

A Work Project, presented as part of the requirements for the Award of a Master's degree in
Finance from the Nova School of Business and Economics.

IMPACT OF INSIDER TRADING BEHAVIOR IN INVESTMENT STRATEGY
PERFORMANCE

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20/12/2023

Abstract

Since mid-2003, the Securities and Exchange Commission (SEC) has made corporate insider filings available in a structured way, allowing for wider access and research. Despite several studies aimed at assessing whether corporate insiders can earn excessive returns, it remains unclear as whether non-insiders can do it by solely looking at corporate insider behavior. Using structured data from corporate insider filings over the period 2003-2022, this study aims at understanding whether a real, replicable, profitable investment strategy can be derived from using both corporate insider purchases and sales, with additional help of some select filters.

Keywords

Insider Transactions, Investment Strategy, Portfolio Returns, Portfolio Strategy, Market Efficiency, S&P500, Stock Market, Financial Markets

Acknowledgments

To my family and friends. To my mum and dad, for being my pillars, and always being there. To my brother, for being my best friend. To my grandparents, aunts, uncles and cousins, for being the best. To my great-grandmother. To my closest friends, for guiding me through life and making me who I am. To my advisor, for the invaluable guidance.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

INTRODUCTION

Corporate insiders have earned a long history of interest from diverse fields study, ranging from finance to economics, from regulation to morality and ethics. One of the key discussions on the topic has revolved around the ability of corporate insiders to access non-public, material and sensitive information before outside investors, allowing them to generate excess returns, which constitutes an apparent market inefficiency. Extensive academic research has been conducted over the years, not only on the ability of corporate insiders to profit from non-public information, but also on the ability of non-insiders to profit from replicating it. Since mid-2003, the Securities and Exchange Commission (SEC) has made corporate insider filings available in a much more structured way, allowing for wider and easier access. Despite several studies aimed at assessing whether corporate insiders can indeed earn excessive returns, it remains unclear as whether non-insiders can do it by solely looking at insider behaviour. Using structured data from corporate insider filings over the period 2003-2022, this study aims at understanding whether a profitable investment strategy can be set by using both corporate insider purchases and sales, with additional help from a set of selected filters.

LITERATURE REVIEW

The ability of insiders to obtain and take advantage of privileged, price-sensitive, and material nonpublic information has been widely researched in the finance community. The earliest findings go back to 1941, with findings from documented insider transactions over the period 1935-39 confirming the willingness from insiders to access nonpublic information for their personal gains (Smith 1941). Later, in 1964, by examining 45 companies in which, within one month, three or more insiders buy their company's stock and no insiders sell it, it is found that the return of insiders of such companies in the next six months are on average 9% greater than the return of the market as a whole (Rogoff 1964). By investigating insider transactions for fifty randomly selected NYSE firms over the period 1957-1961, classifying each month as a

net buying or net selling month, and studying its succeeding months' performance, it is concluded that no relationship between insider trading and subsequent price movements exists (Wu 1964). Glass further examines transactions from 14 calendar months, selecting the eight securities with the greatest excess of insider buyers to sellers within a month, and finds that the average return on these securities is 10 percent above the return of the market as a whole in the seven months following the intensive buying month (Glass 1966). Later research finds that securities experiencing an intensive buying month are more likely to advance than to decline relative to the market in the six subsequent months, with the opposite relationship observed for intensive selling activity. This study further concludes that, for insiders, purchases tend to be followed by purchases and sales tend to be followed by sales, deriving that a change in direction of activity is of probable importance in deducting insiders' expectations concerning their stocks (Lorie and Niederhoffer 1968). The following decade was responsible for great breakthroughs. First, by looking at 52,000 open-market insider transactions for about 800 NYSE stocks over the 1960-66 period, Pratt and DeVere find that, up to twelve months following an insider buy signal (three or more purchases and no sales from insiders within a month), insiders outperformed the market, reporting greater excess returns for purchases than for sales (Pratt and De Vere 1970). Later, by analyzing the return performance over the 1962-68 period for the largest 200 NYSE stocks that experienced intensive insider buying (where the number of insider buying days in a month exceeded the number of insider selling days), Jaffe concludes that insiders do possess special information that allows them to outperform the market. Using the CAPM, he finds that while insiders do indeed generate risk-adjusted excess returns, these are mostly evaporated when transaction costs are taken into consideration (Jaffe 1974). These have been further confirmed for insider activity in Canada (Baesel and Stein 1979) and Great Britain (Pope, R.C. Morris, and D.A. Peel 1990). Additional support comes from examining insider transactions over 1969-72, with findings that insider buying led to positive, while

insider selling led to negative excess returns, with most of the excess returns realized in the first six months, and the biggest gain occurring within the first month. The author further concludes that after the insider acts, the short-term effect is to have the market follow (Finnerty 1976). Given the contradicting findings, further attempts are aimed at finding whether the market inefficiency initially described by Pratt and DeVere had been corrected by market forces. By examining a series of monthly Insider Reports from 1976, composed of 120 stocks identified as “unusual” insider activity, per Pratt and DeVere’s definition, results show no statistical significant differences against market returns, thus providing additional evidence that non-insiders are unable to earn superior short-term returns by mimicking insiders actions, and suggesting that knowledgeable investors may have largely eliminated the apparent market inefficiency. This is also consistent with reported continual deterioration in the rate of return to insider trading (Kerr 1980). By analyzing a dataset of insider transactions in listed and OTC securities over the period 1971-76 and combining insider trading signals with financial ratios data to validate the initial signals, new findings show that returns should be higher when the prediction of profitability is made based on insider transactions and confirmed by financial ratios, rather than when based on insider transactions alone (Trivoli 1980). Further research attempts at finding which other factors might be relevant in evaluating insider trading behavior. Over the period 1974-78, results show that CEOs and directors appear to outperform beneficial owners (owners of 10% or more of a given equity security) and vice-presidents on purchase sales, but to underperform on sale transactions, indicating unequal access to private information (Nunn, G.P. Madden, and M.J. Gombola 1983). Covering a period over 1971-82 and data from the SEC’s Summary, further research indicates that current and past insider trading values do not appear to be related to subsequent market values, suggesting that insider activity lags rather than leads market movements. Despite insiders buying after a declining market and selling after a rising market, and market movements being positive and more significant in the six months

after intensive insider buying, the same is true for months following intensive selling activity, further confirming the semi-strong form of the EMH. The authors conclude that utilizing insider trading for market timing purposes won't produce superior performance. Instead, investors are more likely to profit by concentrating on insider trading activity that appears to be based upon firm-specific information (Lee and Solt 1983). Later, by analyzing 769 NYSE and AMEX listed firms with at least one insider transaction recorded between 1975-81, Seyhun finds that insiders in small firms earn greater excess returns than insiders in large firms. Results further show that only insiders can predict abnormal future stock price changes using superior information, as markets are efficient and outsiders cannot use publicly available information on insiders' transactions to earn abnormal profits net of transaction costs (Seyhun 1986). By examining the characteristics of insider transactions in non-listed firms, results show that insiders wait until after the release of unfavorable information to purchase stock, and until favorable information is released to sell it. In spite of some predictive content, it is concluded that much of the profit opportunity may be absorbed by the high bid-ask spreads in the OTC market. Moreover, while cumulative abnormal returns are not affected by firm size, these are positively related to the insiders' access to information, indicating that different groups possess different information (Lin and J.S. Howe 1990). Further studies report that trade-specific characteristics such as trade size or direction, number of trades or the total volume traded by the insider lead to the incorporation of inside information into price (Meulbroek 1992). Later findings show evidence consistent with the hypothesis that informed trades are concentrated in the medium-size category, and that price movements are mainly due to informed traders' private information (Barclay and Warner 1993). Later, Ferreira confirms Pratt and DeVere's findings, showing that insiders earn superior returns by adjusting their own firm's stock trading to future market movements, contradicting the semi-strong form of EMH (Ferreira 1995).

Since mid-2003, the Securities and Exchange Commission has made insider trading reports available to the public in a structured format, facilitating its access and study. However, most academic papers since use proprietary commercial databases and opaque data manipulation and aggregation processes, making it harder to replicate and draw further conclusions. In 2017, using a broad sample of 993 insider stock purchases and 6,562 insider stock sales from 2002-2009, findings show that insider stock purchases negatively influence corporate bond prices, suggesting that these are associated with a negative signal for the bond market, with purchases from CEO's influencing bond prices the most (Oehler, Walker, and Wendt 2009). Lastly, more recent work aimed at examining the existence of the anchoring bias in the context of insider trading. Using data from 1986-2017 and by comparing the aggregate levels of purchases and sales to high and low prices, the authors found evidence supportive of the bias existence within insiders, using the 52-week low and high as relative anchors. The authors further conclude that when insiders execute their respective transactions against the influence of the bias, such trades can be more informative, with low sales being more likely to be driven by negative information whereas high buys are more likely to be driven by positive information, with return differences more pronounced for insider purchases than for sales (Li et al. 2019). Despite the long history and wide range of research on insider trading, and as contradictions prevail, there is still not a clear answer as to whether, or how, outside investors may be able to profit from reported insiders' transactions. This study aims to fill this research gap, by analyzing insider transaction filings over the period 2003- 22, and combining it with additional relevant metrics, in an attempt to derive a real, replicable and profitable investment strategy.

DATA AND METHODOLOGY

Since mid-2003, the Securities and Exchange Commission (SEC) has made corporate insider filings available to the public in a more structured way, allowing for easier access and investigation. This study uses data of corporate insider filings of all S&P500 constituents over

the period 2003-2022 in order to derive a profitable, replicable investment strategy driven by analysis made on corporate insiders behavior. Given the wide range of publicly available data for the US stock market, as well as the accessibility to SEC filings and reports, the focus of this study will be on US-listed securities. In order to have a relevant and significant analysis, and to make replication easier, this study will examine securities in the S&P500 index, given its size, long tenure, and scrutiny. The period was chosen as to maximize the scope of the analysis, making use of all available filings up to 2022. 2023 filings were excluded as to better control for different holding periods. The dataset will consist of all insider transactions executed over the studied period, as well as some other indicators deemed relevant for strategy construction. The data retrieval starts with finding the constituents of the S&P500 index over the relevant period. In order to make the strategy as replicable as possible, and to avoid possible forward-looking biases, it is important to use the index constituents for each year, rather than just the current ones. Corporate insider transactions are available online at Wharton Research Data Services, from University of Pennsylvania. The data on insider transactions can indeed be filtered by security, however, given it is linked to Factset's database, some additional steps are required. Factset's database filters securities through two different platform-specific IDs: `FSYM_ID` and `Facstet_Entity_ID`. While the first can be defined as a unique Factset identifier assigned to a security, and more suited for backtesting purposes, the latter is a permanent identifier assigned to an entity. For this reason, and given the nature of this study, `FSYM_ID` was deemed as the most reliable identifier, and used to retrieve the required data. In order to get these identifiers for all S&P500 constituents, a two-step process was needed, converting first each company's ticker to its PERMNO (a permanent CRSP database identifier), and then to its final `FSYM_ID`. Given this is not a permanent identifier, each company has several ID's over the period, all of which were taken into account. The data was then retrieved from WRDS, year by year, starting in May, 2003. For the purpose of the study, the following fields for each

transaction were added: Trade number (the sequential number given to each trade within a single transaction filing), Reported Title (insider title within the company), Transacted Shares, Transaction Price, Transaction Value, Trade Date, Filing Date, Nature of Transaction (“A” for Acquisitions, “D” for Disposals) and Reported Shares Owned (by the insider, after the transaction). Each line on the original datafile represents one trade, and includes additional data for each of the mentioned fields. Once the data is retrieved, it must be cleaned. Rows with no Transaction Price, Transacted Shares or Transaction Values were deleted. Empty Reported Title entries were replaced by “N/A”. Few cases of transactions with Trade Date before 2003 (but Filing Date within the period) were also removed. Entries for different trades belonging to the same transaction were aggregated into one only entry, by consolidating trades for the same security occurring on the same day, with the same reported title and signal (Acquisition or Disposal) and summing its transacted shares. Applying a similar process, a weighted average was calculated for the transaction price of these same trades. As per previous findings, and as described in the Literature Review segment, additional datapoints and indicators can be helpful in deriving a profitable insider trading investment strategy. For that reason, further data needed to be retrieved. First, a daily prices time-series for each of the analyzed companies, over the relevant period, with which it was then possible to calculate a time-series for both the 52-week high and 52-week low for each security, as well as its daily price returns. Secondly, a time-series for daily volumes, for each security, which made it possible to compute an average daily volume time-series for each security in the analysis group. A window of 50 trading days, a standard medium-term moving average window, was used for this purpose. Lastly, shares outstanding for each security were also retrieved. Once having the daily values for each of these datapoints, it was possible to link each transaction to its respective price, volume and shares outstanding. The original retrieved dataset makes no distinction between derivative and non-derivative transactions. Given derivative transactions are assumed as less informative than

non-derivative ones, transactions with trade prices below 90% of the day's closing stock price were also excluded from consideration. The final step was to aggregate all the treated data into one single file. The ticker of each security was added for visualization purposes. The final file consists of 243,261 corporate insider transactions, out of which 199,653 were insider purchases, the remaining 43,608 being insider sales. The dataset compiles transactions from 649 distinct S&P500 US-listed companies.

