type="HC0",cluster="group"))
```

```
##
## t test of coefficients:
##
##                             Estimate   Std. Error t value Pr(>|t|)
```

```
## pct_pos_perfFB           1.364244885  0.854932216  1.5957  0.11088
## pos_perf                 0.853537807  0.350358357  2.4362  0.01503 *
## pct_neg_perfFB          -0.014322179  0.007184044 -1.9936  0.04648 *
## Financial_Slack          0.024126395  0.022934582  1.0520  0.29308
## log(Employees)           0.112566070  0.159388182  0.7062  0.48021
## Age                     -0.003098968  0.010995007 -0.2819  0.77812
## Total_Compensation      -0.000025737  0.000057083 -0.4509  0.65219
## pct_pos_perfFB:pos_perf -1.374490663  0.854779304 -1.6080  0.10817
## pos_perf:pct_neg_perfFB  0.430660589  0.189418359  2.2736  0.02321 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model
```

```
RLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Comp
ensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_PE, RLM_PE) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 9.2327, df = 9, p-value = 0.4161
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(RLM_PE)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1087
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1086  0.3295     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
```

```
## -1.022910 -0.093897 -0.025284  0.032298  5.000716
##
## Coefficients:
##                              Estimate   Std. Error z-value    Pr(>|z|)
## (Intercept)              0.057586675  0.081041955  0.7106     0.47735
## pct_pos_perfFB          -0.039108596  0.070787584 -0.5525     0.58062
## pos_perf                 0.056480755  0.028684979  1.9690     0.04895 *
## pct_neg_perfFB           0.000808753  0.002267030  0.3567     0.72128
## Financial_Slack         -0.000700874  0.002990723 -0.2343     0.81471
## log(Employees)          -0.032286083  0.006987880 -4.6203 0.000003832 ***
## Age                     -0.001297103  0.001406429 -0.9223     0.35639
## Total_Compensation       0.000030102  0.000015656  1.9228     0.05451 .
## pct_pos_perfFB:pos_perf  0.038975658  0.070824436  0.5503     0.58210
## pos_perf:pct_neg_perfFB  0.089936236  0.057073570  1.5758     0.11507
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    118.58
## Residual Sum of Squares: 115.38
## R-Squared:      0.027035
## Adj. R-Squared: 0.018904
## Chisq: 29.9254 on 9 DF, p-value: 0.00045172
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_PE)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_PE
## BP = 29.378, df = 9, p-value = 0.0005595

coeftest(RLM_PE,vcov=vcovHC(RLM_PE,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## (Intercept)              0.057586675  0.091238591  0.6312 0.528066
## pct_pos_perfFB          -0.039108596  0.087157506 -0.4487 0.653730
## pos_perf                 0.056480755  0.038066098  1.4838 0.138167
## pct_neg_perfFB           0.000808753  0.001453618  0.5564 0.578072
## Financial_Slack         -0.000700874  0.003565247 -0.1966 0.844189
## log(Employees)          -0.032286083  0.011314414 -2.8535 0.004406 **
## Age                     -0.001297103  0.001586755 -0.8175 0.413848
## Total_Compensation       0.000030102  0.000012334  2.4407 0.014821 *
## pct_pos_perfFB:pos_perf  0.038975658  0.086803468  0.4490 0.653515
## pos_perf:pct_neg_perfFB  0.089936236  0.039215984  2.2934 0.022019 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!
```

```r
FLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary var
iable -> interaction model

RLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*pos_per
f + pct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Tota
l_Compensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary var
iable -> interaction model vs. split sample model!

phtest(FLM_NPO, RLM_NPO) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * pos_perf +
...
## chisq = 36.529, df = 9, p-value = 0.00003193
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 83, T = 1-26, N = 879
##
## Residuals:
##         Min.      1st Qu.       Median      3rd Qu.         Max.
## -17.22371993  -0.10512475  -0.00027147   0.11603975   4.63715665
##
## Coefficients:
##                              Estimate   Std. Error t-value    Pr(>|t|)
## pct_pos_perfFB           1.049265790  0.214594560  4.8895 0.000001226 ***
## pos_perf                 0.442622157  0.097219110  4.5528 0.000006130 ***
## pct_neg_perfFB          -0.010229629  0.006293274 -1.6255     0.10446
## Financial_Slack          0.033341894  0.013802388  2.4157     0.01593 *
## log(Employees)           0.173761491  0.058993431  2.9454     0.00332 **
## Age                      0.008697477  0.006437662  1.3510     0.17707
## Total_Compensation      -0.000023568  0.000051680 -0.4560     0.64849
## pct_pos_perfFB:pos_perf -1.046393744  0.214682303 -4.8741 0.000001322 ***
## pos_perf:pct_neg_perfFB -0.015271229  0.154487329 -0.0989     0.92128
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    545.24
## Residual Sum of Squares: 509.88
## R-Squared:      0.064852
```

```
## Adj. R-Squared: -0.043278
## F-statistic: 6.06422 on 9 and 787 DF, p-value: 0.000000029206
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO
## BP = 27.546, df = 9, p-value = 0.001135

coeftest(FLM_NPO,vcov=vcovHC(FLM_NPO,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value  Pr(>|t|)
## pct_pos_perfFB           1.049265790  0.475167216  2.2082 0.0275177 *
## pos_perf                 0.442622157  0.126104950  3.5100 0.0004737 ***
## pct_neg_perfFB          -0.010229629  0.004420383 -2.3142 0.0209137 *
## Financial_Slack          0.033341894  0.014659774  2.2744 0.0232115 *
## log(Employees)           0.173761491  0.080414748  2.1608 0.0310106 *
## Age                      0.008697477  0.005956307  1.4602 0.1446306
## Total_Compensation      -0.000023568  0.000019797 -1.1905 0.2342095
## pct_pos_perfFB:pos_perf -1.046393744  0.472600167 -2.2141 0.0271064 *
## pos_perf:pct_neg_perfFB -0.015271229  0.058707352 -0.2601 0.7948357
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -
> interaction model

RLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Compe
nsation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -
> interaction model vs. split sample model!

phtest(FLM_IL, RLM_IL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 18.006, df = 9, p-value = 0.03511
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_IL)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 89, T = 1-27, N = 1011
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -7.206203 -0.200426 -0.037878  0.125823 31.630222
##
## Coefficients:
##                              Estimate   Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB           1.304423759  0.337445326  3.8656 0.0001187 ***
## pos_perf                 0.299818832  0.146914633  2.0408 0.0415610 *
## pct_neg_perfFB          -0.001998012  0.010020969 -0.1994 0.8420074
## Financial_Slack          0.056758184  0.015270199  3.7169 0.0002139 ***
## log(Employees)           0.034568369  0.085702232  0.4034 0.6867820
## Age                      0.006444880  0.009888308  0.6518 0.5147150
## Total_Compensation      -0.000029741  0.000081481 -0.3650 0.7151932
## pct_pos_perfFB:pos_perf -1.303967843  0.337464732 -3.8640 0.0001194 ***
## pos_perf:pct_neg_perfFB  0.020330782  0.247543535  0.0821 0.9345612
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1749.2
## Residual Sum of Squares: 1687.4
## R-Squared:      0.035298
## Adj. R-Squared: -0.067195
## F-statistic: 3.71185 on 9 and 913 DF, p-value: 0.00013706
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_IL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_IL
## BP = 33.546, df = 9, p-value = 0.0001073

coeftest(FLM_IL,vcov=vcovHC(FLM_IL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           1.304423759  1.294219317  1.0079  0.31378
## pos_perf                 0.299818832  0.187026578  1.6031  0.10926
## pct_neg_perfFB          -0.001998012  0.007546073 -0.2648  0.79124
```

```
## Financial_Slack          0.056758184  0.027469423  2.0662  0.03909 *
## log(Employees)           0.034568369  0.058272020  0.5932  0.55318
## Age                      0.006444880  0.006711973  0.9602  0.33721
## Total_Compensation      -0.000029741  0.000020745 -1.4336  0.15201
## pct_pos_perfFB:pos_perf -1.303967843  1.292366412 -1.0090  0.31325
## pos_perf:pct_neg_perfFB  0.020330782  0.096715813  0.2102  0.83355
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable
-> interaction model
```

```
RLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*pos_perf + p
ct_neg_perfFB*pos_perf +  Financial_Slack +  log(Employees) + Age + Total_Com
pensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable
-> interaction model vs. split sample model!
```

```
phtest(FLM_FL, RLM_FL) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 39.026, df = 9, p-value = 0.00001139
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(FLM_FL)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 92, T = 1-28, N = 1085
##
## Residuals:
##     Min.  1st Qu.   Median  3rd Qu.     Max.
## -6.12626 -0.43908 -0.12003  0.16966 19.59957
##
## Coefficients:
##                            Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.471240701  0.338537958  1.3920 0.164241
## pos_perf                 0.186627556  0.157183273  1.1873 0.235386
## pct_neg_perfFB           0.009914820  0.011193348  0.8858 0.375954
## Financial_Slack          0.023741273  0.013060331  1.8178 0.069396 .
## log(Employees)          -0.258702451  0.088607098 -2.9197 0.003584 **
## Age                      0.017352446  0.011420373  1.5194 0.128976
## Total_Compensation      -0.000039500  0.000090929 -0.4344 0.664092
## pct_pos_perfFB:pos_perf -0.491842695  0.338651403 -1.4524 0.146721
```

```
## pos_perf:pct_neg_perfFB  0.412701680  0.278727663  1.4807 0.139017
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    2374.6
## Residual Sum of Squares: 2313.4
## R-Squared:      0.025757
## Adj. R-Squared: -0.073252
## F-statistic: 2.89054 on 9 and 984 DF, p-value: 0.0022293
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL
## BP = 17.801, df = 9, p-value = 0.03755

coeftest(FLM_FL,vcov=vcovHC(FLM_FL,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                              Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB           0.471240701  0.523141132  0.9008  0.36792
## pos_perf                 0.186627556  0.120336540  1.5509  0.12125
## pct_neg_perfFB           0.009914820  0.009693368  1.0228  0.30663
## Financial_Slack          0.023741273  0.018908914  1.2556  0.20957
## log(Employees)          -0.258702451  0.117217422 -2.2070  0.02754 *
## Age                      0.017352446  0.011293787  1.5365  0.12475
## Total_Compensation      -0.000039500  0.000044044 -0.8968  0.37003
## pct_pos_perfFB:pos_perf -0.491842695  0.522311189 -0.9417  0.34659
## pos_perf:pct_neg_perfFB  0.412701680  0.179384013  2.3007  0.02162 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**TEMPORAL FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data
=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction
model

RLM_SC3 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Present_Focus + pct_
neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Futur
e_Focus +  Financial_Slack +  log(Employees) + Total_Compensation,data=P_CEO_
Data, model = "random") # pos_perf is a binary variable -> interaction model
vs. split sample model!
```

```
#For Random Model I need to eliminate one CV (Age), since my dataset is not b
ig enough and I would get the error: Error in swar_Between_check(estm[[2L]],
method) : model not estimable: 16 coefficient(s) (incl. intercept) to be esti
mated for the between model but only 13 individual(s)

phtest(FLM_SC3, RLM_SC3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus + pct_neg_
perfFB *  ...
## chisq = 41.567, df = 11, p-value = 0.00001924
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Present_Focus +
##     pct_neg_perfFB * Present_Focus + pct_pos_perfFB * Future_Focus +
##     pct_neg_perfFB * Future_Focus + Financial_Slack + log(Employees) +
##     Age + Total_Compensation, data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.78420860 -0.09404055  0.00070084  0.10475846  1.46476841
##
## Coefficients:
##                                 Estimate  Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                 0.69962594  0.51812320  1.3503 0.1824477
## Present_Focus                  0.01230752  0.03988456  0.3086 0.7588079
## pct_neg_perfFB                -0.49967242  0.84864923 -0.5888 0.5584156
## Future_Focus                  -0.16815521  0.14271210 -1.1783 0.2437568
## Financial_Slack               -0.13515031  0.05150761 -2.6239 0.0112293 *
## log(Employees)                -0.68532872  0.19530125 -3.5091 0.0009048 ***
## Age                           -0.00784529  0.01058664 -0.7411 0.4618120
## Total_Compensation            -0.00060477  0.00025110 -2.4085 0.0193986 *
## pct_pos_perfFB:Present_Focus  -0.05437149  0.03505766 -1.5509 0.1266575
## Present_Focus:pct_neg_perfFB   0.07616592  0.11596817  0.6568 0.5140594
## pct_pos_perfFB:Future_Focus   -0.18893434  0.16360646 -1.1548 0.2531611
## pct_neg_perfFB:Future_Focus   -0.04678558  0.13665802 -0.3424 0.7333885
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.1973
## R-Squared:      0.49346
## Adj. R-Squared: 0.27242
## F-statistic: 4.46492 on 12 and 55 DF, p-value: 0.000058237
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC3) # Breusch-Pagan test
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC3
## BP = 18.223, df = 12, p-value = 0.1091
```

```
#coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_AI3 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_AI3, RLM_AI3) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 52.085, df = 12, p-value = 0.0000005988
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI3)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
```

```
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##    Min. 1st Qu.  Median 3rd Qu.    Max.
## -92.237 -10.693   0.000  11.751 213.197
##
## Coefficients:
##                                Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                71.555668  54.054591  1.3238 0.1898874
## Present_Focus                  3.423189   4.171975  0.8205 0.4147053
## pct_neg_perfFB               -57.035865  91.583350 -0.6228 0.5354557
## Future_Focus                 -24.060979  13.678708 -1.7590 0.0829459 .
## Financial_Slack              -17.265376   4.944172 -3.4921 0.0008346 ***
## log(Employees)               -75.129179  19.755336 -3.8030 0.0003025 ***
## Age                           -1.756446   1.170086 -1.5011 0.1378206
## Total_Compensation            -0.063988   0.028737 -2.2267 0.0291850 *
## pct_pos_perfFB:Present_Focus  -5.944633   3.623677 -1.6405 0.1053881
## Present_Focus:pct_neg_perfFB   8.505288  11.819946  0.7196 0.4741849
## pct_pos_perfFB:Future_Focus  -17.929685  17.279580 -1.0376 0.3030168
## pct_neg_perfFB:Future_Focus   -1.784650   8.919568 -0.2001 0.8419962
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 97172
## R-Squared:      0.43926
## Adj. R-Squared: 0.23098
## F-statistic: 4.56958 on 12 and 70 DF, p-value: 0.000020858
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI3
## BP = 15.12, df = 12, p-value = 0.2349

#coeftest(FLM_AI3,vcov=vcovHC(FLM_AI3,type="HC0",cluster="group"))

FLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model
RLM_RD3 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!
```

```
phtest(FLM_RD3, RLM_RD3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Present_Focus +  .
..
## chisq = 49.953, df = 12, p-value = 0.000001424
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.818422 -0.134219 -0.021731  0.096335  5.477933
##
## Coefficients:
##                                    Estimate   Std. Error t-value Pr(>|t|)
## pct_pos_perfFB                 0.298229002  0.155687259  1.9156  0.05730 .
## Present_Focus                 -0.003988980  0.037530813 -0.1063  0.91550
## pct_neg_perfFB                -0.829909242  0.699259457 -1.1868  0.23714
## Future_Focus                   0.098272739  0.136698046  0.7189  0.47330
## Financial_Slack               -0.045344942  0.031588335 -1.4355  0.15320
## log(Employees)                 0.274754068  0.165010068  1.6651  0.09796 .
## Age                           -0.003606003  0.012352041 -0.2919  0.77073
## Total_Compensation             0.000025739  0.000142018  0.1812  0.85642
## pct_pos_perfFB:Present_Focus -0.035181163  0.015562835 -2.2606  0.02520 *
## Present_Focus:pct_neg_perfFB  0.106125170  0.085435395  1.2422  0.21609
## pct_pos_perfFB:Future_Focus  -0.051287144  0.078505726 -0.6533  0.51456
## pct_neg_perfFB:Future_Focus   0.016806877  0.111921381  0.1502  0.88083
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 50.456
## R-Squared:      0.12008
## Adj. R-Squared: -0.088328
## F-statistic: 1.72851 on 12 and 152 DF, p-value: 0.065741
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD3
## BP = 6.5494, df = 12, p-value = 0.8859

FLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model

RLM_PE3 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Present_Focu
s + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perf
FB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> int
eraction model vs. split sample model!

phtest(FLM_PE3, RLM_PE3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 44.426, df = 12, p-value = 0.00001292
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.6210191 -0.0500202 -0.0022013  0.0517803  1.2009827
##
## Coefficients:
##                                  Estimate   Std. Error t-value     Pr(>|t|
)
## pct_pos_perfFB               -0.020955265  0.051676003 -0.4055      0.6856
7
## Present_Focus                 0.017285878  0.012457297  1.3876      0.1672
9
```

```
## pct_neg_perfFB               -0.126675663  0.232099494 -0.5458      0.5860
2
## Future_Focus                 -0.098434032  0.045373069 -2.1694      0.0316
0 *
## Financial_Slack              -0.009120197  0.010484859 -0.8698      0.3857
6
## log(Employees)               -0.280113517  0.054770447 -5.1143 0.000000935
5 ***
## Age                           0.001595166  0.004099912  0.3891      0.6977
7
## Total_Compensation           -0.000078886  0.000047139 -1.6735      0.0962
9 .
## pct_pos_perfFB:Present_Focus  0.004275495  0.005165645  0.8277      0.4091
5
## Present_Focus:pct_neg_perfFB  0.027963356  0.028357875  0.9861      0.3256
6
## pct_pos_perfFB:Future_Focus  -0.005114568  0.026057766 -0.1963      0.8446
5
## pct_neg_perfFB:Future_Focus  -0.033086541  0.037149152 -0.8906      0.3745
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.5588
## R-Squared:      0.20596
## Adj. R-Squared: 0.0179
## F-statistic: 3.28554 on 12 and 152 DF, p-value: 0.00030342
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE3
## BP = 23.883, df = 12, p-value = 0.0211

coeftest(FLM_PE3,vcov=vcovHC(FLM_PE3,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                               Estimate   Std. Error t value Pr(>|t|)
## pct_pos_perfFB               -0.020955265  0.016412110 -1.2768 0.203614
## Present_Focus                 0.017285878  0.008795149  1.9654 0.051192 .
## pct_neg_perfFB               -0.126675663  0.108512253 -1.1674 0.244883
## Future_Focus                 -0.098434032  0.062148386 -1.5839 0.115305
## Financial_Slack              -0.009120197  0.012215521 -0.7466 0.456454
## log(Employees)               -0.280113517  0.105331362 -2.6594 0.008668 **
## Age                           0.001595166  0.002370921  0.6728 0.502093
## Total_Compensation           -0.000078886  0.000044443 -1.7750 0.077897 .
```

```
## pct_pos_perfFB:Present_Focus  0.004275495  0.002051667  2.0839 0.038842 *
## Present_Focus:pct_neg_perfFB  0.027963356  0.017642026  1.5850 0.115035
## pct_pos_perfFB:Future_Focus  -0.005114568  0.006778566 -0.7545 0.451704
## pct_neg_perfFB:Future_Focus  -0.033086541  0.018530890 -1.7855 0.076177 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# do it if I have heteroscedasticity!!!!

FLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interaction model

RLM_NPO3 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Present_Focus + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction model vs. split sample model!

phtest(FLM_NPO3, RLM_NPO3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Present_Focus +  ...
## chisq = 24.807, df = 12, p-value = 0.01576
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO3)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.9100007 -0.0660261 -0.0032265  0.0762048  0.5049370
##
## Coefficients:
##                                 Estimate  Std. Error t-value   Pr(>|t|)
## pct_pos_perfFB                0.08564588  0.11005355  0.7782    0.43801
## Present_Focus                 0.00301397  0.01317449  0.2288    0.81944
## pct_neg_perfFB                0.05942404  0.24928113  0.2384    0.81200
## Future_Focus                  0.04751090  0.05252288  0.9046    0.36755
```

```
## Financial_Slack               0.00644925  0.01110928  0.5805    0.56267
## log(Employees)                0.30400724  0.07100179  4.2817 0.00003819 **
*
## Age                           0.00427460  0.00463457  0.9223    0.35826
## Total_Compensation            0.00014568  0.00007542  1.9315    0.05584 .
## pct_pos_perfFB:Present_Focus -0.01527472  0.00886545 -1.7229    0.08754 .
## Present_Focus:pct_neg_perfFB -0.02068893  0.03068346 -0.6743    0.50147
## pct_pos_perfFB:Future_Focus   0.00993483  0.03628494  0.2738    0.78472
## pct_neg_perfFB:Future_Focus   0.07117340  0.05967465  1.1927    0.23540
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.7653
## R-Squared:      0.28258
## Adj. R-Squared: 0.067969
## F-statistic: 3.84039 on 12 and 117 DF, p-value: 0.000060439
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_NPO3)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_NPO3
## BP = 20.276, df = 12, p-value = 0.06204
```

```
FLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> intera
ction model

RLM_IL3 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Present_Focus
+ pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_perfFB
*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensation
,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> intera
ction model vs. split sample model!

phtest(FLM_IL3, RLM_IL3) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 18.105, df = 12, p-value = 0.1125
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_IL3)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                  var std.dev share
## idiosyncratic 0.1794  0.4236     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.151922 -0.151909 -0.025458  0.066686  3.431113
##
## Coefficients:
##                                    Estimate   Std. Error z-value Pr(>|z|)
## (Intercept)                     0.531603043  0.335075342  1.5865 0.112622
## pct_pos_perfFB                  0.192047214  0.108381023  1.7720 0.076401 .
## Present_Focus                   0.019778798  0.021643318  0.9139 0.360794
## pct_neg_perfFB                 -0.049001455  0.456982793 -0.1072 0.914608
## Future_Focus                   -0.060803851  0.069269261 -0.8778 0.380058
## Financial_Slack                 0.004439408  0.016449015  0.2699 0.787246
## log(Employees)                 -0.059368244  0.020485310 -2.8981 0.003754 **
## Age                            -0.009363335  0.005434877 -1.7228 0.084920 .
## Total_Compensation              0.000160383  0.000064124  2.5011 0.012379 *
## pct_pos_perfFB:Present_Focus   -0.020860948  0.010798807 -1.9318 0.053386 .
## Present_Focus:pct_neg_perfFB    0.008672029  0.056201917  0.1543 0.877372
## pct_pos_perfFB:Future_Focus    -0.042928946  0.053115395 -0.8082 0.418964
## pct_neg_perfFB:Future_Focus     0.005143603  0.074394697  0.0691 0.944879
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 31.388
## R-Squared:      0.096858
## Adj. R-Squared: 0.03528
## Chisq: 18.8752 on 12 DF, p-value: 0.091586
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL3)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL3
## BP = 6.6535, df = 12, p-value = 0.8796

#coeftest(RLM_IL3,vcov=vcovHC(RLM_IL3,type="HC0",cluster="group"))

FLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model

RLM_FL3 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Present_Foc
us + pct_neg_perfFB*Present_Focus + pct_pos_perfFB*Future_Focus + pct_neg_per
fFB*Future_Focus +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "random") # pos_perf is a binary variable -> in
teraction model vs. split sample model!

phtest(FLM_FL3, RLM_FL3) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Present_Focus +
...
## chisq = 12.545, df = 12, p-value = 0.403
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_FL3)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Present_Focus + pct_neg_perfFB * Present_Focus + pct_pos_perfFB *
##     Future_Focus + pct_neg_perfFB * Future_Focus + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                   var std.dev share
## idiosyncratic 2.9337  1.7128 0.954
## individual    0.1425  0.3774 0.046
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.08493 0.12001 0.16580 0.15101 0.17955 0.17955
##
## Residuals:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##  -2.602  -0.411  -0.130   0.001   0.149  19.651
##
## Coefficients:
##                                Estimate  Std. Error z-value Pr(>|z|)
## (Intercept)                  -0.39490831  1.49126032 -0.2648 0.791152
## pct_pos_perfFB                0.03679323  0.44657506  0.0824 0.934337
## Present_Focus                -0.10938295  0.09291264 -1.1773 0.239089
## pct_neg_perfFB                0.92916775  1.90321001  0.4882 0.625401
## Future_Focus                  0.33536579  0.30295440  1.1070 0.268301
## Financial_Slack               0.19343533  0.07067068  2.7371 0.006198 **
## log(Employees)                0.06849994  0.09441552  0.7255 0.468136
## Age                           0.00690168  0.02386253  0.2892 0.772408
## Total_Compensation           -0.00028081  0.00028310 -0.9919 0.321242
## pct_pos_perfFB:Present_Focus  0.01463411  0.04451822  0.3287 0.742366
## Present_Focus:pct_neg_perfFB -0.13752809  0.23347884 -0.5890 0.555835
## pct_pos_perfFB:Future_Focus  -0.08994659  0.22041216 -0.4081 0.683212
## pct_neg_perfFB:Future_Focus   0.06158588  0.30900519  0.1993 0.842025
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    557.52
## Residual Sum of Squares: 519.24
## R-Squared:      0.068675
## Adj. R-Squared: 0.0051759
## Chisq: 12.9588 on 12 DF, p-value: 0.37204
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL3)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_FL3
## BP = 10.725, df = 12, p-value = 0.5527

**REGULATORY FOCUS**
```

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensation ,da
ta=P_CEO_Data, model = "within") # pos_perf is a binary variable -> interacti
on model
RLM_SC2 <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*Promotion + pct_neg_
perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*log(Prev
ention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Data, mod
el = "random") # pos_perf is a binary variable -> interaction model vs. split
sample model!

phtest(FLM_SC2, RLM_SC2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * Promotion + pct_neg_perf
FB *  ...
## chisq = 74.678, df = 11, p-value = 0.00000000001563
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC2)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * Promotion +
##     pct_neg_perfFB * Promotion + pct_pos_perfFB * log(Prevention +
##     1) + pct_neg_perfFB * log(Prevention + 1) + Financial_Slack +
##     log(Employees) + Age + Total_Compensation, data = P_CEO_Data,
##     model = "within")
##
## Unbalanced Panel: n = 13, T = 1-9, N = 80
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -0.930423 -0.072300  0.011952  0.090958  1.536909
##
## Coefficients:
##                                      Estimate  Std. Error t-value Pr(>|t|
)
## pct_pos_perfFB                     -0.37319057  0.25331982 -1.4732 0.14639
8
## Promotion                          -0.33348954  0.31928457 -1.0445 0.30082
8
## pct_neg_perfFB                      0.15724348  0.26731616  0.5882 0.55878
6
## log(Prevention + 1)                -0.21155349  0.71860940 -0.2944 0.76956
6
## Financial_Slack                    -0.14979507  0.06074255 -2.4661 0.01680
7 *
## log(Employees)                     -0.59350512  0.19595836 -3.0287 0.00373
5 **
## Age                                -0.00608306  0.01085067 -0.5606 0.57733
6
## Total_Compensation                 -0.00076653  0.00022145 -3.4614 0.00104
7 **
## pct_pos_perfFB:Promotion            0.30835133  0.19748725  1.5614 0.12417
2
## Promotion:pct_neg_perfFB           -0.32917600  0.63273669 -0.5202 0.60498
3
## pct_pos_perfFB:log(Prevention + 1)  1.08807865  0.87309788  1.2462 0.21796
3
## pct_neg_perfFB:log(Prevention + 1)  0.52171829  1.46133687  0.3570 0.72244
7
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    10.26
## Residual Sum of Squares: 5.4833
## R-Squared:      0.46558
## Adj. R-Squared: 0.23238
## F-statistic: 3.99295 on 12 and 55 DF, p-value: 0.0001945
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC2) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC2
## BP = 29.247, df = 12, p-value = 0.003621

coeftest(FLM_SC2,vcov=vcovHC(FLM_SC2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                    Estimate  Std. Error t value Pr(>|t|
)
## pct_pos_perfFB                   -0.37319057  0.32991987 -1.1312  0.2629
0
## Promotion                        -0.33348954  0.21169279 -1.5753  0.1209
1
## pct_neg_perfFB                    0.15724348  0.07749703  2.0290  0.0473
1 *
## log(Prevention + 1)              -0.21155349  0.53528303 -0.3952  0.6942
1
## Financial_Slack                  -0.14979507  0.12134459 -1.2345  0.2222
8
## log(Employees)                   -0.59350512  0.37568675 -1.5798  0.1198
9
## Age                              -0.00608306  0.00734448 -0.8282  0.4111
1
## Total_Compensation               -0.00076653  0.00030432 -2.5188  0.0147
1 *
## pct_pos_perfFB:Promotion          0.30835133  0.26513413  1.1630  0.2498
5
## Promotion:pct_neg_perfFB         -0.32917600  0.16515890 -1.9931  0.0512
2 .
## pct_pos_perfFB:log(Prevention + 1)  1.08807865  1.01527323  1.0717  0.2885
3
## pct_neg_perfFB:log(Prevention + 1)  0.52171829  0.65413271  0.7976  0.4285
5
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# do it if I have heteroscedasticity!!!!
```

