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# The Theory and Empirics of False News Shocks

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## Abstract

News articles, which pop up pretending to bear valuable information for investors, cause significant changes in stock prices. But occasionally that information turns out to be false. According to Eugene Fama (1965) and his Efficient Market Hypothesis financial markets are efficient if and when new information about the firm fundamentals is instantaneously incorporated in its stock price. In theory, the recall of false news should lead to a reverse of prices to pre-event levels. In reality, the idea of efficient markets faces many challenges. It will be shown that, besides other market anomalies, public attention induces a persistent rise (fall) in share prices, even though clarifying information has already been published.

**Keywords**: Efficient Markets, Efficient Market Hypothesis, False News Shocks, Investor Behavior

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# 1 Introduction

A continuous discussion is carried on by economists related towards the efficiency of financial markets. Such markets are considered efficient if and when new information about the fundamental value of an asset is instantaneously incorporated in its stock price (Fama, 1965). Nevertheless, financial markets are confronted with noise that affects the processing of informative news and investor behavior towards trading activities. Hence, the idea of efficient financial markets faces many challenges.

Nowadays, new technologies are emerging with increasing frequencies, which have media become more accessible for investors regardless of place and time. The research question of this paper is:

Does the almost unlimited access to media and therefore information result in an improvement of market efficiency?

The difficulty will consist in measuring the level of efficiency. False news shocks can be seen as an experiment to further examine the reactions towards an unexpected presence of new information. It will be of particular interest for this work to examine shocks proven as wrong in order to investigate the context of market efficiency. In theory, rational investors do not only trade on the immediate appearance of the false news, but also right after the announcement of the resolving argument. The pace of the reverse price adjustment will be used as an indicator for the market efficiency.

Firstly, this paper will concentrate on the theoretical background regarding the topic. Eugene Fama describes in his Efficient Market Hypothesis (EMH) how rational market participants react towards new information. It will be seen that market efficiency is strained by immediate price movements. In theory, the recall of false news should lead to a reverse of prices to pre-event levels. Furthermore, several anomalies challenge the EMH. Certain behavioral biases and investment patterns run counter to EMH and generate abnormal returns.

Afterwards, the focus will be turned towards the role of the media in financial markets and investor behavior. Therefore, Tetlock's (2007) studies of stock market news respecting investor psychology will be discussed as well as Peress's (2014) outcomes about the diffusion of information in financial markets. It will be proven that high pessimism triggers downward pressure on asset prices and media thus do not clearly act as noise. Furthermore, the casual impact of media in financial markets will be demonstrated by the studies of Fang and Peress (2009).

The theoretical analysis will be substantiated by an empirical study of false news shocks. An event study approach is performed to assess the time it takes the market to reverse the impact of fake news. The general idea of this measure is to differentiate between the returns that would have been expected if the news shock would not have taken place. Abnormal returns are used to isolate the effect of the event from other general market movements.

The paper is organized as follows. In the next section, we provide a brief description about the theory and background of several streams of research. Section 3 describes the methodology and data. Section 4 presents the results of the paper. Section 5 provides an analysis of possible interpretations for the observed findings. The last section concludes.

# 2 Theory and Background

## 2.1 The Efficient Market Hypothesis and its challenges

In 1970, Eugene Fama developed the EMH. In his studies, he describes that financial markets are efficient if all existing and available information is fully reflected in the price of an asset. Therefore, no market participant is able to purchase (sell) undervalued (overvalued) securities and hence cannot generate excess returns in the long-run.

Consistent with EMH, is the theory of random walks in stock market prices. As soon as new relevant information appears, it should be instantaneously incorporated in prices (Fama, 1965). Therefore, future price changes will be independent from historical price changes. In an

efficient market, prices reflect the judgements of all investors and analysts at any point of time, consequently, there is no need to believe in the chance of finding mispriced assets.

Fama's (1965) assumption for the EMH mainly derives from a concept of constant competition between rational and profit-maximizing investors. Investors have the desire to gain from predicting future values by analyzing currently released information. In fact, the higher the number of investors competing against each other, the lower the probability of finding mispriced assets. Fama (1998) states that in the long-run, some market participants might be able to profit from the discovery of such mispriced securities, but he also assigns this primarily to chance. Moreover, Fama (1998) also claims that even uninformed investors, who built up a well-diversified portfolio, generate returns on the same level as institutional investors. Nevertheless, securities will not perform similarly and the expected return is mainly a function of its' risk. Prices in general reflect the discounted future cash flows derived from expectations built up by analyzing available information. These approaches are rational and follow strict rules, whereas the publishing of news is still random and not predictable.

The EMH implicates that distinct price adjustments during a false news shock emphasize market efficiency. Price changes in individual securities should adjust to such overstated news in an independent and unbiased manner. This means that the full impact of new information must be incorporated instantaneously (Fama, 1998). More news will arrive constantly, but prices are expected to return to pre-event levels as soon as the correction of the false news publication is announced. The reasoning for this assumption implies that the fundamental value of the asset does not change after a recall of the previously published information.