Once the data is cleaned, the investment strategy can start being constructed. Corporate insider transactions were sorted in ticker alphabetical order first, and in chronological order second, according to its trade date, and all the additional relevant datapoints (daily price, 52-week high/low, average volume and shares outstanding were added). The dataset was divided in two periods of roughly ten years (2003-13 and 2014-22). Whereas the first period is used as the in-sample period, for input-testing and strategy optimization, the second is then used for backtesting purposes. Strategies are developed at the in-sample period, after which the most profitable ones are tested at the out-of-sample window, ensuring its replicability. The period division was thought such that both periods would have roughly the same duration, and include both "bull" and "bear" markets. The first period covers most notably the Great Financial Crisis, and the respective recovery afterward, while the second is characterized by an initial up-trending market, the COVID-19 downturn, and a recent market dip. These tests will ultimately dictate the profitability and replicability of each of the drawn strategies.

The investment strategy is centered around buying or selling stocks when corporate insider buying or selling activity is deemed extraordinary. In 1970, Pratt and DeVere defined intensive insider buying activity as three or more insider purchases within a month, with no insider sales recorded for the period. While the definition is widely accepted by the academic community, this study allows for greater flexibility in the signal creation. Buy and Sell signals are still created from consecutive trades, this is, only insider purchases or only insider sales, within a

specified period, however, the number of required consecutive trades or the cutoff period is not set to a single specific value, as opposed to previous papers. Intuitively, and as supported by some evidence described in the Literature Review, corporate insiders tend to sell high and buy low. However, it might also be the case that corporate insiders are momentum investors, hence selling low and buying high, were they to be influenced by some specific biases. For this reason, and to control for different scenarios, it is possible to create both Buy or Sell signals when intensive insider buying or selling activity is observed. Moreover, the model is built in such way that insider purchases and insider sales can be tested separately, if one chooses to. Signals given from this first step are rated as potential purchases or sales, and then subject to confirmation from additional filters, as suggested by prior research. These relate to: i) the reported title of the insider, ii) the relation of the daily price to the 52-week low and high, iii) the transaction size compared to the average daily volume, and iv) the size of the insider position as compared to the total shares outstanding. For each of these variables, a score of 0 or 1 is given, depending on the chosen criteria. If one wants to give priority to executive-level insiders (as research reports wider access to non-public information), transactions with a reported role containing “CEO”, “CFO” or “Executive”, for example, are awarded a score of 1, while others score 0. As research shows corporate insiders are influenced by the anchoring bias, and trades made “against the grain” (purchases far from the 52-week low and sales made far from the 52-week high) are more informative, acquisitions where the price is, in example, 110% or more of the 52-week low, and sales where the price is, for example, below 90% of the 52-week high, are awarded a score of 1, and otherwise a score of 0. Transactions where the transaction value (as a percentage of the average daily volume) is above a certain value (for reference, 1%) are also awarded a score of 1. Transactions where the insider position in the company (measured as shares owned as a percentage of shares outstanding) is above a certain value (for reference, 1%) are awarded a score of 1, and otherwise 0. The four scores are then

summed into a final confirmation score. If this value is above or equal to a certain defined threshold (ranging from zero to four), the initial potential buy or sell signal is confirmed, returning a value of 1, for purchases, or -1, for sales. If these are not met, no signal is created.

By combining each signal created to its respective date and company's PERMNO, it is possible to create a signal matrix, with all the signals created over the studied period. The following step is converting this signal matrix into a position matrix, according to a specific holding period selected. The model looks for signals in the previous X trading days (say, for example, 20 days), and returns the last non-zero value, if any, creating a position of 1, 0 or -1 for each company, every day. By multiplying the previously computed daily return of each company by its respective position from the day before, it is possible to create a return matrix, with the price return on each company according to the taken position, each day. The next step is to average these returns, to find the daily returns of the actual investment strategy. Given that everyday a considerable number of stocks has no position set (position = 0), the average is done only for companies with a position taken on that specific day. Trading costs are also here taken into account, and subtracted to the average of returns each day. Costs are estimated based on the number of trades done each day, and measured as the sum of changes in positions each day. The final step is to calculate the cumulative returns for the strategy. Lastly, a market-hedged strategy is also analysed. The hedging process is based on daily measuring the Beta of the strategy, using a 180-day window, and then shorting the market in that same proportion, thus removing all market fluctuations from the strategy performance, exposing it to the effect of the transactions alone, and not to market movements. A window of 180 days allows for a fair representation of the correlation between the strategy and the market, with less jumps owed to non-invested days. A Beta of 1 is assumed for the first 180 days of the strategy. The performance of each strategy is then evaluated against the S&P500 index, as a benchmark, using a set of widely-used performance indicators, such as the average annual return, standard

deviation and InfoSharpe ratio. The percentage of positive days and months, Kurtosis and Skewness, and maximum drawdown are also computed and taken into account.

RESULTS

The results of this study are given in terms of strategy performance, through several metrics deemed relevant in performance evaluation, as explained previously. The strategy testing is based on two distinct periods: an in-sample period covering the years 2003-13, and an out-of-sample period ranging from 2014-22.

The expectations were clear: corporate insiders are expected to possess non-public material information, allowing them to better predict their own company's stock future price movements, and to profit from it. It is expected that insiders are able to trade on this undisclosed information, purchasing stock before its price rises, and selling it before it drops, profiting from future price movements. This way, the intuitive expectation is that replicating this activity, i.e, buying when insiders buy and selling when insiders sell, should lead to positive returns for the outside investor. It is expected that the strongest the signal (measured by consecutive purchases or sales within a given period), the highest the strategy returns, as these are expected to signal a greater consensus on future price direction within insiders. As previously mentioned in the Literature Review, additional conditions and metrics can be taken into account to select the most informative trades, and build a strategy on them. Given prior research, C-level officers, are expected to be in possession of more relevant information when compared to other insiders, therefore having a greater ability to predict future stock price movements and profit on it. The same goes for the size of the insider's position, where a larger position from the insider is expected to show greater involvement and, therefore, greater price predictability. As seen before, corporate insiders suffer from the anchoring bias, reason for which trades done close to its 52-week anchor (52-week low for purchases and 52-week high for sales) are deemed less

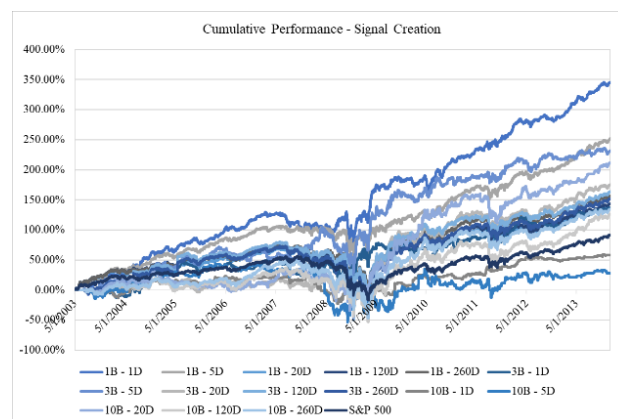
informative. It is expected that trades falling outside of this influence, i.e, purchases well above the stock's 52-week low, and sales well below the 52-week high, are more probable to be done on sensitive information, thus translating into greater returns. The size of the trade is also expected to influence strategy returns, as larger trades are more probable to signal greater confidence in the future stock price direction, but also to (positively or negatively) influence short-term prices. Given an average delay reporting time of 5 days (2-3 trading days), it is possible that the latter effect has a negative impact in the performance of short-term strategies. Nevertheless, it is expected that the larger the transaction, the greater its relevance, thus translating into greater returns. Combining the four conditions together, it is expected that the highest number of criteria met, the more informative a transaction is and, therefore, the more probable to generate positive returns for the outside investor it gets. In regards to the strategy's best holding period, there are no clear expectations to start with. There seems to be support for both a short-term window (of one to five trading days), with the market quickly pricing in the newly available information, a medium-term view (of one to three months), as reported in previous papers, or a longer-term view (of six months up to a year), where insider activity to signal a predisposition to outperform. Results from this paper will be helpful in understanding which is the most relevant. In order to better understand which factors and inputs create the best strategy and translate into better risk-adjusted returns, the study starts by examining insiders purchases and sales separately, and first at the buying patterns of corporate insiders. Consider an annual return of 6.8%, and an InfoSharpe of 0.38 for the S&P500, for the period.

The first strategy analysed is the standard intensive buying strategy, as described by Pratt and DeVere in 1970. This strategy defines intensive buying activity as three or more insider stock purchases within a month (a 30-day period), with no sales. The strategy consists of buying the company's stock once three or more consecutive purchases are done, and holding the position for 20 trading days. No additional criteria is taken into consideration. The strategy provided a

186% cumulative return for the period, and an InfoSharpe of 0.49, above that of the benchmark. Controlling the strategy for different holding periods, it might be possible to see different insider buying patterns. As such, the study will focus on five time windows: 1 trading day, 5 days, 20 days (one month), 120 days (6 months), and 260 days (1 year). The use of several holding periods is expected to help in examining insider trading behaviour and its profitability. Not only different holding periods should be tested, but also different signal creation strategies should be taken into account. In addition to the original intensive buying strategy, other three are assessed in this study: i) “buy all” strategy, where every insider stock purchase creates a buy signal, ii) a buy signal for five consecutive purchases (and no sales) done within one month, and iii) only for ten consecutive insider purchases, within six months, a buy signal is created.

Holding Period	Buy All					3 Transactions within 1 Month					10 Transactions in 180 days					S&P 500
	1-Day	5-Day	20-Day	120-Day	260-Day	1-Day	5-Day	20-Day	120-Day	260-Day	1-Day	5-Day	20-Day	120-Day	260-Day	
Cum. Ret.	345.2%	251.6%	135.4%	143.3%	156.7%	136.5%	231.6%	175.5%	163.6%	151.8%	58.3%	28.1%	211.5%	126.2%	134.6%	91.6%
Avg Annual Ret.	25.7%	18.7%	10.1%	10.7%	11.7%	10.2%	17.2%	13.1%	12.2%	11.3%	4.3%	2.1%	15.7%	9.4%	10.0%	6.8%
St. Dev.	21.5%	22.2%	21.4%	21.2%	20.9%	21.9%	27.9%	26.9%	26.2%	25.0%	17.5%	30.0%	30.9%	28.3%	27.3%	17.9%
InfoSharpe	1.197	0.844	0.472	0.505	0.558	0.465	0.618	0.485	0.464	0.452	0.248	0.070	0.510	0.332	0.367	0.382
% Pos. Days	58%	55%	54%	55%	55%	54%	52%	54%	54%	54%	51%	50%	51%	53%	53%	55%
% Pos. Months	69%	66%	65%	65%	66%	60%	54%	61%	62%	61%	55%	52%	65%	62%	63%	66%
Kurtosis	0.2	0.3	0.1	0.0	0.1	0.7	0.7	0.1	1.0	0.5	2.1	-0.6	0.4	-0.2	-0.1	15.8
Skewness	14.8	16.1	13.8	14.3	13.6	30.3	16.2	12.5	25.8	18.9	68.6	57.2	13.0	15.6	14.4	-0.1
Max. Drawdown	-52.9%	-57.2%	-73.9%	-80.5%	-79.2%	-42.2%	-78.7%	-62.8%	-94.0%	-107.8%	-60.8%	-98.0%	-81.9%	-90.1%	-95.3%	-73.6%

Table 1 – Insider Purchases: Unconstrained signal-creation strategies



Graph 1 – Insider Purchases: Unconstrained signal-creation strategies

Table 1 and Graph 1 aggregate the different signal-creation strategies, for each of the holding periods. All strategies are unconstrained, i.e., no filters are added. Given lower performance all-around, results for the signal-creation strategy consisting of five consecutive trades can be

found in the Appendix. It was expected that the higher the number of consecutive purchases required, the stronger the conviction from insiders on future stock price movements, and therefore the greater the returns. Oppositely, a first analysis shows outperformance from the “Buy All” strategy, indicating that a higher number of consecutive trades does not translate into superior returns. Instead, more consecutive corporate insider purchases appear not to be a direct indicator of higher confidence and consensus over future price movements, not translating into improved risk-adjusted performance. Despite outperformance from the “Buy All” strategy at most holding periods, and InfoSharpe’s close to and above 1, the standard three consecutive purchases within one month strategy also produced interesting results across the different holding periods. These will be the signal-creation strategies at the centre of the analysis moving forward. As previously stated, several criteria might help in understanding how informative, and therefore profitable, a transaction might be. The study will first analyse these individually, aiming at later combining them in the best way possible. All relevant performance measures can be found in table 2 and 3, otherwise in the Appendix.