Now I perform the regression for all the other dimensions of SC:

```
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data$pct_adv_intens_diff, is.infinite)] <- NA


FLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_AI2 <- plm(plm::lead(pct_adv_intens_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_AI2, RLM_AI2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 54.104, df = 11, p-value = 0.000000113
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 15, T = 1-10, N = 97
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -118.02142   -9.56880    0.51997   10.47793  223.32024
##
## Coefficients:
##                                    Estimate Std. Error t-value  Pr(>|t|)
## pct_pos_perfFB                   -21.944419  20.986872 -1.0456 0.2993311
## Promotion                        -29.336016  32.492931 -0.9028 0.3697056
## pct_neg_perfFB                    13.600909  24.726059  0.5501 0.5840266
## log(Prevention + 1)               78.197698  69.386729  1.1270 0.2635979
```

```
## Financial_Slack                      -16.249050   5.515831 -2.9459 0.0043698
**
## log(Employees)                       -72.026960  20.282545 -3.5512 0.0006908
***
## Age                                   -1.637475   1.186760 -1.3798 0.1720439
## Total_Compensation                    -0.085083   0.024758 -3.4366 0.0009951
***
## pct_pos_perfFB:Promotion              20.058403  16.740725  1.1982 0.2348880
## Promotion:pct_neg_perfFB             -24.570612  45.444120 -0.5407 0.5904463
## pct_pos_perfFB:log(Prevention + 1)   50.835853  73.161782  0.6948 0.4894546
## pct_neg_perfFB:log(Prevention + 1)   24.636095 144.900522  0.1700 0.8654842
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    173290
## Residual Sum of Squares: 101760
## R-Squared:      0.41276
## Adj. R-Squared: 0.19464
## F-statistic: 4.10007 on 12 and 70 DF, p-value: 0.000078676
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI2
## BP = 25.922, df = 12, p-value = 0.01101

coeftest(FLM_AI2,vcov=vcovHC(FLM_AI2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                       Estimate Std. Error t value Pr(>|t|)
## pct_pos_perfFB                       -21.944419  19.793453 -1.1087  0.27137
## Promotion                            -29.336016  17.265359 -1.6991  0.09374
.
## pct_neg_perfFB                        13.600909  13.582731  1.0013  0.32011
## log(Prevention + 1)                   78.197698  37.259083  2.0988  0.03945
*
## Financial_Slack                      -16.249050  12.129389 -1.3396  0.18469
## log(Employees)                       -72.026960  45.219439 -1.5928  0.11570
## Age                                   -1.637475   1.163403 -1.4075  0.16371
## Total_Compensation                    -0.085083   0.040139 -2.1197  0.03758
*
## pct_pos_perfFB:Promotion              20.058403  16.764089  1.1965  0.23553
## Promotion:pct_neg_perfFB             -24.570612  25.630413 -0.9587  0.34103
## pct_pos_perfFB:log(Prevention + 1)   50.835853  55.898191  0.9094  0.36624
## pct_neg_perfFB:log(Prevention + 1)   24.636095  80.783846  0.3050  0.76130
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# do it if I have heteroscedasticity!!!!

FLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensati
on ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> int
eraction model
RLM_RD2 <- plm(plm::lead(pct_RD_intens_diff) ~  pct_pos_perfFB*Promotion + pc
t_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*lo
g(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Dat
a, model = "random") # pos_perf is a binary variable -> interaction model vs.
split sample model!

phtest(FLM_RD2, RLM_RD2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 22.667, df = 11, p-value = 0.01969
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.831207 -0.129732 -0.012912  0.111808  4.750089
##
## Coefficients:
##                                       Estimate    Std. Error t-value Pr(
>|t|)
## pct_pos_perfFB                      0.1313485938  0.0735320019  1.7863  0.
07605
## Promotion                          -0.3185207568  0.2986188352 -1.0666  0.
28782
## pct_neg_perfFB                     -0.3522809863  0.2288298450 -1.5395  0.
12576
## log(Prevention + 1)                -0.0924351831  0.6650293068 -0.1390  0.
88964
## Financial_Slack                    -0.0295236748  0.0312251767 -0.9455  0.
34590
## log(Employees)                      0.3038001352  0.1674198734  1.8146  0.
07156
```

```
## Age                                    -0.0029645166  0.0119106973 -0.2489  0.
80378
## Total_Compensation                     -0.0000013506  0.0001352869 -0.0100  0.
99205
## pct_pos_perfFB:Promotion               -0.1053907686  0.0745976190 -1.4128  0.
15976
## Promotion:pct_neg_perfFB                0.8074722911  0.4177576400  1.9329  0.
05511
## pct_pos_perfFB:log(Prevention + 1) -0.7015122889  0.3445179617 -2.0362  0.
04347
## pct_neg_perfFB:log(Prevention + 1) -3.1619072232  1.2329979004 -2.5644  0.
01130
##
## pct_pos_perfFB                         .
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                         .
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB               .
## pct_pos_perfFB:log(Prevention + 1) *
## pct_neg_perfFB:log(Prevention + 1) *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    57.341
## Residual Sum of Squares: 47.453
## R-Squared:      0.17244
## Adj. R-Squared: -0.023562
## F-statistic: 2.63936 on 12 and 152 DF, p-value: 0.0031044
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD2
## BP = 69.884, df = 12, p-value = 0.0000000003367

coeftest(FLM_RD2,vcov=vcovHC(FLM_RD2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate    Std. Error t value
## pct_pos_perfFB                     0.1313485938  0.0384123035  3.4194
## Promotion                         -0.3185207568  0.2430765753 -1.3104
## pct_neg_perfFB                    -0.3522809863  0.3937158656 -0.8948
```

```
## log(Prevention + 1)                -0.0924351831  0.2861171762 -0.3231
## Financial_Slack                    -0.0295236748  0.0112636112 -2.6212
## log(Employees)                      0.3038001352  0.1441646668  2.1073
## Age                                -0.0029645166  0.0052492605 -0.5647
## Total_Compensation                 -0.0000013506  0.0000654814 -0.0206
## pct_pos_perfFB:Promotion           -0.1053907686  0.0331220548 -3.1819
## Promotion:pct_neg_perfFB            0.8074722911  0.9428831588  0.8564
## pct_pos_perfFB:log(Prevention + 1) -0.7015122889  0.1575862015 -4.4516
## pct_neg_perfFB:log(Prevention + 1) -3.1619072232  3.4841082920 -0.9075
##                                      Pr(>|t|)
## pct_pos_perfFB                      0.0008058 ***
## Promotion                           0.1920466
## pct_neg_perfFB                      0.3723304
## log(Prevention + 1)                 0.7470881
## Financial_Slack                     0.0096536 **
## log(Employees)                      0.0367320 *
## Age                                 0.5730768
## Total_Compensation                  0.9835707
## pct_pos_perfFB:Promotion            0.0017743 **
## Promotion:pct_neg_perfFB            0.3931322
## pct_pos_perfFB:log(Prevention + 1) 0.00001641 ***
## pct_neg_perfFB:log(Prevention + 1)  0.3655670
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_PE2 <- plm(plm::lead(pct_plant_equip_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_PE2, RLM_PE2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 83.857, df = 11, p-value = 0.0000000000002637
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE2)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
```

```
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -0.63570074 -0.05720849 -0.00080676  0.05249056  1.18354783
##
## Coefficients:
##                                    Estimate   Std. Error t-value   Pr(
>|t|)
## pct_pos_perfFB                     0.001150330  0.025534867  0.0450    0.
96413
## Promotion                         -0.075506334  0.103698962 -0.7281    0.
46765
## pct_neg_perfFB                     0.053274183  0.079463900  0.6704    0.
50361
## log(Prevention + 1)               -0.276435833  0.230939380 -1.1970    0.
23317
## Financial_Slack                   -0.007534895  0.010843316 -0.6949    0.
48819
## log(Employees)                    -0.245857204  0.058138553 -4.2288 0.000
04042
## Age                               -0.000289447  0.004136132 -0.0700    0.
94430
## Total_Compensation                -0.000079396  0.000046980 -1.6900    0.
09308
## pct_pos_perfFB:Promotion          -0.006420726  0.025904915 -0.2479    0.
80458
## Promotion:pct_neg_perfFB          -0.096450501  0.145071336 -0.6648    0.
50715
## pct_pos_perfFB:log(Prevention + 1)  0.010852660  0.119637982  0.0907    0.
92784
## pct_neg_perfFB:log(Prevention + 1)  0.173962642  0.428173266  0.4063    0.
68510
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                    ***
## Age
## Total_Compensation                .
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    7.0007
## Residual Sum of Squares: 5.7224
## R-Squared:      0.18259
```

```
## Adj. R-Squared: -0.011005
## F-statistic: 2.82947 on 12 and 152 DF, p-value: 0.0015781
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE2
## BP = 22.454, df = 12, p-value = 0.03274

coeftest(FLM_PE2,vcov=vcovHC(FLM_PE2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate   Std. Error t value Pr(>|
t|)
## pct_pos_perfFB                      0.001150330  0.012051502  0.0955  0.92
408
## Promotion                          -0.075506334  0.099948741 -0.7555  0.45
115
## pct_neg_perfFB                      0.053274183  0.038961067  1.3674  0.17
353
## log(Prevention + 1)                -0.276435833  0.315625778 -0.8758  0.38
250
## Financial_Slack                    -0.007534895  0.013013224 -0.5790  0.56
343
## log(Employees)                     -0.245857204  0.106211544 -2.3148  0.02
196 *
## Age                                -0.000289447  0.002684441 -0.1078  0.91
428
## Total_Compensation                 -0.000079396  0.000052734 -1.5056  0.13
425
## pct_pos_perfFB:Promotion           -0.006420726  0.008046758 -0.7979  0.42
616
## Promotion:pct_neg_perfFB           -0.096450501  0.070131810 -1.3753  0.17
107
## pct_pos_perfFB:log(Prevention + 1)  0.010852660  0.068538795  0.1583  0.87
440
## pct_neg_perfFB:log(Prevention + 1)  0.173962642  0.205555051  0.8463  0.39
871
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Co
mpensation ,data=P_CEO_Data, model = "within") # pos_perf is a binary variabl
e -> interaction model
RLM_NPO2 <- plm(plm::lead(pct_nonprod_overhead_diff) ~  pct_pos_perfFB*Promot
```

```
ion + pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_p
erfFB*log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P
_CEO_Data, model = "random") # pos_perf is a binary variable -> interaction m
odel vs. split sample model!

phtest(FLM_NPO2, RLM_NPO2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * Promotion +
...
## chisq = 31.105, df = 11, p-value = 0.00106
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO2)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + log(Employees) + Age + Total_Compensation,
##     data = P_CEO_Data, model = "within")
##
## Unbalanced Panel: n = 24, T = 3-9, N = 153
##
## Residuals:
##       Min.    1st Qu.     Median    3rd Qu.       Max.
## -0.9678999 -0.0546330 -0.0014635  0.0633909  0.4797168
##
## Coefficients:
##                                    Estimate  Std. Error t-value   Pr(>|
t|)
## pct_pos_perfFB                   0.02437588  0.04363290  0.5587     0.5
775
## Promotion                       -0.01254634  0.11367133 -0.1104     0.9
123
## pct_neg_perfFB                  -0.08659728  0.08857118 -0.9777     0.3
302
## log(Prevention + 1)             -0.08297264  0.25880957 -0.3206     0.7
491
## Financial_Slack                  0.00822656  0.01130524  0.7277     0.4
683
## log(Employees)                   0.29699575  0.07131522  4.1645 0.00005
995
## Age                              0.00531907  0.00463431  1.1478     0.2
534
## Total_Compensation               0.00011066  0.00006897  1.6045     0.1
113
## pct_pos_perfFB:Promotion        -0.00533449  0.03865593 -0.1380     0.8
905
```

```
## Promotion:pct_neg_perfFB            0.25824515  0.20019755  1.2900     0.1
996
## pct_pos_perfFB:log(Prevention + 1) -0.21447708  0.15534635 -1.3806     0.1
700
## pct_neg_perfFB:log(Prevention + 1) -0.22550115  0.49790103 -0.4529     0.6
515
##
## pct_pos_perfFB
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                      ***
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1)
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    5.2484
## Residual Sum of Squares: 3.7471
## R-Squared:      0.28606
## Adj. R-Squared: 0.072484
## F-statistic: 3.90655 on 12 and 117 DF, p-value: 0.000048165
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO2)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO2
## BP = 27.486, df = 12, p-value = 0.006573

coeftest(FLM_NPO2,vcov=vcovHC(FLM_NPO2,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                                      Estimate  Std. Error t value  Pr(>|t
|)
## pct_pos_perfFB                      0.02437588  0.01429626  1.7051 0.09083
84
## Promotion                          -0.01254634  0.11636793 -0.1078 0.91432
62
## pct_neg_perfFB                     -0.08659728  0.07802367 -1.1099 0.26932
46
## log(Prevention + 1)                -0.08297264  0.18008601 -0.4607 0.64584
11
```

```
## Financial_Slack                       0.00822656  0.02480452  0.3317 0.74074
25
## log(Employees)                        0.29699575  0.16080491  1.8469 0.06728
37
## Age                                   0.00531907  0.00342529  1.5529 0.12315
27
## Total_Compensation                    0.00011066  0.00012020  0.9207 0.35912
60
## pct_pos_perfFB:Promotion             -0.00533449  0.01321394 -0.4037 0.68716
90
## Promotion:pct_neg_perfFB              0.25824515  0.19035679  1.3566 0.17750
83
## pct_pos_perfFB:log(Prevention + 1) -0.21447708  0.05520094 -3.8854 0.00016
98
## pct_neg_perfFB:log(Prevention + 1) -0.22550115  0.24209245 -0.9315 0.35353
01
##
## pct_pos_perfFB                        .
## Promotion
## pct_neg_perfFB
## log(Prevention + 1)
## Financial_Slack
## log(Employees)                        .
## Age
## Total_Compensation
## pct_pos_perfFB:Promotion
## Promotion:pct_neg_perfFB
## pct_pos_perfFB:log(Prevention + 1) ***
## pct_neg_perfFB:log(Prevention + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
FLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensat
ion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> in
teraction model
RLM_IL2 <- plm(plm::lead(pct_invent_lev_diff) ~  pct_pos_perfFB*Promotion + p
ct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*l
og(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_Da
ta, model = "random") # pos_perf is a binary variable -> interaction model vs
. split sample model!

phtest(FLM_IL2, RLM_IL2) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * Promotion +  ...
## chisq = 15.831, df = 11, p-value = 0.1475
## alternative hypothesis: one model is inconsistent
```

```
#Final Models
summary(RLM_IL2)
```

```
## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
##                   var std.dev share
## idiosyncratic 0.1850  0.4302     1
## individual    0.0000  0.0000     0
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -1.101590 -0.156081 -0.056457  0.077884  3.340352
##
## Coefficients:
##                                      Estimate   Std. Error z-value Pr(>|
z|)
## (Intercept)                          0.515871500  0.334562983  1.5419  0.12
309
## pct_pos_perfFB                       0.044337079  0.051548796  0.8601  0.38
973
## Promotion                           -0.191800890  0.174763541 -1.0975  0.27
243
## pct_neg_perfFB                       0.155639136  0.150441426  1.0345  0.30
088
## log(Prevention + 1)                 -0.151280386  0.362819858 -0.4170  0.67
671
## Financial_Slack                      0.030316489  0.015858806  1.9117  0.05
592 .
## Total_Compensation                   0.000081027  0.000058442  1.3865  0.16
561
## Age                                 -0.008124069  0.005580666 -1.4558  0.14
546
## pct_pos_perfFB:Promotion            -0.034781973  0.052517023 -0.6623  0.50
778
## Promotion:pct_neg_perfFB            -0.330653231  0.276675897 -1.1951  0.23
205
## pct_pos_perfFB:log(Prevention + 1) -0.269784240  0.239380622 -1.1270  0.25
974
## pct_neg_perfFB:log(Prevention + 1)  1.134981223  0.830338684  1.3669  0.17
166
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Total Sum of Squares:    34.754
## Residual Sum of Squares: 32.402
## R-Squared:      0.067688
## Adj. R-Squared: 0.0097476
## Chisq: 12.8506 on 11 DF, p-value: 0.3032
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_IL2)

##
##  studentized Breusch-Pagan test
##
## data:  RLM_IL2
## BP = 6.8545, df = 11, p-value = 0.8107
```

```
FLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack +  log(Employees) + Age + Total_Compensa
tion ,data=P_CEO_Data, model = "within") # pos_perf is a binary variable -> i
nteraction model
RLM_FL2 <- plm(plm::lead(pct_fin_leverage_diff) ~  pct_pos_perfFB*Promotion +
pct_neg_perfFB*Promotion + pct_pos_perfFB*log(Prevention+1) + pct_neg_perfFB*
log(Prevention+1) +  Financial_Slack + Total_Compensation + Age ,data=P_CEO_D
ata, model = "random") # pos_perf is a binary variable -> interaction model v
s. split sample model!

phtest(FLM_FL2, RLM_FL2) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * Promotion +  ..
.
## chisq = 13.493, df = 11, p-value = 0.2623
## alternative hypothesis: one model is inconsistent

#Final Models
summary(RLM_FL2)

## Oneway (individual) effect Random Effect Model
##    (Swamy-Arora's transformation)
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     Promotion + pct_neg_perfFB * Promotion + pct_pos_perfFB *
##     log(Prevention + 1) + pct_neg_perfFB * log(Prevention + 1) +
##     Financial_Slack + Total_Compensation + Age, data = P_CEO_Data,
##     model = "random")
##
## Unbalanced Panel: n = 25, T = 4-10, N = 189
##
## Effects:
```

```
##                   var std.dev share
## idiosyncratic 2.93109 1.71204 0.991
## individual    0.02762 0.16620 0.009
## theta:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.01833 0.02713 0.03989 0.03589 0.04403 0.04403
##
## Residuals:
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -2.4773 -0.4768 -0.1327  0.0008  0.1530 20.1258
##
## Coefficients:
##                                    Estimate  Std. Error z-value Pr(>|z|
)
## (Intercept)                       -0.20724859  1.38679330 -0.1494 0.88120
3
## pct_pos_perfFB                    -0.11621185  0.21072851 -0.5515 0.58130
7
## Promotion                         -0.27263063  0.71922868 -0.3791 0.70464
4
## pct_neg_perfFB                     0.23029922  0.61658214  0.3735 0.70876
9
## log(Prevention + 1)               -1.56678771  1.49852737 -1.0456 0.29576
8
## Financial_Slack                    0.17058829  0.06532899  2.6112 0.00902
2 **
## Total_Compensation                -0.00017293  0.00024299 -0.7117 0.47667
3
## Age                                0.00754091  0.02306008  0.3270 0.74365
9
## pct_pos_perfFB:Promotion           0.05004050  0.21477695  0.2330 0.81577
1
## Promotion:pct_neg_perfFB          -0.24431458  1.13403972 -0.2154 0.82942
6
## pct_pos_perfFB:log(Prevention + 1)  0.59900633  0.97892729  0.6119 0.54060
3
## pct_neg_perfFB:log(Prevention + 1) -0.25424536  3.40064230 -0.0748 0.94040
3
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    570.71
## Residual Sum of Squares: 537.23
## R-Squared:      0.058659
## Adj. R-Squared: 0.00015796
## Chisq: 11.0228 on 11 DF, p-value: 0.44136
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(RLM_FL2)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  RLM_FL2
## BP = 9.9431, df = 11, p-value = 0.5355
```

9. Linear Probability Models

I use the linear probability model for binary variables (and the log-log model for the elasticities of non-binary variables). In this first part I combine all 4 performance possibilities (positive/negative & above/below aspiration) with all 6 possibilities of strategic change (small/big / positive&big / positive & small / negative & small / negative & big). After that I do the same for every single dimension of strategic change (adv_change/rd_change/plant_change/…)

STRATEGIC CHANGE MODELS

Models with binary DV

Linear Probability Model

```
BV_LPM_BSC_PosPerf_AboAsp <- lm(BV_big_strat_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_AboAsp <- lm(BV_small_strat_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5818 -0.5818  0.4182  0.4182  0.6485
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.58182    0.01827  31.854 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.23032    0.03136  -7.344    0.000000000000408 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4884 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.04756,    Adjusted R-squared:  0.04668
## F-statistic: 53.93 on 1 and 1080 DF,  p-value: 0.0000000000004079

summary(BV_LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6485 -0.4182 -0.4182  0.5818  0.5818
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.41818    0.01827  22.895 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.23032    0.03136   7.344    0.000000000000408 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4884 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.04756,    Adjusted R-squared:  0.04668
## F-statistic: 53.93 on 1 and 1080 DF,  p-value: 0.0000000000004079
```

```
BV_LPM_BSC_PosPerf_BelAsp <- lm(BV_big_strat_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_PosPerf_BelAsp <- lm(BV_small_strat_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5631 -0.5631  0.4369  0.4369  0.6532
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)           0.56306    0.01753  32.127 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.21626    0.03345  -6.465       0.000000000153 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.03726,    Adjusted R-squared:  0.03636
## F-statistic: 41.79 on 1 and 1080 DF,  p-value: 0.0000000001533
```

```
summary(BV_LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6532 -0.4369 -0.4369  0.5631  0.5631
```

```
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.43694    0.01753  24.931 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1   0.21626    0.03345   6.465        0.000000000153 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.03726,    Adjusted R-squared:  0.03636
## F-statistic: 41.79 on 1 and 1080 DF,  p-value: 0.0000000001533
```

```
BV_LPM_BSC_NegPerf_AboAsp <- lm(BV_big_strat_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_AboAsp <- lm(BV_small_strat_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7296 -0.4546 -0.4546  0.5454  0.5454
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.45464    0.01595  28.508 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1   0.27492    0.04208   6.533        0.000000000098 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.03719,    Adjusted R-squared:  0.03632
## F-statistic: 42.68 on 1 and 1105 DF,  p-value: 0.00000000009801
```

```
summary(BV_LPM_SSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5454 -0.5454  0.4546  0.4546  0.7296
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.54536    0.01595  34.197 < 0.0000000000000002 ***
```

```
## BV_NegPerf_AboAspT_1 -0.27492    0.04208  -6.533       0.000000000098 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.491 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.03719,    Adjusted R-squared:  0.03632
## F-statistic: 42.68 on 1 and 1105 DF,  p-value: 0.00000000009801
```

```
BV_LPM_BSC_NegPerf_BelAsp <- lm(BV_big_strat_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SSC_NegPerf_BelAsp <- lm(BV_small_strat_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BSC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7629 -0.4229 -0.4229  0.5771  0.5771
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.42286    0.01626  26.012 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  0.34007    0.03551   9.577 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4809 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.07664,    Adjusted R-squared:  0.07581
## F-statistic: 91.72 on 1 and 1105 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SSC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5771 -0.5771  0.4229  0.4229  0.7629
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.57714    0.01626  35.503 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.34007    0.03551  -9.577 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.4809 on 1105 degrees of freedom
##   (6720 observations deleted due to missingness)
## Multiple R-squared:  0.07664,    Adjusted R-squared:  0.07581
## F-statistic: 91.72 on 1 and 1105 DF,  p-value: < 0.00000000000000022

BV_LPM_BAC_PosPerf_AboAsp <- lm(BV_big_adv_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_AboAsp <- lm(BV_small_adv_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5581 -0.5581  0.4419  0.4419  0.6277
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.55810    0.01491  37.422 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.18580    0.02736  -6.791      0.0000000000158 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.493 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02884,    Adjusted R-squared:  0.02821
## F-statistic: 46.12 on 1 and 1553 DF,  p-value: 0.00000000001581

summary(BV_LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6277 -0.4419 -0.4419  0.5581  0.5581
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.44190    0.01491  29.631 < 0.0000000000000002 ***
## BV_PosPerf_AboAspT_1  0.18580    0.02736   6.791      0.0000000000158 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.493 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.02884,    Adjusted R-squared:  0.02821
## F-statistic: 46.12 on 1 and 1553 DF,  p-value: 0.00000000001581
```

```r
BV_LPM_BAC_PosPerf_BelAsp <- lm(BV_big_adv_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_PosPerf_BelAsp <- lm(BV_small_adv_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5593 -0.5593  0.4407  0.4407  0.6747
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.55932    0.01427  39.196 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.23399    0.02906  -8.052   0.0000000000000016 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.04008,    Adjusted R-squared:  0.03946
## F-statistic: 64.84 on 1 and 1553 DF,  p-value: 0.0000000000000016

summary(BV_LPM_SAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6747 -0.4407 -0.4407  0.5593  0.5593
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.44068    0.01427  30.882 < 0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.23399    0.02906   8.052   0.0000000000000016 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.04008,    Adjusted R-squared:  0.03946
## F-statistic: 64.84 on 1 and 1553 DF,  p-value: 0.0000000000000016

BV_LPM_BAC_NegPerf_AboAsp <- lm(BV_big_adv_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_NegPerf_AboAsp <- lm(BV_small_adv_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6754 -0.4532 -0.4532  0.5468  0.5468
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.45322    0.01366  33.183 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1   0.22215    0.03308   6.716       0.000000000026 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.02793,    Adjusted R-squared:  0.02731
## F-statistic:  45.1 on 1 and 1570 DF,  p-value: 0.00000000002605

summary(BV_LPM_SAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5468 -0.5468  0.4532  0.4532  0.6754
##
## Coefficients:
##                       Estimate Std. Error t value             Pr(>|t|)
## (Intercept)            0.54678    0.01366  40.033 < 0.0000000000000002 ***
## BV_NegPerf_AboAspT_1  -0.22215    0.03308  -6.716       0.000000000026 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4932 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.02793,    Adjusted R-squared:  0.02731
## F-statistic:  45.1 on 1 and 1570 DF,  p-value: 0.00000000002605

BV_LPM_BAC_NegPerf_BelAsp <- lm(BV_big_adv_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SAC_NegPerf_BelAsp <- lm(BV_small_adv_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BAC_NegPerf_BelAsp)

##
## Call:
```

```
## lm(formula = BV_big_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6718 -0.4309 -0.4309  0.5691  0.5691
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.43087    0.01425  30.241 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1   0.24088    0.02850   8.453 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4892 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.04353,    Adjusted R-squared:  0.04292
## F-statistic: 71.46 on 1 and 1570 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5691 -0.5691  0.4309  0.4309  0.6718
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.56913    0.01425  39.944 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1  -0.24088    0.02850  -8.453 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4892 on 1570 degrees of freedom
##   (6255 observations deleted due to missingness)
## Multiple R-squared:  0.04353,    Adjusted R-squared:  0.04292
## F-statistic: 71.46 on 1 and 1570 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_PosPerf_AboAsp <- lm(BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_AboAsp <- lm(BV_small_rd_change ~ BV_PosPerf_AboAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5696 -0.5696  0.4304  0.4304  0.7173
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.569576   0.007978   71.39 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.286849   0.016667  -17.21 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4853 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.05814,    Adjusted R-squared:  0.05794
## F-statistic: 296.2 on 1 and 4799 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7173 -0.4304 -0.4304  0.5696  0.5696
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.430424   0.007978   53.95 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.286849   0.016667   17.21 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4853 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.05814,    Adjusted R-squared:  0.05794
## F-statistic: 296.2 on 1 and 4799 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_PosPerf_BelAsp <- lm(BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_PosPerf_BelAsp <- lm(BV_small_rd_change ~ BV_PosPerf_BelAspT_1, da
ta=P_CEO_Data)
```

```
summary(BV_LPM_BRC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5505 -0.5505  0.4495  0.4495  0.7467
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.550531   0.007675   71.73 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.297216   0.019367  -15.35 <0.0000000000000002 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.04678,    Adjusted R-squared:  0.04658
## F-statistic: 235.5 on 1 and 4799 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7467 -0.4495 -0.4495  0.5505  0.5505
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.449469   0.007675   58.56 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.297216   0.019367   15.35 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.04678,    Adjusted R-squared:  0.04658
## F-statistic: 235.5 on 1 and 4799 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_AboAsp <- lm(BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_AboAsp <- lm(BV_small_rd_change ~ BV_NegPerf_AboAspT_1, da
ta=P_CEO_Data)
```

```
summary(BV_LPM_BRC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6384 -0.4417 -0.4417  0.5583  0.5583
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.441657   0.008273   53.38 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.196771   0.016750   11.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.02858,    Adjusted R-squared:  0.02837
## F-statistic:   138 on 1 and 4691 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5583 -0.5583  0.4417  0.4417  0.6384
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.558343   0.008273   67.49 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.196771   0.016750  -11.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4928 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.02858,    Adjusted R-squared:  0.02837
## F-statistic:   138 on 1 and 4691 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_NegPerf_BelAsp <- lm(BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data
=P_CEO_Data)
BV_LPM_SRC_NegPerf_BelAsp <- lm(BV_small_rd_change ~ BV_NegPerf_BelAspT_1, da
ta=P_CEO_Data)

summary(BV_LPM_BRC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6523 -0.4092 -0.4092  0.5908  0.5908
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.409236   0.008686   47.11 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.243050   0.015100   16.10 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4867 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.05234,    Adjusted R-squared:  0.05214
## F-statistic: 259.1 on 1 and 4691 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5908 -0.5908  0.4092  0.4092  0.6523
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.590764   0.008686   68.01 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.243050   0.015100  -16.10 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4867 on 4691 degrees of freedom
##   (3134 observations deleted due to missingness)
## Multiple R-squared:  0.05234,    Adjusted R-squared:  0.05214
## F-statistic: 259.1 on 1 and 4691 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_PosPerf_AboAsp <- lm(BV_big_plant_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_AboAsp <- lm(BV_small_plant_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5689 -0.5689  0.4311  0.4311  0.7380
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.568867   0.007038   80.83 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.306844   0.015628  -19.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.0609, Adjusted R-squared:  0.06074
## F-statistic: 385.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7380 -0.4311 -0.4311  0.5689  0.5689
##
```

```
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.431133   0.007038   61.26 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.306844   0.015628   19.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4846 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.0609, Adjusted R-squared:  0.06074
## F-statistic: 385.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_PosPerf_BelAsp <- lm(BV_big_plant_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_PosPerf_BelAsp <- lm(BV_small_plant_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5546 -0.5546  0.4454  0.4454  0.7975
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.55460    0.00677   81.92 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.35213    0.01834  -19.20 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4852 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.05837,    Adjusted R-squared:  0.05821
## F-statistic: 368.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7975 -0.4454 -0.4454  0.5546  0.5546
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.44540    0.00677   65.79 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1  0.35213    0.01834   19.20 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4852 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.05837,    Adjusted R-squared:  0.05821
## F-statistic: 368.5 on 1 and 5945 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_NegPerf_AboAsp <- lm(BV_big_plant_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_AboAsp <- lm(BV_small_plant_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)

summary(BV_LPM_BPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6419 -0.4352 -0.4352  0.5648  0.5648
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435156   0.007598   57.27 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.206786   0.014857   13.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4916 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.03305,    Adjusted R-squared:  0.03288
## F-statistic: 193.7 on 1 and 5668 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5648 -0.5648  0.4352  0.4352  0.6419
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564844   0.007598   74.34 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.206786   0.014857  -13.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4916 on 5668 degrees of freedom
```

```
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.03305,    Adjusted R-squared:  0.03288
## F-statistic: 193.7 on 1 and 5668 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_NegPerf_BelAsp <- lm(BV_big_plant_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
BV_LPM_SPC_NegPerf_BelAsp <- lm(BV_small_plant_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
```

```
summary(BV_LPM_BPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6476 -0.4037 -0.4037  0.5963  0.5963
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.403695   0.008014   50.37 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.243867   0.013531   18.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4862 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.0542, Adjusted R-squared:  0.05403
## F-statistic: 324.8 on 1 and 5668 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5963 -0.5963  0.4037  0.4037  0.6476
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.596305   0.008014   74.41 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.243867   0.013531  -18.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4862 on 5668 degrees of freedom
##   (2157 observations deleted due to missingness)
## Multiple R-squared:  0.0542, Adjusted R-squared:  0.05403
## F-statistic: 324.8 on 1 and 5668 DF,  p-value: < 0.00000000000000022
```

```r
BV_LPM_BNPC_PosPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_AboAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5759 -0.5759  0.4240  0.4240  0.6584
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.57595    0.01046   55.06 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.23439    0.01883  -12.45 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.04688,    Adjusted R-squared:  0.04658
## F-statistic: 154.9 on 1 and 3149 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6584 -0.4240 -0.4240  0.5759  0.5759
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)            0.42405    0.01046   40.54 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1   0.23439    0.01883   12.45 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4883 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.04688,    Adjusted R-squared:  0.04658
## F-statistic: 154.9 on 1 and 3149 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_PosPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_PosPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_BelAspT
_1, data=P_CEO_Data)
```

```
summary(BV_LPM_BNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5642 -0.5642  0.4358  0.4358  0.7064
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564186   0.009852   57.27 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.270569   0.020829  -12.99 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4873 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.05086,    Adjusted R-squared:  0.05056
## F-statistic: 168.7 on 1 and 3149 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7064 -0.4358 -0.4358  0.5642  0.5642
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435814   0.009852   44.23 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.270569   0.020829   12.99 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4873 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.05086,    Adjusted R-squared:  0.05056
## F-statistic: 168.7 on 1 and 3149 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_NegPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_AboAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Da
ta)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7320 -0.4406 -0.4406  0.5594  0.5594
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.440581   0.009537   46.20 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.291397   0.023041   12.65 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4879 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.04824,    Adjusted R-squared:  0.04793
## F-statistic: 159.9 on 1 and 3156 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_AboAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5594 -0.5594  0.4406  0.4406  0.7320
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.559419   0.009537   58.66 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.291397   0.023041  -12.65 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4879 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.04824,    Adjusted R-squared:  0.04793
## F-statistic: 159.9 on 1 and 3156 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_NegPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)
BV_LPM_SNPC_NegPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_BelAspT
_1, data=P_CEO_Data)

summary(BV_LPM_BNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Da
ta)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6956 -0.4215 -0.4215  0.5785  0.5785
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.421498   0.009992   42.19 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.274099   0.019914   13.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4857 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.05663,    Adjusted R-squared:  0.05633
## F-statistic: 189.4 on 1 and 3156 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_BelAspT_1,
##     data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5785 -0.5785  0.4215  0.4215  0.6956
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.578502   0.009992   57.90 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.274099   0.019914  -13.76 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4857 on 3156 degrees of freedom
##   (4669 observations deleted due to missingness)
## Multiple R-squared:  0.05663,    Adjusted R-squared:  0.05633
## F-statistic: 189.4 on 1 and 3156 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_PosPerf_AboAsp <- lm(BV_big_invent_change ~ BV_PosPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_AboAsp <- lm(BV_small_invent_change ~ BV_PosPerf_AboAspT_1
, data=P_CEO_Data)
```

```
summary(BV_LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5641 -0.5641  0.4359  0.4359  0.6488
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.564076   0.009184   61.42 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.212890   0.017199  -12.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4908 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03695,    Adjusted R-squared:  0.03671
## F-statistic: 153.2 on 1 and 3993 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6488 -0.4359 -0.4359  0.5641  0.5641
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.435924   0.009184   47.47 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.212890   0.017199   12.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4908 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03695,    Adjusted R-squared:  0.03671
## F-statistic: 153.2 on 1 and 3993 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_PosPerf_BelAsp <- lm(BV_big_invent_change ~ BV_PosPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_PosPerf_BelAsp <- lm(BV_small_invent_change ~ BV_PosPerf_BelAspT_1
, data=P_CEO_Data)
```

```
summary(BV_LPM_BIC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5536 -0.5536  0.4464  0.4464  0.6952
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.553639   0.008679   63.79 <0.0000000000000002 ***
```

```
## BV_PosPerf_BelAspT_1 -0.248806   0.019310  -12.88 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.49 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03992,    Adjusted R-squared:  0.03968
## F-statistic:   166 on 1 and 3993 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6952 -0.4464 -0.4464  0.5536  0.5536
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.446361   0.008679   51.43 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.248806   0.019310   12.88 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.49 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.03992,    Adjusted R-squared:  0.03968
## F-statistic:   166 on 1 and 3993 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_NegPerf_AboAsp <- lm(BV_big_invent_change ~ BV_NegPerf_AboAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_AboAsp <- lm(BV_small_invent_change ~ BV_NegPerf_AboAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -0.710 -0.443 -0.443  0.557  0.557
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.443030   0.008614   51.43 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.266983   0.019621   13.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.4889 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.04437,    Adjusted R-squared:  0.04413
## F-statistic: 185.1 on 1 and 3988 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -0.557 -0.557  0.443  0.443  0.710
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.556970   0.008614   64.66 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.266983   0.019621  -13.61 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4889 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.04437,    Adjusted R-squared:  0.04413
## F-statistic: 185.1 on 1 and 3988 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_NegPerf_BelAsp <- lm(BV_big_invent_change ~ BV_NegPerf_BelAspT_1,
data=P_CEO_Data)
BV_LPM_SIC_NegPerf_BelAsp <- lm(BV_small_invent_change ~ BV_NegPerf_BelAspT_1
, data=P_CEO_Data)

summary(BV_LPM_BIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Dat
a)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6414 -0.4379 -0.4379  0.5622  0.5622
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.437847   0.009162   47.79 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.203594   0.017371   11.72 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4917 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.0333, Adjusted R-squared:  0.03306
## F-statistic: 137.4 on 1 and 3988 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_D
ata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5622 -0.5622  0.4379  0.4379  0.6414
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.562153   0.009162   61.35 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.203594   0.017371  -11.72 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4917 on 3988 degrees of freedom
##   (3837 observations deleted due to missingness)
## Multiple R-squared:  0.0333, Adjusted R-squared:  0.03306
## F-statistic: 137.4 on 1 and 3988 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_PosPerf_AboAsp <- lm(BV_big_fin_change ~ BV_PosPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_AboAsp <- lm(BV_small_fin_change ~ BV_PosPerf_AboAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5420 -0.5420 -0.3175  0.4580  0.6825
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.542022   0.006848   79.15 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.224498   0.015543  -14.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4921 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03154,    Adjusted R-squared:  0.03139
## F-statistic: 208.6 on 1 and 6406 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_AboAspT_1, data = P_CEO_Data
```

```
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6825 -0.4580  0.3175  0.5420  0.5420
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.457978   0.006848   66.88 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.224498   0.015543   14.44 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4921 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03154,    Adjusted R-squared:  0.03139
## F-statistic: 208.6 on 1 and 6406 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_PosPerf_BelAsp <- lm(BV_big_fin_change ~ BV_PosPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_PosPerf_BelAsp <- lm(BV_small_fin_change ~ BV_PosPerf_BelAspT_1, d
ata=P_CEO_Data)

summary(BV_LPM_BFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5362 -0.5362 -0.2393  0.4638  0.7607
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.536206   0.006555   81.81 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.296942   0.018379  -16.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03915,    Adjusted R-squared:  0.039
## F-statistic:   261 on 1 and 6406 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7607 -0.4638  0.2393  0.5362  0.5362
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.463794   0.006555   70.76 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.296942   0.018379   16.16 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4902 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.03915,    Adjusted R-squared:  0.039
## F-statistic:   261 on 1 and 6406 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_NegPerf_AboAsp <- lm(BV_big_fin_change ~ BV_NegPerf_AboAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_AboAsp <- lm(BV_small_fin_change ~ BV_NegPerf_AboAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6016 -0.4397 -0.4397  0.5603  0.5603
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.439720   0.007439   59.11 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.161881   0.014352   11.28 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4946 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02062,    Adjusted R-squared:  0.02046
## F-statistic: 127.2 on 1 and 6043 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_AboAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5603 -0.5603  0.4397  0.4397  0.6016
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.560280   0.007439   75.32 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.161881   0.014352  -11.28 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4946 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02062,    Adjusted R-squared:  0.02046
## F-statistic: 127.2 on 1 and 6043 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_NegPerf_BelAsp <- lm(BV_big_fin_change ~ BV_NegPerf_BelAspT_1, dat
a=P_CEO_Data)
BV_LPM_SFC_NegPerf_BelAsp <- lm(BV_small_fin_change ~ BV_NegPerf_BelAspT_1, d
ata=P_CEO_Data)
```

```
summary(BV_LPM_BFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5776 -0.4300 -0.4300  0.5699  0.5699
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.430049   0.007956   54.05 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.147545   0.013255   11.13 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4948 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
## Multiple R-squared:  0.02009,    Adjusted R-squared:  0.01993
## F-statistic: 123.9 on 1 and 6043 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_BelAspT_1, data = P_CEO_Data
)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5699 -0.5699  0.4300  0.4300  0.5776
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.569951   0.007956   71.64 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.147545   0.013255  -11.13 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4948 on 6043 degrees of freedom
##   (1782 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.02009,    Adjusted R-squared:  0.01993
## F-statistic: 123.9 on 1 and 6043 DF,  p-value: < 0.00000000000000022
```