## 2.2 Anomalies challenging market efficiency

The existence of anomalies that have occurred over the past decades have caused serious doubts about the accuracy of the EMH. Consistent with the results of research in

psychology, DeBondt and Thaler (1985) found out that most people overreact to unexpected and dramatic news events. This investor overreaction becomes evident when looking at prior loser portfolios that outperform prior winner portfolios within thirty-six months after the formation. Investors outweigh past performance and disregard the fact that performance tends to mean-revert. Counter to the hypothesis of overreaction are Ball and Brown's (1968) and Gilette's et al. (1999) studies of a so-called post-earnings-announcement drift (PEAD). The researchers state that returns drift up (down) after announcing positive (negative) news regarding the earnings of a firm. This effect is noticeable for a few trading periods and continues moving in the same direction for the rest of the year. EMH would suggest, since all market participants are well -informed about the opportunity to generate abnormal returns by creating portfolios with companies that have announced good earning news (long position) respectively bad earning news (short position), they would actively compete to hold these portfolios, therefore prices would rise or fall in order to eliminate the returns. Nevertheless, the PEAD has survived several robustness checks. Researchers suggest that this anomaly is caused by investor underreaction regarding the information content of earning announcements. History has shown that earning revisions are most likely to cause significant market reactions (Bernard and Thomas, 1989).

Of particularly interest for this paper is also the hypothesis of limited attention. Peress (2014) states that investors suffer from a so-called "information overload" nowadays. The speed of how news are spread today causes a loss in the reliability of information, which results in investors ignoring more timely sources. Klibanoff et al. (1998) investigate investor behavior towards the coverage of major news events on the New York Times front page. Net Asset Values (NAV) are used to provide an accurate measure of closed-end country fund's fundamentals. According to the EMH, the publication in the NY Times should be redundant since the NAV already incorporates all existing fundamental information. Nevertheless, the

authors discover the contrary, those funds react more to changes in fund's NAV after the host country was well publicized on the NY Times cover page. An explanation for such appearances may be found in the limited attention of human beings.

Attention is a scarce resource. Hence, investors' attention is gained towards certain securities, which they decide to react on the media-hyped information by trading those stocks. Barber and Odean (2008) further show that individual investors are usually attracted to attention-grabbing stocks, in contrast to professional investors who are less prone to attention-driven trades due to more time and access to more resources to monitor stocks continuously and follow explicit purchase criteria.

According to Fama (1965, 1998) only two types of traders exist. The first category are noise traders, who hold random beliefs about future dividends comparing to their counterpart, rational arbitrageurs. Due to noise traders, who shift the security price further away from its fundamentals, those returns exceed the ones of rational arbitrageurs. Contrary to the EMH, a significant divergence from efficient prices exist, but they also demonstrate that the asset price is hooked to the fundamental value in the long-run (Delong et al., 1990).

## 2.3 The Role of the Media in Capital Markets

When the effects of media on capital markets are studied, it is to mention first that Tetlock's (2007) article tries to prove what empirical experiments already observed, the interdependence between the content of media and daily equity market activity. By focusing on the influence of Wall Street Journal's (WSJ) column "Abreast of the Market", Tetlock (2007) investigates whether financial news induce, amplify or simply reflect investor beliefs of stock market performance and, therefore, he develops a "pessimism factor". He repeats his test and adds words categorized as "weak" and "negative". The outcome of his predictability regressions stays the same: A modification of the pessimism factor foreshows a statistically significant change in returns and trading volume. Further in his studies, Tetlock (2007) devotes

himself to the timing of pessimism. He sets up a hypothesis test to answer the question whether high pessimism reflects prior investor sentiment or is used as a prediction tool and concludes that both theories hold a little bit of truth. Thus, after long periods of low returns, media pessimism forecasts low returns in the short-run, but predicts high future returns in the long-run. Tetlock (2007) explains the occurrence of the latter effect by referring to noise trades, that caused a significant change in the stock price. In the long run, prices will be reversed to its fundamentals. The next step is to look further into negative investor sentiment and its ability to forecast Dow Jones returns. With his regression model Tetlock (2007) shows that the pessimism factor has a statistically and economically significant impact on the next day returns (p-value < 0.001) and that on average, the impact of a one-standard deviation variation in the media pessimism factor causes a movement of 8.1 basis points on the next day Dow Jones returns. This temporary negative influence is eliminated by a reversal later in the trading week. Assuming that newspapers contain stale information about fundamental values, the market reacts consistent with the EMH in the long-run. Secondly, the impact of past Dow Jones returns and its ability to predict negative sentiment are investigated. The regression indicates an increase in pessimism after negative returns on the prior trading day. A 1% decrease in prior Dow Jones returns results in a significant increase in the pessimism factor by 5.8% of one standard deviation (p-value < 0.003). Moreover, Tetlock's (2007) studies provide evidence that the pessimism factor influences market activity. The absolute value of pessimism predicts an increase in trading volume on the next day (p-value < 0.01 – the results not only hold for the pessimism factor, but also for negative and weak words). The phenomena can be explained in a way where pessimism acts as a proxy for disagreement between noise traders and rational arbitrageurs. This leads to an incline in supply or demand by noise traders, which will be absorbed by market makers. Tetlock (2007) concludes that small stocks have the highest level of ownership. Consequently, investor sentiment can be used to predict the return of small

stocks, which amounts to a larger and longer-lasting impact. He carries out an analogous test using the daily Fama – French small-minus big (SMB) factor and notices a longer lasting effect of negative sentiment on SMB returns. In other words, the impact of an increase in pessimism is still negative after five trading days.