Signal - Every Purchase generates a Buy Signal																								
	1-Day Holding Period								5-Day Holding Period								20-Day Holding Period							
% of 52W Low	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	125%	0	0	0	0					
Role	0	0	C-level	on C-Level	0	0	0	0	0	0	C-level	0	0	0	0	C-level	0	0	0					
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	>1%	0	0	0	0	0	>1%	0	0					
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	>0.1%	0	0	0	0	>0.1%	0					
Cum. Ret.	345.2%	272.2%	281.6%	348.6%	323.0%	250.9%	331.7%	302.0%	251.6%	200.6%	217.6%	285.0%	382.6%	135.4%	132.9%	109.2%	166.4%	147.0%						
Avg Annual Ret.	25.7%	20.3%	21.0%	26.0%	24.0%	18.7%	24.7%	22.5%	18.7%	14.9%	16.2%	21.2%	28.5%	10.1%	9.9%	8.1%	12.4%	10.9%						
St. Dev.	21.5%	24.0%	21.6%	23.4%	21.9%	20.1%	21.9%	22.4%	22.2%	27.2%	26.1%	27.4%	30.3%	21.4%	25.1%	22.2%	23.3%	26.5%						
InfoSharpe	1.197	0.843	0.972	1.108	1.096	0.930	1.130	1.005	0.844	0.550	0.621	0.773	0.942	0.472	0.395	0.366	0.532	0.412						
% Pos. Days	58%	55%	54%	57%	58%	57%	58%	55%	55%	54%	54%	53%	54%	54%	54%	53%	54%	53%						
% Pos. Months	69%	63%	62%	69%	64%	63%	69%	70%	66%	67%	66%	61%	71%	65%	62%	61%	60%	63%						
Kurtosis	0.16	-0.91	2.98	0.77	0.37	0.66	0.47	1.84	0.29	-1.26	-2.02	3.74	2.56	0.11	0.05	0.05	0.63	-0.08						
Skewness	14.84	33.55	62.56	18.52	17.71	31.48	17.24	39.33	16.06	25.91	74.16	79.29	56.35	13.81	16.76	17.06	15.04	10.72						
Max. Drawdown	-52.9%	-82.1%	-38.4%	-50.3%	-52.9%	-37.7%	-50.5%	-51.7%	-57.2%	-105.2%	-65.8%	-57.5%	-81.8%	-73.9%	-63.1%	-84.2%	-85.7%	-135.4%						

Signal - Three Purchases within One Month																								
	1-Day Holding Period								5-Day Holding Period								20-Day Holding Period							
% of 52W Low	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	125%	0	0	0	0					
Role	0	0	C-level	on C-Level	0	0	0	0	0	0	C-level	0	0	0	0	C-level	0	0	0					
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	>1%	0	0	0	0	0	>1%	0	0					
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	>0.1%	0	0	0	0	>0.1%	0					
Cum. Ret.	136.5%	3.0%	96.9%	89.4%	85.9%	98.7%	49.3%	98.5%	231.6%	122.8%	63.6%	237.3%	196.2%	175.5%	147.6%	121.5%	86.8%	160.0%						
Avg Annual Ret.	10.2%	0.2%	7.2%	6.7%	6.4%	7.4%	3.7%	7.3%	17.2%	9.1%	4.7%	17.7%	14.6%	13.1%	11.0%	9.0%	6.5%	11.9%						
St. Dev.	21.9%	18.2%	17.6%	22.2%	23.0%	12.5%	23.4%	14.9%	27.9%	29.8%	29.1%	21.7%	27.1%	26.9%	33.0%	28.1%	24.7%	30.3%						
InfoSharpe	0.465	0.012	0.410	0.299	0.279	0.590	0.157	0.493	0.618	0.307	0.163	0.815	0.538	0.485	0.333	0.322	0.262	0.393						
% Pos. Days	54%	53%	52%	54%	53%	58%	53%	54%	52%	51%	50%	54%	51%	54%	52%	50%	51%	51%						
% Pos. Months	60%	56%	58%	62%	56%	63%	59%	58%	54%	50%	49%	63%	60%	61%	56%	54%	65%	66%						
Kurtosis	0.65	-2.72	5.01	1.05	2.18	2.29	1.14	3.24	0.68	0.13	-0.05	8.00	6.34	0.06	-0.62	0.59	1.09	0.99						
Skewness	30.35	99.42	155.77	67.95	63.38	105.59	71.98	84.95	16.23	44.44	77.33	201.13	152.53	12.48	25.13	15.00	27.70	20.16						
Max. Drawdown	-42.2%	-104.9%	-43.9%	-85.6%	-44.5%	-34.6%	-66.8%	-44.2%	-78.7%	-112.2%	-105.6%	-51.5%	-47.1%	-62.8%	-71.1%	-71.8%	-115.2%	-84.3%						

Table 2 and 3 – Filter performance for both signal strategies, and different holding periods

The first condition evaluated was the price relationship to the 52-week low. Based on prior research, it is expected that purchases at higher prices (taken against the respective 52-week low) are more informative, and therefore more likely to produce above-market returns. Findings show, however, a different pattern. Filtering the model through different price levels (transaction prices above 125%, 150% or 175% of the 52-week low), observed results show an inverse relationship between the price-level and the risk-adjusted strategy performance. The “buy all” strategy, on a 1-day holding period, remains as the best performer, namely at the 125% level. Oppositely to expectations, increasing the price threshold to 150%, or later to 175%, reduced the performance of the strategies, with the InfoSharpe ratio for the same strategy reducing to close to zero for the latter level. Through the three different price levels, performance was rather stable at the long-term holding period (260 trading days), reporting InfoSharpe’s of 0.5 all-around. If instead, the original intensive buying definition of three or more purchases is used, performances are again comparatively lower, with no clear direction of change owed to the filter. While there seems to be a performance improvement with higher relative price levels (175%), thus supporting previous findings, longer-term periods performed better at prices closer to the 52-week low. The filter does not appear to not work on its own, not resulting in clear better risk-adjusted performance. The 125% price level was regardless the best filter value. The second condition assessed was the corporate insider role within the firm. Here, the expectation was that, given some level of information asymmetry, C-level executive insiders are able to outperform non-C-level insiders. Instead, results appear to show the opposite, with trades replicating non C-level executives outperforming their C-level peers across the different holding periods, for both signal-creation strategies. The three consecutive purchases signal performs worse across almost all holding-periods, for both groups. Although the filter is not sufficient to improve performance on its own, risk-adjusted returns are still comparatively high. Looking at the transaction size (relative to the average daily volume),

expectations were similar: the larger the transaction, the more informative, and therefore the most profitable, it should be. For this purpose, the two signal-creation strategies were tested at two volume filters: $>1\%$ and $>3\%$, for the five holding periods. Given the observed results, an opposite filter of $<1\%$ was added. Results seem to support the initial expectations, with performance improving at the $> 1\%$ level, for most holding periods, across both signal-creation strategies. The strongest exception comes from the “buy all” strategy, at the 1-day holding period, with performance being best at the $<1\%$ of volume level. The 3% level shows mixed performance shifts, probably given fewer transactions considered, with cases of strong underperformance. The last condition to be tested is the insider’s position within the firm (relative to total shares outstanding). Given the expectations that a larger position within the company is related to a greater access to relevant information, two different filter levels were tested, one at 0.1% of total shares outstanding (the median reported position), the second at 1%. As previously, a filter with the opposite direction was also tested ($<0.1\%$). Observed results show a similar pattern to the previous filter, with performance improvements at the $> 0.1\%$ level for most strategies and holding periods, but a clear outperformance at the $< 0.1\%$ level for the “buy all” strategy on a 1-day holding period. This time, however, with a weaker pattern for the standard signal-creation strategy of three consecutive purchases. Once again, the filter at a 1% level shows no clear improvements, probably given too few transactions considered. Nevertheless, the filter is considered to improve risk-adjusted performance at the 0.1% level. The last step in evaluating insider purchases’ profitability is setting up a strategy that combines the different tested filters with the initial signals given by corporate insiders purchases. For this purpose, the most significant results (as described above) are used as inputs for the model, and different threshold values (the number of filters required to be met) are tested. Given previously observed results, the signal-creation strategy tested is the “buy all” - every purchase creates a (potential) buy signal. All five holding periods are still considered and tested. In essence, two

combinations are tested: i) transactions with prices above 125% of the 52-week low, from non C-level insiders, volume below 1%, and insider position under 0.1% (expected to outperform for short-term periods) and, ii) 125% filter, but done by C-level insiders, with volume above 1%, and insider position above 0.1%. Both combinations were tested for different thresholds.

Strategy	> 125% of wk low, c-level insider, >1% vol, >0.1% shares														
Holding Period	1-Day					5-Day					20-Day				
Threshold	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	345.2%	345.0%	294.7%	179.0%	12.2%	251.6%	248.0%	286.1%	326.7%	22.8%	135.4%	122.8%	146.7%	202.2%	35.7%
Avg Annual Ret.	25.7%	25.7%	21.9%	13.3%	0.9%	18.7%	18.5%	21.3%	24.3%	1.7%	10.1%	9.1%	10.9%	15.1%	2.7%
St. Dev.	21.5%	22.6%	22.1%	18.1%	6.6%	22.2%	24.0%	26.5%	28.2%	11.9%	21.4%	22.7%	23.6%	27.3%	22.2%
InfoSharpe	1.20	1.14	0.99	0.74	0.14	0.84	0.77	0.80	0.86	0.14	0.47	0.40	0.46	0.55	0.12
% Pos. Days	58%	56%	55%	52%	50%	55%	55%	54%	52%	51%	54%	54%	53%	53%	52%
% Pos. Months	69%	67%	65%	61%	46%	66%	66%	67%	65%	48%	65%	63%	62%	66%	50%
Kurtosis	0.16	0.31	0.81	3.13	5.31	0.29	0.10	0.31	4.67	0.05	0.11	-0.10	-0.03	0.64	0.95
Skewness	14.84	12.68	22.13	67.21	156.55	16.06	15.31	18.57	82.36	43.82	13.81	13.56	13.15	14.09	38.23
Max. Drawdown	-52.9%	-53.3%	-50.9%	-52.6%	-19.6%	-57.2%	-60.0%	-72.7%	-37.0%	-51.3%	-73.9%	-77.2%	-102.3%	-49.2%	-80.3%

Strategy	> 125% of wk low, non c-level insider, < 1% vol, < 0.1% shares														
Holding Period	1-Day					5-Day					20-Day				
Threshold	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	345.2%	347.2%	344.3%	291.1%	160.8%	251.6%	244.9%	231.4%	213.3%	120.1%	135.4%	134.7%	213.3%	133.5%	131.0%
Avg Annual Ret.	25.7%	25.8%	25.6%	21.7%	12.0%	18.7%	18.2%	17.2%	15.9%	8.9%	10.1%	10.0%	15.9%	9.9%	9.8%
St. Dev.	21.5%	21.6%	22.0%	23.6%	23.0%	22.2%	22.1%	22.5%	23.4%	28.3%	21.4%	21.4%	23.4%	21.9%	26.2%
InfoSharpe	1.20	1.20	1.17	0.92	0.52	0.84	0.82	0.77	0.68	0.32	0.47	0.47	0.68	0.45	0.37
% Pos. Days	58%	58%	58%	56%	56%	55%	55%	55%	55%	54%	54%	54%	55%	54%	53%
% Pos. Months	69%	68%	66%	65%	60%	66%	66%	68%	65%	60%	65%	65%	65%	63%	59%
Kurtosis	0.16	0.23	0.40	0.73	-1.03	0.29	0.24	0.47	0.23	-0.83	0.11	0.11	0.23	0.24	0.06
Skewness	14.84	15.43	15.36	23.63	41.80	16.06	15.97	17.60	17.18	25.38	13.81	13.85	17.18	14.88	17.34
Max. Drawdown	-52.9%	-53.3%	-46.8%	-80.5%	-77.4%	-57.2%	-55.4%	-51.8%	-82.3%	-114.0%	-73.9%	-74.0%	-82.3%	-71.2%	-66.7%

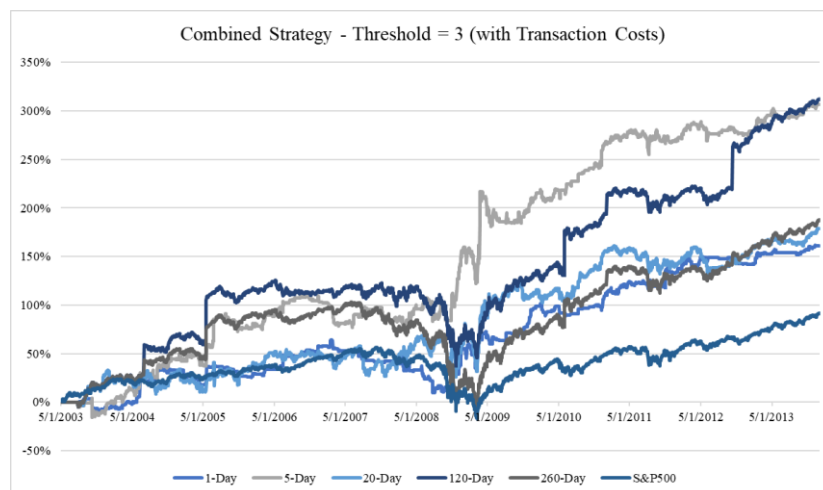
Table 4 and 5: “Buy All”: Combined Strategies, at different thresholds and holding periods

Tables 4 and 5 summarize the different results. Observed results confirm initial expectations, with the first combination clearly outperforming at the 1-day holding period, and the second achieving better risk-adjusted performance for most other periods. The most important finding comes, however, when analyzing the performance relationship to the threshold value used, most significantly for the second combination. It is observable that, for all but the 1-day holding period, increasing the threshold (this is, increasing the number of required filters and, therefore, the strictness of the model) does result in better risk-adjusted performance, indicating that combining these conditions, and the selected values and directions, does enhance strategy performance. The optimal threshold level is deemed as three, requiring three out of four filters to be successfully met. Performance is then strongly hurt for a threshold of four, most probably because of a fewer number of transactions considered (transactions must meet all four criteria).