10. Log-Log Models

the variables are absolute (only positive) and standardized values!

Log-Log Model with elasticities of continuous DV and IVs:

```
LPM_BSC_PosPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05242 -0.05242  0.00016  0.02029  1.48284
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.052421   0.003036  17.267 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.104428   0.035810  -2.916              0.003
62
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08781 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.007813,   Adjusted R-squared:  0.006894
## F-statistic: 8.504 on 1 and 1080 DF,  p-value: 0.003617

summary(LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05296 -0.02067 -0.02067  0.02290  0.03170
##
## Coefficients:
```

```
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0206685  0.0007809  26.469 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0403922  0.0092108   4.385            0.00001
27
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02259 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.01749,    Adjusted R-squared:  0.01659
## F-statistic: 19.23 on 1 and 1080 DF,  p-value: 0.00001271
```

```
LPM_BSC_PosPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_PosPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05347 -0.05347 -0.00091  0.01971  1.48179
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.053466   0.002936  18.212 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.217867   0.051603  -4.222            0.00002
63
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08744 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.01624,    Adjusted R-squared:  0.01533
## F-statistic: 17.82 on 1 and 1080 DF,  p-value: 0.00002626
```

```
summary(LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
```

```
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04383 -0.02072 -0.02072  0.02334  0.03168
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0207173  0.0007566  27.382 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0655176  0.0132992   4.926          0.0000009
68
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02253 on 1080 degrees of freedom
##   (6745 observations deleted due to missingness)
## Multiple R-squared:  0.02198,    Adjusted R-squared:  0.02107
## F-statistic: 24.27 on 1 and 1080 DF,  p-value: 0.0000009684

LPM_BSC_NegPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.13363 -0.04224 -0.04224  0.01982  1.49302
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.042235   0.002632  16.045 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.069004   0.014695  -4.696             0.0000
03
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.08413 on 1088 degrees of freedom
##   (6737 observations deleted due to missingness)
## Multiple R-squared:  0.01986,    Adjusted R-squared:  0.01896
## F-statistic: 22.05 on 1 and 1088 DF,  p-value: 0.000002996

summary(LPM_SSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.024076 -0.024076  0.009076  0.022319  0.045717
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0240764  0.0007049  34.158 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0211532  0.0039349   5.376         0.00000009
32
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02253 on 1088 degrees of freedom
##   (6737 observations deleted due to missingness)
## Multiple R-squared:  0.02587,    Adjusted R-squared:  0.02498
## F-statistic:  28.9 on 1 and 1088 DF,  p-value: 0.00000009324

LPM_BSC_NegPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SSC_NegPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.12068 -0.04091 -0.04091  0.01910  1.47520
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.040915   0.002659  15.387 < 0.00000000000000
02
```

```
## log(NegPerf_BelAspT_1 + 1) -0.046643   0.007849  -5.943        0.000000003
78
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08435 on 1078 degrees of freedom
##   (6747 observations deleted due to missingness)
## Multiple R-squared:  0.03172,    Adjusted R-squared:  0.03082
## F-statistic: 35.32 on 1 and 1078 DF,  p-value: 0.000000003777

summary(LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02454 -0.02454  0.01025  0.02182  0.04963
##
## Coefficients:
##                             Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                0.0245414  0.0007047  34.824 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0140307  0.0020802   6.745      0.00000000002
49
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02236 on 1078 degrees of freedom
##   (6747 observations deleted due to missingness)
## Multiple R-squared:  0.04049,    Adjusted R-squared:  0.0396
## F-statistic: 45.49 on 1 and 1078 DF,  p-value: 0.00000000002492

P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BAC_PosPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
```

```
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0637 -0.0637 -0.0338  0.0226  3.3059
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.063664   0.004963  12.827 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.091522   0.064810  -1.412               0.15
8
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1755 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.001282,   Adjusted R-squared:  0.0006394
## F-statistic: 1.994 on 1 and 1553 DF,  p-value: 0.1581

summary(LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04394 -0.02568 -0.02497  0.03345  0.04379
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0256832  0.0008216  31.258 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0228283  0.0107293   2.128               0.033
5 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02905 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.002906,   Adjusted R-squared:  0.002264
## F-statistic: 4.527 on 1 and 1553 DF,  p-value: 0.03352

LPM_BAC_PosPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_PosPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0658 -0.0658 -0.0028  0.0218  3.3033
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.065833   0.004842  13.597 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.251355   0.091813  -2.738              0.006
26
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1752 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
## Multiple R-squared:  0.004803,   Adjusted R-squared:  0.004162
## F-statistic: 7.495 on 1 and 1553 DF,  p-value: 0.006258

summary(LPM_SAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04809 -0.02509 -0.02347  0.03263  0.04424
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0250894  0.0007994  31.385 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0652110  0.0151586   4.302             0.0000
18
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02892 on 1553 degrees of freedom
##   (6272 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.01178,    Adjusted R-squared:  0.01114
## F-statistic: 18.51 on 1 and 1553 DF,  p-value: 0.00001799

#LPM_BAC_NegPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_CEO_Data)
#LPM_SAC_NegPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BAC_NegPerf_AboAsp)
#summary(LPM_SAC_NegPerf_AboAsp)

LPM_BAC_NegPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SAC_NegPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0872 -0.0561 -0.0561  0.0230  3.3131
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.056088   0.004642   12.08 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.016604   0.011372   -1.46               0.14
4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1731 on 1508 degrees of freedom
##   (6317 observations deleted due to missingness)
## Multiple R-squared:  0.001412,   Adjusted R-squared:  0.0007495
## F-statistic: 2.132 on 1 and 1508 DF,  p-value: 0.1445

summary(LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02845 -0.02845 -0.01169  0.03274  0.05381
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
```

```
|)
## (Intercept)                0.0284461  0.0007747  36.720 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0116969  0.0018980   6.163       0.0000000009
15
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02889 on 1508 degrees of freedom
##   (6317 observations deleted due to missingness)
## Multiple R-squared:  0.02457,    Adjusted R-squared:  0.02392
## F-statistic: 37.98 on 1 and 1508 DF,  p-value: 0.0000000009149

LPM_BRDC_PosPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0293 -0.0293  0.0057  0.0109  3.9658
##
## Coefficients:
##                             Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.029325   0.001643  17.848 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.009987   0.019337  -0.516               0.60
6
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1074 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  5.558e-05,  Adjusted R-squared:  -0.0001528
## F-statistic: 0.2667 on 1 and 4799 DF,  p-value: 0.6056

summary(LPM_SRDC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
## -0.04206 -0.01290 -0.01290  0.01694  0.02202
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0129011  0.0002268  56.871 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0213117  0.0026698   7.983  0.000000000000001
78
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01483 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.0131, Adjusted R-squared:  0.0129
## F-statistic: 63.72 on 1 and 4799 DF,  p-value: 0.000000000000001778

LPM_BRDC_PosPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_PosPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0306 -0.0306  0.0044  0.0106  3.9645
##
## Coefficients:
##                              Estimate Std. Error t value           Pr(>|t|
)
## (Intercept)                 0.030581   0.001624  18.832 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.111066   0.035363  -3.141             0.001
7 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1073 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.002051,   Adjusted R-squared:  0.001843
## F-statistic: 9.864 on 1 and 4799 DF,  p-value: 0.001695

summary(LPM_SRDC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04672 -0.01278 -0.01278  0.01646  0.02214
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0127808  0.0002233   57.25 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0521115  0.0048617   10.72 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01475 on 4799 degrees of freedom
##   (3026 observations deleted due to missingness)
## Multiple R-squared:  0.02338,    Adjusted R-squared:  0.02318
## F-statistic: 114.9 on 1 and 4799 DF,  p-value: < 0.00000000000000022

LPM_BRDC_NegPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1261 -0.0256 -0.0256  0.0122  3.9695
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.025618   0.001660  15.433 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.023169   0.004825  -4.802           0.000001
62
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1071 on 4587 degrees of freedom
```

```
##   (3238 observations deleted due to missingness)
## Multiple R-squared:  0.005002,   Adjusted R-squared:  0.004785
## F-statistic: 23.06 on 1 and 4587 DF,  p-value: 0.000001621

summary(LPM_SRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.014562 -0.014562 -0.007874  0.017053  0.034281
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0145624  0.0002313  62.959 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) 0.0059082  0.0006723   8.788 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01492 on 4587 degrees of freedom
##   (3238 observations deleted due to missingness)
## Multiple R-squared:  0.01656,    Adjusted R-squared:  0.01634
## F-statistic: 77.23 on 1 and 4587 DF,  p-value: < 0.00000000000000022

LPM_BRDC_NegPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SRDC_NegPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0460 -0.0260 -0.0260  0.0122  3.9684
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.026023   0.001679   15.49 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) -0.003273   0.003209   -1.02              0.30
8
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.1043 on 4385 degrees of freedom
##   (3440 observations deleted due to missingness)
## Multiple R-squared:  0.0002372,  Adjusted R-squared:  9.169e-06
## F-statistic:  1.04 on 1 and 4385 DF,  p-value: 0.3078
```

```
summary(LPM_SRDC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015123 -0.015123 -0.006443  0.016799  0.035766
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0151231  0.0002408  62.799 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0042434  0.0004602   9.221 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01496 on 4385 degrees of freedom
##   (3440 observations deleted due to missingness)
## Multiple R-squared:  0.01902,    Adjusted R-squared:  0.0188
## F-statistic: 85.03 on 1 and 4385 DF,  p-value: < 0.00000000000000022
```

```
LPM_BPC_PosPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1138 -0.1138 -0.0266  0.0370  3.9210
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.113758   0.002906  39.147 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.074849   0.032308  -2.317              0.020
6 *
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2146 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.000902,   Adjusted R-squared:  0.000734
## F-statistic: 5.367 on 1 and 5945 DF,  p-value: 0.02055
```

```
summary(LPM_SPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.07076 -0.02494 -0.02494  0.02994  0.06119
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0249442  0.0004116  60.607 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0224811  0.0045758   4.913          0.0000009
21
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03039 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.004044,   Adjusted R-squared:  0.003876
## F-statistic: 24.14 on 1 and 5945 DF,  p-value: 0.0000009207
```

```
LPM_BPC_PosPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_PosPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1181 -0.1181 -0.0290  0.0366  3.9033
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
```

```
|)
## (Intercept)                 0.118142   0.002886  40.939 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.530788   0.068074  -7.797  0.000000000000007
42
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2136 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.01012,    Adjusted R-squared:  0.009957
## F-statistic:  60.8 on 1 and 5945 DF,  p-value: 0.000000000000007422

summary(LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.14706 -0.02441 -0.02441  0.02884  0.06173
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0244109  0.0004082   59.80 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0936979  0.0096295    9.73 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03021 on 5945 degrees of freedom
##   (1880 observations deleted due to missingness)
## Multiple R-squared:  0.01568,    Adjusted R-squared:  0.01551
## F-statistic: 94.68 on 1 and 5945 DF,  p-value: < 0.00000000000000022

#LPM_BPC_NegPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)
#LPM_SPC_NegPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BPC_NegPerf_AboAsp)
#summary(LPM_SPC_NegPerf_AboAsp)

LPM_BPC_NegPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)
LPM_SPC_NegPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3213 -0.0907 -0.0907  0.0349  3.9308
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.090658   0.002953  30.705 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.037552   0.005277  -7.116     0.000000000001
27
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1993 on 5198 degrees of freedom
##   (2627 observations deleted due to missingness)
## Multiple R-squared:  0.009647,   Adjusted R-squared:  0.009456
## F-statistic: 50.63 on 1 and 5198 DF,  p-value: 0.000000000001266

summary(LPM_SPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02968 -0.02968 -0.01240  0.02903  0.08803
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0296781  0.0004496   66.01 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0095352  0.0008037   11.87 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03035 on 5198 degrees of freedom
##   (2627 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.02637,    Adjusted R-squared:  0.02618
## F-statistic: 140.8 on 1 and 5198 DF,  p-value: < 0.00000000000000022

LPM_BNPC_PosPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0485 -0.0485 -0.0077  0.0077  3.9133
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.048485   0.003003  16.143 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.118381   0.037371  -3.168              0.001
55
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1515 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.003176,   Adjusted R-squared:  0.00286
## F-statistic: 10.03 on 1 and 3149 DF,  p-value: 0.001551

summary(LPM_SNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02557 -0.01523 -0.01420  0.01986  0.02638
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0152337  0.0003435  44.350 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0113768  0.0042738   2.662              0.007
81
```

```
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01733 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.002245,   Adjusted R-squared:  0.001928
## F-statistic: 7.086 on 1 and 3149 DF,  p-value: 0.007808
```

```
LPM_BNPC_PosPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_PosPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0478 -0.0478 -0.0102  0.0077  3.9140
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.047785   0.002927  16.328 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.181142   0.058950  -3.073              0.002
14
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1515 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.002989,   Adjusted R-squared:  0.002673
## F-statistic: 9.442 on 1 and 3149 DF,  p-value: 0.002139
```

```
summary(LPM_SNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02396 -0.01519 -0.01408  0.01986  0.02643
```

```
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0151861  0.0003344  45.414 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0233987  0.0067358   3.474              0.000
52
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01732 on 3149 degrees of freedom
##   (4676 observations deleted due to missingness)
## Multiple R-squared:  0.003817,   Adjusted R-squared:  0.003501
## F-statistic: 12.07 on 1 and 3149 DF,  p-value: 0.0005201
```

```
LPM_BNPC_NegPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_AboAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.22556 -0.03650 -0.03650  0.01147  2.36529
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.036497   0.002213  16.492 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.042220   0.009200  -4.589           0.000004
63
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1194 on 3095 degrees of freedom
##   (4730 observations deleted due to missingness)
## Multiple R-squared:  0.006759,   Adjusted R-squared:  0.006438
## F-statistic: 21.06 on 1 and 3095 DF,  p-value: 0.000004628
```

```
summary(LPM_SNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01617 -0.01617 -0.01114  0.01990  0.03312
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0161688  0.0003223  50.174 < 0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) 0.0048865  0.0013397   3.647             0.0002
69
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01739 on 3095 degrees of freedom
##   (4730 observations deleted due to missingness)
## Multiple R-squared:  0.00428,    Adjusted R-squared:  0.003958
## F-statistic:  13.3 on 1 and 3095 DF,  p-value: 0.0002693

LPM_BNPC_NegPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_CEO_Data)
LPM_SNPC_NegPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_BelAs
pT_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.13182 -0.03332 -0.03332  0.01421  2.34439
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.033325   0.001901  17.533 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.022073   0.005085  -4.341            0.00001
47
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1004 on 3018 degrees of freedom
##   (4807 observations deleted due to missingness)
## Multiple R-squared:  0.006205,   Adjusted R-squared:  0.005875
## F-statistic: 18.84 on 1 and 3018 DF,  p-value: 0.00001467
```

```
summary(LPM_SNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.01641 -0.01641 -0.01060  0.01970  0.03469
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0164141  0.0003305  49.667 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0028632  0.0008842   3.238              0.001
22
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01745 on 3018 degrees of freedom
##   (4807 observations deleted due to missingness)
## Multiple R-squared:  0.003462,   Adjusted R-squared:  0.003132
## F-statistic: 10.49 on 1 and 3018 DF,  p-value: 0.001216
```

```
LPM_BIC_PosPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_AboAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0854 -0.0854 -0.0086  0.0295  3.8143
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
```

```
## (Intercept)                 0.085442   0.003178   26.89 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.129010   0.033600   -3.84             0.0001
25
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1882 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.003678,   Adjusted R-squared:  0.003429
## F-statistic: 14.74 on 1 and 3993 DF,  p-value: 0.0001252

summary(LPM_SIC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.11614 -0.02378 -0.02378  0.02952  0.05251
##
## Coefficients:
##                             Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                0.0237769  0.0004812  49.412 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.0262654  0.0050880   5.162          0.0000002
56
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0285 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.00663,    Adjusted R-squared:  0.006381
## F-statistic: 26.65 on 1 and 3993 DF,  p-value: 0.0000002559

LPM_BIC_PosPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_BelAspT_1
+1), data=P_CEO_Data)
LPM_SIC_PosPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0875 -0.0875 -0.0101  0.0305  3.8065
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.087512   0.003195   27.39 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.365626   0.067702   -5.40         0.00000007
03
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1879 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.007251,   Adjusted R-squared:  0.007003
## F-statistic: 29.17 on 1 and 3993 DF,  p-value: 0.00000007033

summary(LPM_SIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04473 -0.02361 -0.02361  0.02959  0.05264
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                 0.0236077  0.0004842  48.752 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.0598811  0.0102610   5.836        0.000000005
78
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02847 on 3993 degrees of freedom
##   (3832 observations deleted due to missingness)
## Multiple R-squared:  0.008457,   Adjusted R-squared:  0.008209
## F-statistic: 34.06 on 1 and 3993 DF,  p-value: 0.000000005778

#LPM_BIC_NegPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_CEO_Data)
```

```
#LPM_SIC_NegPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_AboAsp
T_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BIC_NegPerf_AboAsp)
#summary(LPM_SIC_NegPerf_AboAsp)

LPM_BIC_NegPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_BelAspT_1
+1), data=P_CEO_Data)
LPM_SIC_NegPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1832 -0.0692 -0.0692  0.0329  3.8249
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.069179   0.002855  24.230 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.025904   0.006422  -4.034             0.0000
56
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1683 on 3810 degrees of freedom
##   (4015 observations deleted due to missingness)
## Multiple R-squared:  0.004252,   Adjusted R-squared:  0.003991
## F-statistic: 16.27 on 1 and 3810 DF,  p-value: 0.00005597

summary(LPM_SIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.02703 -0.02703 -0.01424  0.02980  0.06973
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
```

```
## (Intercept)                0.0270288  0.0004865  55.563 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.0085105  0.0010941   7.778  0.000000000000009
39
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02868 on 3810 degrees of freedom
##   (4015 observations deleted due to missingness)
## Multiple R-squared:  0.01563,    Adjusted R-squared:  0.01537
## F-statistic:  60.5 on 1 and 3810 DF,  p-value: 0.000000000000009389

psych::describe(P_CEO_Data$NegPerf_AboAsp)

##    vars    n  mean   sd median trimmed mad    min max range   skew kurtosi
s
## X1    1 6806 -0.28 2.16      0   -0.05   0 -93.09   0 93.09 -23.83   750.1
3
##      se
## X1 0.03

P_CEO_Data[sapply(P_CEO_Data, is.nan)] <- NA
P_CEO_Data[sapply(P_CEO_Data, is.infinite)] <- NA

LPM_BFC_PosPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0721 -0.0721 -0.0470 -0.0132  3.6881
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.072078   0.002618  27.528 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) -0.025759   0.013989  -1.841              0.065
6 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2068 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.000529,   Adjusted R-squared:  0.000373
## F-statistic: 3.391 on 1 and 6406 DF,  p-value: 0.06561

summary(LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.006462 -0.005180 -0.005180  0.004360  0.019755
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.00517962 0.00009003  57.530 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.00021474 0.00048100   0.446               0.6
55
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007112 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  3.111e-05,  Adjusted R-squared:  -0.000125
## F-statistic: 0.1993 on 1 and 6406 DF,  p-value: 0.6553

LPM_BFC_PosPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_PosPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0747 -0.0747 -0.0463 -0.0133  3.6855
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.074665   0.002681  27.849 < 0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.302275   0.065387  -4.623           0.000003
86
```

```
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2065 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.003325,   Adjusted R-squared:  0.003169
## F-statistic: 21.37 on 1 and 6406 DF,  p-value: 0.000003859

summary(LPM_SFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.023676 -0.005027 -0.005027  0.004254  0.019907
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                0.00502734 0.00009203  54.628 < 0.0000000000000
002
## log(PosPerf_BelAspT_1 + 1) 0.01424670 0.00224447   6.347       0.000000000
234
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.007089 on 6406 degrees of freedom
##   (1419 observations deleted due to missingness)
## Multiple R-squared:  0.00625,    Adjusted R-squared:  0.006095
## F-statistic: 40.29 on 1 and 6406 DF,  p-value: 0.0000000002339

#LPM_BFC_NegPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_CEO_Data)
#LPM_SFC_NegPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BFC_NegPerf_AboAsp)
#summary(LPM_SFC_NegPerf_AboAsp)

LPM_BFC_NegPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_CEO_Data)
LPM_SFC_NegPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_CEO_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1636 -0.0606 -0.0606 -0.0121  3.6738
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.060630   0.002770  21.888 < 0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.022279   0.004847  -4.596            0.00000
44
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1914 on 5445 degrees of freedom
##   (2380 observations deleted due to missingness)
## Multiple R-squared:  0.003865,   Adjusted R-squared:  0.003682
## F-statistic: 21.13 on 1 and 5445 DF,  p-value: 0.0000044
```

```
summary(LPM_SFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_CEO_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.005707 -0.005707 -0.004162  0.004722  0.020942
##
## Coefficients:
##                               Estimate Std. Error t value
Pr(>|t|)
## (Intercept)                 0.0057068  0.0001041  54.839 <
0.0000000000000002
## log(NegPerf_BelAspT_1 + 1) 0.0007075  0.0001821   3.885
0.000104
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.00719 on 5445 degrees of freedom
```

```
##   (2380 observations deleted due to missingness)
## Multiple R-squared:  0.002764,   Adjusted R-squared:  0.002581
## F-statistic: 15.09 on 1 and 5445 DF,  p-
```

10.4 10.4 Full Data (H1 & H2)

2. Loading Dataset

```
Compustat <- read_xlsx("data/Compustat_SIC_2000_3999.xlsx")

#changing column names
colnames(Compustat) <- c("Company_ID",  "Data_Date",    "Fiscal_Year",  "Indu
stry Format",  "Level of Consolidation - Company Annual Descriptor",   "Popul
ation Source",    "Data Format",  "Ticker Symbol",    "CUSIP",    "Company Na
me", "ISO_Currency_Code",    "Current Assets - Total",   "Acquisitions", "Ass
ets_Total", "Equity_Total", "Cash", "Long-Term Debt - Total",   "Dividends Co
mmon/Ordinary",    "Dividends - Preferred/Preference", "Dividends - Total",
"EBIT", "Earnings Before Interest", "Employees",    "Inventories_Total",    "
Current Liabilities - Total",  "Liabilities and Stockholders Equity - Total",
"Liabilities_Total",    "Net_Income",   "PPE_Total_Gross",  "Property, Plant,
and Equipment - Buildings (Net)", "PPE_Total_Net",    "Retained Earnings",
"Revenue - Total",  "SalesTurnover",    "Stockholders Equity - Parent", "Stoc
kholders Equity - Total",  "Interest Expense - Total (Financial Services)",
"Deferred Taxes (Balance Sheet)",   "Income Taxes - Deferred",  "Income Taxes
Paid",    "Income Taxes - Total", "Working Capital (Balance Sheet)",  "Advert
ising_Expense",  "Interest and Related Expense - Total", "RD_Expense",   "Res
earch & Development - Prior",   "SGA_Expense",  "Active/Inactive Status Marke
r",    "Market_Value_Total_Fiscal",    "Company Legal Name",   "North America
n Industry Classification Code",  "Standard_Industry_Classification_Code",
"Company Initial Public Offering Date")
```

Choose Manufactoring Industry (SIC 2000-3999)

```
Compustat$Standard_Industry_Classification_Code <- as.numeric(Compustat$Stand
ard_Industry_Classification_Code)# changind SIC to "numeric"
Compustat <- Compustat %>% filter(Standard_Industry_Classification_Code %in%
(2000:3999))

# Removing companies listed in CAD
Compustat<- Compustat[Compustat$ISO_Currency_Code == "USD", ]

table(is.na(Compustat$"Fiscal_Year")) # Eliminate 44 NA´s in the Fiscal Years

##
## FALSE  TRUE
## 97746    44

Compustat <- Compustat %>% drop_na(Fiscal_Year)
```

```
Compustat$Company_ID <- as.numeric(Compustat$Company_ID)# changind ID to "num
eric"

str(Compustat$Company_ID)

##  num [1:97746] 1009 1009 1009 1009 1009 ...

str(Compustat$Fiscal_Year)

##  num [1:97746] 1990 1991 1992 1993 1994 ...

P_Data <- pdata.frame(Compustat, index=c("Company_ID", "Fiscal_Year")) #Creat
e Panel Data
```

---

2. Creating Strategic Change Variables

STRATEGIC CHANGE:

```
P_Data$"adv_intens" <- as.numeric(P_Data$Advertising_Expense / P_Data$SalesTu
rnover)
P_Data$"RD_intens" <- as.numeric(P_Data$RD_Expense / P_Data$SalesTurnover)
P_Data$"plant_equip" <- as.numeric(P_Data$PPE_Total_Net / P_Data$PPE_Total_Gr
oss)
P_Data$"nonprod_overhead" <- as.numeric(P_Data$SGA_Expense / P_Data$SalesTurn
over)
P_Data$"invent_lev" <- as.numeric(P_Data$Inventories_Total / P_Data$SalesTurn
over)
P_Data$"fin_leverage" <- as.numeric(P_Data$Liabilities_Total / P_Data$Equity_
Total)

P_Data$"adv_intens_diff" <- as.numeric(P_Data$adv_intens - plm::lag(P_Data$ad
v_intens, k = 1, default = NA, order_by = NULL))
P_Data$"RD_intens_diff" <- as.numeric(P_Data$RD_intens - plm::lag(P_Data$RD_i
ntens, k = 1, default = NA, order_by = NULL))
P_Data$"plant_equip_diff" <- as.numeric(P_Data$plant_equip - plm::lag(P_Data$
plant_equip, k = 1, default = NA, order_by = NULL))
P_Data$"nonprod_overhead_diff" <- as.numeric(P_Data$nonprod_overhead - plm::l
ag(P_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL))
P_Data$"invent_lev_diff" <- as.numeric(P_Data$invent_lev - plm::lag(P_Data$in
vent_lev , k = 1, default = NA, order_by = NULL))
P_Data$"fin_leverage_diff" <- as.numeric(P_Data$fin_leverage - plm::lag(P_Dat
a$fin_leverage , order_by = NULL))

P_Data$"pct_adv_intens_diff" <- as.numeric((P_Data$adv_intens - plm::lag(P_Da
ta$adv_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_Data$adv_int
ens, k = 1, default = NA, order_by = NULL))
P_Data$"pct_RD_intens_diff" <- as.numeric((P_Data$RD_intens - plm::lag(P_Data
$RD_intens, k = 1, default = NA, order_by = NULL))/plm::lag(P_Data$RD_intens,
k = 1, default = NA, order_by = NULL))
P_Data$"pct_plant_equip_diff" <- as.numeric((P_Data$plant_equip - plm::lag(P_
Data$plant_equip, k = 1, default = NA, order_by = NULL))/plm::lag(P_Data$plan
t_equip, k = 1, default = NA, order_by = NULL))
P_Data$"pct_nonprod_overhead_diff" <- as.numeric((P_Data$nonprod_overhead - p
lm::lag(P_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL))/lead
(P_Data$nonprod_overhead , k = 1, default = NA, order_by = NULL))
```

```
P_Data$"pct_invent_lev_diff" <- as.numeric((P_Data$invent_lev - plm::lag(P_Da
ta$invent_lev , k = 1, default = NA, order_by = NULL))/plm::lag(P_Data$invent
_lev , k = 1, default = NA, order_by = NULL))
P_Data$"pct_fin_leverage_diff" <- as.numeric((P_Data$fin_leverage - plm::lag(
P_Data$fin_leverage , order_by = NULL))/plm::lag(P_Data$fin_leverage , order_
by = NULL))
```