Other researchers who investigates the contribution of the media to price formation come to similar conclusions. Peress (2014) attempts to prove that, contrary to the EMH, public information diffuses gradually and this affects equity prices. In his studies, Peress (2014) provides evidence that the media has a significant impact on financial markets, even though public information diffuses gradually through investor population. Setting up a causal link from the media to capital markets is problematic. It might be the case that both the market and the media respond to fundamental new information. In order to be able to assess the causal influence of the media, Peress (2014) identifies nationwide newspaper strikes in the print media that are not driven by stock market developments and prevent market participants from receiving news. His studies reveal that on a strike day the equally weighted share turnover on a country's stock market falls by 12.3% (p-value < 0.005). When market capitalization weights are used, this effect is not significant anymore (-1.4%, p-value < 0.681). The contradiction between equally-weighted and value-weighted averages leads to the assumption that media strikes mainly affect small firms. The author further suggests that individual traders are highly responsive to newspaper strikes, unlike professional investors, retail investors do not have access to professional news services (e.g. Bloomberg or Reuters) and hence rely on the local news coverage of newspapers. Additionally, small stocks are more sensitive to press coverage and a usually owned by individual investors. These findings are consistent with Tetlock (2007). Peress (2014) also finds that absolute returns behave counter in comparison to turnover, dispersion and price range. These variables fall significantly on a strike day, but absolute returns do not. From the contrasting behavior of market activity, the author concludes that

despite of the strike some informed investors remain in the market and therefore media is not essential to the informational efficiency of stock markets, even though it plays an important role to multiply information among investors. Additionally, the divergence between return dispersion and the absolute value of markets returns indicates that media influences individual prices, but not the market. As a result, media attracts less price sensitive investors also called noise traders. Supportive evidence is also found by Engelberg and Parsons (2011), who state that media is capable of influencing prices.

In further studies, Lang and Peress (2009) examine the cross-sectional relation between media coverage and stock returns. They find statistically and economically significant return premiums on stocks with no media coverage. Those premiums amount to 0.20% (p-value <0.005) per month, and stay persistent after controlling for risk factors. In particular, they find that for large stocks, which are already covered by many information channels, the role of mass media is limited. They further conclude that return differences are even higher for small stocks, stocks with low analyst coverage, high unsystematic risk and for those securities that are mainly owned by private investors. From their findings, it can be derived that the media effect on returns arises from its ability to disseminate information widely and therefore, media coverage can be seen as the contribution to a progressive impounding of information into prices.

# 3 Methodology

In order to assess the impact of false news shocks on capital markets in the US, an event study approach is used to measure the time it takes the market to reverse the impact of the false news. Central for this study is the measurement of abnormal stock returns. Given this basic premise, a Patell (1976) parametric test is performed and the effect of how a particular event changes a firm's prospects by quantifying its impact on the firm's stock price is investigated. The initial task is to define the event of interest by screening the online news columns of eight

major American financial news providers. When selecting the news providers, it was of particular importance that they all cover the newest breaking stories without requiring a subscription. No subscription fees allow to assume that individual investors have the same access to breaking news as institutional ones. Focusing on a time frame starting on January 1st, 1999 until December 31st, 2015, the webpages of "Wall Street Journal", "Financial Times", Bloomberg's "Business Insider", "Reuters", "Forbes", "Business Week", "CNN Money" and "CNBC" have been searched seeking for words like "fake news", "false news" and "hoax". It is also important that the affected company gave a clearing statement within the same trading day to assure that the fake news can be considered as canceled out within the same trading session.

The sample is not limited to firms of the S&P 500, which leads to a number of 24 events matching the search criteria. In a more detailed prospective, the sample includes 12 technology respectively technology-services companies, one airline, four firms related to consumer products, two healthcare companies, an energy, a mining, an insurance company and a traditional manufacturer. At this stage, it is useful to control for market reaction by differentiating between information that is supposed to benefit or harm a firm, here after referred as good or bad news. A further sub-grouping by summarizing firm characteristics (e.g. market cap, industry, value/growth firm) is needed to allow a more in-depth analysis of the effects of a false news shock and to assess for more firm-related stock market reactions. Such a step helps to generate evidence for a more general understanding of security price determinants and to attribute certain differences in structural and return characteristics to firm idiosyncrasies. Regarding market capitalization, the common definitions for large respectively small firms are applied. For the industry classification, it is differed between technology industries (SIC 73XX) and non-technology industries. As a last step, each firm in the sample is defined as a value or growth firm according to its unique characteristics. This leads to a

sample distribution of 12 bad news and 12 good ones. More details about the sample distribution are presented in Figure 1. The input data on daily stock information comes from the Center for Research in Security Prices (CRSP).