Despite the observed superior performance in some select strategies, these have been analyzed for a frictionless market with no transaction costs. In order to assess the replicability and real-life profitability of these strategies, it is important to take these into account. For this purpose, a transaction cost of 2bps was used, reflecting both explicit and implicit costs for long-only transactions. Table 6 and Graph 2 aggregate the observed results, with all strategies but the most active strategy (1-day holding period), displaying superior performance after transactions costs. The highest Sharpe is attributable to the second combined strategy, for a 5-day holding period. After accounting for transaction costs, all returns for the first combination, at the 1-day holding period, vanish, given higher trading intensity. Hedging these strategies against the market did not improve risk-adjusted performance across all holding periods.

Strategy	> 125%, C-level, > 1% vol, > 0.1% shares threshold = 3					> 125%, C-level, > 1% vol, > 0.1% shares, hedged threshold = 3					> 125%, non C-level, < 1% vol, < 0.1% threshold			
	With Transaction Costs					With Transaction Costs								
	1d	5d	20d	120d	260d	1d	5d	20d	120d	260d	0	1	2	3
Cum. Ret.	161.2%	306.5%	178.8%	312.2%	187.6%	130.6%	245.0%	83.8%	209.2%	85.0%	-37.6%	-31.9%	-12.4%	12.4%
Avg Annual Ret.	12.0%	22.8%	13.3%	23.2%	14.0%	9.8%	18.3%	6.3%	15.7%	6.4%	-2.8%	-2.4%	-0.9%	0.9%
St. Dev.	18.1%	28.2%	27.3%	32.8%	26.5%	18.0%	26.0%	19.7%	25.0%	14.6%	21.5%	21.6%	22.0%	23.6%
InfoSharpe	0.66	0.81	0.49	0.71	0.53	0.54	0.71	0.32	0.63	0.44	-0.13	-0.11	-0.04	0.04
% Pos. Days	51%	52%	52%	54%	54%	47%	49%	50%	50%	50%	51%	52%	52%	52%
% Pos. Months	60%	65%	66%	63%	61%	48%	55%	52%	52%	52%	43%	43%	45%	48%
Kurtosis	3.08	4.67	0.63	10.23	2.98	61.20	82.53	22.81	598.64	479.26	-0.05	0.02	0.23	0.62
Skewness	67.24	82.47	14.10	222.63	60.70	3.07	4.93	1.08	22.16	17.25	14.77	15.30	15.26	23.43
Max. Drawdown	-54.1%	-37.7%	-49.6%	-87.5%	-112.2%	-56.2%	-63.7%	-44.9%	-35.2%	-48.7%	-144.3%	-143.1%	-127.5%	-130.2%

Table 6 – “Buy All”: Combined Strategies with transaction costs, hedged



Graph 2: “Buy All”: Combined Strategy with transaction costs

The study moves on to a similar analysis done over corporate insider sales alone. This analysis starts by studying different signal creation strategies, then testing it for the different holding

periods. Four different strategies were used to create the signal: i) every sale creates a potential sell signal, ii) if three consecutive sales are done within a month, iii) if five consecutive sales are done within a month, and iv) when ten consecutive sales are done within six months . All of these were initially tested with no constraints, for the same five holding periods. As opposed to initial expectations, all of the signal-creation strategies and holding period combinations performed negatively, with the worst performances falling on the longer-term holding periods. Table 7 and Graph 3 display one of the tested signal-creation strategies, and its performance against the benchmark. Indeed, it seems as a combination of factors might be undermining the profitability of replicating insider sales. Most notably, a possible key factor explaining this pattern might be a strategy Beta of roughly -1.1, showing that the strategy is consistently taking the opposite direction of the index. Given the historical positive performance of the S&P500, the study deems insider sales replication as considerably harder to achieve. As such, no further analysis is done on insider selling activity. Further discussion can be found later on the paper.

Signal: Three Consecutive Sales within 1 month					
	1d	5d	20d	120d	260d
Cum. Ret.	-36.0%	-22.1%	-74.0%	-109.9%	-122.4%
Avg Annual Ret.	-2.7%	-1.6%	-5.5%	-8.2%	-9.1%
St. Dev.	18.2%	19.3%	19.2%	19.6%	19.9%
InfoSharpe	-0.15	-0.09	-0.29	-0.42	-0.46
% Pos. Days	48%	48%	46%	45%	45%
% Pos. Months	45%	42%	37%	34%	33%
Kurtosis	0.76	0.21	0.12	-0.07	-0.01
Skewness	28.08	16.97	13.96	14.53	14.13
Max. Drawdown	-89.2%	-85.8%	-116.9%	-130.6%	-141.8%

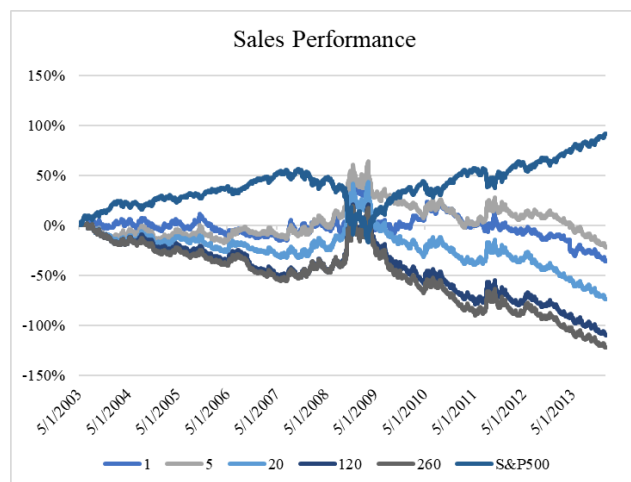


Table 7 and Graph 3: Insider Sales: Signal-creation strategy performance

The above-mentioned results find that, indeed, for the in-sample period, select strategies created on corporate insider purchases were able to outperform the market, after considering transaction costs. It is now important to find whether performance holds at the backtesting out-of-sample period. For this purpose, the most profitable combined strategy was tested at the five

holding periods. Consider a InfoSharpe ratio of 0.57 for the S&P 500 for the period. Table 8 and Graph 4 summarize the key findings. While the strategy at the short-term holding periods clearly outperformed the market, supporting in-sample findings, post-transaction costs performance did not hold for medium and long-term periods. As previously, these displayed lower InfoSharpe's when compared to shorter-term periods, with performance however being below that of the market, which performed comparatively higher. Nevertheless, results do confirm that outsiders can indeed profit from replicating corporate insider purchases.

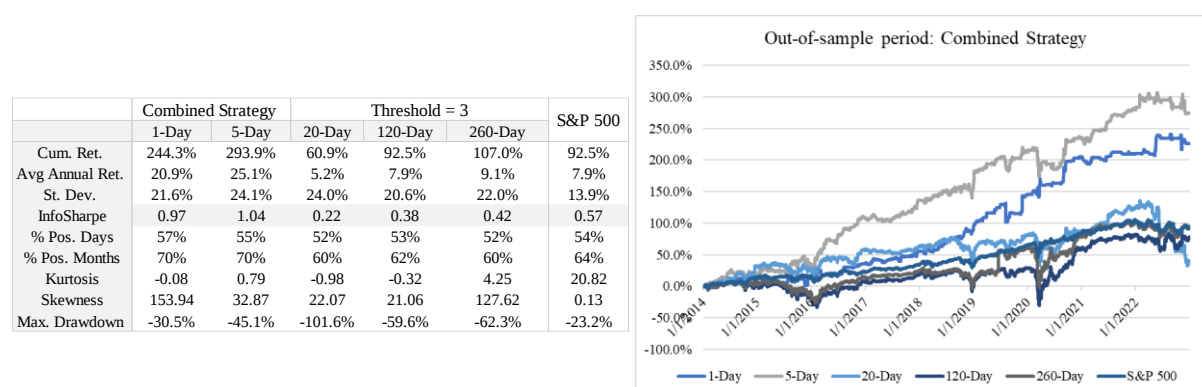


Table 8 and Graph 4: Combined Strategy: Performance at the out-of-sample period

DISCUSSION

The most important finding of this paper is that, in fact, outside investors are able to profit by developing an investment strategy that replicates corporate insider transactions. While it is true that the best pre-transaction costs risk-adjusted performance was observed at the short-term unconstrained strategies, this performance mostly evaporates once costs are taken into account. Instead, this study finds that combining the four studied conditions, at the respective studied values and directions, can in fact lead to greater post-transaction costs performance. This is more strongly observed for short-term holding periods (1 and 5-days), with outperformance against the market at both the in-sample and out-of-sample period. This confirms the initial hypothesis that outside investors can profit from replicating corporate insiders, supporting previous research of an apparent market inefficiency. However, not all initial expectations were

confirmed. This segment discusses the main differences between this study's results and previous findings and expectations. Looking first at corporate insider purchases, initial expectations were that these would precede upward stock price movements, with the stronger the signal, the stronger the strategy returns. While performance across strategies was positive, confirming the first expectations, the "buy all" strategy displayed the best risk-adjusted performance all-around, with further increases in the number of consecutive transactions not being able to enhance performance. Instead, it appears as these strategies are filtering through already profitable signals, decreasing its upside potential. Requiring ten consecutive purchases within six months will forego most of the short and medium-term gains, reason for which it also underperformed other strategies. Holding period-wise, there were no clear expectations to start with. The study finds that the short-term periods, i.e., 1 and 5-day holding periods, are responsible for the best risk-adjusted performance across most strategies, which is confirmed at both the in-sample and out-of-sample periods. As opposed to previous findings, the medium-term period of one month (20 trading days) displayed the worst performance for most strategies, with returns generally picking up at the longer-term windows of 120 and 260 trading days. Nevertheless, short-term holding periods were the only to deliver consistent risk-adjusted post-transaction costs outperformance, at both periods. Looking at the chosen and tested filters, results are also mixed. Looking first at the price level (measured against the 52-week price low), results are not clear in supporting previous findings. Purchases done far from their anchoring level might be indeed more informative, however these are not clearly translated to improved risk-adjusted performance. Instead, results show mixed direction movements, with the 125% level being the overall best performing filter for the "buy all" strategy, but 175% being the best level for the three consecutive purchases strategy. Nevertheless, performance is not improved at any holding period by adding the filter, indicating that trades done at prices closer to the 52-week low generated superior returns. Regarding the role filter, findings are

clear in contradicting initial views. Despite previous research on informational asymmetry across corporate insiders, results support an opposite view in which non C-level insiders are able to earn stronger returns. More importantly, outside investors are better-off in looking for non C-level insiders than its C-level, executive peers, with strategies filtering through the first outperforming the second at nearly all holding periods, across both strategies. This relationship might be owed to the greater visibility of purchases done by C-level insiders, which might be quickly incorporated into stock prices. It is plausible that, given a reporting lag of 2-3 trading days, by the time the trades are reported, most of the returns are already gone. Once again, the filter is however not enough to improve risk-adjusted performance on its own, despite performing better when compared to the first filter. For the final two conditions, the study finds very similar trends. Initial expectations were that, given stronger conviction on future stock price movements and a stronger influence within the company, higher volume (as a % of average daily volume) and a larger position (as % of total shares outstanding) would translate into improved risk-adjusted performance. This was the case for medium and long-term strategies, with filters of 1% (for the volume) and 0.1% (for the position size) delivering the best performance across both strategies. Increasing the value of the filters, however, did not directly translate to higher returns, as shown by tests at the 3% (for the volume) and 1% (for the position size) levels, although this was most probably owed to the considerably fewer number of transactions considered, and most pronounced for the strategy based on three consecutive purchases. Despite creating improved performance at the medium and long-term periods, the same was not observed for the short-term windows, with performance at the 1-day holding period being improved by taking the opposite direction filter, this is, for purchases with a volume below 1% of the average daily volume, or a insider position size below 0.1% of the total shares outstanding. Returns are, however, mostly washed up by transaction costs. Regardless, performance for the initial filters of volume $> 1\%$ and position size $> 0.1\%$ does

hold up at significant values for all holding periods, reason for which these are considered significant in improving insider-replicating strategies' performance. Results further show that combining all four filters, and taking its most significant values and directions, is significant in generating better risk-adjusted performance. Moreover, by increasing the model threshold, this is, the number of criteria that considered transactions should meet, performance is improved, with higher threshold values generating higher InfoSharpe's. This is only unobserved for a threshold of four, as the model becomes too restrictive and too few purchases are considered. The fact that this combined strategy, at a threshold of three, and after transaction costs, is able to outperform the market for both the in and out-of-sample periods, is the most relevant finding of this study. The last discussion topic revolves around corporate insider sales. While it was initially expected that mimicking insider activity, i.e., selling when insiders sell, should lead to superior returns, the complete opposite was observed, with performance being strongly negative across most holding periods and signal-creation strategies. A wide range of factors might be helpful in explaining this behaviour. First, it is important to notice that this study is being done on S&P500 companies, which aggregates some of the largest and most successful companies in the world, widely regarded as "the winners of the winners". To create a profitable strategy that consistently bets against these, is therefore a challenging and unreasonable task. This is strongly supported by a strategy Beta of roughly -1.1, indicating that the strategy consists of taking the opposite direction of the market. Given the equity market premia, and an index that has historically performed at significant positive levels, it is improbable that such strategy would work. Moreover, some kind of survivorship bias is probably in play, as the least successful companies are excluded from the index, and therefore from this study, and the most successful remain. The nature of the insider sale might also be a factor at play. Stock-based compensation is common amongst the largest companies, stocks which corporate insiders might immediately sell, regardless of its future stock price movement views. The negative

performance from sales replicating strategies further supports previous findings showing that corporate insider sales are in fact less informative than corporate insider purchases.