Replace Inf. and NAN values:

```
P_Data[sapply(P_Data, is.nan)] <- NA
P_Data[sapply(P_Data, is.infinite)] <- NA
```

Standardizing -> I standardize the absolute values (mean=0, standard deviation=1)

```
P_Data$"stand_adv" <- (P_Data$pct_adv_intens_diff - mean(na.omit(P_Data$pct_a
dv_intens_diff))) / sd(na.omit(P_Data$pct_adv_intens_diff))
P_Data$"stand_RD" <- (P_Data$pct_RD_intens_diff - mean(na.omit(P_Data$pct_RD_
intens_diff))) / sd(na.omit(P_Data$pct_RD_intens_diff))
P_Data$"stand_plant" <- (P_Data$pct_plant_equip_diff - mean(na.omit(P_Data$pc
t_plant_equip_diff))) / sd(na.omit(P_Data$pct_plant_equip_diff))
P_Data$"stand_nonprod" <- (P_Data$pct_nonprod_overhead_diff - mean(na.omit(P_
Data$pct_nonprod_overhead_diff))) / sd(na.omit(P_Data$pct_nonprod_overhead_di
ff))
P_Data$"stand_invent" <- (P_Data$pct_invent_lev_diff - mean(na.omit(P_Data$pc
t_invent_lev_diff))) / sd(na.omit(P_Data$pct_invent_lev_diff))
P_Data$"stand_fin" <- (P_Data$pct_fin_leverage_diff - mean(na.omit(P_Data$pct
_fin_leverage_diff))) / sd(na.omit(P_Data$pct_fin_leverage_diff))
```

Check MEAN & SD

```
mean(P_Data$stand_adv,na.rm=TRUE)

## [1] 0.00000000000000000001710623

mean(P_Data$stand_RD,na.rm=TRUE)

## [1] -0.00000000000000000206892

mean(P_Data$stand_plant,na.rm=TRUE)

## [1] -0.00000000000000000730288

mean(P_Data$stand_nonprod,na.rm=TRUE)

## [1] -0.00000000000000001323412

mean(P_Data$stand_invent,na.rm=TRUE)

## [1] -0.00000000000000001397768

mean(P_Data$stand_fin,na.rm=TRUE)

## [1] -0.00000000000000002144746

sd(na.omit(P_Data$stand_adv))

## [1] 1
```

```
sd(na.omit(P_Data$stand_RD))
```

```
## [1] 1
```

```
sd(na.omit(P_Data$stand_plant))
```

```
## [1] 1
```

```
sd(na.omit(P_Data$stand_nonprod))
```

```
## [1] 1
```

```
sd(na.omit(P_Data$stand_invent))
```

```
## [1] 1
```

```
sd(na.omit(P_Data$stand_fin))
```

```
## [1] 1
```

Check nr. of NA´s

```
table(is.na(P_Data$"stand_adv"))
```

```
##
## FALSE  TRUE
## 23656 74090
```

```
table(is.na(P_Data$"stand_RD"))
```

```
##
## FALSE  TRUE
## 56684 41062
```

```
table(is.na(P_Data$"stand_plant"))
```

```
##
## FALSE  TRUE
## 81346 16400
```

```
table(is.na(P_Data$"stand_nonprod"))
```

```
##
## FALSE  TRUE
## 63058 34688
```

```
table(is.na(P_Data$"stand_invent"))
```

```
##
## FALSE  TRUE
## 71980 25766
```

```
table(is.na(P_Data$"stand_fin"))
```

```
##
## FALSE  TRUE
## 84066 13680
```

Standardized Advertising has a lot of NA´s! Since there are too many missing observations, I will create a robustness check, where I omit “stand_adv” in developing the strategic change variable. (-> see “robustness check”)

To create the SC variable I need the absolute values

```
P_Data$"abs_stand_adv" <- abs(P_Data$stand_adv)
P_Data$"abs_stand_RD" <- abs(P_Data$stand_RD)
P_Data$"abs_stand_plant" <- abs(P_Data$stand_plant)
P_Data$"abs_stand_nonprod" <- abs(P_Data$stand_nonprod)
P_Data$"abs_stand_invent" <- abs(P_Data$stand_invent)
P_Data$"abs_stand_fin" <- abs(P_Data$stand_fin)
```

Now I can finally create the Strategic change variable:

```
P_Data$strat_change <- (P_Data$"abs_stand_adv" + P_Data$"abs_stand_RD" + P_Da
ta$"abs_stand_plant" + P_Data$"abs_stand_nonprod" + P_Data$"abs_stand_invent"
+ P_Data$"abs_stand_fin") / 6

P_Data$strat_change2 <- (P_Data$"abs_stand_RD" + P_Data$"abs_stand_plant" + P
_Data$"abs_stand_nonprod" + P_Data$"abs_stand_invent" + P_Data$"abs_stand_fin
") / 5 #robustness check
```

I compare both strat_change variables and see, that omitting the “stand_adv” variable saves me from a lot additional NA´s (-> but I still have 17K observations)

```
table(is.na(P_Data$"strat_change"))

##
## FALSE  TRUE
## 14957 82789

table(is.na(P_Data$"strat_change2")) #for robustness check

##
## FALSE  TRUE
## 43401 54345
```

Assumption check for normal distribution of the data:

I perform the Shapiro-Wilk normality test to check whether the dependent variables follow a normal distribution or not.

H0: he dependent variable follows the normal distribution H1: the dependent variable does not follow a normal distribution If the p value of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from a normal distribution.

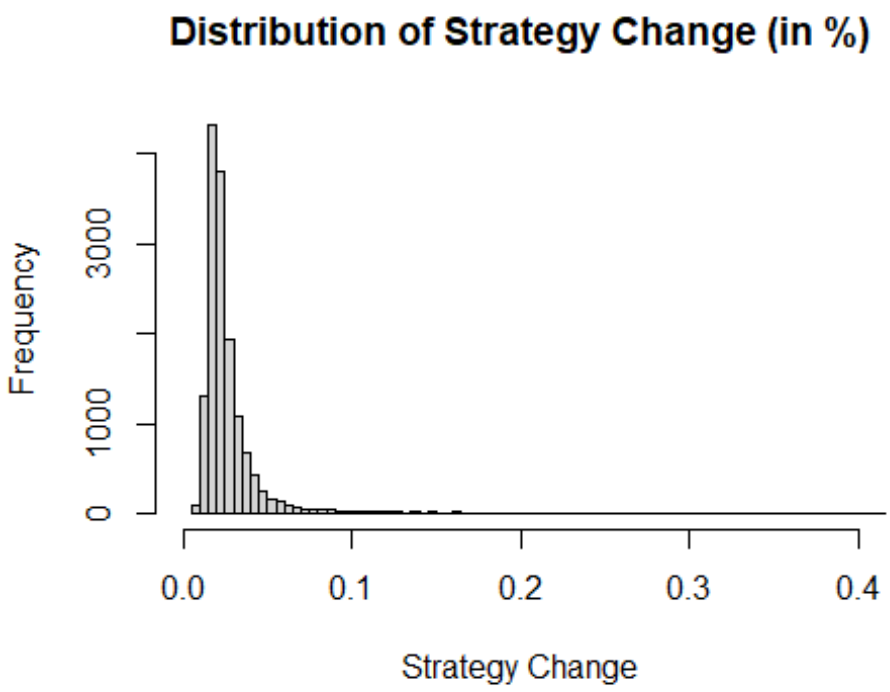
```
#saphiroSC <- shapiro.test(P_Data$strat_change)
#saphiroSC # see result of strat_change test

#saphiroAI <- shapiro.test(P_Data$adv_intens)
#saphiroAI # see result of performance test

#saphiroRD <- shapiro.test(P_Data$RD_intens)
#saphiroRD # see result of performance test
```

```
#saphiroPE <- shapiro.test(P_Data$plant_equip)
#saphiroPE # see result of performance test

#saphiroNPO <- shapiro.test(P_Data$nonprod_overhead)
#saphiroNPO # see result of performance test

#saphiroIL <- shapiro.test(P_Data$invent_lev)
#saphiroIL # see result of performance test

#saphiroFL <- shapiro.test(P_Data$fin_leverage)
#saphiroFL # see result of performance test
```

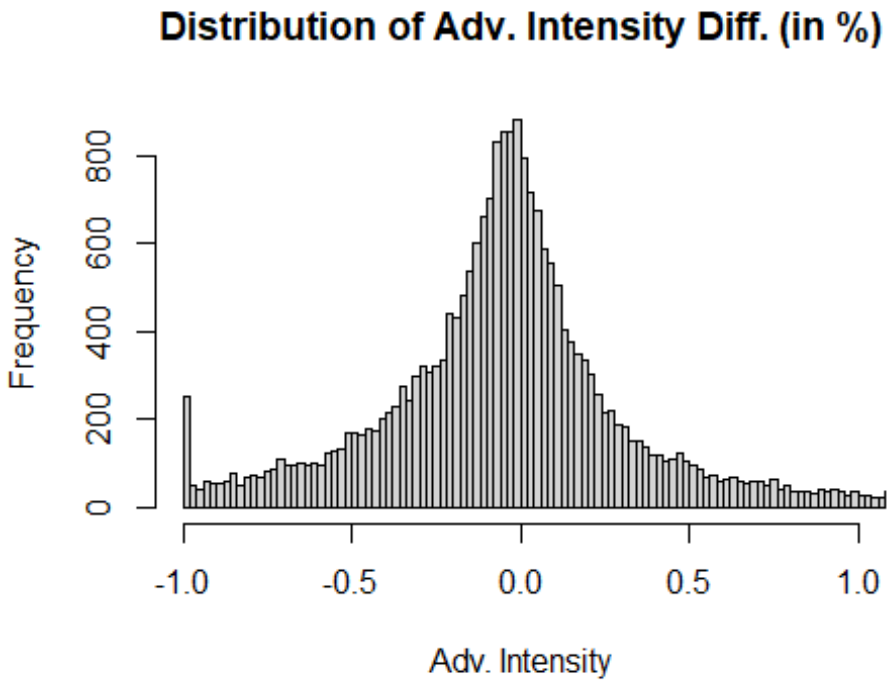
cannot do it because I have too many observations -> max. 5000 observations

In the Histogram below, it can be observed that the variables do not always follow a normal distribution, but almost every time it approaches a normal distribution. In

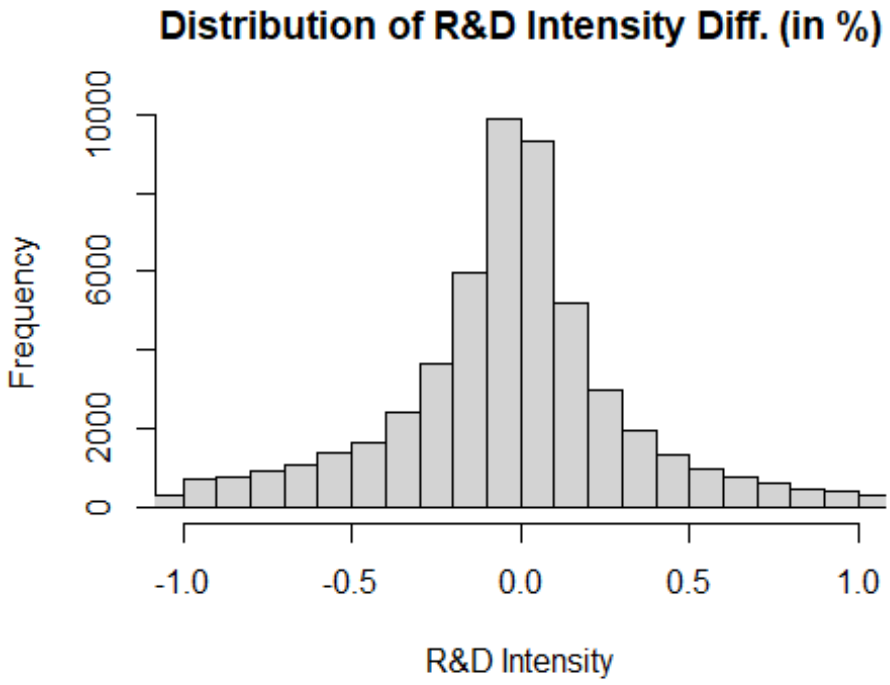
```
hist(P_Data$strat_change , breaks =(8000), main="Distribution of Strategy Cha
nge (in %)", xlab="Strategy Change", xlim = c(0,0.4))
```



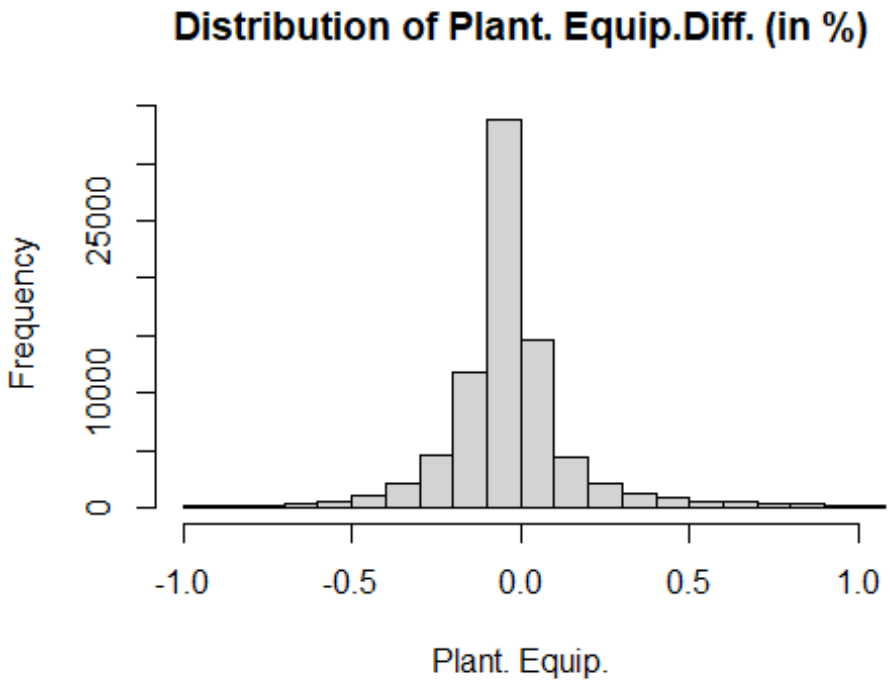

```
hist(P_Data$pct_adv_intens_diff , breaks =(40000), main="Distribution of Adv.
Intensity Diff. (in %)", xlab="Adv. Intensity", xlim = c(-1,1))
```



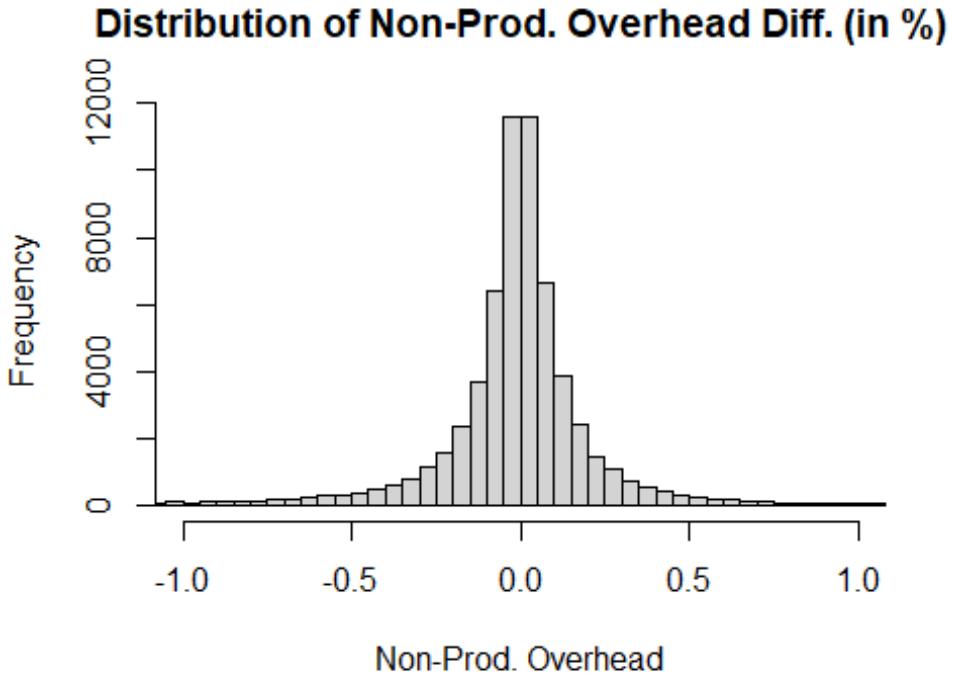

```
hist(P_Data$pct_RD_intens_diff , breaks =(250000), main="Distribution of R&D
Intensity Diff. (in %)", xlab="R&D Intensity", xlim = c(-1,1))
```



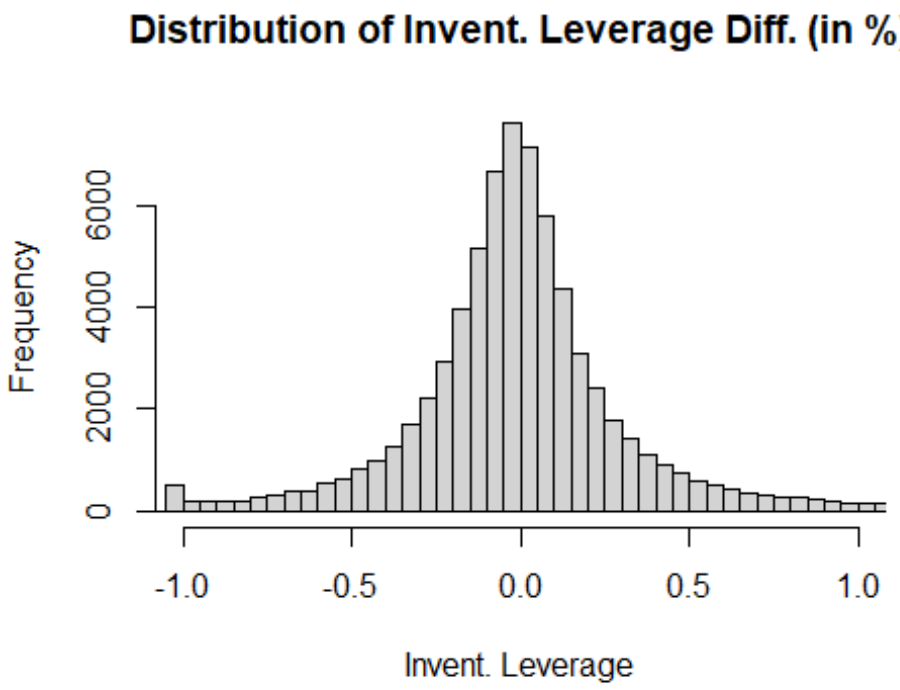

```
hist(P_Data$pct_plant_equip_diff , breaks =(25000), main="Distribution of Pla
nt. Equip.Diff. (in %)", xlab="Plant. Equip.", xlim = c(-1,1))
```



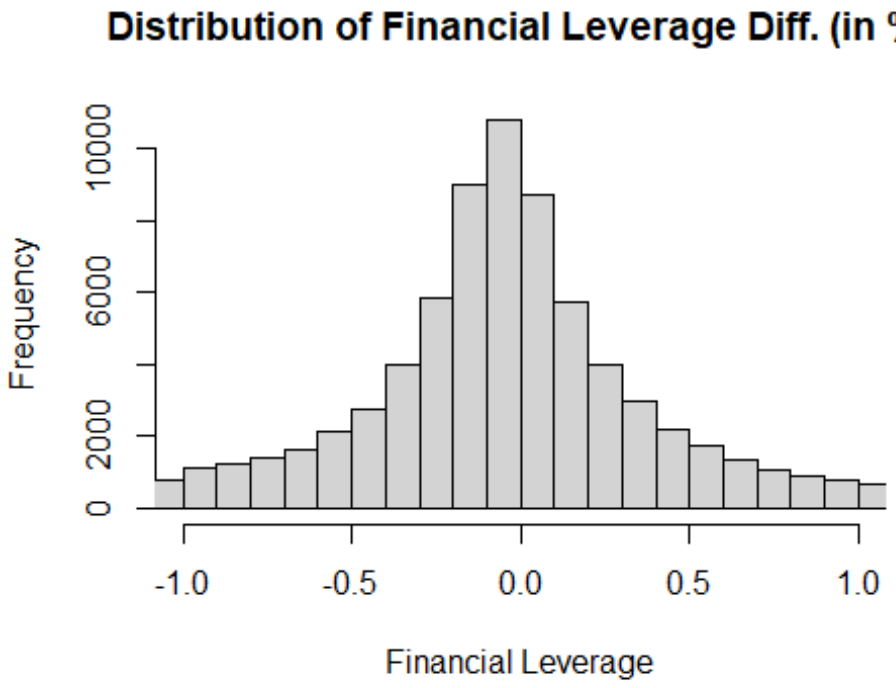

```
#par(mfrow=c(2,2)) # init 4 charts in 1 panel

hist(P_Data$pct_nonprod_overhead_diff , breaks =(60000), main="Distribution o
f Non-Prod. Overhead Diff. (in %)", xlab="Non-Prod. Overhead", xlim = c(-1,1)
)
```



```
hist(P_Data$pct_invent_lev_diff , breaks =(60000), main="Distribution of Inve
nt. Leverage Diff. (in %)", xlab="Invent. Leverage", xlim = c(-1,1))
```




```
hist(P_Data$pct_fin_leverage_diff , breaks =(100000), main="Distribution of F
inancial Leverage Diff. (in %)", xlab="Financial Leverage", xlim = c(-1,1))
```



I use the positive and negative median of the strategy changes (=differences) to determine if a strategy change is small or big

```
tapply(P_Data$strat_change, ifelse(P_Data$strat_change > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.02191204
```

```
tapply(P_Data$pct_adv_intens_diff, ifelse(P_Data$pct_adv_intens_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1847728  0.2005835
```

```
tapply(P_Data$pct_RD_intens_diff, ifelse(P_Data$pct_RD_intens_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1701778  0.1856465
```

```
tapply(P_Data$pct_plant_equip_diff, ifelse(P_Data$pct_plant_equip_diff > 0, 'positive', 'negative'), median) # median
```

```
##    negative    positive
## -0.07500827  0.08340642
```

```
tapply(P_Data$pct_nonprod_overhead_diff, ifelse(P_Data$pct_nonprod_overhead_diff > 0, 'positive', 'negative'), median) # median
```

```
##    negative    positive
## -0.08208986  0.07496642
```

```
tapply(P_Data$pct_invent_lev_diff, ifelse(P_Data$pct_invent_lev_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.1410250  0.1517726
```

```
tapply(P_Data$pct_fin_leverage_diff, ifelse(P_Data$pct_fin_leverage_diff > 0, 'positive', 'negative'), median) # median
```

```
##   negative   positive
## -0.2476345  0.3205636
```

```
#also using the absolute (not standardized values) would be good
```

Big Strategic Change:

```
P_Data <- P_Data %>% mutate( BV_big_strat_change = case_when (
                             strat_change >= 0.05379924 ~ 1,
                             strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_Data <- P_Data %>% mutate( BV_small_strat_change = case_when (
                             strat_change >= 0.05379924 ~ 0,
                             strat_change < 0.05379924 ~ 1))
```

Big Adv. Change:

```
P_Data <- P_Data %>% mutate( BV_big_adv_change = case_when (
                              pct_adv_intens_diff <= -0.2465952 ~ 1,
                              pct_adv_intens_diff >= 0.3758354 ~ 1,
                              pct_adv_intens_diff > -0.2465952 ~ 0,
                              pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Adv. Change

```
P_Data <- P_Data %>% mutate( BV_small_adv_change = case_when (
                              pct_adv_intens_diff <= -0.2465952 ~ 0,
                              pct_adv_intens_diff >= 0.3758354 ~ 0,
                              pct_adv_intens_diff > -0.2465952 ~ 1,
                              pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Positive Adv. Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_adv_change = case_when (
                              pct_adv_intens_diff >= 0.3758354 ~ 1,
                              pct_adv_intens_diff < 0.3758354 ~ 0))
```

Small Positive Adv. Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_adv_change = case_when (
                              pct_adv_intens_diff <= 0 ~ 0,
                              pct_adv_intens_diff >= 0.3758354 ~ 0,
                              pct_adv_intens_diff < 0.3758354 ~ 1))
```

Big Negative Adv. Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_adv_change = case_when (
                              pct_adv_intens_diff <= -0.2465952 ~ 1,
                              pct_adv_intens_diff > -0.2465952 ~ 0))
```

Small Negative Adv. Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_adv_change = case_when (
                              pct_adv_intens_diff >= 0 ~ 0,
                              pct_adv_intens_diff <= -0.2465952 ~ 0,
                              pct_adv_intens_diff > -0.2465952 ~ 1))
```

Big R&D. Change:

```
P_Data <- P_Data %>% mutate( BV_big_rd_change = case_when (
                              pct_RD_intens_diff <= -0.2982761 ~ 1,
                              pct_RD_intens_diff >= 0.3519554 ~ 1,
                              pct_RD_intens_diff > -0.2982761 ~ 0,
                              pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small R&D. Change

```
P_Data <- P_Data %>% mutate( BV_small_rd_change = case_when (
                             pct_RD_intens_diff <= -0.2982761 ~ 0,
                             pct_RD_intens_diff >= 0.3519554 ~ 0,
                             pct_RD_intens_diff > -0.2982761 ~ 1,
                             pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Positive R&D. Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_rd_change = case_when (
                             pct_RD_intens_diff >= 0.3519554 ~ 1,
                             pct_RD_intens_diff < 0.3519554 ~ 0))
```

Small Positive R&D. Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_rd_change = case_when (
                             pct_RD_intens_diff <= 0 ~ 0,
                             pct_RD_intens_diff >= 0.3519554 ~ 0,
                             pct_RD_intens_diff < 0.3519554 ~ 1))
```

Big Negative R&D. Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_rd_change = case_when (
                             pct_RD_intens_diff <= -0.2982761 ~ 1,
                             pct_RD_intens_diff > -0.2982761 ~ 0))
```

Small Negative R&D. Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_rd_change = case_when (
                             P_Data$pct_RD_intens_diff >= 0 ~ 0,
                             P_Data$pct_RD_intens_diff <= -0.2982761 ~ 0,
                             P_Data$pct_RD_intens_diff > -0.2982761 ~ 1))
```

Big Plant Change:

```
P_Data <- P_Data %>% mutate( BV_big_plant_change = case_when (
                             P_Data$pct_plant_equip_diff <= -0.0920045 ~ 1,
                             P_Data$pct_plant_equip_diff >= 0.1110405  ~ 1,
                             P_Data$pct_plant_equip_diff > -0.0920045 ~ 0,
                             P_Data$pct_plant_equip_diff < 0.1110405  ~ 0))
```

Small Plant Change

```
P_Data <- P_Data %>% mutate( BV_small_plant_change = case_when (
                             P_Data$pct_plant_equip_diff <= -0.0920045 ~ 0,
                             P_Data$pct_plant_equip_diff >= 0.1110405  ~ 0,
                             P_Data$pct_plant_equip_diff > -0.0920045 ~ 1,
                             P_Data$pct_plant_equip_diff < 0.1110405  ~ 1))
```

Big Positive Plant Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_plant_change = case_when (
                             P_Data$pct_plant_equip_diff >= 0.1110405  ~ 1,
                             P_Data$pct_plant_equip_diff < 0.1110405  ~ 0))
```

Small Positive Plant Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_plant_change = case_when (
                              P_Data$pct_plant_equip_diff <= 0 ~ 0,
                              P_Data$pct_plant_equip_diff >= 0.1110405  ~ 0,
                              P_Data$pct_plant_equip_diff < 0.1110405  ~ 1))
```

Big Negative Plant Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_plant_change = case_when (
                              P_Data$pct_plant_equip_diff <= -0.0920045 ~ 1,
                              P_Data$pct_plant_equip_diff > -0.0920045 ~ 0))
```

Small Negative Plant Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_plant_change = case_when (
                              P_Data$pct_plant_equip_diff >= 0 ~ 0,
                              P_Data$pct_plant_equip_diff <= -0.0920045 ~ 0,
                              P_Data$pct_plant_equip_diff > -0.0920045 ~ 1))
```

Big Non-Prod. Change:

```
P_Data <- P_Data %>% mutate( BV_big_nonprod_change = case_when (
                              P_Data$pct_nonprod_overhead_diff <= -0.1142313
~ 1,
                              P_Data$pct_nonprod_overhead_diff >= 0.0932076
~ 1,
                              P_Data$pct_nonprod_overhead_diff > -0.1142313 ~
0,
                              P_Data$pct_nonprod_overhead_diff < 0.0932076  ~
0))
```

Small Non-Prod. Change

```
P_Data <- P_Data %>% mutate( BV_small_nonprod_change = case_when (
                              P_Data$pct_nonprod_overhead_diff <= -0.1142313
~ 0,
                              P_Data$pct_nonprod_overhead_diff >= 0.0932076
~ 0,
                              P_Data$pct_nonprod_overhead_diff > -0.1142313 ~
1,
                              P_Data$pct_nonprod_overhead_diff < 0.0932076  ~
1))
```

Big Positive Non-Prod. Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_nonprod_change = case_when (
                              P_Data$pct_nonprod_overhead_diff >= 0.0932076
~ 1,
                              P_Data$pct_nonprod_overhead_diff < 0.0932076  ~
0))
```

Small Positive Non-Prod. Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_nonprod_change = case_when (
                              P_Data$pct_nonprod_overhead_diff <= 0 ~ 0,
```

```
                                P_Data$pct_nonprod_overhead_diff >= 0.0932076
~ 0,
                                P_Data$pct_nonprod_overhead_diff < 0.0932076  ~
1))
```

Big Negative Non-Prod. Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_nonprod_change = case_when (
                                P_Data$pct_nonprod_overhead_diff <= -0.1142313
~ 1,
                                P_Data$pct_nonprod_overhead_diff > -0.1142313 ~
0))
```

Small Negative Non-Prod. Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_nonprod_change = case_when (
                                P_Data$pct_nonprod_overhead_diff >= 0 ~ 0,
                                P_Data$pct_nonprod_overhead_diff <= -0.1142313
~ 0,
                                P_Data$pct_nonprod_overhead_diff > -0.1142313 ~
1))
```

Big Inventory Change

```
P_Data <- P_Data %>% mutate( BV_big_invent_change = case_when (
                                P_Data$pct_invent_lev_diff <= -0.2112387 ~ 1,
                                P_Data$pct_invent_lev_diff >= 0.2100990 ~ 1,
                                P_Data$pct_invent_lev_diff > -0.2112387 ~ 0,
                                P_Data$pct_invent_lev_diff < 0.2100990 ~ 0))
```

Small Invent. Change

```
P_Data <- P_Data %>% mutate( BV_small_invent_change = case_when (
                                P_Data$pct_invent_lev_diff <= -0.2112387 ~ 0,
                                P_Data$pct_invent_lev_diff >= 0.2100990 ~ 0,
                                P_Data$pct_invent_lev_diff > -0.2112387 ~ 1,
                                P_Data$pct_invent_lev_diff < 0.2100990 ~ 1))
```