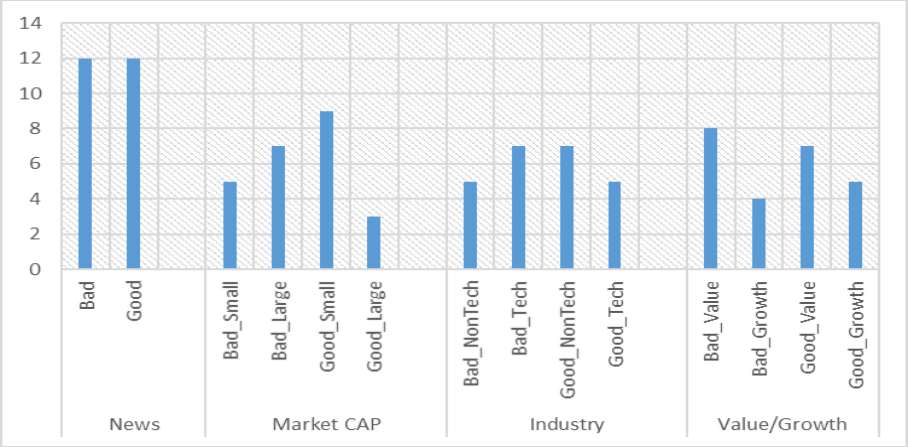


*Figure 1 Overview of sample content*

A valuation of the event's impact requires the measure of the abnormal return (AR). The AR is the ex post return of the security minus the normal return over the event window:

$$AR_{i,T} = R_{i,T} - E\{R_{i,T}|X_{i,T}\} \tag{1}$$

Where $AR_{i,T}$, $R_{i,T}$, $E\{R_{i,T}|X_{i,T}\}$ are the abnormal, actual and normal return respectively for time period t. $X_{i,T}$ is the conditional information for the normal return model. In this case, $X_{i,T}$ is derived from the Fama and French (1993) Multi-factor Model due to variance reduction:

$$AR_{i,T} = R_{i,T} - E(R_{i,T}) = R_{i,T} - (r_{f,T} + \alpha_i + \beta_{i,M}(R_{M,T} - r_{f,T}) + \beta_{i,SMB}SMB_T + \beta_{i,HML}HML_T \tag{2}$$

where $SMB_T$ stands for "small minus big" and $HML_T$ stands for "high minus low". The $SMB_T$ factor should capture the excess return from small over big stocks and the $HML_T$ factor should capture the excess return of securities with a high market-to-book ratio over stocks with a low one. For the event study the WRDS database event study research application is used. Therefore, a normal performance model (2) has to be selected. 270 trading days are selected to guarantee a sufficient estimation window. The gap between estimation period and event period is set for 20 days to prevent the former from influencing the results of the performance model.

The pre-event period is defined as a window of three days prior (t = -3) to the relative event date (t = 0). Whereas the post-event window is set for three days post (t = +3) the event. The former is used to analyze our results in in the short-run. In order to see long-term effects, another event window of a 41-days range around the event date (t = ±20) is set. This relatively long time frame is chosen to better analyze the long-term effects of the event. Having set the event window larger than one facilitates the use of ARs around the event date in the analysis. In order to ascertain the magnitude of ARs over the entire event window, the sample specific cumulative abnormal returns (CAR) are calculated:

$$CAR_{i,(T1,T2)} = \sum_{t=T1}^{T2} AR_{i,t} \tag{3}$$

Another measure to calculate the overall return over the event period is the buy-and-hold abnormal return (BHAR). Given by its definition as the difference between the realized buy-and-hold return and the normal buy-and-hold return, BHARs allow for compounding and are more adapted for long-run event studies:

$$BHAR_{i,(T1,T2)} = \prod_{t=T1}^{T2}\left(1 + R_{i,t}\right) - \prod_{t=T1}^{T2}(1 + E\left\{R_{i,T}\middle|X_{i,T}\right\} \tag{4}$$

For a further analysis of the sample regarding the post event security behavior in the short respectively long-run, the cross-sectional average of each measure is used:

$$\overline{CAR}_{(T1,T2)} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i(T1,T2)} \tag{5}$$

$$\overline{BHAR}_{(T1,T2)} = \frac{1}{N}\sum_{i=1}^{N} BHAR_{i(T1,T2)} \tag{6}$$

where the averaged CAR is used to interpret results in the short-run (t= ±3) and the averaged BHAR to do so for longer periods. As mentioned before, by performing a parametric test it is assumed that individual firm's abnormal returns are cross-sectional independent and normally distributed, therefore the test statistic grounds on a classic t-test. The Pattel's (1976) test of

standardized event-window ARs corrects for the test's prediction error and overcomes its proneness to event-induced volatility.