FURTHER RESEARCH AND RECOMMENDATIONS

Despite the profitable, successful and replicable strategy obtained, it is clear that not all the chosen filters (and its directions and values) are the best in enhancing strategy performance, with most not achieving improved performance on its own. For that reason, other conditions, values and directions should be tested, in order to further improve risk-adjusted performance. Not only other conditions could be tested, but also other geographies and indices could be subject to similar analysis. Further research could be done on the profitability and replicability of this strategy for other indices (NASDAQ-100 or Rusell 2000, for example) or other countries such as Canada, the UK, Germany, or other developed markets, although insider corporate filings might be not as accessible elsewhere. On a different note, the counter-intuitive negative performance from sales-replicating strategies was one of the most unexpected findings of this study. Further research on the topic should focus more specifically on insider sales activity alone, and how this could be better used in profitable strategy generation. For that purpose, it is important to focus on some important notions: i) less granularity might be helpful, especially given low processing power, and ii) a differentiation between benefits-related sales from the other might be important, if possible, as to filter through non-informative trades, and better focus on insiders attempts at predicting future price movements. Less transactions, or the study of smaller periods at a time, might also be helpful in better understanding patterns. The same goes for holding periods and conditions: less periods and conditions allow for better flexibility and testing, aiding in generating superior returns. Lastly, these should also be tested for statistical significance in order to further strengthen the observed results and support the conclusions. In the specific case of this study, given the low processing power available, to do so was not possible.

REFERENCES

- Baesel, Jerome B., and Garry R. Stein. 1979. "The Value of Information: Inferences from the Profitability of Insider Trading." *The Journal of Financial and Quantitative Analysis* 14 (3): 553. <https://doi.org/10.2307/2330188>.
- Barclay, Michael J., and Jerold B. Warner. 1993. "Stealth Trading and Volatility." *Journal of Financial Economics* 34 (3): 281–305. [https://doi.org/10.1016/0304-405X\(93\)90029-B](https://doi.org/10.1016/0304-405X(93)90029-B).
- Ferreira, Eurico J. 1995. "Insider Trading Activity, Different Market Regimens, and Abnormal Returns." *Financial Review* 30 (2): 193–210. <https://doi.org/10.1111/j.1540-6288.1995.tb00830.x>.
- Glass, G. 1966. *Extensive Insider Accumulation as an Indicator of Near-Term Stock Price Performance*.
- Jeffrey F. Jaffe. 1974. "The Effect of Regulation Changes on Insider Trading." *The Bell Journal of Economics and Management Science* 5.
- Kerr, Halbert S. 1980. "The Battle of Insider Trading vs. Market Efficiency." <https://pm-research.com/content/ijpormgmt/6/4>.
- Lee, Wayne Y., and Michael E. Solt. 1983. "Insider Trading: A Poor Guide to Market Timing." *Journal of Portfolio Management*.
- Li, Ruihai, Xuewu (Wesley) Wang, Zhipeng Yan, and Qunzi Zhang. 2019. "Trading against the Grain: *When Insiders Buy High and Sell Low*." *The Journal of Portfolio Management* 46 (1): 139–51. <https://doi.org/10.3905/jpm.2019.46.1.139>.
- Lin, J, and J.S. Howe. 1990. "Insider Trading in the OTC Market." *Journal of Portfolio Management*.
- Lorie, James H., and Victor Niederhoffer. 1968. "Predictive and Statistical Properties of Insider Trading." *The Journal of Law and Economics* 11 (1): 35–53. <https://doi.org/10.1086/466642>.
- Meulbroek, Lisa K. 1992. "An Empirical Analysis of Illegal Insider Trading." *The Journal of Finance* 47 (5): 1661. <https://doi.org/10.2307/2328992>.
- Nunn, K.P, G.P. Madden, and M.J. Gombola. 1983. "Are Some Insiders More 'Inside' than Others?" *Journal of Portfolio Management*.
- Oehler, Andreas, Thomas John Walker, and Stefan Wendt. 2009. "On the Bond Market's Evaluation of Insider Stock Trading Activities - Evidence from Germany." *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1343438>.
- Pope, P.F, R.C. Morris, and D.A. Peel. 1990. "Insider Trading: Some Evidence on Market Efficiency and Directors' Share Dealings in Great Britain." *Journal of Business, Finance, and Accounting* 17.
- Pratt, Shannon P., and Charles W. De Vere. 1978. "Relationship between Insider Trading and Rates of Return for NYSE Common Stocks, 1960-66." *Modern Developments in Investment Management : A Book of Readings*.

Rogoff, Donald L. 1964. “THE FORECASTING PROPERTIES OF INSIDERS’ TRANSACTIONS*.” *The Journal of Finance* 19 (4): 697–98. <https://doi.org/10.1111/j.1540-6261.1964.tb02901.x>.

Seyhun, H.Nejat. 1986. “Insiders’ Profits, Costs of Trading, and Market Efficiency.” *Journal of Financial Economics* 16 (2): 189–212. [https://doi.org/10.1016/0304-405X\(86\)90060-7](https://doi.org/10.1016/0304-405X(86)90060-7).

Smith, Frank P. 1941. “Management Trading.” *The ANNALS of the American Academy of Political and Social Science* 217 (1): 190–91. <https://doi.org/10.1177/000271624121700155>.

Trivoli, G.W. 1980. “How to Profit from Insider Trading Information.” *Journal of Portfolio Management*.

Wu, H. 1964. “Corporate Insider Trading in the Stock Market.” *National Banking Review* 2.

APPENDIX

Strategy	Buy All					3 Transactions within 1 Month				
Holding Period	1-Day	5-Day	20-Day	120-Day	260-Day	1-Day	5-Day	20-Day	120-Day	260-Day
	Unconstrained									
Cum. Ret.	345.2%	251.6%	135.4%	143.3%	156.7%	136.5%	231.6%	175.5%	163.6%	151.8%
Avg Annual Ret.	25.7%	18.7%	10.1%	10.7%	11.7%	10.2%	17.2%	13.1%	12.2%	11.3%
St. Dev.	21.5%	22.2%	21.4%	21.2%	20.9%	21.9%	27.9%	26.9%	26.2%	25.0%
InfoSharpe	1.197	0.844	0.472	0.505	0.558	0.465	0.618	0.485	0.464	0.452
% Pos. Days	58%	55%	54%	55%	55%	54%	52%	54%	54%	54%
% Pos. Months	69%	66%	65%	65%	66%	60%	54%	61%	62%	61%
Kurtosis	0.2	0.3	0.1	0.0	0.1	0.7	0.7	0.1	1.0	0.5
Skewness	14.8	16.1	13.8	14.3	13.6	30.3	16.2	12.5	25.8	18.9
Max. Drawdown	-52.9%	-57.2%	-73.9%	-80.5%	-79.2%	-42.2%	-78.7%	-62.8%	-94.0%	-107.8%

Strategy	5 Transactions in 30 days					10 Transactions in 180 days					S&P 500
Holding Period	1-Day	5-Day	20-Day	120-Day	260-Day	1-Day	5-Day	20-Day	120-Day	260-Day	
	Unconstrained										
Cum. Ret.	86.9%	146.0%	161.1%	206.8%	148.1%	58.3%	28.1%	211.5%	126.2%	134.6%	91.6%
Avg Annual Ret.	6.5%	10.9%	12.0%	15.4%	11.0%	4.3%	2.1%	15.7%	9.4%	10.0%	6.8%
St. Dev.	17.3%	25.3%	30.3%	29.6%	27.7%	17.5%	30.0%	30.9%	28.3%	27.3%	17.9%
InfoSharpe	0.374	0.430	0.396	0.520	0.399	0.248	0.070	0.510	0.332	0.367	0.382
% Pos. Days	55%	51%	52%	53%	54%	51%	50%	51%	53%	53%	55%
% Pos. Months	61%	64%	62%	60%	63%	55%	52%	65%	62%	63%	66%
Kurtosis	1.1	0.8	0.3	2.5	1.3	2.1	-0.6	0.4	-0.2	-0.1	15.8
Skewness	90.8	28.2	16.0	65.4	33.5	68.6	57.2	13.0	15.6	14.4	-0.1
Max. Drawdown	-42.7%	-91.9%	-87.1%	-70.0%	-105.3%	-60.8%	-98.0%	-81.9%	-90.1%	-95.3%	-73.6%

Table 1 – Insider Purchases: Signal-Creation Strategies

Strategy	1b, > 125% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	272.2%	200.6%	132.9%	149.1%	155.9%
Avg Annual Ret.	20.3%	14.9%	9.9%	11.1%	11.6%
St. Dev.	24.0%	27.2%	25.1%	24.4%	23.8%
InfoSharpe	0.84	0.55	0.39	0.46	0.49
% Pos. Days	55%	54%	54%	54%	55%
% Pos. Months	63%	67%	62%	62%	63%
Kurtosis	-0.91	-1.26	0.05	-0.01	0.00
Skewness	33.55	25.91	16.76	17.14	15.51
Max. Drawdown	-82.1%	-105.2%	-63.1%	-79.9%	-85.4%

Strategy	1b, > 150% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	159.9%	237.9%	183.6%	110.1%	200.9%
Avg Annual Ret.	11.9%	17.7%	13.7%	8.2%	15.0%
St. Dev.	20.4%	34.1%	34.3%	29.0%	29.8%
InfoSharpe	0.58	0.52	0.40	0.28	0.50
% Pos. Days	55%	53%	54%	54%	54%
% Pos. Months	58%	62%	60%	56%	59%
Kurtosis	0.88	1.12	-0.71	-0.09	1.53
Skewness	21.58	50.89	28.35	16.11	31.07
Max. Drawdown	-53.1%	-94.5%	-79.1%	-118.4%	-104.3%

Strategy	1b, > 175% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	26.6%	95.8%	52.1%	46.0%	336.6%
Avg Annual Ret.	2.0%	7.1%	3.9%	3.4%	25.1%
St. Dev.	17.3%	28.8%	39.7%	32.9%	47.5%
InfoSharpe	0.11	0.25	0.10	0.10	0.53
% Pos. Days	52%	50%	52%	53%	53%
% Pos. Months	50%	57%	55%	52%	60%
Kurtosis	0.38	-0.12	0.35	-0.25	15.92
Skewness	36.80	33.37	25.82	13.75	425.97
Max. Drawdown	-55.1%	-114.7%	-168.0%	-197.9%	-150.0%

Table 2 – “Buy All”: Price as % of 52-week low filter

Strategy	3b 1m, 125% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	3.0%	122.8%	147.6%	205.1%	200.9%
Avg Annual Ret.	0.2%	9.1%	11.0%	15.3%	15.0%
St. Dev.	18.2%	29.8%	33.0%	32.3%	29.8%
InfoSharpe	0.01	0.31	0.33	0.47	0.50
% Pos. Days	53%	51%	52%	54%	54%
% Pos. Months	56%	50%	56%	60%	60%
Kurtosis	-2.72	0.13	-0.62	5.42	2.24
Skewness	99.42	44.44	25.13	165.96	62.26
Max. Drawdown	-104.9%	-112.2%	-71.1%	-72.5%	-87.5%

Strategy	3b 1m, 150% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	31.4%	93.7%	266.7%	70.7%	180.1%
Avg Annual Ret.	2.3%	7.0%	19.9%	5.3%	13.4%
St. Dev.	11.5%	26.0%	41.0%	38.0%	37.5%
InfoSharpe	0.20	0.27	0.48	0.14	0.36
% Pos. Days	53%	50%	52%	52%	54%
% Pos. Months	59%	55%	56%	53%	60%
Kurtosis	2.81	4.05	-1.70	0.23	0.23
Skewness	122.46	125.14	100.40	23.44	20.07
Max. Drawdown	-29.6%	-82.1%	-77.2%	-145.8%	-100.5%