Big Positive Invent. Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_invent_change = case_when (
                                P_Data$pct_invent_lev_diff >= 0.2100990 ~ 1,
                                P_Data$pct_invent_lev_diff < 0.2100990 ~ 0))
```

Small Positive Invent. Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_invent_change = case_when (
                                P_Data$pct_invent_lev_diff <= 0 ~ 0,
                                P_Data$pct_invent_lev_diff >= 0.2100990 ~ 0,
                                P_Data$pct_invent_lev_diff < 0.2100990 ~ 1))
```

Big Negative Invent. Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_invent_change = case_when (
                             P_Data$pct_invent_lev_diff <= -0.2112387 ~ 1,
                             P_Data$pct_invent_lev_diff > -0.2112387 ~ 0))
```

Small Negative Invent. Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_invent_change = case_when (
                             P_Data$pct_invent_lev_diff >= 0 ~ 0,
                             P_Data$pct_invent_lev_diff <= -0.2112387 ~ 0,
                             P_Data$pct_invent_lev_diff > -0.2112387 ~ 1))
```

Big Fin. Change:

```
P_Data <- P_Data %>% mutate( BV_big_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff <= -0.3880235 ~ 1,
                             P_Data$pct_fin_leverage_diff >= 0.5415713  ~ 1,
                             P_Data$pct_fin_leverage_diff > -0.3880235 ~ 0,
                             P_Data$pct_fin_leverage_diff < 0.5415713  ~ 0))
```

Small Fin. Change

```
P_Data <- P_Data %>% mutate( BV_small_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff <= -0.3880235 ~ 0,
                             P_Data$pct_fin_leverage_diff >= 0.5415713  ~ 0,
                             P_Data$pct_fin_leverage_diff > -0.3880235 ~ 1,
                             P_Data$pct_fin_leverage_diff < 0.5415713  ~ 1))
```

Big Positive Fin. Change:

```
P_Data <- P_Data %>% mutate( BV_big_pos_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff >= 0.5415713  ~ 1,
                             P_Data$pct_fin_leverage_diff < 0.5415713  ~ 0))
```

Small Positive Fin. Change

```
P_Data <- P_Data %>% mutate( BV_small_pos_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff <= 0 ~ 0,
                             P_Data$pct_fin_leverage_diff >= 0.5415713  ~ 0,
                             P_Data$pct_fin_leverage_diff < 0.5415713  ~ 1))
```

Big Negative Fin. Change:

```
P_Data <- P_Data %>% mutate( BV_big_neg_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff <= -0.3880235 ~ 1,
                             P_Data$pct_fin_leverage_diff > -0.3880235 ~ 0))
```

Small Negative Fin. Change

```
P_Data <- P_Data %>% mutate( BV_small_neg_fin_change = case_when (
                             P_Data$pct_fin_leverage_diff >= 0 ~ 0,
                             P_Data$pct_fin_leverage_diff <= -0.3880235 ~ 0,
                             P_Data$pct_fin_leverage_diff > -0.3880235 ~ 1))
```

Continuous Variables:

```
tapply(P_Data$strat_change, ifelse(P_Data$strat_change > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.02191204
```

```
tapply(P_Data$abs_stand_adv, ifelse(P_Data$abs_stand_adv > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.05753418
```

```
tapply(P_Data$abs_stand_RD, ifelse(P_Data$abs_stand_RD > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.01403551
```

```
tapply(P_Data$abs_stand_plant, ifelse(P_Data$abs_stand_plant > 0, 'positive', 'negative'), median) # median
```

```
##  positive
## 0.0154293
```

```
tapply(P_Data$abs_stand_nonprod, ifelse(P_Data$abs_stand_nonprod > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.01634275
```

```
tapply(P_Data$abs_stand_invent, ifelse(P_Data$abs_stand_invent > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.01938806
```

```
tapply(P_Data$abs_stand_fin, ifelse(P_Data$abs_stand_fin > 0, 'positive', 'negative'), median) # median
```

```
##   positive
## 0.00658389
```

Big Strategic Change:

```
P_Data <- P_Data %>% mutate( big_strat_change = case_when (
                              strat_change >= 0.05379924 ~ strat_change,
                              strat_change < 0.05379924 ~ 0))
```

Small Strategic Change

```
P_Data <- P_Data %>% mutate( small_strat_change = case_when (
                              strat_change >= 0.05379924 ~ 0,
                              strat_change < 0.05379924 ~ strat_change))
```

Big Adv. Change:

```
P_Data$"big_adv_change" <- ifelse(P_Data$abs_stand_adv >= 0.07193945, P_Data$
abs_stand_adv, 0)
```

Small Adv. Change

```
P_Data$"small_adv_change" <- ifelse(P_Data$abs_stand_adv <= 0.07193945, P_Dat
a$abs_stand_adv, 0)
```

Big R&D Change:

```
P_Data$"big_RD_change" <- ifelse(P_Data$abs_stand_RD >= 0.03553555, P_Data$ab
s_stand_RD, 0)
```

Small R&D Change

```
P_Data$"small_RD_change" <- ifelse(P_Data$abs_stand_RD <= 0.03553555, P_Data$
abs_stand_RD, 0)
```

Big Plant. Change:

```
P_Data$"big_plant_change" <- ifelse(P_Data$abs_stand_plant >= 0.08998155, P_D
ata$abs_stand_plant, 0)
```

Small Plant Change

```
P_Data$"small_plant_change" <- ifelse(P_Data$abs_stand_plant <= 0.08998155, P
_Data$abs_stand_plant, 0)
```

Big Nonprod Change:

```
P_Data$"big_nonprod_change" <- ifelse(P_Data$abs_stand_nonprod >= 0.04249124,
P_Data$abs_stand_nonprod, 0)
```

Small Nonprod Change

```
P_Data$"small_nonprod_change" <- ifelse(P_Data$abs_stand_nonprod <= 0.0424912
4, P_Data$abs_stand_nonprod, 0)
```

Big invent Change:

```
P_Data$"big_invent_change" <- ifelse(P_Data$abs_stand_invent >= 0.07927686, P
_Data$abs_stand_invent, 0)
```

Small invent. Change

```
P_Data$"small_invent_change" <- ifelse(P_Data$abs_stand_invent <= 0.07927686,
P_Data$abs_stand_invent, 0)
```

Big fin Change:

```
P_Data$"big_fin_change" <- ifelse(P_Data$abs_stand_fin >= 0.02525311, P_Data$
abs_stand_fin, 0)
```

Small fin. Change

```
P_Data$"small_fin_change" <- ifelse(P_Data$abs_stand_fin <= 0.02525311, P_Dat
a$abs_stand_fin, 0)
```

---

2. Creating PF Variables

PerformanceROA = Return on Assets: net income / total assets (-> as %)

```
P_Data$"ROA_Performance" <- P_Data$Net_Income / P_Data$Assets_Total

psych::describe(P_Data$ROA_Performance)

##    vars     n mean  sd median trimmed  mad  min max range skew kurtosis  s
e
## X1    1 92746  NaN NaN   0.01   -0.08 0.13 -Inf Inf   Inf  NaN      NaN Na
N

#eliminating Inf & NAN
P_Data$ROA_Performance[sapply(P_Data$ROA_Performance, is.nan)] <- NA
P_Data$ROA_Performance[sapply(P_Data$ROA_Performance, is.infinite)] <- NA

psych::describe(P_Data$ROA_Performance) # -> to eliminate NAN and INF and out
liers

##    vars     n  mean     sd median trimmed  mad      min  max   range   ske
w
## X1    1 92548 -2.71 154.44   0.01   -0.08 0.13 -29700.5 1827 31527.5 -141.
7
##    kurtosis   se
## X1 24093.27 0.51

P_Data <- P_Data %>%
    group_by(Company_ID) %>%
     mutate(ROA_PerformanceT_1 = dplyr::lag(ROA_Performance, n = 1, default =
NA))



P_Data <- P_Data %>%
  group_by(Company_ID) %>%
    mutate(Strat_ChangeT.1 = dplyr::lead(strat_change, n = 1, default = NA))


class(P_Data) # what type of dataset is it

## [1] "grouped_df" "tbl_df"     "tbl"        "data.frame"
```

```
P_Data <- pdata.frame(P_Data, index=c("Company_ID", "Fiscal_Year")) #Create P
anel Data
class(P_Data) # what type of dataset is it

## [1] "pdata.frame" "data.frame"
```

ASPIRED PERFORMANCE FEEDBACK:

HAit = α * Pit + (1 - α) * HAit-1

Creating Variable fur HA

```
P_Data$asp_perf_fb_0 <- P_Data$ROA_PerformanceT_1
P_Data$asp_perf_fb_1 <- (0.1*P_Data$ROA_Performance)+(0.9*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_2 <- (0.2*P_Data$ROA_Performance)+(0.8*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_3 <- (0.3*P_Data$ROA_Performance)+(0.7*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_4 <- (0.4*P_Data$ROA_Performance)+(0.6*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_5 <- (0.5*P_Data$ROA_Performance)+(0.5*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_6 <- (0.6*P_Data$ROA_Performance)+(0.4*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_7 <- (0.7*P_Data$ROA_Performance)+(0.3*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_8 <- (0.8*P_Data$ROA_Performance)+(0.2*P_Data$ROA_Performa
nceT_1)
P_Data$asp_perf_fb_9 <- (0.9*P_Data$ROA_Performance)+(0.1*P_Data$ROA_Performa
nceT_1)
```

+++ Check the best Alpha before continuing!

```
αModel0 <- lm(strat_change ~ asp_perf_fb_0, data = P_Data)
αModel1 <- lm(strat_change ~ asp_perf_fb_1, data = P_Data)
αModel2 <- lm(strat_change ~ asp_perf_fb_2, data = P_Data)
αModel3 <- lm(strat_change ~ asp_perf_fb_3, data = P_Data)
αModel4 <- lm(strat_change ~ asp_perf_fb_4, data = P_Data)
αModel5 <- lm(strat_change ~ asp_perf_fb_5, data = P_Data)
αModel6 <- lm(strat_change ~ asp_perf_fb_6, data = P_Data)
αModel7 <- lm(strat_change ~ asp_perf_fb_7, data = P_Data)
αModel8 <- lm(strat_change ~ asp_perf_fb_8, data = P_Data)
αModel9 <- lm(strat_change ~ asp_perf_fb_9, data = P_Data)

summary(αModel0)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_0, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3519 -0.0166 -0.0131 -0.0066 24.6638
##
```

```
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035051   0.002050  17.098 < 0.0000000000000002 ***
## asp_perf_fb_0 -0.009890   0.002537  -3.899            0.0000971 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14953 degrees of freedom
##   (82791 observations deleted due to missingness)
## Multiple R-squared:  0.001015,   Adjusted R-squared:  0.0009487
## F-statistic:  15.2 on 1 and 14953 DF,  p-value: 0.00009712

summary(αModel1)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3235 -0.0166 -0.0130 -0.0066 24.6643
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035038   0.002051  17.086 < 0.0000000000000002 ***
## asp_perf_fb_1 -0.009842   0.002534  -3.884             0.000103 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.001008,   Adjusted R-squared:  0.000941
## F-statistic: 15.08 on 1 and 14952 DF,  p-value: 0.0001033

summary(αModel2)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_2, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3563 -0.0166 -0.0131 -0.0066 24.6649
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035065   0.002051  17.100 < 0.0000000000000002 ***
## asp_perf_fb_2 -0.009352   0.002474  -3.781             0.000157 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.000955,   Adjusted R-squared:  0.0008882
## F-statistic: 14.29 on 1 and 14952 DF,  p-value: 0.0001571
```

```
summary(αModel3)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_3, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4123 -0.0167 -0.0132 -0.0066 24.6655
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035126   0.002050  17.135 < 0.0000000000000002 ***
## asp_perf_fb_3 -0.008538   0.002367  -3.607              0.00031 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0008695,  Adjusted R-squared:  0.0008027
## F-statistic: 13.01 on 1 and 14952 DF,  p-value: 0.0003105

summary(αModel4)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_4, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4416 -0.0168 -0.0133 -0.0066 24.6661
##
## Coefficients:
##                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.035206   0.002049   17.18 <0.0000000000000002 ***
## asp_perf_fb_4 -0.007563   0.002231   -3.39               0.0007 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0007681,  Adjusted R-squared:  0.0007013
## F-statistic: 11.49 on 1 and 14952 DF,  p-value: 0.0007002

summary(αModel5)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_5, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4492 -0.0169 -0.0134 -0.0066 24.6665
##
## Coefficients:
```

```
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035292   0.002048  17.231 < 0.0000000000000002 ***
## asp_perf_fb_5 -0.006567   0.002082  -3.155              0.00161 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2491 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0006651,  Adjusted R-squared:  0.0005983
## F-statistic: 9.952 on 1 and 14952 DF,  p-value: 0.00161
```

```
summary(αModel6)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_6, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4417 -0.0170 -0.0135 -0.0066 24.6669
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035375   0.002047  17.280 < 0.0000000000000002 ***
## asp_perf_fb_6 -0.005640   0.001932  -2.919              0.00351 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2492 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0005696,  Adjusted R-squared:  0.0005028
## F-statistic: 8.522 on 1 and 14952 DF,  p-value: 0.003514
```

```
summary(αModel7)
```

```
##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_7, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4250 -0.0171 -0.0135 -0.0066 24.6672
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.035449   0.002046  17.325 < 0.0000000000000002 ***
## asp_perf_fb_7 -0.004822   0.001789  -2.695              0.00704 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2492 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0004857,  Adjusted R-squared:  0.0004189
## F-statistic: 7.266 on 1 and 14952 DF,  p-value: 0.007036
```

```
summary(αModel8)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_8, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4036 -0.0172 -0.0136 -0.0066 24.6674
##
## Coefficients:
##                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.035514   0.002045  17.364 <0.0000000000000002 ***
## asp_perf_fb_8 -0.004124   0.001657  -2.489              0.0128 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2492 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0004142,  Adjusted R-squared:  0.0003473
## F-statistic: 6.195 on 1 and 14952 DF,  p-value: 0.01282

summary(αModel9)

##
## Call:
## lm(formula = strat_change ~ asp_perf_fb_9, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3802 -0.0173 -0.0137 -0.0066 24.6676
##
## Coefficients:
##                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.035570   0.002044  17.398 <0.0000000000000002 ***
## asp_perf_fb_9 -0.003536   0.001536  -2.302              0.0214 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2492 on 14952 degrees of freedom
##   (82792 observations deleted due to missingness)
## Multiple R-squared:  0.0003542,  Adjusted R-squared:  0.0002874
## F-statistic: 5.298 on 1 and 14952 DF,  p-value: 0.02136
```

α=0.0 gives the best Adj. R2 results

Robustness check:

```
αModel1R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_1, data = P_Data) #Strate_Change
T.1 = lead(strat_change)
αModel2R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_2, data = P_Data)
αModel3R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_3, data = P_Data)
αModel4R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_4, data = P_Data)
αModel5R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_5, data = P_Data)
αModel6R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_6, data = P_Data)
```

```
αModel7R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_7, data = P_Data)
αModel8R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_8, data = P_Data)
αModel9R <- lm(Strat_ChangeT.1 ~ asp_perf_fb_9, data = P_Data)
αModel10R <- lm(Strat_ChangeT.1 ~ ROA_Performance, data = P_Data)

summary(αModel1R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3172 -0.0166 -0.0130 -0.0061 24.6678
##
## Coefficients:
##                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.034793   0.002189  15.894 <0.0000000000000002 ***
## asp_perf_fb_1 -0.004231   0.001898  -2.228              0.0259 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0003638,  Adjusted R-squared:  0.0002906
## F-statistic: 4.966 on 1 and 13643 DF,  p-value: 0.02587

summary(αModel2R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_2, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3311 -0.0165 -0.0129 -0.0061 24.6676
##
## Coefficients:
##                Estimate Std. Error t value            Pr(>|t|)
## (Intercept)    0.034730   0.002190  15.859 <0.0000000000000002 ***
## asp_perf_fb_2 -0.004942   0.002049  -2.412              0.0159 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0004261,  Adjusted R-squared:  0.0003529
## F-statistic: 5.816 on 1 and 13643 DF,  p-value: 0.01589

summary(αModel3R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_3, data = P_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3403 -0.0164 -0.0129 -0.0062 24.6673
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034659   0.002191  15.819 < 0.0000000000000002 ***
## asp_perf_fb_3 -0.005764   0.002210  -2.608              0.00912 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0004982,  Adjusted R-squared:  0.000425
## F-statistic: 6.801 on 1 and 13643 DF,  p-value: 0.009122

summary(αModel4R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_4, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3413 -0.0163 -0.0128 -0.0062 24.6669
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034583   0.002192   15.78 < 0.0000000000000002 ***
## asp_perf_fb_4 -0.006675   0.002375   -2.81              0.00496 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0005784,  Adjusted R-squared:  0.0005052
## F-statistic: 7.896 on 1 and 13643 DF,  p-value: 0.004961

summary(αModel5R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_5, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3296 -0.0162 -0.0127 -0.0061 24.6665
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034507   0.002193  15.734 < 0.0000000000000002 ***
## asp_perf_fb_5 -0.007619   0.002535  -3.006              0.00265 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0006619,  Adjusted R-squared:  0.0005886
## F-statistic: 9.036 on 1 and 13643 DF,  p-value: 0.002652

summary(αModel6R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_6, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3007 -0.0161 -0.0126 -0.0061 24.6661
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034441   0.002194  15.699 < 0.0000000000000002 ***
## asp_perf_fb_6 -0.008490   0.002672  -3.177              0.00149 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2547 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0007394,  Adjusted R-squared:  0.0006662
## F-statistic:  10.1 on 1 and 13643 DF,  p-value: 0.00149

summary(αModel7R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_7, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2665 -0.0160 -0.0125 -0.0061 24.6656
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034399   0.002194  15.677 < 0.0000000000000002 ***
## asp_perf_fb_7 -0.009144   0.002770  -3.302              0.000964 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2546 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0007984,  Adjusted R-squared:  0.0007251
## F-statistic:  10.9 on 1 and 13643 DF,  p-value: 0.0009637

summary(αModel8R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_8, data = P_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2950 -0.0160 -0.0125 -0.0062 24.6652
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034391   0.002194  15.675 < 0.0000000000000002 ***
## asp_perf_fb_8 -0.009439   0.002810  -3.359             0.000785 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2546 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0008262,  Adjusted R-squared:  0.0007529
## F-statistic: 11.28 on 1 and 13643 DF,  p-value: 0.0007854

summary(αModel9R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ asp_perf_fb_9, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3112 -0.0160 -0.0125 -0.0062 24.6650
##
## Coefficients:
##                Estimate Std. Error t value             Pr(>|t|)
## (Intercept)    0.034421   0.002193  15.694 < 0.0000000000000002 ***
## asp_perf_fb_9 -0.009303   0.002787  -3.338             0.000845 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2546 on 13643 degrees of freedom
##   (84101 observations deleted due to missingness)
## Multiple R-squared:  0.0008162,  Adjusted R-squared:  0.000743
## F-statistic: 11.14 on 1 and 13643 DF,  p-value: 0.000845

summary(αModel10R)

##
## Call:
## lm(formula = Strat_ChangeT.1 ~ ROA_Performance, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3519 -0.0166 -0.0131 -0.0066 24.6638
##
## Coefficients:
##                  Estimate Std. Error t value             Pr(>|t|)
## (Intercept)      0.035051   0.002050  17.098 < 0.0000000000000002 ***
## ROA_Performance -0.009890   0.002537  -3.899            0.0000971 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.2491 on 14953 degrees of freedom
##   (82791 observations deleted due to missingness)
## Multiple R-squared:  0.001015,   Adjusted R-squared:  0.0009487
## F-statistic:  15.2 on 1 and 14953 DF,  p-value: 0.00009712

P_Data$"neg_perf" <- ifelse(P_Data$ROA_Performance < 0, 1, 0)
```

1 = we have negative performance; 0 = we have not a negative performance (= we have a positive performance)

```
P_Data$"pos_perf" <- ifelse(P_Data$ROA_Performance > 0, 1, 0)
```

1 = we have positive performance; 0 = we have not a positive performance (= we have a negative performance)

```
P_Data <- P_Data %>% mutate(Performance_below_aspiration = case_when (
                        asp_perf_fb_0 >= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_0 < ROA_Performance ~ 0))

P_Data <- P_Data %>% mutate(Performance_above_aspiration = case_when (
                        asp_perf_fb_0 <= ROA_Performance ~ ROA_Performance,
                        asp_perf_fb_0 > ROA_Performance ~ 0))

P_Data <- P_Data %>% mutate( PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate( PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate( NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate( NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
ROA_Performance,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_Data$PosPerf_AboAspT_1 <- plm::lag(P_Data$PosPerf_AboAsp, k = 1, default =
NA, order_by = NULL)
P_Data$PosPerf_BelAspT_1 <- plm::lag(P_Data$PosPerf_BelAsp, k = 1, default =
NA, order_by = NULL)
P_Data$NegPerf_AboAspT_1 <- plm::lag(P_Data$NegPerf_AboAsp, k = 1, default =
NA, order_by = NULL)
```

```
P_Data$NegPerf_BelAspT_1 <- plm::lag(P_Data$NegPerf_BelAsp, k = 1, default =
NA, order_by = NULL)
```

To calculate the PF I create the % difference between the performance and the aspired performance of a company

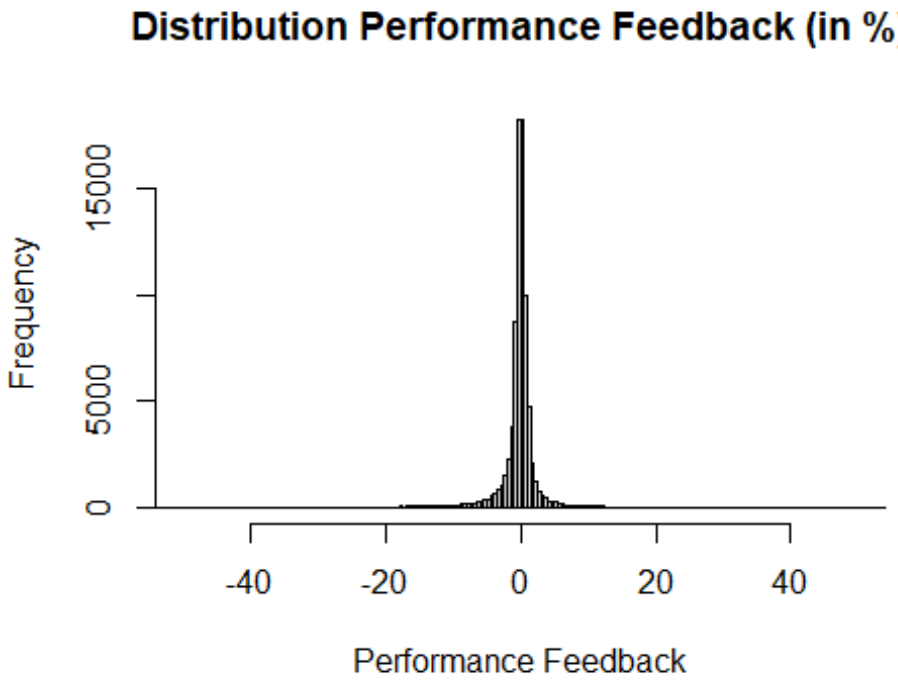
```
P_Data$"pct_PerfFB" <- (P_Data$"ROA_Performance" - P_Data$"asp_perf_fb_0") /a
bs(P_Data$"asp_perf_fb_0")
#eliminating Inf & NAN
P_Data$pct_PerfFB[sapply(P_Data$pct_PerfFB, is.nan)] <- NA
P_Data$pct_PerfFB[sapply(P_Data$pct_PerfFB, is.infinite)] <- NA

#winsorize
#DescTools::Winsorize(P_Data$pct_PerfFB, na.rm = TRUE, probs = c(0.05, 0.95))
P_Data$pct_PerfFB <- DescTools::Winsorize(P_Data$pct_PerfFB, minval = NULL, m
axval = NULL, probs = c(0.001, 0.999),
          na.rm = TRUE, type = 7)



psych::describe(P_Data$pct_PerfFB)

##    vars     n  mean    sd median trimmed  mad    min    max  range   skew
## X1    1 83767 -1.17 16.92  -0.02   -0.07 0.91 -363.4 126.71 490.12 -14.05
##    kurtosis   se
## X1   284.64 0.06

P_Data$"pct_neg_perfFB" <- ifelse(P_Data$pct_PerfFB < 0, P_Data$pct_PerfFB, 0
)
```

Nr. = we have negative performance feedback difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

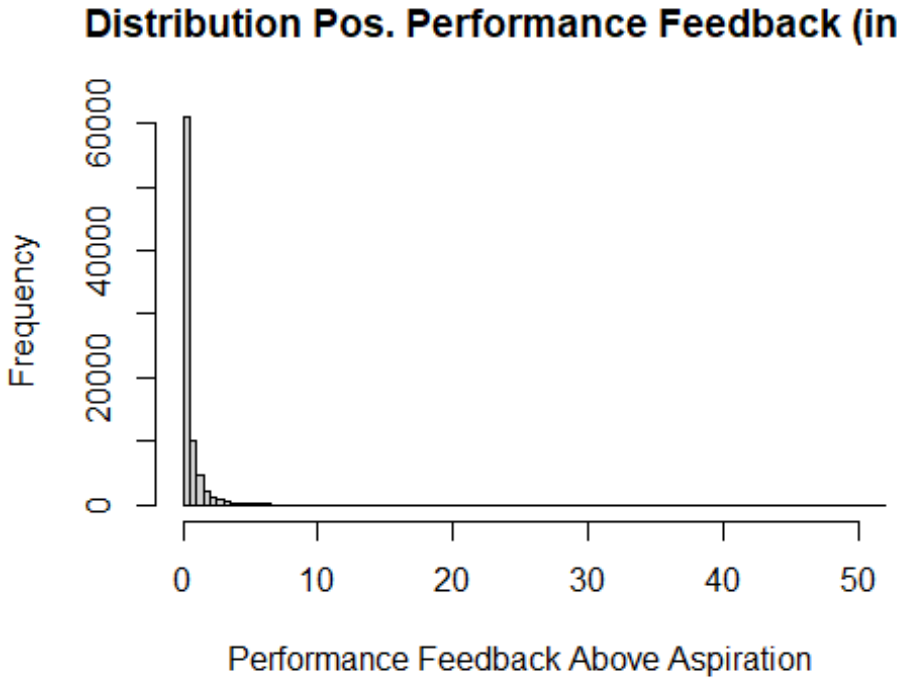
```
P_Data$"pct_pos_perfFB" <- ifelse(P_Data$pct_PerfFB > 0, P_Data$pct_PerfFB, 0
)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

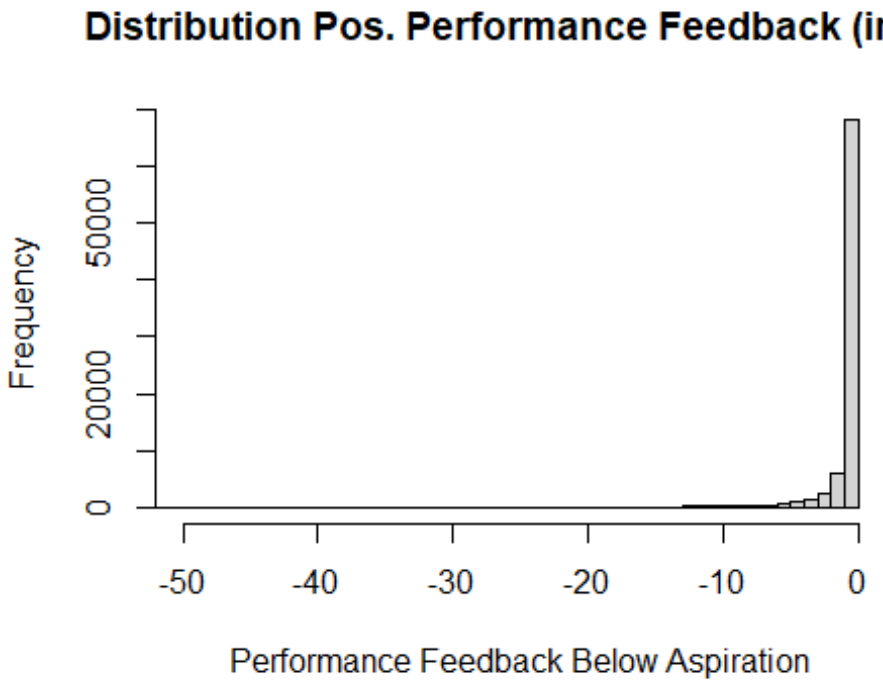
```
#check distribution
hist(P_Data$pct_PerfFB , main="Distribution Performance Feedback (in %)",brea
ks =(800),xlim = c(-50,50), xlab="Performance Feedback")
```




```
hist(P_Data$pct_pos_perfFB , main="Distribution Pos. Performance Feedback (in
%)",breaks =(300),xlim = c(-0,50), xlab="Performance Feedback Above Aspiratio
n")
```




```
hist(P_Data$pct_neg_perfFB , main="Distribution Pos. Performance Feedback (in
%)",breaks =(300),xlim = c(-50,0), xlab="Performance Feedback Below Aspiratio
n")
```




```
P_Data$"pct_Perf_Diff_YoY" <- (P_Data$"ROA_Performance" - P_Data$"ROA_Perform
anceT_1") /abs(P_Data$"ROA_PerformanceT_1")
#eliminating Inf & NAN
P_Data$pct_Perf_Diff_YoY[sapply(P_Data$pct_Perf_Diff_YoY, is.nan)] <- NA
P_Data$pct_Perf_Diff_YoY[sapply(P_Data$pct_Perf_Diff_YoY, is.infinite)] <- NA

psych::describe(P_Data$pct_Perf_Diff_YoY)

##    vars     n  mean      sd median trimmed  mad       min     max    range
skew
## X1    1 83767 -9.32 1856.82  -0.02   -0.07 0.91 -534571.6 1907.74 536479.3
-285
##    kurtosis   se
## X1 82004.13 6.42

P_Data$"pct_neg_perf_YoY" <- ifelse(P_Data$pct_Perf_Diff_YoY < 0, P_Data$pct_
Perf_Diff_YoY, 0)
```

Nr. = we have negative performance difference; 0 = we have not a negative performance difference (= we have a positive performance difference)

```
P_Data$"pct_pos_perf_YoY" <- ifelse(P_Data$pct_Perf_Diff_YoY > 0, P_Data$pct_
Perf_Diff_YoY, 0)
```

Nr. = we have positive performance difference; 0 = we have not a positive performance difference (= we have a negative performance difference)

```
psych::describe(P_Data$pct_neg_perf_YoY)

##    vars     n   mean      sd median trimmed  mad       min max    range
skew
## X1    1 83767 -10.51 1856.74  -0.02   -0.32 0.02 -534571.6   0 534571.6 -2
```

```
85.04
##    kurtosis   se
## X1 82018.27 6.42

#Creating Binary Variables
P_Data <- P_Data %>% mutate(BV_Performance_above_aspiration = case_when (
                        asp_perf_fb_1 <= ROA_Performance ~ 1,
                        asp_perf_fb_1 > ROA_Performance ~ 0))

P_Data <- P_Data %>% mutate(BV_PosPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | pos_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate(BV_PosPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & pos_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | pos_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate(BV_NegPerf_AboAsp = case_when (
                       (Performance_above_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_above_aspiration == 0 | neg_perf != 1)~ 0
))

P_Data <- P_Data %>% mutate(BV_NegPerf_BelAsp = case_when (
                       (Performance_below_aspiration != 0 & neg_perf == 1) ~
1,
                       (Performance_below_aspiration == 0 | neg_perf != 1)~ 0
))