# 4 Results

From the news sample, it becomes clear that most of the false and harmful information was deliberately produced to impact stock prices. In this sample, only the bankruptcy filing of United Airlines and the heart-attack of former Apple CEO Steve Jobs can be considered as accidently published false information. Most of the fake news is remarkable often spread via social media platforms (e.g. Twitter) or open press release distribution platforms (e.g. newswire). It can also be seen that besides news stating wrongly reported firm earnings announcement, information about a pretended SEC investigation is commonly used by the delinquents. It is also worth mentioning that information about a preference for certain firms or industry sectors cannot be provided. For good news, only two types of information seem to cause persistent positive effects on the stock prices in our sample. The focus is either on the introduction of a new innovative product that seems to derive a significant competitive advantage for the firm or a company already agreed on or is still looking to be acquired. Accounting for new inventions, those can mostly be attributed to technology firms, whereas takeover bids happen to occur equally often in every sampled sector.

Figure 2 presents the results of investor behavior on bad respectively good news based on daily data, as described by the equations (1) to (6). It can be seen, that after sharp price movements that occurred on the event date, stock prices remain at the induced level. This pattern applies for both, good and bad news. In the short-run, there are small adjustments towards a reverse movement, but drops or jumps back to pre-event levels fail to appear. A mean CAR of -4.6% is the result of a -5.6% AR on the adverse event date. The abnormal effects pertaining the events of the sample are statistically ($t$ = -6.18) and economically significantly

different from zero, and thus not the result of pure chance. In the BHARs analysis sharp price movements prior to the event can be recognized, but they cannot be attributed to any statistically significant events. In this analysis, the mean BHAR on t = 0 equals 5.3%. Although it remains positive, it suffers a 5.5% decline. It takes usually between five and six trading days until investors start trusting in the fundamentals of badly affected securities again. In case of good news, the mean CAR on the event date amounts of 26.8% ($t$ = 12.19), which can be attributed to a 21.1% increase. Counter to bad news, a price reversal in the short-run cannot be seen and therefore no immediate price correction. When looking at BHARs, it takes a stock between seven and eight days until the event induced return shock reverses to pre-event levels. Only when looking at the long-term results, the existence of an upwards movement starting at least 10 days prior to the event can be seen, but any significant effects that drive this movement cannot be found.

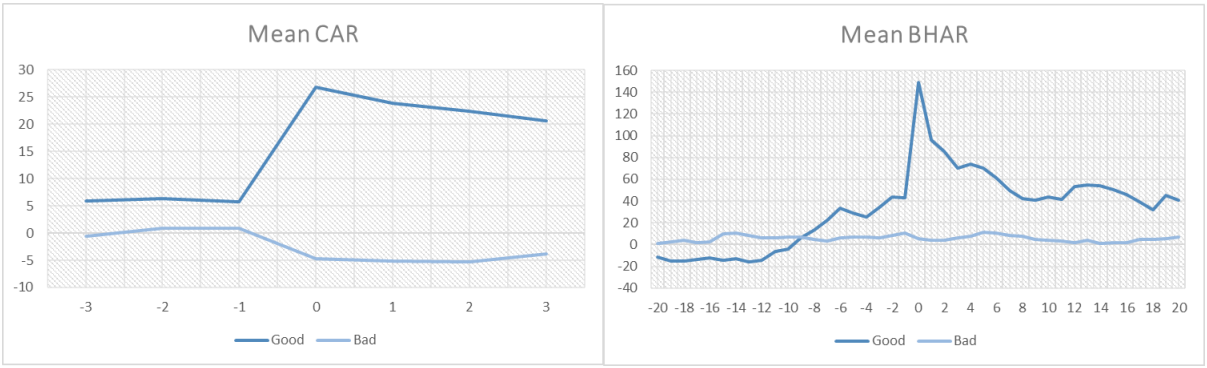


*Figure 2 Stock price effects on Good/Bad News - daily data in percent*

In Figure 3 the results towards security movements according to firm size are plotted. In this case, it is examined how long it takes stock prices to reverse only taking the news type and the company size in consideration. In the short-run and considering bad news, stock prices for companies with a small market capitalization drop by 6.9%, which can be considered statistically significant ($t$ = -6.81) on the event date. On t = +1 a not economically significant correction followed by an almost constant path is noticed. Whereas, the drop for large firms turns out to be with 4.4% smaller ($t$ = -2.28). However, in the long-run, it takes small stocks in

average six days to closely reverse to pre-event levels. Large stocks recover within the fourth trading session. The realized change of BHARs on the event date amounts on average of -7.1% for small firms and -5.5% for large caps. Now, focusing on good news leads to different results. Firstly, the mean CAR for small firms on t=0 is with 15.86% ($t$ = 5.88) and respectively 8.66% for the mean BHAR significantly larger than it is for large firms. It is worth to mention that the mean CAR results from an enormous price jump on t=0 (14.9%). Large firms count for a mean CAR of 3.6% ($t$ = 5.57), which is the result of an abnormal increase of 5.4% on the event. For both firms, small and large, a price correction does not take place in the short-run. For small cap stocks the anticipated reversal does not even occur in the sample's long-run. Only large cap stocks recover from the 2% gain within six trading days. Sharp price movements a few days before and after the event date cannot contributed to any statistical relevant relationships.