Strategy	3b 1m, 175% of 52wk low				
	1d	5d	20d	120d	260d
Cum. Ret.	5.3%	98.5%	103.5%	53.2%	122.2%
Avg Annual Ret.	0.4%	7.3%	7.7%	4.0%	9.1%
St. Dev.	8.3%	18.0%	32.4%	40.1%	45.5%
InfoSharpe	0.05	0.41	0.24	0.10	0.20
% Pos. Days	50%	51%	49%	50%	52%
% Pos. Months	57%	54%	52%	55%	61%
Kurtosis	-1.25	4.60	-3.98	-0.74	-0.15
Skewness	150.66	96.43	144.50	39.35	30.44
Max. Drawdown	-18.7%	-29.4%	-93.2%	-174.5%	-131.3%

Table 3 – Three Purchases: Price as % of 52-week low filter

Strategy	1b, c-level				
	1d	5d	20d	120d	260d
Cum. Ret.	281.6%	217.6%	109.2%	136.1%	147.0%
Avg Annual Ret.	21.0%	16.2%	8.1%	10.1%	10.9%
St. Dev.	21.6%	26.1%	22.2%	22.1%	21.9%
InfoSharpe	0.97	0.62	0.37	0.46	0.50
% Pos. Days	54%	54%	53%	54%	55%
% Pos. Months	62%	66%	61%	66%	65%
Kurtosis	2.98	-2.02	0.05	0.34	0.23
Skewness	62.56	74.16	17.06	19.04	15.57
Max. Drawdown	-38.4%	-65.8%	-84.2%	-77.8%	-88.7%

Strategy	1b, non c-level				
	1d	5d	20d	120d	260d
Cum. Ret.	348.6%	237.1%	137.0%	139.9%	154.9%
Avg Annual Ret.	26.0%	17.7%	10.2%	10.4%	11.5%
St. Dev.	23.4%	22.8%	21.7%	21.2%	21.1%
InfoSharpe	1.11	0.78	0.47	0.49	0.55
% Pos. Days	57%	55%	55%	55%	55%
% Pos. Months	69%	65%	64%	65%	66%
Kurtosis	0.77	0.24	0.17	0.00	0.10
Skewness	18.52	13.83	13.46	14.26	14.15
Max. Drawdown	-50.3%	-64.5%	-73.1%	-80.0%	-79.4%

Table 4 – “Buy All”: Role filter

Strategy	3b 1m, c-level				
	1d	5d	20d	120d	260d
Cum. Ret.	96.9%	63.6%	121.5%	173.6%	131.6%
Avg Annual Ret.	7.2%	4.7%	9.0%	12.9%	9.8%
St. Dev.	17.6%	29.1%	28.1%	28.2%	26.7%
InfoSharpe	0.41	0.16	0.32	0.46	0.37
% Pos. Days	52%	50%	50%	53%	54%
% Pos. Months	58%	49%	54%	63%	63%
Kurtosis	5.01	-0.05	0.59	2.89	1.75
Skewness	155.77	77.33	15.00	70.83	45.14
Max. Drawdown	-43.9%	-105.6%	-71.8%	-90.3%	-107.0%

Strategy	3b 1m, non c-level				
	1d	5d	20d	120d	260d
Cum. Ret.	89.4%	192.3%	153.6%	166.5%	149.2%
Avg Annual Ret.	6.7%	14.3%	11.4%	12.4%	11.1%
St. Dev.	22.2%	29.2%	30.7%	27.4%	25.4%
InfoSharpe	0.30	0.49	0.37	0.45	0.44
% Pos. Days	54%	52%	53%	53%	54%
% Pos. Months	62%	58%	58%	59%	60%
Kurtosis	1.05	0.58	-0.64	1.68	0.69
Skewness	67.95	33.59	20.39	44.54	22.97
Max. Drawdown	-85.6%	-91.1%	-89.2%	-90.1%	-106.0%

Table 5 – Three Purchases: Role filter

Strategy	1b, <1% vol				
	1d	5d	20d	120d	260d
Cum. Ret.	323.0%	225.9%	131.9%	131.8%	152.7%
Avg Annual Ret.	24.0%	16.8%	9.8%	9.8%	11.4%
St. Dev.	21.9%	22.8%	21.6%	21.2%	21.1%
InfoSharpe	1.10	0.74	0.45	0.46	0.54
% Pos. Days	58%	55%	54%	55%	55%
% Pos. Months	64%	66%	63%	64%	66%
Kurtosis	0.37	0.23	0.15	-0.01	0.08
Skewness	17.71	18.72	14.31	14.63	13.90
Max. Drawdown	-52.9%	-59.6%	-75.1%	-78.7%	-79.0%

Strategy	1b, > 1%				
	1d	5d	20d	120d	260d
Cum. Ret.	250.9%	285.0%	166.4%	199.3%	159.8%
Avg Annual Ret.	18.7%	21.2%	12.4%	14.8%	11.9%
St. Dev.	20.1%	27.4%	23.3%	23.8%	22.2%
InfoSharpe	0.93	0.77	0.53	0.62	0.54
% Pos. Days	57%	53%	54%	54%	55%
% Pos. Months	63%	61%	60%	63%	63%
Kurtosis	0.66	3.74	0.63	2.94	1.05
Skewness	31.48	79.29	15.04	60.97	25.46
Max. Drawdown	-37.7%	-57.5%	-85.7%	-88.9%	-97.4%

Strategy	1b, > 3%				
	1d	5d	20d	120d	260d
Cum. Ret.	163.5%	200.1%	136.4%	249.7%	195.7%
Avg Annual Ret.	12.2%	14.9%	10.2%	18.6%	14.6%
St. Dev.	16.8%	24.2%	25.5%	27.0%	22.7%
InfoSharpe	0.72	0.62	0.40	0.69	0.64
% Pos. Days	57%	53%	52%	53%	54%
% Pos. Months	65%	63%	57%	60%	60%
Kurtosis	2.55	0.77	0.68	7.09	2.00
Skewness	68.59	27.70	14.98	146.31	38.45
Max. Drawdown	-37.2%	-67.3%	-100.1%	-89.5%	-92.4%

Table 6 – “Buy All”: Volume as % of Daily Average Volume filter

Strategy	3b 1m, <1% vol				
	1d	5d	20d	120d	260d
Cum. Ret.	85.9%	164.6%	165.7%	135.0%	122.5%
Avg Annual Ret.	6.4%	12.3%	12.3%	10.0%	9.1%
St. Dev.	23.0%	29.3%	27.8%	25.5%	24.8%
InfoSharpe	0.28	0.42	0.44	0.39	0.37
% Pos. Days	53%	51%	53%	54%	54%
% Pos. Months	56%	52%	59%	61%	60%
Kurtosis	2.18	0.64	0.14	0.12	0.09
Skewness	63.38	20.28	13.82	16.77	17.18
Max. Drawdown	-44.5%	-91.9%	-61.3%	-86.8%	-106.0%

Strategy	3b 1m, 1%				
	1d	5d	20d	120d	260d
Cum. Ret.	98.7%	237.3%	86.8%	262.1%	222.3%
Avg Annual Ret.	7.4%	17.7%	6.5%	19.5%	16.5%
St. Dev.	12.5%	21.7%	24.7%	39.8%	32.7%
InfoSharpe	0.59	0.82	0.26	0.49	0.51
% Pos. Days	58%	54%	51%	51%	53%
% Pos. Months	63%	63%	65%	55%	63%
Kurtosis	2.29	8.00	1.09	16.41	9.25
Skewness	105.59	201.13	27.70	504.54	250.91
Max. Drawdown	-34.6%	-51.5%	-115.2%	-103.0%	-113.6%

Strategy	3b 1m, 3%				
	1d	5d	20d	120d	260d
Cum. Ret.	35.5%	120.6%	84.7%	379.9%	223.4%
Avg Annual Ret.	2.6%	9.0%	6.3%	28.3%	16.6%
St. Dev.	11.1%	15.8%	21.7%	64.8%	43.5%
InfoSharpe	0.24	0.57	0.29	0.44	0.38
% Pos. Days	55%	54%	51%	51%	51%
% Pos. Months	59%	64%	68%	58%	54%
Kurtosis	1.09	1.56	0.47	30.71	22.79
Skewness	142.77	74.24	27.04	1167.79	854.89
Max. Drawdown	-34.6%	-52.4%	-118.8%	-99.3%	-112.0%

Table 7 – Three Transactions: Volume as % of Daily Average Volume filter

Strategy	1b 1m, <0.1% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	331.7%	221.8%	132.4%	141.3%	155.1%
Avg Annual Ret.	24.7%	16.5%	9.9%	10.5%	11.5%
St. Dev.	21.9%	22.4%	21.4%	21.2%	21.0%
InfoSharpe	1.13	0.74	0.46	0.50	0.55
% Pos. Days	58%	55%	54%	55%	55%
% Pos. Months	69%	66%	63%	64%	65%
Kurtosis	0.47	0.46	0.21	0.06	0.07
Skewness	17.24	18.20	14.83	14.81	13.87
Max. Drawdown	-50.5%	-56.8%	-71.0%	-79.0%	-78.7%

Strategy	1b 1m, > 0.1% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	302.0%	382.6%	147.0%	252.0%	195.7%
Avg Annual Ret.	22.5%	28.5%	10.9%	18.8%	14.6%
St. Dev.	22.4%	30.3%	26.5%	29.1%	25.2%
InfoSharpe	1.01	0.94	0.41	0.65	0.58
% Pos. Days	55%	54%	53%	53%	54%
% Pos. Months	70%	71%	63%	63%	62%
Kurtosis	1.84	2.56	-0.08	7.10	1.87
Skewness	39.33	56.35	10.72	163.69	36.79
Max. Drawdown	-51.7%	-81.8%	-135.4%	-96.4%	-105.4%

Strategy	1b 1m, > 1% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	123.9%	192.8%	247.9%	308.6%	255.4%
Avg Annual Ret.	9.2%	14.4%	18.5%	23.0%	19.0%
St. Dev.	15.8%	24.0%	28.6%	36.9%	30.5%
InfoSharpe	0.58	0.60	0.64	0.62	0.62
% Pos. Days	59%	55%	51%	53%	54%
% Pos. Months	67%	68%	63%	54%	63%
Kurtosis	2.31	1.44	1.14	12.28	9.38
Skewness	66.28	38.37	19.62	346.49	258.81
Max. Drawdown	-46.1%	-67.5%	-70.9%	-79.1%	-97.0%

Table 8 – “Buy All”: Insider Position as % of Total Shares Outstanding filter

Strategy	3b 1m, <0.1% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	49.3%	139.8%	168.2%	136.6%	147.7%
Avg Annual Ret.	3.7%	10.4%	12.5%	10.2%	11.0%
St. Dev.	23.4%	29.5%	27.9%	25.5%	25.0%
InfoSharpe	0.16	0.35	0.45	0.40	0.44
% Pos. Days	53%	52%	53%	54%	54%
% Pos. Months	59%	56%	58%	61%	60%
Kurtosis	1.14	-0.91	0.16	0.14	0.44
Skewness	71.98	51.18	14.54	16.99	19.31
Max. Drawdown	-66.8%	-115.4%	-59.6%	-88.1%	-103.0%

Strategy	3b 1m, > 1% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	98.5%	196.2%	160.0%	429.0%	286.3%
Avg Annual Ret.	7.3%	14.6%	11.9%	31.9%	21.3%
St. Dev.	14.9%	27.1%	30.3%	71.4%	46.1%
InfoSharpe	0.49	0.54	0.39	0.45	0.46
% Pos. Days	54%	51%	51%	51%	53%
% Pos. Months	58%	60%	66%	62%	61%
Kurtosis	3.24	6.34	0.99	33.22	22.62
Skewness	84.95	152.53	20.16	1342.34	795.35
Max. Drawdown	-44.2%	-47.1%	-84.3%	-89.6%	-111.9%

Strategy	3b 1m, > 3% shares				
	1d	5d	20d	120d	260d
Cum. Ret.	8.0%	31.4%	92.2%	67.3%	92.4%
Avg Annual Ret.	0.6%	2.3%	6.9%	5.0%	6.9%
St. Dev.	10.7%	16.0%	21.8%	28.9%	28.6%
InfoSharpe	0.06	0.15	0.31	0.17	0.24
% Pos. Days	55%	52%	50%	50%	52%
% Pos. Months	54%	52%	71%	57%	64%
Kurtosis	0.30	0.69	0.94	-0.10	-0.25
Skewness	138.12	81.93	32.32	17.05	11.10
Max. Drawdown	-46.9%	-66.0%	-69.2%	-105.8%	-108.3%

Table 9 – Three Transactions: Insider Position as % of Total Shares Outstanding filter