P_Data$BV_PosPerf_AboAspT_1 <- plm::lag(P_Data$BV_PosPerf_AboAsp, k = 1, defa
ult = NA, order_by = NULL)
P_Data$BV_PosPerf_BelAspT_1 <- plm::lag(P_Data$BV_PosPerf_BelAsp, k = 1, defa
ult = NA, order_by = NULL)
P_Data$BV_NegPerf_AboAspT_1 <- plm::lag(P_Data$BV_NegPerf_AboAsp, k = 1, defa
ult = NA, order_by = NULL)
P_Data$BV_NegPerf_BelAspT_1 <- plm::lag(P_Data$BV_NegPerf_BelAsp, k = 1, defa
ult = NA, order_by = NULL)
```

6. Control Variables

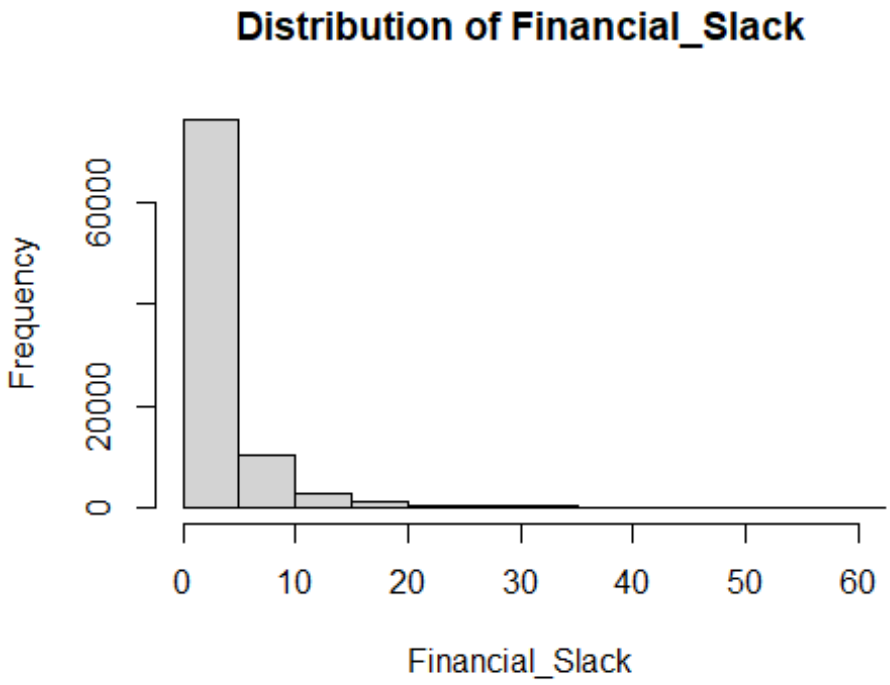
Firm Size: “Employees” -> in K

Financial Slack

```
P_Data$"Financial_Slack" <- as.numeric(P_Data$Current.Assets...Total / P_Data
$Current.Liabilities...Total)
```

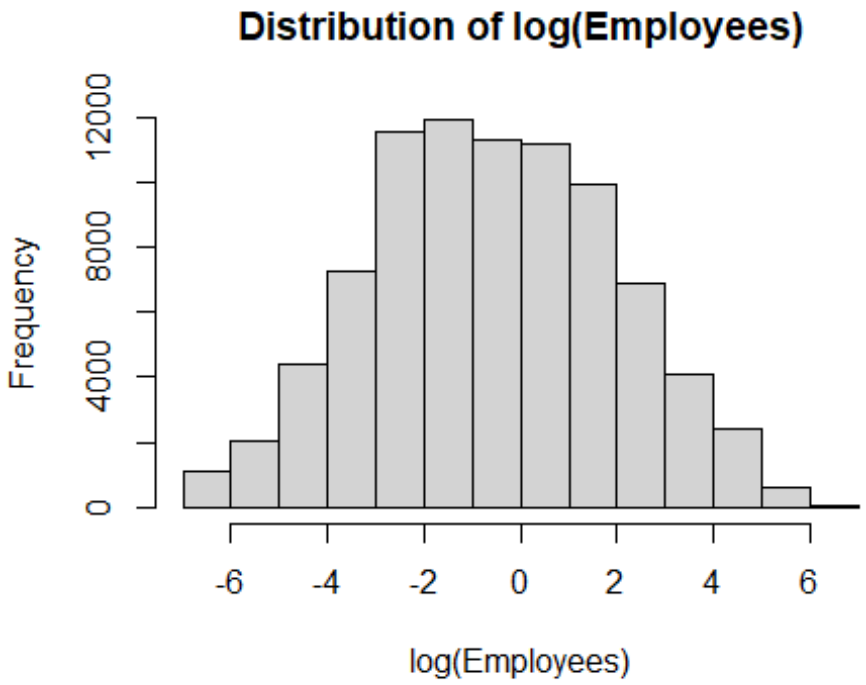
4. Additional Datasets

```
# Deviding in profitable and non-profitable companies:
Data_PosPerf<- P_Data[P_Data$"pos_perf" != 0, ]
Data_NegPerf<- P_Data[P_Data$"neg_perf" != 0, ]

#Deviding into above and below aspiration
Data_PosPerf_AboAsp<- Data_PosPerf[Data_PosPerf$Performance_above_aspiration
!= 0, ]
Data_PosPerf_BelAsp<- Data_PosPerf[Data_PosPerf$Performance_below_aspiration
!= 0, ]
Data_NegPerf_AboAsp<- Data_NegPerf[Data_NegPerf$Performance_above_aspiration
!= 0, ]
Data_NegPerf_BelAsp<- Data_NegPerf[Data_NegPerf$Performance_below_aspiration
!= 0, ]

#eliminating Inf & NAN
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.nan)] <- NA
Data_PosPerf_AboAsp[sapply(Data_PosPerf_AboAsp, is.infinite)] <- NA

Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.nan)] <- NA
Data_PosPerf_BelAsp[sapply(Data_PosPerf_BelAsp, is.infinite)] <- NA

Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.nan)] <- NA
Data_NegPerf_AboAsp[sapply(Data_NegPerf_AboAsp, is.infinite)] <- NA

Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.nan)] <- NA
Data_NegPerf_BelAsp[sapply(Data_NegPerf_BelAsp, is.infinite)] <- NA

#check distribution
hist(P_Data$Financial_Slack , main="Distribution of Financial_Slack", xlab="F
inancial_Slack", breaks =(2000),xlim = c(-0,60))
```




```
hist(P_Data$Employees , main="Distribution of Employees", xlab="Employees", b
reaks =(1000),xlim = c(-0,100))
```

```
hist(log(P_Data$Employees) , main="Distribution of log(Employees)",xlab="log(
Employees)")
```



EXPORT dataset to Excell:

```
#library(writexl)
#write_xlsx(P_Data,"data/CompFinal.xlsx")
```

5. Variables Overview

SC Variables: strategic_change (-> standardized) pct_adv_intens_diff pct_RD_intens_diff pct_plant_equip_diff pct_nonprod_overhead_diff pct_invent_lev_diff pct_fin_leverage_diff

SC Binary Variables: big_strat_change small_strat_change big_pos_strat_change small_pos_strat_change big_neg_strat_change small_neg_strat_change

big_adv_change small_adv_change big_pos_adv_change small_pos_adv_change big_neg_adv_change small_neg_adv_change

big_rd_change small_rd_change big_pos_rd_change small_pos_rd_change big_neg_rd_change small_neg_rd_change

big_plant_change small_plant_change big_pos_plant_change small_pos_plant_change big_neg_plant_change small_neg_plant_change

big_plant_change small_plant_change big_pos_plant_change small_pos_plant_change big_neg_plant_change small_neg_plant_change

big_nonprod_change small_nonprod_change big_pos_nonprod_change small_pos_nonprod_change big_neg_nonprod_change small_neg_nonprod_change

big_nonprod_change small_nonprod_change big_pos_nonprod_change small_pos_nonprod_change big_neg_nonprod_change small_neg_nonprod_change

big_invent_change small_invent_change big_pos_invent_change small_pos_invent_change big_neg_invent_change small_neg_invent_change

big_fin_change small_fin_change big_pos_fin_change small_pos_fin_change big_neg_fin_change small_neg_fin_change

Performance Variables pos_perf neg_perf pct_Perf_Diff pct_pos_perfFB pct_neg_perfFB

pct_PerfFB pct_pos_perfFB pct_neg_perfFB

Performance_above_aspiration Performance_below_aspiration

PosPerf_AboAsp PosPerf_BelAsp NegPerf_AboAsp NegPerf_BelAsp

4. Datasets Overview

P_Data Data_PosPerf Data_NegPerf Data_PosPerf_AboAsp Data_PosPerf_BelAsp Data_NegPerf_AboAsp Data_NegPerf_BelAsp

5. Descriptive Statistics

Assessing the impact of the Perf.FB of both types of companies depending on their profitability level:

SD analysis:

```
sd(Data_PosPerf$strat_change, na.rm = TRUE)

## [1] 0.1381845

sd(Data_NegPerf$strat_change, na.rm = TRUE)

## [1] 0.374181

sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.1355203

sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1417246

sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.6064844

sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1122229
```

Variance Inflation Factors (VIF)

Some companies have 0 employees, so to do log(Emloyees) I need to eliminate them -> (log(-1) returns NaN and log(0) return Inf)

```
psych::describe(P_Data$Employees)
```

```
##    vars     n mean    sd median trimmed  mad min    max  range  skew kurto
sis
## X1    1 85447 7.89 29.45   0.51    1.98 0.74   0 863.82 863.82 10.14   162
.28
##     se
## X1 0.1
```

```
P_Data$"Employees" <- ifelse(P_Data$Employees != 0, P_Data$Employees, NA)
```

```
psych::describe(P_Data$Employees)
```

```
##    vars     n mean    sd median trimmed  mad min    max  range skew kurtos
is
## X1    1 84710 7.96 29.57   0.53    2.02 0.76   0 863.82 863.82 10.1   160.
97
##     se
## X1 0.1
```

```
P_Data[sapply(P_Data, is.nan)] <- NA
P_Data[sapply(P_Data, is.infinite)] <- NA


PLM1 <- lm(strat_change ~  pct_pos_perfFB*pos_perf + pct_neg_perfFB*pos_perf
+ log(Employees) + log(Financial_Slack)  ,data=P_Data)
```

```
regclass::VIF(PLM1)
```

```
##          pct_pos_perfFB                pos_perf          pct_neg_perfFB
##             1242.069926                1.673471                1.038405
##          log(Employees)    log(Financial_Slack) pct_pos_perfFB:pos_perf
##                1.267274                1.106123             1246.010032
## pos_perf:pct_neg_perfFB
##                1.152441
```

```
#CORRELATION MATRIX
# Select columns of interest
Correlation_Data <- P_Data %>%
  select(strat_change, Employees, Financial_Slack, pct_pos_perfFB,  pct_neg_p
erfFB, pos_perf, neg_perf)
```

```
psych::describe(Correlation_Data)
```

```
##                 vars     n  mean    sd median trimmed  mad     min      ma
x
## strat_change       1 14957  0.04  0.25   0.02    0.02 0.01    0.01    24.7
0
## Employees          2 84710  7.96 29.57   0.53    2.02 0.76    0.00   863.8
2
## Financial_Slack    3 92146  3.98 48.36   2.20    2.61 1.51    0.00 13545.0
0
## pct_pos_perfFB     4 83767  0.93  5.56   0.00    0.25 0.00    0.00   126.7
1
## pct_neg_perfFB     5 83767 -2.10 15.86  -0.02   -0.32 0.02 -363.40     0.0
0
## pos_perf           6 92548  0.54  0.50   1.00    0.55 0.00    0.00     1.0
```

```
## neg_perf           7 92548  0.46  0.50   0.00    0.45 0.00    0.00     1.0
0
##                     range   skew kurtosis   se
## strat_change        24.70  72.98  6658.47 0.00
## Employees          863.82  10.10   160.97 0.10
## Financial_Slack  13545.00 245.87 67254.18 0.16
## pct_pos_perfFB     126.71  16.75   333.66 0.02
## pct_neg_perfFB     363.40 -17.65   360.01 0.05
## pos_perf             1.00  -0.15    -1.98 0.00
## neg_perf             1.00   0.15    -1.98 0.00

#cor(Correlation_Data, method = "pearson", use = "complete.obs")
#cor(Correlation_Data, use = "complete.obs")

library(Hmisc)
Correlation_Matrix <- rcorr(as.matrix(Correlation_Data))
Correlation_Matrix

##                 strat_change Employees Financial_Slack pct_pos_perfFB
## strat_change            1.00     -0.02            0.01           0.00
## Employees              -0.02      1.00           -0.01           0.00
## Financial_Slack         0.01     -0.01            1.00           0.01
## pct_pos_perfFB          0.00      0.00            0.01           1.00
## pct_neg_perfFB         -0.01      0.02            0.00           0.02
## pos_perf               -0.05      0.16           -0.01           0.12
## neg_perf                0.05     -0.16            0.01          -0.12
##                 pct_neg_perfFB pos_perf neg_perf
## strat_change             -0.01    -0.05     0.05
## Employees                 0.02     0.16    -0.16
## Financial_Slack           0.00    -0.01     0.01
## pct_pos_perfFB            0.02     0.12    -0.12
## pct_neg_perfFB            1.00     0.13    -0.13
## pos_perf                  0.13     1.00    -1.00
## neg_perf                 -0.13    -1.00     1.00
##
## n
##                 strat_change Employees Financial_Slack pct_pos_perfFB
## strat_change           14957     14532           14865          14953
## Employees              14532     84710           83895          79238
## Financial_Slack        14865     83895           92146          83044
## pct_pos_perfFB         14953     79238           83044          83767
## pct_neg_perfFB         14953     79238           83044          83767
## pos_perf               14956     84451           91679          83767
## neg_perf               14956     84451           91679          83767
##                 pct_neg_perfFB pos_perf neg_perf
## strat_change             14953    14956    14956
## Employees                79238    84451    84451
## Financial_Slack          83044    91679    91679
## pct_pos_perfFB           83767    83767    83767
## pct_neg_perfFB           83767    83767    83767
## pos_perf                 83767    92548    92548
## neg_perf                 83767    92548    92548
##
```

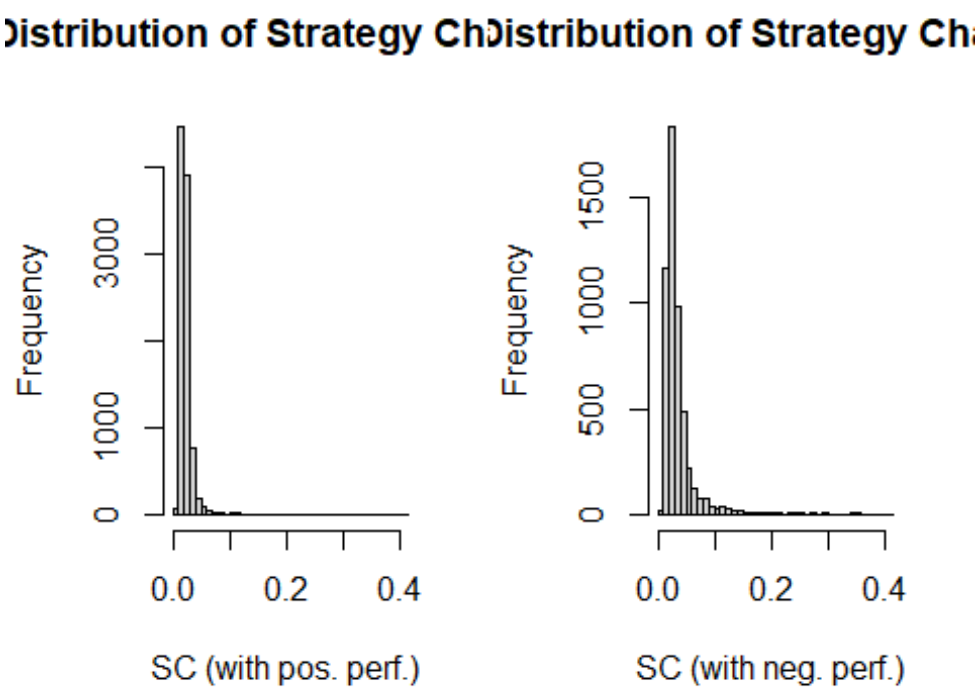
```
## P
##                 strat_change Employees Financial_Slack pct_pos_perfFB
## strat_change                    0.0218          0.4892          0.5555
## Employees       0.0218                          0.0002          0.1719
## Financial_Slack 0.4892       0.0002                             0.0806
## pct_pos_perfFB  0.5555       0.1719          0.0806
## pct_neg_perfFB  0.2173       0.0000          0.7054          0.0000
## pos_perf        0.0000       0.0000          0.0160          0.0000
## neg_perf        0.0000       0.0000          0.0159          0.0000
##                 pct_neg_perfFB pos_perf neg_perf
## strat_change    0.2173           0.0000   0.0000
## Employees       0.0000           0.0000   0.0000
## Financial_Slack 0.7054           0.0160   0.0159
## pct_pos_perfFB  0.0000           0.0000   0.0000
## pct_neg_perfFB                   0.0000   0.0000
## pos_perf        0.0000                    0.0000
## neg_perf        0.0000           0.0000
```

```
#cor.mat <- Correlation_Data %>% cor_mat()
# Significance levels
#cor.mat %>% cor_get_pval()
# Visualize
# Gather/collapse correlation matrix into long format
#cor.mat %>% cor_gather()
```

Here we can see, that companies with a positive performance have a weaker reaction in strategy change (sd=0.117) and that companies with a negative feedback tend to change their strategy more (sd=0.272).

Companies with a neg. performance have tend to have a stronger strategic change.

```
par(mfrow=c(1,2)) # init 2 charts in 1 panel

hist(Data_PosPerf$strat_change , breaks =(1000), main="Distribution of Strate
gy Change", xlab="SC (with pos. perf.)", xlim = c(0,0.4))

hist(Data_NegPerf$strat_change , breaks =(2000), main="Distribution of Strate
gy Change", xlab="SC (with neg. perf.)", xlim = c(0,0.4))
```

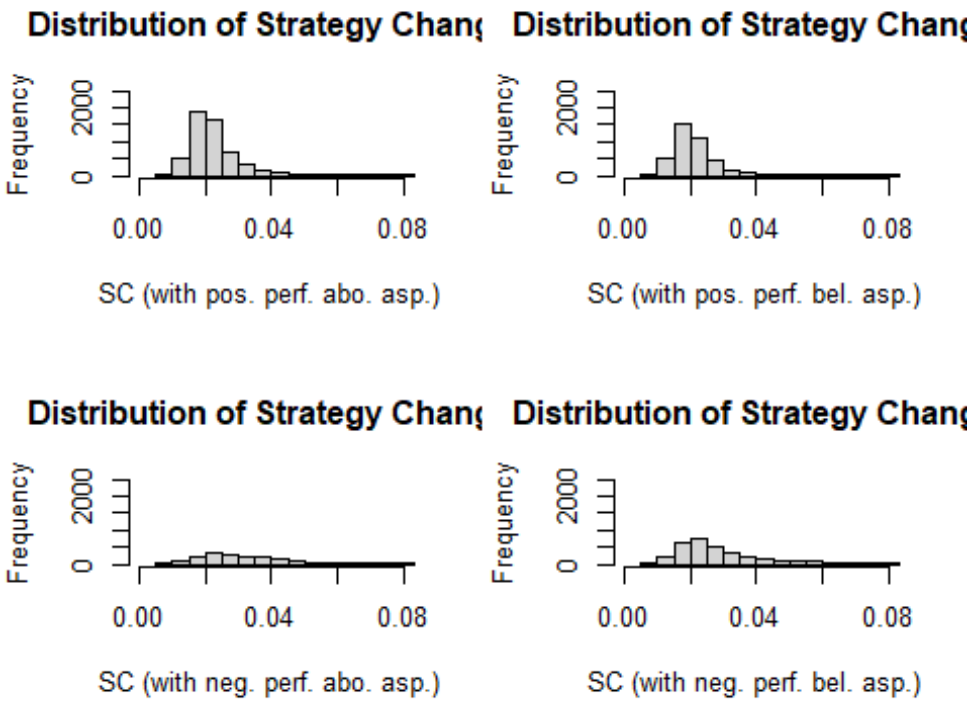



```
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.1355203

sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.6064844

sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1417246

sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1122229

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.1355203

sd(Data_PosPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1417246

sd(Data_NegPerf_AboAsp$strat_change, na.rm = TRUE)

## [1] 0.6064844

sd(Data_NegPerf_BelAsp$strat_change, na.rm = TRUE)

## [1] 0.1122229
```

Here again I can see, that neg. perf. there tend to be a bigger strategic change than with a positive performance

When comparing the implications of the aspiration level, I can see, that companies performing below asp. tend to change their strategy more if compared with companies performing above asp. level. This difference is the highest when the perf. fb. is negative.

```
par(mfrow=c(2,2)) # init 2 charts in 1 panel

hist(Data_PosPerf_AboAsp$strat_change , breaks =(2000), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_PosPerf_BelAsp$strat_change , breaks =(2000), main="Distribution of
Strategy Change", xlab="SC (with pos. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_NegPerf_AboAsp$strat_change , breaks =(4000), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. abo. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))

hist(Data_NegPerf_BelAsp$strat_change , breaks =(1000), main="Distribution of
Strategy Change", xlab="SC (with neg. perf. bel. asp.)", xlim = c(0,0.08), yl
im = c(0,2500))
```



An analysis of SD´s might be interesting also for the values (changes) of the other SC dimensions

```
sd(Data_PosPerf$pct_adv_intens_diff, na.rm = TRUE)

## [1] 6.656683
```

```r
sd(Data_NegPerf$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 9.54718
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 7.518556
```

```r
sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 9.506913
```

```r
sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 5.309032
```

```r
sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 9.573738
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 7.518556
```

```r
sd(Data_PosPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 5.309032
```

```r
sd(Data_NegPerf_AboAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 9.506913
```

```r
sd(Data_NegPerf_BelAsp$pct_adv_intens_diff, na.rm = TRUE)
```

```
## [1] 9.573738
```

```r
sd(Data_PosPerf$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 6.492857
```

```r
sd(Data_NegPerf$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 238.7673
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 7.802233
```

```r
sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 35.11217
```

```r
sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 3.936293
```

```r
sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)
```

```
## [1] 301.7457

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 7.802233

sd(Data_PosPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 3.936293

sd(Data_NegPerf_AboAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 35.11217

sd(Data_NegPerf_BelAsp$pct_RD_intens_diff, na.rm = TRUE)

## [1] 301.7457

sd(Data_PosPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 1.345527

sd(Data_NegPerf$pct_plant_equip_diff, na.rm = TRUE)

## [1] 15.44499

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 1.747066

sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 3.452822

sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 0.2849549

sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 19.34862

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 1.747066

sd(Data_PosPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 0.2849549

sd(Data_NegPerf_AboAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 3.452822

sd(Data_NegPerf_BelAsp$pct_plant_equip_diff, na.rm = TRUE)

## [1] 19.34862
```

```r
sd(Data_PosPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 1.838703
```

```r
sd(Data_NegPerf$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 28.22622
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 2.374267
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 47.52419
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.4137829
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.215137
```

```r
#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 2.374267
```

```r
sd(Data_PosPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 0.4137829
```

```r
sd(Data_NegPerf_AboAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 47.52419
```

```r
sd(Data_NegPerf_BelAsp$pct_nonprod_overhead_diff, na.rm = TRUE)
```

```
## [1] 5.215137
```

```r
sd(Data_PosPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 4.18682
```

```r
sd(Data_NegPerf$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 33.8958
```

```r
#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 1.56404
```

```r
sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 36.45776
```

```r
sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)
```

```
## [1] 6.196321

sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)

## [1] 32.46267

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)

## [1] 1.56404

sd(Data_PosPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)

## [1] 6.196321

sd(Data_NegPerf_AboAsp$pct_invent_lev_diff, na.rm = TRUE)

## [1] 36.45776

sd(Data_NegPerf_BelAsp$pct_invent_lev_diff, na.rm = TRUE)

## [1] 32.46267

sd(Data_PosPerf$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 29.41276

sd(Data_NegPerf$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 59.02656

#Pos. Perf. vs. Neg. Perf. (with same asp. result)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 9.244549

sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 64.87698

sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 44.357

sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 55.25144

#Abo. Asp. vs. Bel. Asp. (with same Perf.)
sd(Data_PosPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 9.244549

sd(Data_PosPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 44.357

sd(Data_NegPerf_AboAsp$pct_fin_leverage_diff, na.rm = TRUE)

## [1] 64.87698
```

```
sd(Data_NegPerf_BelAsp$pct_fin_leverage_diff, na.rm = TRUE)
```

```
## [1] 55.25144
```

6. Statistical Models:

Since I have panel data I use the random/fixed model

FIXED & RANDOM LM of Overall Strategic Change

```
FLM_SC <- plm(plm::lead(strat_change) ~  pct_pos_perfFB*pos_perf + pct_neg_pe
rfFB*pos_perf + log(Financial_Slack) +  log(Employees),data=P_Data, model = "
within") # pos_perf is a binary variable -> interaction model
RLM_SC <- plm(plm::lead(strat_change) ~ pct_pos_perfFB*pos_perf + pct_neg_per
fFB*pos_perf + Financial_Slack + log(Employees),data=P_Data, model = "random"
) # pos_perf is a binary variable -> interaction model vs. split sample model
!

phtest(FLM_SC, RLM_SC) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf + pct_neg_perfF
B *  ...
## chisq = 30.371, df = 6, p-value = 0.00003341
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_SC)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(strat_change) ~ pct_pos_perfFB * pos_perf +
##     pct_neg_perfFB * pos_perf + log(Financial_Slack) + log(Employees),
##     data = P_Data, model = "within")
##
## Unbalanced Panel: n = 1958, T = 1-28, N = 13150
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -4.11107688 -0.00955543 -0.00049136  0.00726284 20.46312875
##
## Coefficients:
##                            Estimate  Std. Error t-value       Pr(>|t|)
## pct_pos_perfFB          -0.02288181  0.01384586 -1.6526        0.09844 .
## pos_perf                -0.00632375  0.00727118 -0.8697        0.38448
## pct_neg_perfFB           0.00012112  0.00016420  0.7376        0.46075
## log(Financial_Slack)    -0.01157887  0.00549730 -2.1063        0.03520 *
## log(Employees)          -0.02980370  0.00516987 -5.7649 0.000000008388 ***
## pct_pos_perfFB:pos_perf  0.02278907  0.01384792  1.6457        0.09986 .
## pos_perf:pct_neg_perfFB  0.00122894  0.01169163  0.1051        0.91629
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Total Sum of Squares:    701.59
## Residual Sum of Squares: 699.09
## R-Squared:      0.0035643
## Adj. R-Squared: -0.1714
## F-statistic: 5.71557 on 7 and 11185 DF, p-value: 0.0000012888
```

ASSUMPTION TESTING:

Testing for heteroskedasticity

I check for heteroskedasticity (=residual analysis) for the models:

Check for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_SC) # Breusch-Pagan test

##
##  studentized Breusch-Pagan test
##
## data:  FLM_SC
## BP = 15.283, df = 7, p-value = 0.03254

coeftest(FLM_SC,vcov=vcovHC(FLM_SC,type="HC0",cluster="group"))

##
## t test of coefficients:
##
##                             Estimate  Std. Error t value Pr(>|t|)
## pct_pos_perfFB          -0.02288181  0.02251592 -1.0163   0.3095
## pos_perf                -0.00632375  0.00660152 -0.9579   0.3381
## pct_neg_perfFB           0.00012112  0.00010332  1.1723   0.2411
## log(Financial_Slack)    -0.01157887  0.01512585 -0.7655   0.4440
## log(Employees)          -0.02980370  0.02351458 -1.2675   0.2050
## pct_pos_perfFB:pos_perf  0.02278907  0.02246164  1.0146   0.3103
## pos_perf:pct_neg_perfFB  0.00122894  0.00463075  0.2654   0.7907

# do it if I have heteroscedasticity!!!!
```