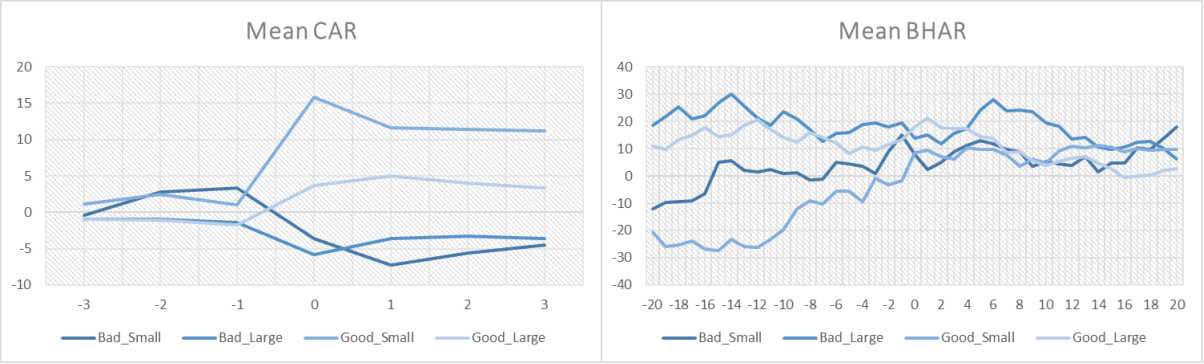


*Figure 3 Stock price effects on Small/Large Firms - daily data in percent*

The continued research on the impact of industry affiliation under the influence of news is summarized in Figure 4. In respect to technology firms and bad news, the mean CAR on t = 0 equals to -12.2% after suffering a from a decline of 9.5%. The results can be considered statistically different from zero ($t$ = -7.09). Non-technology firms suffer with a decline of 2.5% less than their counterparts ($t$ = -1.96) and are able to almost return to pre-event price levels within three trading days. For good news, the mean CAR of technology firms increases by 32.5% ($t$ = 13.08), whereas non-technology firms only experience a rise of 9.8% ($t$ = 6.28). When it comes to the stock movement after the event, a familiar pattern can be recognized.

There is the intention of a short correction, but it straightens out after t = 1. In the long-run, it takes badly affected technology (non-technology) stocks in general between six (five) trading days to bounce back to pre-event levels. The results in case of good news slightly differ, in general it takes both industries between seven and eight trading days to fully recover.

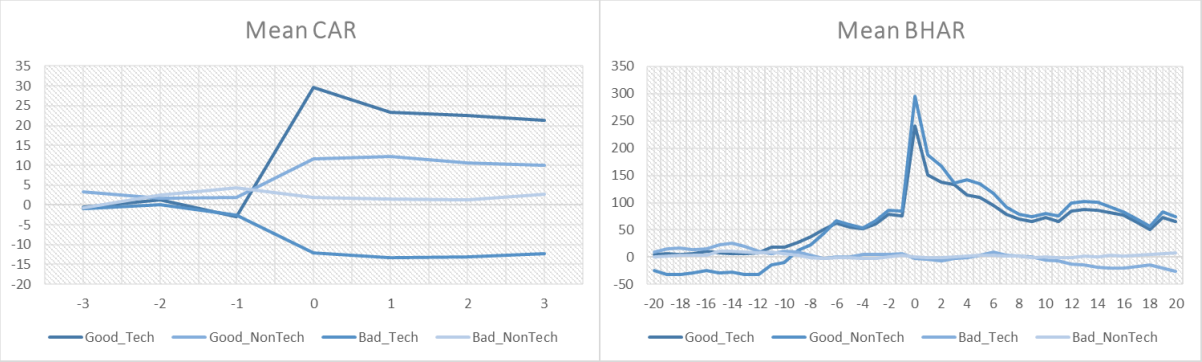


*Figure 4 Stock price effects on Non-Tech/Tech Firms – daily data in percent*

In the following section, further investigations on the influence of firm's value or growth definition are conducted. Figure 5 presents graphically the roles news and firm definitions play with respect to investor behavior. Looking closer into value stocks affected by adverse information, a price drop of 7.1% leads to a mean CAR of -6.3% ($t$ = -2.33) on the event date. Growth stocks' mean CAR suffers a slightly smaller decline of 4.7% ($t$ = -6.1). In contrast, favorable news lead to a price increase of 9.8% ($t$ = 5.26) for value stocks and respectively to a 32.5% ($t$ = 14.01) rise of growth stocks. Furthermore, the non-existing behavior of a stock price correction can be recognized. Prices seem to be almost stable once the announcement appeared and the expected rebound does not occur in the short-run. Interestingly, when looking at long term periods, it can be seen that value firms do not recover from harmful news in our sample period. Prices seem to decline even further, but any statistical evidence for such a behavior cannot be found. On the other hand, growth firms recover within four trading days. Accounting for good news, value firms also do not recover during our sample period, but stay at the shock induced level. Growth firm's securities, on the other hand, fully recover within seven trading days.