Signal - Every Purchase generates a Buy Signal																
	1-Day Holding Period								5-Day Holding Period							
	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	0	0
% of 52W Low Role	0	0	C-level	non C-Level	0	0	0	0	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	345.2%	272.2%	281.6%	348.6%	323.0%	250.9%	331.7%	302.0%	251.6%	200.6%	217.6%	237.1%	225.9%	285.0%	221.8%	382.6%
Avg Annual Ret.	25.7%	20.3%	21.0%	26.0%	24.0%	18.7%	24.7%	22.5%	18.7%	14.9%	16.2%	17.7%	16.8%	21.2%	16.5%	28.5%
St. Dev.	21.5%	24.0%	21.6%	23.4%	21.9%	20.1%	21.9%	22.4%	22.2%	27.2%	26.1%	22.8%	22.8%	27.4%	22.4%	30.3%
InfoSharpe	1.197	0.843	0.972	1.108	1.096	0.930	1.130	1.005	0.844	0.550	0.621	0.776	0.738	0.773	0.738	0.942
% Pos. Days	58%	55%	54%	57%	58%	57%	58%	55%	55%	54%	54%	55%	55%	53%	55%	54%
% Pos. Months	69%	63%	62%	69%	64%	63%	69%	70%	66%	67%	66%	65%	66%	61%	66%	71%
Kurtosis	0.16	-0.91	2.98	0.77	0.37	0.66	0.47	1.84	0.29	-1.26	-2.02	0.24	0.23	3.74	0.46	2.56
Skewness	14.84	33.55	62.56	18.52	17.71	31.48	17.24	39.33	16.06	25.91	74.16	13.83	18.72	79.29	18.20	56.35
Max. Drawdown	-52.9%	-82.1%	-38.4%	-50.3%	-52.9%	-37.7%	-50.5%	-51.7%	-57.2%	-105.2%	-65.8%	-64.5%	-59.6%	-57.5%	-56.8%	-81.8%

	20-Day Holding Period								120-Day Holding Period							
	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	0	0
% of 52W Low Role	0	0	C-level	non C-Level	0	0	0	0	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	135.4%	132.9%	109.2%	137.0%	131.9%	166.4%	132.4%	147.0%	143.3%	149.1%	136.1%	139.9%	131.8%	199.3%	141.3%	252.0%
Avg Annual Ret.	10.1%	9.9%	8.1%	10.2%	9.8%	12.4%	9.9%	10.9%	10.7%	11.1%	10.1%	10.4%	9.8%	14.8%	10.5%	18.8%
St. Dev.	21.4%	25.1%	22.2%	21.7%	21.6%	23.3%	21.4%	26.5%	21.2%	24.4%	22.1%	21.2%	21.2%	23.8%	21.2%	29.1%
InfoSharpe	0.472	0.395	0.366	0.470	0.455	0.532	0.462	0.412	0.505	0.455	0.458	0.490	0.462	0.624	0.497	0.645
% Pos. Days	54%	54%	53%	55%	54%	54%	54%	53%	55%	54%	54%	55%	55%	54%	55%	53%
% Pos. Months	65%	62%	61%	64%	63%	60%	63%	63%	65%	62%	66%	65%	64%	63%	64%	63%
Kurtosis	0.11	0.05	0.05	0.17	0.15	0.63	0.21	-0.08	0.00	-0.01	0.34	0.00	-0.01	2.94	0.06	7.10
Skewness	13.81	16.76	17.06	13.46	14.31	15.04	14.83	10.72	14.29	17.14	19.04	14.26	14.63	60.97	14.81	163.69
Max. Drawdown	-73.9%	-63.1%	-84.2%	-73.1%	-75.1%	-85.7%	-71.0%	-135.4%	-80.5%	-79.9%	-77.8%	-80.0%	-78.7%	-88.9%	-79.0%	-96.4%

	260-Day Holding Period							
	0	125%	0	0	0	0	0	0
% of 52W Low Role	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	156.7%	155.9%	147.0%	154.9%	152.7%	159.8%	155.1%	195.7%
Avg Annual Ret.	11.7%	11.6%	10.9%	11.5%	11.4%	11.9%	11.5%	14.6%
St. Dev.	20.9%	23.8%	21.9%	21.1%	21.1%	22.2%	21.0%	25.2%
InfoSharpe	0.558	0.489	0.499	0.547	0.539	0.536	0.551	0.578
% Pos. Days	55%	55%	55%	55%	55%	55%	55%	54%
% Pos. Months	66%	63%	65%	66%	66%	63%	65%	62%
Kurtosis	0.05	0.00	0.23	0.10	0.08	1.05	0.07	1.87
Skewness	13.63	15.51	15.57	14.15	13.90	25.46	13.87	36.79
Max. Drawdown	-79.2%	-85.4%	-88.7%	-79.4%	-79.0%	-97.4%	-78.7%	-105.4%

Table 10 – “Buy All”: Aggregated Filters

Signal - Three Purchases within One Month																
	1-Day Holding Period								5-Day Holding Period							
% of 52W Low	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	0	0
Role	0	0	C-level	non C-Level	0	0	0	0	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	136.5%	3.0%	96.9%	89.4%	85.9%	98.7%	49.3%	98.5%	231.6%	122.8%	63.6%	192.3%	164.6%	237.3%	139.8%	196.2%
Avg Annual Ret.	10.2%	0.2%	7.2%	6.7%	6.4%	7.4%	3.7%	7.3%	17.2%	9.1%	4.7%	14.3%	12.3%	17.7%	10.4%	14.6%
St. Dev.	21.9%	18.2%	17.6%	22.2%	23.0%	12.5%	23.4%	14.9%	27.9%	29.8%	29.1%	29.2%	29.3%	21.7%	29.5%	27.1%
InfoSharpe	0.465	0.012	0.410	0.299	0.279	0.590	0.157	0.493	0.618	0.307	0.163	0.489	0.418	0.815	0.353	0.538
% Pos. Days	54%	53%	52%	54%	53%	58%	53%	54%	52%	51%	50%	52%	51%	54%	52%	51%
% Pos. Months	60%	56%	58%	62%	56%	63%	59%	58%	54%	50%	49%	58%	52%	63%	56%	60%
Kurtosis	0.65	-2.72	5.01	1.05	2.18	2.29	1.14	3.24	0.68	0.13	-0.05	0.58	0.64	8.00	-0.91	6.34
Skewness	30.35	99.42	155.77	67.95	63.38	105.59	71.98	84.95	16.23	44.44	77.33	33.59	20.28	201.13	51.18	152.53
Max. Drawdown	-42.2%	-104.9%	-43.9%	-85.6%	-44.5%	-34.6%	-66.8%	-44.2%	-78.7%	-112.2%	-105.6%	-91.1%	-91.9%	-51.5%	-115.4%	-47.1%

	20-Day Holding Period								120-Day Holding Period							
% of 52W Low	0	125%	0	0	0	0	0	0	0	125%	0	0	0	0	0	0
Role	0	0	C-level	non C-Level	0	0	0	0	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	175.5%	147.6%	121.5%	153.6%	165.7%	86.8%	168.2%	160.0%	163.6%	205.1%	173.6%	166.5%	135.0%	262.1%	136.6%	429.0%
Avg Annual Ret.	13.1%	11.0%	9.0%	11.4%	12.3%	6.5%	12.5%	11.9%	12.2%	15.3%	12.9%	12.4%	10.0%	19.5%	10.2%	31.9%
St. Dev.	26.9%	33.0%	28.1%	30.7%	27.8%	24.7%	27.9%	30.3%	26.2%	32.3%	28.2%	27.4%	25.5%	39.8%	25.5%	71.4%
InfoSharpe	0.485	0.333	0.322	0.372	0.444	0.262	0.449	0.393	0.464	0.473	0.458	0.453	0.394	0.490	0.399	0.447
% Pos. Days	54%	52%	50%	53%	53%	51%	53%	51%	54%	54%	53%	53%	54%	51%	54%	51%
% Pos. Months	61%	56%	54%	58%	59%	65%	58%	66%	62%	60%	63%	59%	61%	55%	61%	62%
Kurtosis	0.06	-0.62	0.59	-0.64	0.14	1.09	0.16	0.99	0.96	5.42	2.89	1.68	0.12	16.41	0.14	33.22
Skewness	12.48	25.13	15.00	20.39	13.82	27.70	14.54	20.16	25.75	165.96	70.83	44.54	16.77	504.54	16.99	1342.34
Max. Drawdown	-62.8%	-71.1%	-71.8%	-89.2%	-61.3%	-115.2%	-59.6%	-84.3%	-94.0%	-72.5%	-90.3%	-90.1%	-86.8%	-103.0%	-88.1%	-89.6%

	260-Day Holding Period							
% of 52W Low	0	125%	0	0	0	0	0	0
Role	0	0	C-level	non C-Level	0	0	0	0
% of Volume	0	0	0	0	<1%	>1%	0	0
% of Shrs. Outs.	0	0	0	0	0	0	<0.1%	>0.1%
Cum. Ret.	151.8%	200.9%	131.6%	149.2%	122.5%	222.3%	147.7%	92.4%
Avg Annual Ret.	11.3%	15.0%	9.8%	11.1%	9.1%	16.5%	11.0%	6.9%
St. Dev.	25.0%	29.8%	26.7%	25.4%	24.8%	32.7%	25.0%	28.6%
InfoSharpe	0.452	0.502	0.367	0.437	0.368	0.507	0.439	0.240
% Pos. Days	54%	54%	54%	54%	54%	53%	54%	52%
% Pos. Months	61%	60%	63%	60%	60%	63%	60%	64%
Kurtosis	0.47	2.24	1.75	0.69	0.09	9.25	0.44	-0.25
Skewness	18.94	62.26	45.14	22.97	17.18	250.91	19.31	11.10
Max. Drawdown	-107.8%	-87.5%	-107.0%	-106.0%	-106.0%	-113.6%	-103.0%	-108.3%

Table 11 – Three Transactions: Aggregated Filters

Strategy	> 125% of wk low, c-level insider, >1% vol, >0.1% shares														
Holding Period	1-Day					5-Day					20-Day				
Threshold	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	345.2%	345.0%	294.7%	179.0%	12.2%	251.6%	248.0%	286.1%	326.7%	22.8%	135.4%	122.8%	146.7%	202.2%	35.7%
Avg Annual Ret.	25.7%	25.7%	21.9%	13.3%	0.9%	18.7%	18.5%	21.3%	24.3%	1.7%	10.1%	9.1%	10.9%	15.1%	2.7%
St. Dev.	21.5%	22.6%	22.1%	18.1%	6.6%	22.2%	24.0%	26.5%	28.2%	11.9%	21.4%	22.7%	23.6%	27.3%	22.2%
InfoSharpe	1.20	1.14	0.99	0.74	0.14	0.84	0.77	0.80	0.86	0.14	0.47	0.40	0.46	0.55	0.12
% Pos. Days	58%	56%	55%	52%	50%	55%	55%	54%	52%	51%	54%	54%	53%	53%	52%
% Pos. Months	69%	67%	65%	61%	46%	66%	66%	67%	65%	48%	65%	63%	62%	66%	50%
Kurtosis	0.16	0.31	0.81	3.13	5.31	0.29	0.10	0.31	4.67	0.05	0.11	-0.10	-0.03	0.64	0.95
Skewness	14.84	12.68	22.13	67.21	156.55	16.06	15.31	18.57	82.36	43.82	13.81	13.56	13.15	14.09	38.23
Max. Drawdown	-52.9%	-53.3%	-50.9%	-52.6%	-19.6%	-57.2%	-60.0%	-72.7%	-37.0%	-51.3%	-73.9%	-77.2%	-102.3%	-49.2%	-80.3%

Strategy	> 125% of wk low, c-level insider, >1% vol, >0.1% shares									
Holding Period	120-Day					260-Day				
Threshold	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	143.3%	136.4%	174.7%	329.2%	81.2%	156.7%	150.6%	166.2%	201.9%	179.6%
Avg Annual Ret.	10.7%	10.2%	13.0%	24.5%	6.0%	11.7%	11.2%	12.4%	15.0%	13.4%
St. Dev.	21.2%	22.2%	23.5%	32.8%	28.4%	20.9%	21.7%	22.9%	26.5%	27.8%
InfoSharpe	0.50	0.46	0.55	0.75	0.21	0.56	0.52	0.54	0.57	0.48
% Pos. Days	55%	54%	54%	54%	53%	55%	55%	55%	54%	54%
% Pos. Months	65%	65%	66%	65%	62%	66%	65%	65%	63%	62%
Kurtosis	0.00	-0.10	0.64	10.23	-0.51	0.05	0.02	0.20	2.98	0.38
Skewness	14.29	15.25	21.41	222.53	15.16	13.63	14.19	15.29	60.66	18.99
Max. Drawdown	-80.5%	-87.5%	-78.0%	-84.8%	-133.6%	-79.2%	-86.1%	-89.7%	-110.3%	-124.0%