Now I perform the regression for all the other dimensions of SC:

```
P_Data[sapply(P_Data$pct_adv_intens_diff, is.nan)] <- NA
P_Data[sapply(P_Data$pct_adv_intens_diff, is.infinite)] <- NA

FLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "w
ithin") # pos_perf is a binary variable -> interaction model
RLM_AI <- plm(plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "r
andom") # pos_perf is a binary variable -> interaction model vs. split sample
model!

phtest(FLM_AI, RLM_AI) #H0: I should use the random effect panel model

##
##  Hausman Test
```

```
##
## data:  plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 18.713, df = 7, p-value = 0.009135
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_AI)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_adv_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 2941, T = 1-30, N = 20623
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -134.903415   -0.298902   -0.045846    0.169533  513.336634
##
## Coefficients:
##                            Estimate Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.2696811  0.3545955  0.7605 0.446947
## pos_perf                 0.4077469  0.1848270  2.2061 0.027390 *
## pct_neg_perfFB           0.0022183  0.0039999  0.5546 0.579186
## Financial_Slack         -0.0668454  0.0237746 -2.8116 0.004935 **
## log(Employees)          -0.2570179  0.1198919 -2.1437 0.032067 *
## pct_pos_perfFB:pos_perf -0.2754953  0.3546751 -0.7768 0.437314
## pos_perf:pct_neg_perfFB  0.3712728  0.3004673  1.2357 0.216605
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1143500
## Residual Sum of Squares: 1142400
## R-Squared:      0.00095938
## Adj. R-Squared: -0.16561
## F-statistic: 2.42477 on 7 and 17675 DF, p-value: 0.017606
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_AI)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_AI
## BP = 10.241, df = 7, p-value = 0.1753

FLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
eg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "wi
thin") # pos_perf is a binary variable -> interaction model
RLM_RD <- plm(plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB*pos_perf + pct_n
```

```
eg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "ra
ndom") # pos_perf is a binary variable -> interaction model vs. split sample
model!

phtest(FLM_RD, RLM_RD) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB * pos_perf + pct_neg
_perfFB *  ...
## chisq = 56.561, df = 7, p-value = 0.0000000007307
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_RD)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_RD_intens_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 5199, T = 1-30, N = 49769
##
## Residuals:
##        Min.     1st Qu.      Median     3rd Qu.        Max.
## -4570.25928    -1.06289    -0.12214     0.81906 13704.05653
##
## Coefficients:
##                           Estimate Std. Error t-value Pr(>|t|)
## pct_pos_perfFB            3.214884   2.776374  1.1579  0.24689
## pos_perf                  2.283660   1.605772  1.4222  0.15499
## pct_neg_perfFB            0.063842   0.038943  1.6394  0.10115
## Financial_Slack          -0.027689   0.139988 -0.1978  0.84321
## log(Employees)           -2.330153   0.938349 -2.4832  0.01302 *
## pct_pos_perfFB:pos_perf -3.221034   2.777335 -1.1598  0.24615
## pos_perf:pct_neg_perfFB  0.561010   2.815514  0.1993  0.84206
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    549410000
## Residual Sum of Squares: 549250000
## R-Squared:      0.00029042
## Adj. R-Squared: -0.11648
## F-statistic: 1.84939 on 7 and 44563 DF, p-value: 0.073471
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_RD)
```

```
##
##  studentized Breusch-Pagan test
##
## data:  FLM_RD
## BP = 13.939, df = 7, p-value = 0.05227
```

```
FLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "
within") # pos_perf is a binary variable -> interaction model
RLM_PE <- plm(plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB*pos_perf + pct
_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "
random") # pos_perf is a binary variable -> interaction model vs. split sampl
e model!

phtest(FLM_PE, RLM_PE) #H0: I should use the random effect panel model
```

```
##
##  Hausman Test
##
## data:  plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 26.167, df = 7, p-value = 0.0004702
## alternative hypothesis: one model is inconsistent
```

```
#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_PE)
```

```
## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_plant_equip_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 7052, T = 1-30, N = 69534
##
## Residuals:
##         Min.      1st Qu.       Median      3rd Qu.         Max.
## -134.6174104   -0.1712837   -0.0076563    0.1312522 2386.1442589
##
## Coefficients:
##                             Estimate  Std. Error t-value      Pr(>|t|)
## pct_pos_perfFB           0.40606894  0.24278862  1.6725       0.09443 .
## pos_perf                 0.06173759  0.13823704  0.4466       0.65516
## pct_neg_perfFB           0.00029438  0.00329483  0.0893       0.92881
## Financial_Slack         -0.00949534  0.00917949 -1.0344       0.30095
## log(Employees)          -0.41052197  0.07638485 -5.3744 0.00000007712 ***
## pct_pos_perfFB:pos_perf -0.41021295  0.24287590 -1.6890       0.09123 .
## pos_perf:pct_neg_perfFB -0.02848490  0.23875172 -0.1193       0.90503
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    8100200
## Residual Sum of Squares: 8095900
## R-Squared:      0.000531
```

```
## Adj. R-Squared: -0.11238
## F-statistic: 4.74167 on 7 and 62475 DF, p-value: 0.000024464
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_PE)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_PE
## BP = 5.6034, df = 7, p-value = 0.5867

FLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB*pos_perf
+ pct_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, mode
l = "within") # pos_perf is a binary variable -> interaction model
RLM_NPO <- plm(plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB*pos_perf
+ pct_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, mode
l = "random") # pos_perf is a binary variable -> interaction model vs. split
sample model!

phtest(FLM_NPO, RLM_NPO) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB * pos_perf +
...
## chisq = 103.83, df = 7, p-value < 0.00000000000000022
## alternative hypothesis: one model is inconsistent

#Final Models -> BP Test is in all cases significant -> Fixed E. Model
summary(FLM_NPO)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_nonprod_overhead_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 5582, T = 1-29, N = 54752
##
## Residuals:
##           Min.        1st Qu.         Median        3rd Qu.           Max.
## -703.241000429   -0.112303096   -0.000098621    0.126090250  471.326508326
##
## Coefficients:
##                            Estimate  Std. Error t-value     Pr(>|t|)
## pct_pos_perfFB           0.30298807  0.15795634  1.9182     0.055094 .
## pos_perf                 0.20706116  0.07930111  2.6111     0.009029 **
## pct_neg_perfFB           0.00046718  0.00207374  0.2253     0.821759
## Financial_Slack          0.00105743  0.00447580  0.2363     0.813236
```

```
## log(Employees)           0.24644524  0.04804502  5.1295 0.0000002917 ***
## pct_pos_perfFB:pos_perf -0.30285016  0.15798138 -1.9170     0.055244 .
## pos_perf:pct_neg_perfFB  0.01768310  0.13156958  0.1344     0.893086
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1720300
## Residual Sum of Squares: 1719000
## R-Squared:      0.00072111
## Adj. R-Squared: -0.11286
## F-statistic: 5.06823 on 7 and 49163 DF, p-value: 0.0000091378
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_NPO)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_NPO
## BP = 17.016, df = 7, p-value = 0.0173

coeftest(FLM_NPO,vcov=vcovHC(FLM_NPO,type="HC0",cluster="group")) #to correct
the model from heteroscedasticity

##
## t test of coefficients:
##
##                            Estimate  Std. Error t value     Pr(>|t|)
## pct_pos_perfFB           0.30298807  0.19903693  1.5223    0.1279477
## pos_perf                 0.20706116  0.03677698  5.6302 0.0000000181 ***
## pct_neg_perfFB           0.00046718  0.00148737  0.3141    0.7534466
## Financial_Slack          0.00105743  0.00288968  0.3659    0.7144173
## log(Employees)           0.24644524  0.06357217  3.8766    0.0001061 ***
## pct_pos_perfFB:pos_perf -0.30285016  0.19894378 -1.5223    0.1279428
## pos_perf:pct_neg_perfFB  0.01768310  0.01226720  1.4415    0.1494513
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

FLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "w
ithin") # pos_perf is a binary variable -> interaction model
RLM_IL <- plm(plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB*pos_perf + pct_
neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model = "r
andom") # pos_perf is a binary variable -> interaction model vs. split sample
model!

phtest(FLM_IL, RLM_IL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB * pos_perf +  ...
```

```
## chisq = 27.687, df = 7, p-value = 0.0002505
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_IL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_invent_lev_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 6269, T = 1-30, N = 62572
##
## Residuals:
##         Min.      1st Qu.       Median      3rd Qu.         Max.
## -509.6366107   -0.3141886   -0.0073303    0.2773784 3641.1604484
##
## Coefficients:
##                            Estimate Std. Error t-value      Pr(>|t|)
## pct_pos_perfFB           0.1172170  0.5297458  0.2213        0.8249
## pos_perf                 0.2238384  0.2722843  0.8221        0.4110
## pct_neg_perfFB           0.0013613  0.0066242  0.2055        0.8372
## Financial_Slack          0.0119930  0.0346428  0.3462        0.7292
## log(Employees)          -0.8947596  0.1648219 -5.4286 0.00000005702 ***
## pct_pos_perfFB:pos_perf -0.1197108  0.5298757 -0.2259        0.8213
## pos_perf:pct_neg_perfFB  0.0355707  0.4578335  0.0777        0.9381
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    26587000
## Residual Sum of Squares: 26572000
## R-Squared:      0.00055001
## Adj. R-Squared: -0.11085
## F-statistic: 4.42575 on 7 and 56296 DF, p-value: 0.000062888
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_IL)

##
##  studentized Breusch-Pagan test
##
## data:  FLM_IL
## BP = 8.4366, df = 7, p-value = 0.2957

FLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model =
"within") # pos_perf is a binary variable -> interaction model
RLM_FL <- plm(plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB*pos_perf + pc
t_neg_perfFB*pos_perf + Financial_Slack+ log(Employees),data=P_Data, model =
"random") # pos_perf is a binary variable -> interaction model vs. split samp
```

```
le model!

phtest(FLM_FL, RLM_FL) #H0: I should use the random effect panel model

##
##  Hausman Test
##
## data:  plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB * pos_perf +  ...
## chisq = 39.679, df = 7, p-value = 0.00000145
## alternative hypothesis: one model is inconsistent

#Final Models
summary(FLM_FL)

## Oneway (individual) effect Within Model
##
## Call:
## plm(formula = plm::lead(pct_fin_leverage_diff) ~ pct_pos_perfFB *
##     pos_perf + pct_neg_perfFB * pos_perf + Financial_Slack +
##     log(Employees), data = P_Data, model = "within")
##
## Unbalanced Panel: n = 7174, T = 1-30, N = 70814
##
## Residuals:
##         Min.      1st Qu.       Median      3rd Qu.         Max.
## -3074.215142    -0.531560    -0.085586     0.349238  3074.215142
##
## Coefficients:
##                            Estimate Std. Error t-value Pr(>|t|)
## pct_pos_perfFB           0.9284441  0.6078441  1.5274 0.126657
## pos_perf                 0.1309751  0.3524899  0.3716 0.710213
## pct_neg_perfFB           0.0039975  0.0081796  0.4887 0.625048
## Financial_Slack          0.0013534  0.0022352  0.6055 0.544836
## log(Employees)           0.6052227  0.1862492  3.2495 0.001157 **
## pct_pos_perfFB:pos_perf -0.9142434  0.6080684 -1.5035 0.132710
## pos_perf:pct_neg_perfFB  0.0308265  0.6132357  0.0503 0.959908
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    54598000
## Residual Sum of Squares: 54587000
## R-Squared:      0.00021348
## Adj. R-Squared: -0.1126
## F-statistic: 1.94101 on 7 and 63633 DF, p-value: 0.059052
```

ASSUMPTION TESTING:

Testing for heteroskedasticity through: Breusch-Pagan test

```
bptest(FLM_FL)

##
##  studentized Breusch-Pagan test
##
```

```
## data:  FLM_FL
## BP = 11.679, df = 7, p-value = 0.1116
```

9. Linear Probability Models

I use the linear probability model for binary variables (and the log-log model for the elasticities of non-binary variables). In this first part I combine all 4 performance possibilities (positive/negative & above/below aspiration) with all 6 possibilities of strategic change (small/big / positive&big / positive & small / negative & small / negative & big). After that I do the same for every single dimension of strategic change (adv_change/rd_change/plant_change/…)

STRATEGIC CHANGE MODELS

Models with binary DV

Linear Probability Model

```
BV_LPM_BSC_PosPerf_AboAsp <- lm(BV_big_strat_change ~ BV_PosPerf_AboAspT_1, d
ata=P_Data)
BV_LPM_SSC_PosPerf_AboAsp <- lm(BV_small_strat_change ~ BV_PosPerf_AboAspT_1,
data=P_Data)

summary(BV_LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.08196 -0.08196 -0.08196 -0.03482  0.96518
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.081958   0.002581   31.75 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.047133   0.004285  -11.00 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2453 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.008467,   Adjusted R-squared:  0.008397
## F-statistic:   121 on 1 and 14167 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.96518  0.03482  0.08196  0.08196  0.08196
##
```

```
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.918042   0.002581   355.7 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.047133   0.004285    11.0 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2453 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.008467,   Adjusted R-squared:  0.008397
## F-statistic:   121 on 1 and 14167 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BSC_PosPerf_BelAsp <- lm(BV_big_strat_change ~ BV_PosPerf_BelAspT_1, d
ata=P_Data)
BV_LPM_SSC_PosPerf_BelAsp <- lm(BV_small_strat_change ~ BV_PosPerf_BelAspT_1,
data=P_Data)
```

```
summary(BV_LPM_BSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.08016 -0.08016 -0.08016 -0.02315  0.97685
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.080158   0.002406   33.31 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.057012   0.004645  -12.27 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.245 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.01052,    Adjusted R-squared:  0.01045
## F-statistic: 150.6 on 1 and 14167 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.97685  0.02315  0.08016  0.08016  0.08016
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.919842   0.002406  382.28 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.057012   0.004645   12.27 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.245 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.01052,    Adjusted R-squared:  0.01045
## F-statistic: 150.6 on 1 and 14167 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BSC_NegPerf_AboAsp <- lm(BV_big_strat_change ~ BV_NegPerf_AboAspT_1, d
ata=P_Data)
BV_LPM_SSC_NegPerf_AboAsp <- lm(BV_small_strat_change ~ BV_NegPerf_AboAspT_1,
data=P_Data)
```

```
summary(BV_LPM_BSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.14136 -0.04819 -0.04819 -0.04819  0.95181
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.048188   0.002076   23.21 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.093167   0.006028   15.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2342 on 14431 degrees of freedom
##   (83313 observations deleted due to missingness)
## Multiple R-squared:  0.01628,    Adjusted R-squared:  0.01622
## F-statistic: 238.9 on 1 and 14431 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.95181  0.04819  0.04819  0.04819  0.14136
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.951812   0.002076  458.46 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.093167   0.006028  -15.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2342 on 14431 degrees of freedom
##   (83313 observations deleted due to missingness)
## Multiple R-squared:  0.01628,    Adjusted R-squared:  0.01622
## F-statistic: 238.9 on 1 and 14431 DF,  p-value: < 0.00000000000000022
```

```r
BV_LPM_BSC_NegPerf_BelAsp <- lm(BV_big_strat_change ~ BV_NegPerf_BelAspT_1, d
ata=P_Data)
BV_LPM_SSC_NegPerf_BelAsp <- lm(BV_small_strat_change ~ BV_NegPerf_BelAspT_1,
data=P_Data)

summary(BV_LPM_BSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_strat_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.10565 -0.04711 -0.04711 -0.04711  0.95289
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.047107   0.002196   21.45 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.058543   0.004824   12.14 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2349 on 14431 degrees of freedom
##   (83313 observations deleted due to missingness)
## Multiple R-squared:  0.0101, Adjusted R-squared:  0.01003
## F-statistic: 147.3 on 1 and 14431 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_strat_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.95289  0.04711  0.04711  0.04711  0.10565
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.952893   0.002196  433.94 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.058543   0.004824  -12.14 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2349 on 14431 degrees of freedom
##   (83313 observations deleted due to missingness)
## Multiple R-squared:  0.0101, Adjusted R-squared:  0.01003
## F-statistic: 147.3 on 1 and 14431 DF,  p-value: < 0.00000000000000022

BV_LPM_BAC_PosPerf_AboAsp <- lm(BV_big_adv_change ~ BV_PosPerf_AboAspT_1, dat
a=P_Data)
BV_LPM_SAC_PosPerf_AboAsp <- lm(BV_small_adv_change ~ BV_PosPerf_AboAspT_1, d
ata=P_Data)

summary(BV_LPM_BAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4339 -0.4339 -0.2673  0.5661  0.7327
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.433931   0.003960  109.58 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.166628   0.006687  -24.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4777 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.02696,    Adjusted R-squared:  0.02692
## F-statistic:   621 on 1 and 22411 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SAC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7327 -0.5661  0.2673  0.4339  0.4339
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.566069   0.003960  142.95 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.166628   0.006687   24.92 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4777 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.02696,    Adjusted R-squared:  0.02692
## F-statistic:   621 on 1 and 22411 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BAC_PosPerf_BelAsp <- lm(BV_big_adv_change ~ BV_PosPerf_BelAspT_1, dat
a=P_Data)
BV_LPM_SAC_PosPerf_BelAsp <- lm(BV_small_adv_change ~ BV_PosPerf_BelAspT_1, d
ata=P_Data)
```

```
summary(BV_LPM_BAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.4154 -0.4154 -0.2650  0.5846  0.7350
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.415361   0.003738  111.12 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.150344   0.007259  -20.71 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4797 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.01878,    Adjusted R-squared:  0.01874
## F-statistic:   429 on 1 and 22411 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SAC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_adv_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7350 -0.5846  0.2650  0.4154  0.4154
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.584639   0.003738  156.41 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.150344   0.007259   20.71 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4797 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.01878,    Adjusted R-squared:  0.01874
## F-statistic:   429 on 1 and 22411 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BAC_NegPerf_AboAsp <- lm(BV_big_adv_change ~ BV_NegPerf_AboAspT_1, dat
a=P_Data)
BV_LPM_SAC_NegPerf_AboAsp <- lm(BV_small_adv_change ~ BV_NegPerf_AboAspT_1, d
ata=P_Data)
```

```
summary(BV_LPM_BAC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5685 -0.3366 -0.3366  0.6634  0.6634
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.336568   0.003362  100.10 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.231960   0.009656   24.02 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4754 on 22746 degrees of freedom
##   (74998 observations deleted due to missingness)
## Multiple R-squared:  0.02474,    Adjusted R-squared:  0.0247
## F-statistic: 577.1 on 1 and 22746 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SAC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6634 -0.6634  0.3366  0.3366  0.5685
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.663432   0.003362  197.32 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.231960   0.009656  -24.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4754 on 22746 degrees of freedom
##   (74998 observations deleted due to missingness)
## Multiple R-squared:  0.02474,    Adjusted R-squared:  0.0247
## F-statistic: 577.1 on 1 and 22746 DF,  p-value: < 0.00000000000000022

BV_LPM_BAC_NegPerf_BelAsp <- lm(BV_big_adv_change ~ BV_NegPerf_BelAspT_1, dat
a=P_Data)
BV_LPM_SAC_NegPerf_BelAsp <- lm(BV_small_adv_change ~ BV_NegPerf_BelAspT_1, d
ata=P_Data)

summary(BV_LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_adv_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5303 -0.3187 -0.3187  0.4697  0.6813
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.318692   0.003548   89.83 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.211647   0.007610   27.81 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4734 on 22746 degrees of freedom
##   (74998 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.03289,    Adjusted R-squared:  0.03284
## F-statistic: 773.5 on 1 and 22746 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_adv_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6813 -0.4697  0.3187  0.3187  0.5303
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.681308   0.003548  192.04 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.211647   0.007610  -27.81 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4734 on 22746 degrees of freedom
##   (74998 observations deleted due to missingness)
## Multiple R-squared:  0.03289,    Adjusted R-squared:  0.03284
## F-statistic: 773.5 on 1 and 22746 DF,  p-value: < 0.00000000000000022

BV_LPM_BRC_PosPerf_AboAsp <- lm(BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data
=P_Data)
BV_LPM_SRC_PosPerf_AboAsp <- lm(BV_small_rd_change ~ BV_PosPerf_AboAspT_1, da
ta=P_Data)

summary(BV_LPM_BRC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3931 -0.3931 -0.1972  0.6069  0.8028
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.393118   0.002396  164.10 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.195939   0.004256  -46.04 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4617 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.03753,    Adjusted R-squared:  0.03751
## F-statistic:  2120 on 1 and 54365 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SRC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8028 -0.6069  0.1972  0.3931  0.3931
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.606882   0.002396  253.33 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.195939   0.004256   46.04 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4617 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.03753,    Adjusted R-squared:  0.03751
## F-statistic:  2120 on 1 and 54365 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_PosPerf_BelAsp <- lm(BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data
=P_Data)
BV_LPM_SRC_PosPerf_BelAsp <- lm(BV_small_rd_change ~ BV_PosPerf_BelAspT_1, da
ta=P_Data)

summary(BV_LPM_BRC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.3735 -0.3735 -0.1819  0.6264  0.8181
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.373546   0.002255  165.66 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.191690   0.004788  -40.04 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4638 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.02864,    Adjusted R-squared:  0.02862
## F-statistic:  1603 on 1 and 54365 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.8181 -0.6264  0.1819  0.3735  0.3735
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.626454   0.002255  277.82 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.191690   0.004788   40.04 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4638 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.02864,    Adjusted R-squared:  0.02862
## F-statistic:  1603 on 1 and 54365 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_AboAsp <- lm(BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data
=P_Data)
BV_LPM_SRC_NegPerf_AboAsp <- lm(BV_small_rd_change ~ BV_NegPerf_AboAspT_1, da
ta=P_Data)

summary(BV_LPM_BRC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5139 -0.2780 -0.2780  0.4861  0.7220
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.277982   0.002141  129.85 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.235934   0.005336   44.21 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4567 on 54250 degrees of freedom
##   (43494 observations deleted due to missingness)
## Multiple R-squared:  0.03478,    Adjusted R-squared:  0.03476
## F-statistic:  1955 on 1 and 54250 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7220 -0.4861  0.2780  0.2780  0.5139
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.722018   0.002141  337.27 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.235934   0.005336  -44.21 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4567 on 54250 degrees of freedom
##   (43494 observations deleted due to missingness)
## Multiple R-squared:  0.03478,    Adjusted R-squared:  0.03476
## F-statistic:  1955 on 1 and 54250 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BRC_NegPerf_BelAsp <- lm(BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data
=P_Data)
BV_LPM_SRC_NegPerf_BelAsp <- lm(BV_small_rd_change ~ BV_NegPerf_BelAspT_1, da
ta=P_Data)

summary(BV_LPM_BRC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_rd_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4664 -0.2641 -0.2641  0.5336  0.7359
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.264045   0.002273  116.18 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.202329   0.004487   45.09 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4564 on 54250 degrees of freedom
##   (43494 observations deleted due to missingness)
## Multiple R-squared:  0.03613,    Adjusted R-squared:  0.03611
## F-statistic:  2033 on 1 and 54250 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SRC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_rd_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7359 -0.5336  0.2641  0.2641  0.4664
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.735955   0.002273  323.83 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.202329   0.004487  -45.09 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4564 on 54250 degrees of freedom
##   (43494 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.03613,    Adjusted R-squared:  0.03611
## F-statistic:  2033 on 1 and 54250 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_PosPerf_AboAsp <- lm(BV_big_plant_change ~ BV_PosPerf_AboAspT_1, d
ata=P_Data)
BV_LPM_SPC_PosPerf_AboAsp <- lm(BV_small_plant_change ~ BV_PosPerf_AboAspT_1,
data=P_Data)

summary(BV_LPM_BPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4906 -0.4906 -0.2795  0.5094  0.7205
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.490564   0.002107  232.82 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.211029   0.003743  -56.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4843 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.03948,    Adjusted R-squared:  0.03947
## F-statistic:  3179 on 1 and 77334 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7205 -0.5094  0.2795  0.4906  0.4906
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.509436   0.002107  241.78 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.211029   0.003743   56.38 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4843 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.03948,    Adjusted R-squared:  0.03947
## F-statistic:  3179 on 1 and 77334 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_PosPerf_BelAsp <- lm(BV_big_plant_change ~ BV_PosPerf_BelAspT_1, d
ata=P_Data)
BV_LPM_SPC_PosPerf_BelAsp <- lm(BV_small_plant_change ~ BV_PosPerf_BelAspT_1,
```

```
data=P_Data)

summary(BV_LPM_BPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_plant_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4738 -0.4738 -0.2522  0.5262  0.7478
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.473757   0.001984  238.81 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.221582   0.004174  -53.09 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4854 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.03516,    Adjusted R-squared:  0.03515
## F-statistic:  2819 on 1 and 77334 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_plant_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7478 -0.5262  0.2522  0.4738  0.4738
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.526243   0.001984  265.27 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.221582   0.004174   53.09 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4854 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.03516,    Adjusted R-squared:  0.03515
## F-statistic:  2819 on 1 and 77334 DF,  p-value: < 0.00000000000000022

BV_LPM_BPC_NegPerf_AboAsp <- lm(BV_big_plant_change ~ BV_NegPerf_AboAspT_1, d
ata=P_Data)
BV_LPM_SPC_NegPerf_AboAsp <- lm(BV_small_plant_change ~ BV_NegPerf_AboAspT_1,
data=P_Data)

summary(BV_LPM_BPC_NegPerf_AboAsp)

##
## Call:
```

```
## lm(formula = BV_big_plant_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6281 -0.3688 -0.3688  0.6312  0.6312
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.368814   0.001889  195.26 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.259301   0.004835   53.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4826 on 77042 degrees of freedom
##   (20702 observations deleted due to missingness)
## Multiple R-squared:  0.03599,    Adjusted R-squared:  0.03598
## F-statistic:  2876 on 1 and 77042 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6312 -0.6312  0.3688  0.3688  0.6281
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.631186   0.001889  334.17 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.259301   0.004835  -53.63 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4826 on 77042 degrees of freedom
##   (20702 observations deleted due to missingness)
## Multiple R-squared:  0.03599,    Adjusted R-squared:  0.03598
## F-statistic:  2876 on 1 and 77042 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BPC_NegPerf_BelAsp <- lm(BV_big_plant_change ~ BV_NegPerf_BelAspT_1, d
ata=P_Data)
BV_LPM_SPC_NegPerf_BelAsp <- lm(BV_small_plant_change ~ BV_NegPerf_BelAspT_1,
data=P_Data)
```

```
summary(BV_LPM_BPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_plant_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5964 -0.3446 -0.3446  0.6554  0.6554
##
```

```
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.344559   0.001998  172.45 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.251846   0.003969   63.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4792 on 77042 degrees of freedom
##   (20702 observations deleted due to missingness)
## Multiple R-squared:  0.04967,    Adjusted R-squared:  0.04966
## F-statistic:  4027 on 1 and 77042 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_plant_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6554 -0.6554  0.3446  0.3446  0.5964
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.655441   0.001998  328.05 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.251846   0.003969  -63.46 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4792 on 77042 degrees of freedom
##   (20702 observations deleted due to missingness)
## Multiple R-squared:  0.04967,    Adjusted R-squared:  0.04966
## F-statistic:  4027 on 1 and 77042 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_PosPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1
, data=P_Data)
BV_LPM_SNPC_PosPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_AboAspT
_1, data=P_Data)
```

```
summary(BV_LPM_BNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4808 -0.4808 -0.3109  0.5192  0.6891
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.480797   0.002502  192.16 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.169904   0.004136  -41.08 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.4865 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.02752,    Adjusted R-squared:  0.02751
## F-statistic:  1687 on 1 and 59625 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_AboAspT_1,
##     data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6891 -0.5192  0.3109  0.4808  0.4808
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.519203   0.002502  207.51 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.169904   0.004136   41.08 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4865 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.02752,    Adjusted R-squared:  0.02751
## F-statistic:  1687 on 1 and 59625 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_PosPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1
, data=P_Data)
BV_LPM_SNPC_PosPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_PosPerf_BelAspT
_1, data=P_Data)
```

```
summary(BV_LPM_BNPC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4572 -0.4572 -0.3105  0.5428  0.6895
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.457157   0.002333  195.98 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.146700   0.004551  -32.23 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4891 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.01713,    Adjusted R-squared:  0.01711
## F-statistic:  1039 on 1 and 59625 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_PosPerf_BelAspT_1,
##     data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6895 -0.5428  0.3105  0.4572  0.4572
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.542843   0.002333  232.71 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.146700   0.004551   32.23 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4891 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.01713,    Adjusted R-squared:  0.01711
## F-statistic:  1039 on 1 and 59625 DF,  p-value: < 0.00000000000000022

BV_LPM_BNPC_NegPerf_AboAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1
, data=P_Data)
BV_LPM_SNPC_NegPerf_AboAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_AboAspT
_1, data=P_Data)

summary(BV_LPM_BNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6192 -0.3807 -0.3807  0.6193  0.6193
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.380719   0.002092  181.96 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.238459   0.006187   38.54 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4856 on 60810 degrees of freedom
##   (36934 observations deleted due to missingness)
## Multiple R-squared:  0.02385,    Adjusted R-squared:  0.02383
## F-statistic:  1486 on 1 and 60810 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SNPC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_AboAspT_1,
```

```
##     data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6193 -0.6193  0.3807  0.3807  0.6192
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.619281   0.002092  295.97 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.238459   0.006187  -38.54 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4856 on 60810 degrees of freedom
##   (36934 observations deleted due to missingness)
## Multiple R-squared:  0.02385,    Adjusted R-squared:  0.02383
## F-statistic:  1486 on 1 and 60810 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BNPC_NegPerf_BelAsp <- lm(BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1
, data=P_Data)
BV_LPM_SNPC_NegPerf_BelAsp <- lm(BV_small_nonprod_change ~ BV_NegPerf_BelAspT
_1, data=P_Data)

summary(BV_LPM_BNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_nonprod_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5819 -0.3609 -0.3609  0.6391  0.6391
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.360934   0.002208  163.46 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.220997   0.004785   46.19 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4831 on 60810 degrees of freedom
##   (36934 observations deleted due to missingness)
## Multiple R-squared:  0.03389,    Adjusted R-squared:  0.03387
## F-statistic:  2133 on 1 and 60810 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SNPC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_nonprod_change ~ BV_NegPerf_BelAspT_1,
##     data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6391 -0.6391  0.3609  0.3609  0.5819
```

```
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.639066   0.002208  289.42 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.220997   0.004785  -46.19 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4831 on 60810 degrees of freedom
##   (36934 observations deleted due to missingness)
## Multiple R-squared:  0.03389,    Adjusted R-squared:  0.03387
## F-statistic:  2133 on 1 and 60810 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_PosPerf_AboAsp <- lm(BV_big_invent_change ~ BV_PosPerf_AboAspT_1,
data=P_Data)
BV_LPM_SIC_PosPerf_AboAsp <- lm(BV_small_invent_change ~ BV_PosPerf_AboAspT_1
, data=P_Data)

summary(BV_LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4252 -0.4252 -0.2859  0.5748  0.7141
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.425232   0.002283   186.2 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.139376   0.003840   -36.3 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4798 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.01893,    Adjusted R-squared:  0.01891
## F-statistic:  1318 on 1 and 68300 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7141 -0.5748  0.2859  0.4252  0.4252
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.574768   0.002283   251.7 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.139376   0.003840    36.3 <0.0000000000000002 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4798 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.01893,    Adjusted R-squared:  0.01891
## F-statistic:  1318 on 1 and 68300 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_PosPerf_BelAsp <- lm(BV_big_invent_change ~ BV_PosPerf_BelAspT_1,
data=P_Data)
BV_LPM_SIC_PosPerf_BelAsp <- lm(BV_small_invent_change ~ BV_PosPerf_BelAspT_1
, data=P_Data)
```

```
summary(BV_LPM_BIC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4106 -0.4106 -0.2747  0.5894  0.7253
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.410578   0.002131   192.7 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.135913   0.004221   -32.2 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4807 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.01495,    Adjusted R-squared:  0.01494
## F-statistic:  1037 on 1 and 68300 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7253 -0.5894  0.2747  0.4106  0.4106
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.589422   0.002131   276.6 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.135913   0.004221    32.2 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4807 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.01495,    Adjusted R-squared:  0.01494
## F-statistic:  1037 on 1 and 68300 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BIC_NegPerf_AboAsp <- lm(BV_big_invent_change ~ BV_NegPerf_AboAspT_1,
data=P_Data)
BV_LPM_SIC_NegPerf_AboAsp <- lm(BV_small_invent_change ~ BV_NegPerf_AboAspT_1
, data=P_Data)

summary(BV_LPM_BIC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5615 -0.3395 -0.3395  0.6605  0.6605
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.339533   0.001932  175.75 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.221986   0.005507   40.31 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4764 on 69342 degrees of freedom
##   (28402 observations deleted due to missingness)
## Multiple R-squared:  0.0229, Adjusted R-squared:  0.02288
## F-statistic:  1625 on 1 and 69342 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SIC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6605 -0.6605  0.3395  0.3395  0.5615
##
## Coefficients:
##                        Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.660467   0.001932  341.87 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.221986   0.005507  -40.31 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4764 on 69342 degrees of freedom
##   (28402 observations deleted due to missingness)
## Multiple R-squared:  0.0229, Adjusted R-squared:  0.02288
## F-statistic:  1625 on 1 and 69342 DF,  p-value: < 0.00000000000000022

BV_LPM_BIC_NegPerf_BelAsp <- lm(BV_big_invent_change ~ BV_NegPerf_BelAspT_1,
data=P_Data)
BV_LPM_SIC_NegPerf_BelAsp <- lm(BV_small_invent_change ~ BV_NegPerf_BelAspT_1
, data=P_Data)

summary(BV_LPM_BIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_big_invent_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4942 -0.3300 -0.3300  0.6700  0.6700
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.329992   0.002057  160.41 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.164163   0.004342   37.81 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4771 on 69342 degrees of freedom
##   (28402 observations deleted due to missingness)
## Multiple R-squared:  0.0202, Adjusted R-squared:  0.02019
## F-statistic:  1430 on 1 and 69342 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SIC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_invent_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6700 -0.6700  0.3300  0.3300  0.4942
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.670008   0.002057  325.68 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.164163   0.004342  -37.81 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4771 on 69342 degrees of freedom
##   (28402 observations deleted due to missingness)
## Multiple R-squared:  0.0202, Adjusted R-squared:  0.02019
## F-statistic:  1430 on 1 and 69342 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_PosPerf_AboAsp <- lm(BV_big_fin_change ~ BV_PosPerf_AboAspT_1, dat
a=P_Data)
BV_LPM_SFC_PosPerf_AboAsp <- lm(BV_small_fin_change ~ BV_PosPerf_AboAspT_1, d
ata=P_Data)
```

```
summary(BV_LPM_BFC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -0.4119 -0.4119 -0.2381  0.5881  0.7619
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.411878   0.002015  204.39 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 -0.173783   0.003619  -48.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4726 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.02811,    Adjusted R-squared:  0.0281
## F-statistic:  2306 on 1 and 79724 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7619 -0.5881  0.2381  0.4119  0.4119
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.588122   0.002015  291.85 <0.0000000000000002 ***
## BV_PosPerf_AboAspT_1 0.173783   0.003619   48.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4726 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.02811,    Adjusted R-squared:  0.0281
## F-statistic:  2306 on 1 and 79724 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_PosPerf_BelAsp <- lm(BV_big_fin_change ~ BV_PosPerf_BelAspT_1, dat
a=P_Data)
BV_LPM_SFC_PosPerf_BelAsp <- lm(BV_small_fin_change ~ BV_PosPerf_BelAspT_1, d
ata=P_Data)

summary(BV_LPM_BFC_PosPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4043 -0.4043 -0.1935  0.5957  0.8065
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.404337   0.001890  213.92 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 -0.210820   0.004032  -52.29 <0.0000000000000002 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4714 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.03316,    Adjusted R-squared:  0.03315
## F-statistic:  2734 on 1 and 79724 DF,  p-value: < 0.00000000000000022
```

```
summary(BV_LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_PosPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8065 -0.5957  0.1935  0.4043  0.4043
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.595663   0.001890  315.15 <0.0000000000000002 ***
## BV_PosPerf_BelAspT_1 0.210820   0.004032   52.29 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4714 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.03316,    Adjusted R-squared:  0.03315
## F-statistic:  2734 on 1 and 79724 DF,  p-value: < 0.00000000000000022
```

```
BV_LPM_BFC_NegPerf_AboAsp <- lm(BV_big_fin_change ~ BV_NegPerf_AboAspT_1, dat
a=P_Data)
BV_LPM_SFC_NegPerf_AboAsp <- lm(BV_small_fin_change ~ BV_NegPerf_AboAspT_1, d
ata=P_Data)
```

```
summary(BV_LPM_BFC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.5344 -0.3103 -0.3103  0.6897  0.6897
##
## Coefficients:
##                      Estimate Std. Error t value            Pr(>|t|)
## (Intercept)          0.310307   0.001816  170.89 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 0.224144   0.004572   49.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4685 on 79041 degrees of freedom
##   (18703 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.02951,    Adjusted R-squared:  0.0295
## F-statistic:  2403 on 1 and 79041 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_NegPerf_AboAsp)

##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_AboAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6897 -0.6897  0.3103  0.3103  0.5344
##
## Coefficients:
##                         Estimate Std. Error t value            Pr(>|t|)
## (Intercept)             0.689693   0.001816  379.83 <0.0000000000000002 ***
## BV_NegPerf_AboAspT_1 -0.224144   0.004572  -49.02 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4685 on 79041 degrees of freedom
##   (18703 observations deleted due to missingness)
## Multiple R-squared:  0.02951,    Adjusted R-squared:  0.0295
## F-statistic:  2403 on 1 and 79041 DF,  p-value: < 0.00000000000000022

BV_LPM_BFC_NegPerf_BelAsp <- lm(BV_big_fin_change ~ BV_NegPerf_BelAspT_1, dat
a=P_Data)
BV_LPM_SFC_NegPerf_BelAsp <- lm(BV_small_fin_change ~ BV_NegPerf_BelAspT_1, d
ata=P_Data)

summary(BV_LPM_BFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = BV_big_fin_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.4774 -0.2995 -0.2995  0.5225  0.7005
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.299484   0.001939  154.44 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 0.177965   0.003807   46.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4691 on 79041 degrees of freedom
##   (18703 observations deleted due to missingness)
## Multiple R-squared:  0.02691,    Adjusted R-squared:  0.02689
## F-statistic:  2185 on 1 and 79041 DF,  p-value: < 0.00000000000000022

summary(BV_LPM_SFC_NegPerf_BelAsp)
```

```
##
## Call:
## lm(formula = BV_small_fin_change ~ BV_NegPerf_BelAspT_1, data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7005 -0.5225  0.2995  0.2995  0.4774
##
## Coefficients:
##                       Estimate Std. Error t value            Pr(>|t|)
## (Intercept)           0.700516   0.001939  361.25 <0.0000000000000002 ***
## BV_NegPerf_BelAspT_1 -0.177965   0.003807  -46.75 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4691 on 79041 degrees of freedom
##   (18703 observations deleted due to missingness)
## Multiple R-squared:  0.02691,    Adjusted R-squared:  0.02689
## F-statistic:  2185 on 1 and 79041 DF,  p-value: < 0.00000000000000022
```

10. Log-Log Models

the variables are absolute (only positive) and standardized values!