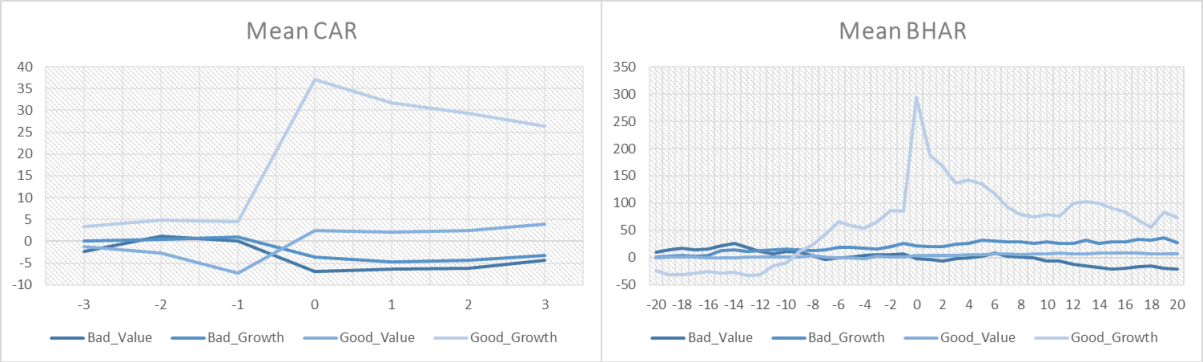


*Figure 5 Stock effects on Value/Growth Firms - daily data in percent*

# 5 Discussion

The identified news studied by Klibanoff et al. (1998), Tetlock (2007) and Fang and Peress (2009) mainly refer to factors, which at that particular time were still of potential importance for the predictability of the future firm profitability. This study is contradictory, as it only investigates false news that were responsible for a significant variation of stock prices from firm fundamentals. Assuming the existence of fake news and the clarifying announcement, the latter should cancel the former out. Therefore, the release of false information should not have a direct impact on investor beliefs about the firm fundamental values. However, the observed results imply an investor overreaction triggered by certain private signals (e.g. reading a newspaper article) that result in an effect on share prices. The absence of an immediate reverse might be induced by persistent indirect asset-pricing effects. This section presents some indirect effects on false news in order to find explanations for the observed results. This study clearly shows what DeBondt and Thaler (1985) already suggested in their studies, 31 years ago. The researchers concluded that market participants overreact to not expected news events. The presented outcomes not only support their theory, but they also show the differences in magnitude depending on more summarized firm characteristics.

The results clearly show that false news trigger a shock in the short-run, but the effects will not persist over longer periods. This is consistent with DeLong et al. (1990). They prove

the effect of public announcements being dependent on perceived reliability and content. Firstly, a minimal level of reliability is necessary for the news to be persuasive. Additionally, the content should match the investors belief. Hence, new false information can reinforce investor perceptions and leads to reactions. This is mainly the case in this study, since all the information was published via highly respected and trusted news providers. Regarding the second aspect, their theory seems certainly supported by this studies' outcomes as well. By sorting the sample, it can be seen that the effect of overreaction occurs mainly for a positive public announcement attracting the fundamentals of a growth stock. This circumstance suggests that investors anticipate their beliefs coming true either by the development of the long-desired innovation or the acquisition proposal, which underlines that other firms share their opinion about the future potential. In comparison, the higher decline, badly affected value firms suffer from, may be explained by investors' recognition of their already low expectations. In addition, the results from the industry analysis support the classical research assumptions. Technology businesses are also perceived to be riskier and more volatile than their counterparts. In fact, such companies face high research and development expenditures and uncertain commercialization perspectives of their inventions. This leads investments in technology to have a higher risk-return reward. From the sample, it becomes clear that investors highly appreciate favorable news, whereas bad news are very unwelcomed at the same time. A possible explanation goes along with the one explaining investor behavior towards growth stocks. In the appearance of a false company announcement declaring a technological breakthrough, investors see their expectations approved and immediately foresee a prosperous company's future without verifying the information. The same happens when the news turn out to be bad, investors seem to lose trust in the firm's market potential.

Consistent with this study's observations is also Peress (2014), who predicts that investors suffer from a so-called "information overload" due to the limited attention of human

beings. He sees a preference towards trusted media sources rather than official company sources. His theory holds true with the findings of this study in which only news providers perceived as prestigious and reliable are considered. Nevertheless, in times when such news providers tend to post redundant or even false news as soon as they appear on social media platforms (e.g. Twitter), as it happened in most of the sample cases, market participants face difficulties to verify the information. Furthermore, the speed in which news are presented may come at the expense of reliability. It is challenging for individual investors to sort out unnecessary information. Whereas, the overestimation of constantly accessible financial information intensifies the overconfidence bias. Such traders attribute high values to the information they acquire and fade out the potential risks or ignore other signals, which causes a delayed price reversal. From Barber and Odean (2008) it is already known that recently published news attract a high degree of attention to individual investors that again tend to overestimate the feasible quality of short-term information related to long-term results.

In addition, in can be seen in the study's results that ARs for either good or bad news are smaller for securities issued by large cap companies. This underlines that on one hand, Fang and Peress's (2009) and Peress (2014) theses of small cap stocks, which are mostly held by individual investors, rely on the mass media, whereas smaller return premiums for large cap stocks are due to constant broad media coverage and often favored by institutional investors.