Log-Log Model with elasticities of continuous DV and IVs:

```
LPM_BSC_PosPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_Data)
LPM_SSC_PosPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0096 -0.0096 -0.0096 -0.0093  3.2370
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0096328  0.0006565  14.673 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.0048041  0.0092088  -0.522               0.6
02
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.06942 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  1.921e-05,  Adjusted R-squared:  -5.137e-05
## F-statistic: 0.2722 on 1 and 14167 DF,  p-value: 0.6019

summary(LPM_SSC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.022134 -0.004676 -0.001059  0.004593  0.033061
##
## Coefficients:
##                                Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                  0.02213429  0.00009174 241.264 <0.000000000000
0002
## log(PosPerf_AboAspT_1 + 1) -0.01183610  0.00128687  -9.198 <0.000000000000
0002
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0097 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.005936,   Adjusted R-squared:  0.005866
## F-statistic:  84.6 on 1 and 14167 DF,  p-value: < 0.00000000000000022

LPM_BSC_PosPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_Data)
LPM_SSC_PosPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BSC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0105 -0.0105 -0.0105 -0.0086  3.2361
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|
t|)
## (Intercept)                 0.0105035  0.0006391  16.436 < 0.0000000000000
002
```

```
## log(PosPerf_BelAspT_1 + 1) -0.0558757  0.0142463  -3.922            0.0000
882
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06938 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.001085,   Adjusted R-squared:  0.001014
## F-statistic: 15.38 on 1 and 14167 DF,  p-value: 0.00008819
```

```
summary(LPM_SSC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.021923 -0.004668 -0.001075  0.004591  0.031336
##
## Coefficients:
##                               Estimate  Std. Error t value             Pr(
>|t|)
## (Intercept)                 0.02192333  0.00008955 244.823 < 0.00000000000
00002
## log(PosPerf_BelAspT_1 + 1) -0.00959921  0.00199620  -4.809           0.000
00153
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.009721 on 14167 degrees of freedom
##   (83577 observations deleted due to missingness)
## Multiple R-squared:  0.00163,    Adjusted R-squared:  0.001559
## F-statistic: 23.12 on 1 and 14167 DF,  p-value: 0.000001534
```

```
LPM_BSC_NegPerf_AboAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_Data)
LPM_SSC_NegPerf_AboAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BSC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -0.1506 -0.0071 -0.0071 -0.0071  3.2395
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0070890  0.0005464   12.97 <0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.0326631  0.0029146  -11.21 <0.00000000000000
02
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06431 on 14319 degrees of freedom
##   (83425 observations deleted due to missingness)
## Multiple R-squared:  0.008695,   Adjusted R-squared:  0.008625
## F-statistic: 125.6 on 1 and 14319 DF,  p-value: < 0.00000000000000022

summary(LPM_SSC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.026186 -0.004525 -0.001103  0.004364  0.030777
##
## Coefficients:
##                               Estimate  Std. Error t value             Pr(
>|t|)
## (Intercept)                 0.02162423  0.00007931  272.65 < 0.00000000000
00002
## log(NegPerf_AboAspT_1 + 1) -0.00110856  0.00042304   -2.62              0.
00879
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.009335 on 14319 degrees of freedom
##   (83425 observations deleted due to missingness)
## Multiple R-squared:  0.0004793,  Adjusted R-squared:  0.0004095
## F-statistic: 6.867 on 1 and 14319 DF,  p-value: 0.00879

LPM_BSC_NegPerf_BelAsp <- lm(log(big_strat_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_Data)
LPM_SSC_NegPerf_BelAsp <- lm(log(small_strat_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0671 -0.0070 -0.0070 -0.0070  3.2318
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.0069676  0.0005512  12.640 < 0.0000000000000
002
## log(NegPerf_BelAspT_1 + 1) -0.0129862  0.0020421  -6.359       0.000000000
209
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0639 on 14171 degrees of freedom
##   (83573 observations deleted due to missingness)
## Multiple R-squared:  0.002846,   Adjusted R-squared:  0.002775
## F-statistic: 40.44 on 1 and 14171 DF,  p-value: 0.0000000002091

summary(LPM_SSC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_strat_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.040812 -0.004368 -0.001020  0.004264  0.030868
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.02144239  0.00007875  272.29 <0.000000000000
0002
## log(NegPerf_BelAspT_1 + 1) -0.00355329  0.00029173  -12.18 <0.000000000000
0002
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.009128 on 14171 degrees of freedom
##   (83573 observations deleted due to missingness)
## Multiple R-squared:  0.01036,    Adjusted R-squared:  0.01029
## F-statistic: 148.3 on 1 and 14171 DF,  p-value: < 0.00000000000000022

P_Data[sapply(P_Data, is.nan)] <- NA
P_Data[sapply(P_Data, is.infinite)] <- NA

LPM_BAC_PosPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_Data)
LPM_SAC_PosPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0538 -0.0538 -0.0494  0.0319  4.3204
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|t
|)
## (Intercept)                  0.053829   0.001118  48.167 < 0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.069488   0.015194  -4.574           0.000004
82
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1512 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.0009325,  Adjusted R-squared:  0.0008879
## F-statistic: 20.92 on 1 and 22411 DF,  p-value: 0.000004822

summary(LPM_SAC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.070345 -0.026505  0.001051  0.022588  0.042959
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
```

```
)
## (Intercept)                0.0265050  0.0001803 146.985 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0202174  0.0024516   8.247 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02439 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.003025,   Adjusted R-squared:  0.002981
## F-statistic: 68.01 on 1 and 22411 DF,  p-value: < 0.00000000000000022

LPM_BAC_PosPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_Data)
LPM_SAC_PosPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0556 -0.0556 -0.0493  0.0311  4.3183
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.055554   0.001101  50.436 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.217517   0.024620  -8.835 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.151 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.003471,   Adjusted R-squared:  0.003426
## F-statistic: 78.06 on 1 and 22411 DF,  p-value: < 0.00000000000000022

summary(LPM_SAC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.056010 -0.026157  0.000889  0.022515  0.043307
##
```

```
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0261572  0.0001775   147.4 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) 0.0547356  0.0039669    13.8 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02432 on 22411 degrees of freedom
##   (75333 observations deleted due to missingness)
## Multiple R-squared:  0.008424,   Adjusted R-squared:  0.00838
## F-statistic: 190.4 on 1 and 22411 DF,  p-value: < 0.00000000000000022

#LPM_BAC_NegPerf_AboAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_Data)
#LPM_SAC_NegPerf_AboAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BAC_NegPerf_AboAsp)
#summary(LPM_SAC_NegPerf_AboAsp)

LPM_BAC_NegPerf_BelAsp <- lm(log(big_adv_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_Data)
LPM_SAC_NegPerf_BelAsp <- lm(log(small_adv_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2272 -0.0440 -0.0440  0.0329  4.3298
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0440264  0.0009838   44.75 <0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.0378718  0.0035371  -10.71 <0.00000000000000
02
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1425 on 22195 degrees of freedom
##   (75549 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.005139,   Adjusted R-squared:  0.005094
## F-statistic: 114.6 on 1 and 22195 DF,  p-value: < 0.00000000000000022

summary(LPM_SAC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_adv_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.028819 -0.028306  0.002204  0.021742  0.093434
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0288189  0.0001663   173.3 <0.000000000000000
2 ***
## log(NegPerf_BelAspT_1 + 1) 0.0111212  0.0005979    18.6 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02408 on 22195 degrees of freedom
##   (75549 observations deleted due to missingness)
## Multiple R-squared:  0.01535,    Adjusted R-squared:  0.01531
## F-statistic:   346 on 1 and 22195 DF,  p-value: < 0.00000000000000022

LPM_BRDC_PosPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_Data)
LPM_SRDC_PosPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0218 -0.0032 -0.0030 -0.0030  5.1285
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0029676  0.0002998   9.897 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0056501  0.0038509   1.467               0.14
2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.06499 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  3.96e-05,   Adjusted R-squared:  2.12e-05
## F-statistic: 2.153 on 1 and 54365 DF,  p-value: 0.1423

summary(LPM_SRDC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0136355 -0.0007426  0.0003714  0.0014370  0.0209350
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01363550  0.00001588  858.46 <0.000000000000
0002
## log(PosPerf_AboAspT_1 + 1) -0.00277239  0.00020399  -13.59 <0.000000000000
0002
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.003443 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.003386,   Adjusted R-squared:  0.003368
## F-statistic: 184.7 on 1 and 54365 DF,  p-value: < 0.00000000000000022

LPM_BRDC_PosPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_Data)
LPM_SRDC_PosPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BRDC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0034 -0.0034 -0.0034 -0.0034  5.1281
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|
t|)
## (Intercept)                 0.0034306  0.0002999  11.440 < 0.0000000000000
002
```

```
## log(PosPerf_BelAspT_1 + 1) -0.0211283  0.0077721  -2.718              0.00
656
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06499 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.0001359,  Adjusted R-squared:  0.0001175
## F-statistic:  7.39 on 1 and 54365 DF,  p-value: 0.006561
```

```
summary(LPM_SRDC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0136002 -0.0007396  0.0003733  0.0014438  0.0209703
##
## Coefficients:
##                               Estimate  Std. Error t value             Pr(
>|t|)
## (Intercept)                 0.01360023  0.00001591  855.09 < 0.00000000000
00002
## log(PosPerf_BelAspT_1 + 1) -0.00311223  0.00041221   -7.55   0.00000000000
00442
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.003447 on 54365 degrees of freedom
##   (43379 observations deleted due to missingness)
## Multiple R-squared:  0.001047,   Adjusted R-squared:  0.001029
## F-statistic:    57 on 1 and 54365 DF,  p-value: 0.00000000000004418
```

```
LPM_BRDC_NegPerf_AboAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_AboAspT_1+1)
, data=P_Data)
LPM_SRDC_NegPerf_AboAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_AboAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BRDC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -0.0349 -0.0024 -0.0024 -0.0024  4.7446
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                  0.0023846  0.0002544   9.374 < 0.0000000000000
002
## log(NegPerf_AboAspT_1 + 1) -0.0053850  0.0009892  -5.444         0.0000000
523
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05731 on 53471 degrees of freedom
##   (44273 observations deleted due to missingness)
## Multiple R-squared:  0.000554,   Adjusted R-squared:  0.0005353
## F-statistic: 29.64 on 1 and 53471 DF,  p-value: 0.00000005232

summary(LPM_SRDC_NegPerf_AboAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0140209 -0.0006946  0.0003738  0.0013704  0.0210633
##
## Coefficients:
##                               Estimate  Std. Error t value             Pr(>
|t|)
## (Intercept)                 0.01350716  0.00001473 916.797 <0.000000000000
0002
## log(NegPerf_AboAspT_1 + 1) -0.00010016  0.00005729  -1.748              0.
0804
##
## (Intercept)                 ***
## log(NegPerf_AboAspT_1 + 1) .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.003319 on 53471 degrees of freedom
##   (44273 observations deleted due to missingness)
## Multiple R-squared:  5.717e-05,  Adjusted R-squared:  3.847e-05
## F-statistic: 3.057 on 1 and 53471 DF,  p-value: 0.0804

LPM_BRDC_NegPerf_BelAsp <- lm(log(big_RD_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_Data)
LPM_SRDC_NegPerf_BelAsp <- lm(log(small_RD_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units
```

```
summary(LPM_BRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0194 -0.0024 -0.0024 -0.0024  4.7468
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.0023870  0.0002563   9.311 < 0.0000000000000
002
## log(NegPerf_BelAspT_1 + 1) -0.0021575  0.0007087  -3.044              0.00
233
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05635 on 52136 degrees of freedom
##   (45608 observations deleted due to missingness)
## Multiple R-squared:  0.0001777,  Adjusted R-squared:  0.0001585
## F-statistic: 9.267 on 1 and 52136 DF,  p-value: 0.002335

summary(LPM_SRDC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_RD_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0155367 -0.0006506  0.0004118  0.0013523  0.0209440
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01343571  0.00001468   915.1 <0.000000000000
0002
## log(NegPerf_BelAspT_1 + 1) -0.00045866  0.00004059   -11.3 <0.000000000000
0002
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.003227 on 52136 degrees of freedom
##   (45608 observations deleted due to missingness)
## Multiple R-squared:  0.002443,   Adjusted R-squared:  0.002424
## F-statistic: 127.7 on 1 and 52136 DF,  p-value: < 0.00000000000000022

LPM_BPC_PosPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_AboAspT_1+
1), data=P_Data)
LPM_SPC_PosPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_AboAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0093 -0.0056 -0.0056 -0.0056  5.4763
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0056052  0.0002513  22.306 <0.000000000000000
2 ***
## log(PosPerf_AboAspT_1 + 1) 0.0007646  0.0029975   0.255               0.79
9
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06568 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  8.413e-07,  Adjusted R-squared:  -1.209e-05
## F-statistic: 0.06506 on 1 and 77334 DF,  p-value: 0.7987

summary(LPM_SPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.018149 -0.007905 -0.002914  0.003902  0.098299
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01814910  0.00005133  353.61 <0.000000000000
0002
## log(PosPerf_AboAspT_1 + 1) -0.01094294  0.00061224  -17.87 <0.000000000000
0002
##
```

```
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01341 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.004114,   Adjusted R-squared:  0.004101
## F-statistic: 319.5 on 1 and 77334 DF,  p-value: < 0.00000000000000022

LPM_BPC_PosPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_Data)
LPM_SPC_PosPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(PosPerf_BelAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0062 -0.0062 -0.0062 -0.0062  5.4756
##
## Coefficients:
##                              Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.0062452  0.0002536  24.621 < 0.0000000000000
002
## log(PosPerf_BelAspT_1 + 1) -0.0432446  0.0064850  -6.668       0.000000000
026
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06566 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.0005747,  Adjusted R-squared:  0.0005618
## F-statistic: 44.47 on 1 and 77334 DF,  p-value: 0.00000000002602

summary(LPM_SPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.018434 -0.007889 -0.002766  0.004009  0.100642
##
```

```
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01843402  0.00005159  357.29 <0.000000000000
0002
## log(PosPerf_BelAspT_1 + 1) -0.04186023  0.00131910  -31.73 <0.000000000000
0002
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01336 on 77334 degrees of freedom
##   (20410 observations deleted due to missingness)
## Multiple R-squared:  0.01285,    Adjusted R-squared:  0.01284
## F-statistic:  1007 on 1 and 77334 DF,  p-value: < 0.00000000000000022

#LPM_BPC_NegPerf_AboAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_Data)
#LPM_SPC_NegPerf_AboAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BPC_NegPerf_AboAsp)
#summary(LPM_SPC_NegPerf_AboAsp)

LPM_BPC_NegPerf_BelAsp <- lm(log(big_plant_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_Data)
LPM_SPC_NegPerf_BelAsp <- lm(log(small_plant_change+1) ~ log(NegPerf_BelAspT_
1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0447 -0.0039 -0.0039 -0.0039  5.4723
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0039085  0.0002174  17.976 <0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.0051821  0.0006130  -8.453 <0.00000000000000
02
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.05704 on 73799 degrees of freedom
##   (23945 observations deleted due to missingness)
## Multiple R-squared:  0.0009674,  Adjusted R-squared:  0.0009538
## F-statistic: 71.46 on 1 and 73799 DF,  p-value: < 0.00000000000000022

summary(LPM_SPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_plant_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.054508 -0.006984 -0.002166  0.003528  0.069769
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01637519  0.00004702  348.29 <0.000000000000
0002
## log(NegPerf_BelAspT_1 + 1) -0.00650253  0.00013256  -49.05 <0.000000000000
0002
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01233 on 73799 degrees of freedom
##   (23945 observations deleted due to missingness)
## Multiple R-squared:  0.03157,    Adjusted R-squared:  0.03156
## F-statistic:  2406 on 1 and 73799 DF,  p-value: < 0.00000000000000022

LPM_BNPC_PosPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_Data)
LPM_SNPC_PosPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_AboAs
pT_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0108 -0.0108 -0.0108 -0.0082  5.2380
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|
t|)
## (Intercept)                 0.0107931  0.0004043  26.694 < 0.0000000000000
```

```
002
## log(PosPerf_AboAspT_1 + 1) -0.0397155  0.0053042  -7.488   0.0000000000000
712
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0897 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.0009394,  Adjusted R-squared:  0.0009226
## F-statistic: 56.06 on 1 and 59625 DF,  p-value: 0.00000000000007115

summary(LPM_SNPC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -0.0306888 -0.0046097  0.0001308  0.0041962  0.0265637
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                0.01503747 0.00003732  402.98 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) 0.00634679 0.00048953   12.96 <0.00000000000000
02
##
## (Intercept)                ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.008278 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.002811,   Adjusted R-squared:  0.002795
## F-statistic: 168.1 on 1 and 59625 DF,  p-value: < 0.00000000000000022

LPM_BNPC_PosPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_Data)
LPM_SNPC_PosPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(PosPerf_BelAs
pT_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0110 -0.0110 -0.0110 -0.0085  5.2378
##
## Coefficients:
##                              Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                  0.010961   0.000398  27.538 <0.000000000000000
2 ***
## log(PosPerf_BelAspT_1 + 1) -0.085823   0.009192  -9.336 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08968 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.00146,    Adjusted R-squared:  0.001443
## F-statistic: 87.17 on 1 and 59625 DF,  p-value: < 0.00000000000000022

summary(LPM_SNPC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.064050 -0.004608  0.000091  0.004192  0.026630
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.01497102 0.00003669  408.10 <0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) 0.01608573 0.00084722   18.99 <0.00000000000000
02
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.008265 on 59625 degrees of freedom
##   (38119 observations deleted due to missingness)
## Multiple R-squared:  0.006009,   Adjusted R-squared:  0.005993
## F-statistic: 360.5 on 1 and 59625 DF,  p-value: < 0.00000000000000022

LPM_BNPC_NegPerf_AboAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_AboAspT
_1+1), data=P_Data)
LPM_SNPC_NegPerf_AboAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_AboAs
pT_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.2004 -0.0057 -0.0057 -0.0057  4.3357
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0057043  0.0002805   20.34 <0.00000000000000
02
## log(NegPerf_AboAspT_1 + 1) -0.0322092  0.0014985  -21.49 <0.00000000000000
02
##
## (Intercept)                ***
## log(NegPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06785 on 60262 degrees of freedom
##   (37482 observations deleted due to missingness)
## Multiple R-squared:  0.007608,   Adjusted R-squared:  0.007591
## F-statistic:   462 on 1 and 60262 DF,  p-value: < 0.00000000000000022
```

```
summary(LPM_SNPC_NegPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015523 -0.004398  0.000046  0.004061  0.034719
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t|
)
## (Intercept)                 0.0155228  0.0000334   464.7 <0.000000000000000
2 ***
## log(NegPerf_AboAspT_1 + 1) 0.0026589  0.0001785    14.9 <0.000000000000000
2 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.008081 on 60262 degrees of freedom
##   (37482 observations deleted due to missingness)
## Multiple R-squared:  0.00367,    Adjusted R-squared:  0.003653
## F-statistic:   222 on 1 and 60262 DF,  p-value: < 0.00000000000000022
```

```
LPM_BNPC_NegPerf_BelAsp <- lm(log(big_nonprod_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_Data)
LPM_SNPC_NegPerf_BelAsp <- lm(log(small_nonprod_change+1) ~ log(NegPerf_BelAs
pT_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1398 -0.0046 -0.0046 -0.0046  4.3433
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0046301  0.0002572   18.00 <0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.0189536  0.0009496  -19.96 <0.00000000000000
02
##
## (Intercept)                 ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06108 on 59451 degrees of freedom
##   (38293 observations deleted due to missingness)
## Multiple R-squared:  0.006656,   Adjusted R-squared:  0.00664
## F-statistic: 398.4 on 1 and 59451 DF,  p-value: < 0.00000000000000022

summary(LPM_SNPC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_nonprod_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.015625 -0.004341 -0.000010  0.003994  0.033442
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.01562465 0.00003371  463.53 <0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) 0.00217641 0.00012444   17.49 <0.00000000000000
02
##
## (Intercept)                 ***
```

```
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.008004 on 59451 degrees of freedom
##   (38293 observations deleted due to missingness)
## Multiple R-squared:  0.005119,   Adjusted R-squared:  0.005102
## F-statistic: 305.9 on 1 and 59451 DF,  p-value: < 0.00000000000000022
```

```
LPM_BIC_PosPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_AboAspT_1
+1), data=P_Data)
LPM_SIC_PosPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_AboAspT
_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0057 -0.0057 -0.0057 -0.0055  5.2668
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0056928  0.0003273  17.393 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.0038633  0.0042593  -0.907               0.3
64
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0784 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  1.204e-05,  Adjusted R-squared:  -2.596e-06
## F-statistic: 0.8227 on 1 and 68300 DF,  p-value: 0.3644
```

```
summary(LPM_SIC_PosPerf_AboAsp)
```

```
##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.020800 -0.007494 -0.001495  0.005163  0.089109
##
## Coefficients:
```

```
##                                Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                  0.02080047  0.00005125  405.85 <0.000000000000
0002
## log(PosPerf_AboAspT_1 + 1) -0.01328581  0.00066695  -19.92 <0.000000000000
0002
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01228 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.005776,   Adjusted R-squared:  0.005762
## F-statistic: 396.8 on 1 and 68300 DF,  p-value: < 0.00000000000000022

LPM_BIC_PosPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(PosPerf_BelAspT_1
+1), data=P_Data)
LPM_SIC_PosPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(PosPerf_BelAspT
_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_PosPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0062 -0.0062 -0.0062 -0.0058  5.2663
##
## Coefficients:
##                               Estimate Std. Error t value             Pr(>|
t|)
## (Intercept)                 0.0061761  0.0003264  18.921 < 0.0000000000000
002
## log(PosPerf_BelAspT_1 + 1) -0.0375831  0.0080412  -4.674           0.00000
296
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.07839 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.0003197,  Adjusted R-squared:  0.0003051
## F-statistic: 21.84 on 1 and 68300 DF,  p-value: 0.000002962

summary(LPM_SIC_PosPerf_BelAsp)

##
## Call:
```

```
## lm(formula = log(small_invent_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.020801 -0.007502 -0.001471  0.005209  0.059527
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.02080128  0.00005112  406.95 <0.000000000000
0002
## log(PosPerf_BelAspT_1 + 1) -0.02554549  0.00125920  -20.29 <0.000000000000
0002
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01227 on 68300 degrees of freedom
##   (29444 observations deleted due to missingness)
## Multiple R-squared:  0.00599,    Adjusted R-squared:  0.005975
## F-statistic: 411.6 on 1 and 68300 DF,  p-value: < 0.00000000000000022

#LPM_BIC_NegPerf_AboAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_AboAspT_
1+1), data=P_Data)
#LPM_SIC_NegPerf_AboAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_AboAsp
T_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BIC_NegPerf_AboAsp)
#summary(LPM_SIC_NegPerf_AboAsp)

LPM_BIC_NegPerf_BelAsp <- lm(log(big_invent_change+1) ~ log(NegPerf_BelAspT_1
+1), data=P_Data)
LPM_SIC_NegPerf_BelAsp <- lm(log(small_invent_change+1) ~ log(NegPerf_BelAspT
_1+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0577 -0.0038 -0.0038 -0.0038  5.2687
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|
t|)
## (Intercept)                 0.0037623  0.0002730  13.780 < 0.0000000000000
002
```

```
## log(NegPerf_BelAspT_1 + 1) -0.0068510  0.0009396  -7.291    0.000000000000
311
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06893 on 67544 degrees of freedom
##   (30200 observations deleted due to missingness)
## Multiple R-squared:  0.0007864,  Adjusted R-squared:  0.0007717
## F-statistic: 53.16 on 1 and 67544 DF,  p-value: 0.0000000000003106

summary(LPM_SIC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_invent_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.039065 -0.006927 -0.001036  0.005108  0.056732
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.01951382  0.00004551  428.83 <0.000000000000
0002
## log(NegPerf_BelAspT_1 + 1) -0.00502018  0.00015661  -32.05 <0.000000000000
0002
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01149 on 67544 degrees of freedom
##   (30200 observations deleted due to missingness)
## Multiple R-squared:  0.01499,    Adjusted R-squared:  0.01497
## F-statistic:  1028 on 1 and 67544 DF,  p-value: < 0.00000000000000022

psych::describe(P_Data$NegPerf_AboAsp)

##    vars     n  mean   sd median trimmed mad      min max   range    skew
## X1    1 87755 -0.23 8.19      0       0   0 -1584.25   0 1584.25 -126.75
##    kurtosis   se
## X1 20147.91 0.03

P_Data[sapply(P_Data, is.nan)] <- NA
P_Data[sapply(P_Data, is.infinite)] <- NA

LPM_BFC_PosPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_AboAspT_1+1)
, data=P_Data)
LPM_SFC_PosPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_AboAspT_1+
```

```
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0190 -0.0190 -0.0190 -0.0182  4.8997
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0189821  0.0004089  46.428 <0.00000000000000
02
## log(PosPerf_AboAspT_1 + 1) -0.0085901  0.0034466  -2.492              0.01
27
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1) *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1117 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  7.791e-05,  Adjusted R-squared:  6.537e-05
## F-statistic: 6.212 on 1 and 79724 DF,  p-value: 0.01269

summary(LPM_SFC_PosPerf_AboAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_AboAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.005956 -0.004800 -0.001818  0.002882  0.019098
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.00595614  0.00002209 269.673 <0.000000000000
0002
## log(PosPerf_AboAspT_1 + 1) -0.00009623  0.00018619  -0.517              0
.605
##
## (Intercept)                 ***
## log(PosPerf_AboAspT_1 + 1)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.006035 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  3.351e-06,  Adjusted R-squared:  -9.193e-06
## F-statistic: 0.2671 on 1 and 79724 DF,  p-value: 0.6053
```

```
LPM_BFC_PosPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(PosPerf_BelAspT_1+1)
, data=P_Data)
LPM_SFC_PosPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(PosPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.0199 -0.0199 -0.0199 -0.0151  4.8987
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                  0.0199482  0.0004214  47.338 <0.00000000000000
02
## log(PosPerf_BelAspT_1 + 1) -0.0872894  0.0103803  -8.409 <0.00000000000000
02
##
## (Intercept)                 ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1117 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.0008862,  Adjusted R-squared:  0.0008737
## F-statistic: 70.71 on 1 and 79724 DF,  p-value: < 0.00000000000000022
```

```
summary(LPM_SFC_PosPerf_BelAsp)
```

```
##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(PosPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.006033 -0.004781 -0.001800  0.002883  0.024481
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.00603294  0.00002276  265.08 <0.000000000000
```

```
0002
## log(PosPerf_BelAspT_1 + 1) -0.00568852  0.00056061  -10.15 <0.000000000000
0002
##
## (Intercept)                ***
## log(PosPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.006032 on 79724 degrees of freedom
##   (18020 observations deleted due to missingness)
## Multiple R-squared:  0.00129,    Adjusted R-squared:  0.001277
## F-statistic:   103 on 1 and 79724 DF,  p-value: < 0.00000000000000022

#LPM_BFC_NegPerf_AboAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_AboAspT_1+1
), data=P_Data)
#LPM_SFC_NegPerf_AboAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_AboAspT_1
+1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

#summary(LPM_BFC_NegPerf_AboAsp)
#summary(LPM_SFC_NegPerf_AboAsp)

LPM_BFC_NegPerf_BelAsp <- lm(log(big_fin_change+1) ~ log(NegPerf_BelAspT_1+1)
, data=P_Data)
LPM_SFC_NegPerf_BelAsp <- lm(log(small_fin_change+1) ~ log(NegPerf_BelAspT_1+
1), data=P_Data)#Here, a 1% increase in DV changes IV by X% units

summary(LPM_BFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(big_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1460 -0.0143 -0.0143 -0.0143  4.9044
##
## Coefficients:
##                               Estimate Std. Error t value            Pr(>|t
|)
## (Intercept)                 0.0143086  0.0003851   37.16 <0.00000000000000
02
## log(NegPerf_BelAspT_1 + 1) -0.0184681  0.0010667  -17.31 <0.00000000000000
02
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1019 on 75152 degrees of freedom
##   (22592 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.003973,   Adjusted R-squared:  0.00396
## F-statistic: 299.8 on 1 and 75152 DF,  p-value: < 0.00000000000000022

summary(LPM_SFC_NegPerf_BelAsp)

##
## Call:
## lm(formula = log(small_fin_change + 1) ~ log(NegPerf_BelAspT_1 +
##     1), data = P_Data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.011920 -0.004576 -0.001685  0.002779  0.019074
##
## Coefficients:
##                               Estimate  Std. Error t value            Pr(>
|t|)
## (Intercept)                 0.00586571  0.00002217  264.59 <0.000000000000
0002
## log(NegPerf_BelAspT_1 + 1) -0.00076900  0.00006140  -12.52 <0.000000000000
0002
##
## (Intercept)                ***
## log(NegPerf_BelAspT_1 + 1) ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.005867 on 75152 degrees of freedom
##   (22592 observations deleted due to missingness)
## Multiple R-squared:  0.002083,   Adjusted R-squared:  0.002069
## F-statistic: 156.8 on 1 and 75152 DF,  p-value: < 0.00000000000000022
```