On the other hand, the small firm effect and the theory of a premium that is required by uncertainty-averse investors to hold a risky asset holds true (Fama, 1998, Tetlock, 2007, Fang and Peress, 2009). This study's results show similar effects for the small, growth and technology firms in the sample, which by classical research are considered riskier than their counterparts. The researchers further state that market participants, when confronted with unwelcomed and uncertain news, take the worst-case of the quality of the information. This may lead to a deterioration in the quality of information regarding an affected firm and

therefore has persistent negative short-term effects on prices for fundamentals.

Another possible explanation in case of bad news is provided by Fang and Peress (2009). They find in their studies that investors demand higher returns on illiquid assets. Assuming harmful affected firms suffer an exogenous liquidity shock, stock prices fall to offset investors through higher expected future returns. Building on that, the researchers develop a theory of liquidity levels. They differ between a "normal" - and a "low liquidity"- level that is characterized by a higher bid-ask spread and a lower price. It might be the case that the news event and the subsequent trading halt of some stocks act as an adverse shock to liquidity. Stocks move from "normal" to "low-liquidity" temporarily. Hence, the widened spread during the sharp price movements and relative high transaction costs prevent liquidity traders from trading. Even though the news has been identified as wrong, the lack of active liquidity traders has led to a persistent higher bid-ask spread and generates lower liquidity levels. However, supportive evidence cannot be found and Fang and Peress's (2009) implications remain unclear.

From an arbitrary point of view, theory would expect rational investors to challenge noise traders on their over-pessimistic (over-optimistic) expectations, due to the awareness of the misevaluation in the short-run (Fama, 1998). Counter to the classical views, arbitrage is risky and limited. DeLong et al. (1990) assume that noise trader risk can lead to a mispricing that persist in the short-run due to some rational investors' only interest in the next period's price. Arbitrageurs see themselves confronted to two types of risk: The uncertainty of fundamentals continuing to divert even further and the challenge of timing the elimination of the arbitrage opportunity. The results from the event study support the beneficial attribute of an irrational investment strategy in the short-run, but also show the occurrence of rational behavior over time in most of the cases. The absence of an immediate reversal allows to assume investor fear, which can also be attributed to noise trader risk. Delong et al. (1990) assume that

traders are well-aware of the false news, but at the same time, they are afraid to be opposed to informed sellers. Due to many market participants who react instantly on the just announced news without verifying the information, it seems to be rational for investors to sell (buy) stocks even though they identified the news as false. Acting on not verified or fractions of information leads to persistent drifts, because information diffuses slowly among investors (Peress, 2014).

Although this study confirms what recent research predicts, this research approach faces certain limitations. New search algorithms can be held responsible for triggering news shocks by screening online platforms. With respect to new trading technologies, a more efficient analysis can be provided by using intraday data (e.g. 5 min frequency) instead of daily data. Furthermore, using a pre-determined research tool, which only allows for basic variable adjustments, exacerbates the release of required data. It is difficult to discover cases that have similar characteristics as false news shocks. A number of first apparently related cases were subsequently shown to result from fraud and ended with firms declaring bankruptcy. The relatively sparse occurrence of such events yields to the small sample. Due to difficulties, such as the low statistical power or the effect of sample induced biases associated with unique firm characteristics, these results can be questioned regarding reliability and unambiguity and therefore have to be interpreted carefully.

# 6 Conclusion

This paper presents views and thoughts about theories and empirics addressing false news shocks. Firstly, it is discovered that Fama's EMH is challenged by various market anomalies, which are measurable due to an interdependence of the media and capital markets. Behavioral biases lead to investor behavior that cannot be described as rational. Even the downward pressure stock prices experience after days with high pessimism in the media is studied in this paper. According to Tetlock (2007) it is also possible to create a profitable

trading strategy relying on analyzing investor sentiment in newspaper articles. However, it is questionable if this strategy will remain beneficial due to transaction costs and taxes, but it still demonstrates the influence of the media to harm the idea of efficient markets with the diffusion of false information.

In the event study, the impact of a false news shock on the stock price of an affected firm is measured. The existence of realized AR that are significantly different from zero on the event date not only demonstrates that those returns are not the result of pure chance, but also supports recent research. This study demonstrates investor overreaction towards unexpected news and further strengthens the existence of higher required returns for riskier and more volatile stocks. Furthermore, the shocks have a persistent effect on the stocks' price level: it took securities almost always seven trading days to return to the by our risk model implied price levels.

Thus, to conclude in relation to the research question, this paper provides evidence on the importance of mass media in spreading information among market participants and affecting how they perceive news. Stock prices suffer or gain from sharp price movements after the publication of false news. Nevertheless, an immediate price correction despite unlimited media access fails to appear and therefore further challenges market efficiency. A sustainable theory that helps to rationalize the indirect price effects cannot be established. Although disrupted liquidity, noise trader risk, perceived reliability and information overload provide supportive evidence, but they cannot be made individually accountable for the inefficiency.

Furthermore, it is difficult to find similar characterized episodes, which do not involve fraud and result in the company declaring bankruptcy. Hence, it would be of particularly interest for EMH research to complete this investigation by examining if market participants anticipate potential spillover effects for company peers or main suppliers and draw the same conclusion about those firms

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