Table 12 – “Buy All”: Combined Strategy #1 at different threshold levels

Strategy	> 125% of wk low, non c-level insider, < 1% vol, < 0.1% shares														
Holding Period	1-Day					5-Day					20-Day				
Threshold	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	345.2%	347.2%	344.3%	291.1%	160.8%	251.6%	244.9%	231.4%	213.3%	120.1%	135.4%	134.7%	213.3%	133.5%	131.0%
Avg Annual Ret.	25.7%	25.8%	25.6%	21.7%	12.0%	18.7%	18.2%	17.2%	15.9%	8.9%	10.1%	10.0%	15.9%	9.9%	9.8%
St. Dev.	21.5%	21.6%	22.0%	23.6%	23.0%	22.2%	22.1%	22.5%	23.4%	28.3%	21.4%	21.4%	23.4%	21.9%	26.2%
InfoSharpe	1.20	1.20	1.17	0.92	0.52	0.84	0.82	0.77	0.68	0.32	0.47	0.47	0.68	0.45	0.37
% Pos. Days	58%	58%	58%	56%	56%	55%	55%	55%	55%	54%	54%	54%	55%	54%	53%
% Pos. Months	69%	68%	66%	65%	60%	66%	66%	68%	65%	60%	65%	65%	65%	63%	59%
Kurtosis	0.16	0.23	0.40	0.73	-1.03	0.29	0.24	0.47	0.23	-0.83	0.11	0.11	0.23	0.24	0.06
Skewness	14.84	15.43	15.36	23.63	41.80	16.06	15.97	17.60	17.18	25.38	13.81	13.85	17.18	14.88	17.34
Max. Drawdown	-52.9%	-53.3%	-46.8%	-80.5%	-77.4%	-57.2%	-55.4%	-51.8%	-82.3%	-114.0%	-73.9%	-74.0%	-82.3%	-71.2%	-66.7%

	> 125% of wk low, non c-level insider, < 1% vol, < 0.1% shares									
	120-Day					260-Day				
	0	1	2	3	4	0	1	2	3	4
Cum. Ret.	143.3%	143.6%	144.1%	134.0%	117.9%	156.7%	156.3%	156.4%	149.5%	157.6%
Avg Annual Ret.	10.7%	10.7%	10.7%	10.0%	8.8%	11.7%	11.6%	11.6%	11.1%	11.7%
St. Dev.	21.2%	21.2%	21.3%	21.5%	24.1%	20.9%	21.0%	21.0%	21.3%	24.1%
InfoSharpe	0.50	0.50	0.50	0.46	0.36	0.56	0.56	0.55	0.52	0.49
% Pos. Days	55%	55%	55%	55%	54%	55%	55%	55%	55%	54%
% Pos. Months	65%	65%	64%	66%	61%	66%	66%	66%	66%	63%
Kurtosis	0.00	0.01	0.02	0.03	-0.09	0.05	0.06	0.05	0.08	0.07
Skewness	14.29	14.50	14.62	14.91	15.63	13.63	13.83	13.68	14.19	15.68
Max. Drawdown	-80.5%	-80.4%	-79.3%	-77.9%	-80.9%	-79.2%	-79.0%	-79.2%	-79.6%	-79.9%

Table 13 – “Buy All”: Combined Strategy #2 at different threshold levels

Strategy	threshold = 1				
	1d	5d	20d	120d	260d
Cum. Ret.	345.0%	248.0%	122.8%	136.4%	150.6%
Avg Annual Ret.	25.7%	18.5%	9.1%	10.2%	11.2%
St. Dev.	22.6%	24.0%	22.7%	22.2%	21.7%
InfoSharpe	1.14	0.77	0.40	0.46	0.52
% Pos. Days	56%	55%	54%	54%	55%
% Pos. Months	67%	66%	63%	65%	65%
Kurtosis	0.31	0.10	-0.10	-0.10	0.02
Skewness	12.68	15.31	13.56	15.25	14.19
Max. Drawdown	-53.3%	-60.0%	-77.2%	-87.5%	-86.1%

Strategy	threshold = 2				
	1d	5d	20d	120d	260d
Cum. Ret.	294.7%	286.1%	146.7%	174.7%	166.2%
Avg Annual Ret.	21.9%	21.3%	10.9%	13.0%	12.4%
St. Dev.	22.1%	26.5%	23.6%	23.5%	22.9%
InfoSharpe	0.99	0.80	0.46	0.55	0.54
% Pos. Days	55%	54%	53%	54%	55%
% Pos. Months	65%	67%	62%	66%	65%
Kurtosis	0.81	0.31	-0.03	0.64	0.20
Skewness	22.13	18.57	13.15	21.41	15.29
Max. Drawdown	-50.9%	-72.7%	-102.3%	-78.0%	-89.7%

Strategy	threshold = 3				
	1d	5d	20d	120d	260d
Cum. Ret.	179.0%	326.7%	202.2%	329.2%	201.9%
Avg Annual Ret.	13.3%	24.3%	15.1%	24.5%	15.0%
St. Dev.	18.1%	28.2%	27.3%	32.8%	26.5%
InfoSharpe	0.74	0.86	0.55	0.75	0.57
% Pos. Days	52%	52%	53%	54%	54%
% Pos. Months	61%	65%	66%	65%	63%
Kurtosis	3.13	4.67	0.64	10.23	2.98
Skewness	67.21	82.36	14.09	222.53	60.66
Max. Drawdown	-52.6%	-37.0%	-49.2%	-84.8%	-110.3%

	threshold = 4				
	1	5	20	120	260
Cum. Ret.	12.2%	22.8%	35.7%	81.2%	179.6%
Avg Annual Ret.	0.9%	1.7%	2.7%	6.0%	13.4%
St. Dev.	6.6%	11.9%	22.2%	28.4%	27.8%
InfoSharpe	0.14	0.14	0.12	0.21	0.48
% Pos. Days	50%	51%	52%	53%	54%
% Pos. Months	46%	48%	50%	62%	62%
Kurtosis	5.31	0.05	0.95	-0.51	0.38
Skewness	156.55	43.82	38.23	15.16	18.99
Max. Drawdown	-19.6%	-51.3%	-80.3%	-133.6%	-124.0%

Table 14 - “Buy All”: Combined Strategy #1 at different threshold levels and holding periods

Strategy	threshold = 1				
	1d	5d	20d	120d	260d
Cum. Ret.	347.2%	244.9%	134.7%	143.6%	156.3%
Avg Annual Ret.	25.8%	18.2%	10.0%	10.7%	11.6%
St. Dev.	21.6%	22.1%	21.4%	21.2%	21.0%
InfoSharpe	1.20	0.82	0.47	0.50	0.56
% Pos. Days	58%	55%	54%	55%	55%
% Pos. Months	68%	66%	65%	65%	66%
Kurtosis	0.23	0.24	0.11	0.01	0.06
Skewness	15.43	15.97	13.85	14.50	13.83
Max. Drawdown	-53.3%	-55.4%	-74.0%	-80.4%	-79.0%

Strategy	threshold = 2				
	1d	5d	20d	120d	260d
Cum. Ret.	344.3%	231.4%	132.3%	144.1%	156.4%
Avg Annual Ret.	25.6%	17.2%	9.8%	10.7%	11.6%
St. Dev.	22.0%	22.5%	21.5%	21.3%	21.0%
InfoSharpe	1.17	0.77	0.46	0.50	0.55
% Pos. Days	58%	55%	54%	55%	55%
% Pos. Months	66%	68%	64%	64%	66%
Kurtosis	0.40	0.47	0.16	0.02	0.05
Skewness	15.36	17.60	14.13	14.62	13.68
Max. Drawdown	-46.8%	-51.8%	-71.8%	-79.3%	-79.2%

Strategy	threshold = 3				
	1d	5d	20d	120d	260d
Cum. Ret.	291.1%	213.3%	133.5%	134.0%	149.5%
Avg Annual Ret.	21.7%	15.9%	9.9%	10.0%	11.1%
St. Dev.	23.6%	23.4%	21.9%	21.5%	21.3%
InfoSharpe	0.92	0.68	0.45	0.46	0.52
% Pos. Days	56%	55%	54%	55%	55%
% Pos. Months	65%	65%	63%	66%	66%
Kurtosis	0.73	0.23	0.24	0.03	0.08
Skewness	23.63	17.18	14.88	14.91	14.19
Max. Drawdown	-80.5%	-82.3%	-71.2%	-77.9%	-79.6%

	threshold = 4				
	1	5	20	120	260
Cum. Ret.	160.8%	120.1%	131.0%	117.9%	157.6%
Avg Annual Ret.	12.0%	8.9%	9.8%	8.8%	11.7%
St. Dev.	23.0%	28.3%	26.2%	24.1%	24.1%
InfoSharpe	0.52	0.32	0.37	0.36	0.49
% Pos. Days	56%	54%	53%	54%	54%
% Pos. Months	60%	60%	59%	61%	63%
Kurtosis	-1.03	-0.83	0.06	-0.09	0.07
Skewness	41.80	25.38	17.34	15.63	15.68
Max. Drawdown	-77.4%	-114.0%	-66.7%	-80.9%	-79.9%

Table 15 - “Buy All”: Combined Strategy #2 at different threshold levels and holding periods

> 125% of wk low, c-level insider, >1% vol, >0.1% shares , w/ tr. costs					
Strategy	threshold = 3				
	1d	5d	20d	120d	260d
Cum. Ret.	161.2%	306.5%	178.8%	312.2%	187.6%
Avg Annual Ret.	12.0%	22.8%	13.3%	23.2%	14.0%
St. Dev.	18.1%	28.2%	27.3%	32.8%	26.5%
InfoSharpe	0.66	0.81	0.49	0.71	0.53
% Pos. Days	51%	52%	52%	54%	54%
% Pos. Months	60%	65%	66%	63%	61%
Kurtosis	3.08	4.67	0.63	10.23	2.98
Skewness	67.24	82.47	14.10	222.63	60.70
Max. Drawdown	-54.1%	-37.7%	-49.6%	-87.5%	-112.2%

Table 16 - “Buy All”: Combined Strategy #1 at threshold=3, with transaction costs

> 125% of wk low, c-level insider, >1% vol, >0.1% shares , w/ tr. Costs , hedged					
	threshold = 3				
	1d	5d	20d	120d	260d
Cum. Ret.	130.6%	245.0%	83.8%	209.2%	85.0%
Avg Annual Ret.	9.8%	18.3%	6.3%	15.7%	6.4%
St. Dev.	18.0%	26.0%	19.7%	25.0%	14.6%
InfoSharpe	0.54	0.71	0.32	0.63	0.44
% Pos. Days	47%	49%	50%	50%	50%
% Pos. Months	48%	55%	52%	52%	52%
Kurtosis	61.20	82.53	22.81	598.64	479.26
Skewness	3.07	4.93	1.08	22.16	17.25
Max. Drawdown	-56.2%	-63.7%	-44.9%	-35.2%	-48.7%

Table 17 - “Buy All”: Combined Strategy #1 at threshold=3, with transaction costs, hedged

> 125% of wk low, non c-level insider, < 1% vol, < 0.1% shares, w/ tr. Costs				
threshold	0	1	2	3
Cum. Ret.	-37.6%	-31.9%	-12.4%	12.4%
Avg Annual Ret.	-2.8%	-2.4%	-0.9%	0.9%
St. Dev.	21.5%	21.6%	22.0%	23.6%
InfoSharpe	-0.13	-0.11	-0.04	0.04
% Pos. Days	51%	52%	52%	52%
% Pos. Months	43%	43%	45%	48%
Kurtosis	-0.05	0.02	0.23	0.62
Skewness	14.77	15.30	15.26	23.43
Max. Drawdown	-144.3%	-143.1%	-127.5%	-130.2%

Table 18 - “Buy All”: Combined Strategy #2 at 1-day holding period, with transaction costs

Signal: Three Consecutive Sales within 1 month					
	1d	5d	20d	120d	260d
Cum. Ret.	-36.0%	-22.1%	-74.0%	-109.9%	-122.4%
Avg Annual Ret.	-2.7%	-1.6%	-5.5%	-8.2%	-9.1%
St. Dev.	18.2%	19.3%	19.2%	19.6%	19.9%
InfoSharpe	-0.15	-0.09	-0.29	-0.42	-0.46
% Pos. Days	48%	48%	46%	45%	45%
% Pos. Months	45%	42%	37%	34%	33%
Kurtosis	0.76	0.21	0.12	-0.07	-0.01
Skewness	28.08	16.97	13.96	14.53	14.13
Max. Drawdown	-89.2%	-85.8%	-116.9%	-130.6%	-141.8%

Signal: One Sale only					
	1d	5d	20d	120d	260d
Cum. Ret.	-42.8%	-53.0%	-90.8%	-125.5%	-135.9%
Avg Annual Ret.	-3.2%	-3.9%	-6.8%	-9.3%	-10.1%
St. Dev.	17.2%	19.5%	19.6%	20.2%	20.4%
InfoSharpe	-0.19	-0.20	-0.35	-0.46	-0.50
% Pos. Days	47%	47%	46%	45%	45%
% Pos. Months	21%	21%	19%	19%	18%
Kurtosis	0.08	-0.11	0.00	0.01	0.02
Skewness	16.47	17.77	14.45	13.90	13.74

Signal: Five Consecutive Sales within one month					
	1d	5d	20d	120d	260d
Cum. Ret.	-112.9%	-39.1%	-75.3%	-118.3%	-126.8%
Avg Annual Ret.	-8.4%	-2.9%	-5.6%	-8.8%	-9.4%
St. Dev.	19.4%	20.2%	19.4%	20.0%	19.9%
InfoSharpe	-0.43	-0.14	-0.29	-0.44	-0.47
% Pos. Days	47%	48%	46%	46%	45%
% Pos. Months	22%	22%	19%	19%	18%
Kurtosis	-0.83	0.42	0.16	-0.26	-0.11
Skewness	28.90	17.24	12.41	15.44	14.43

Signal: Ten Consecutive Sales within one month					
	1d	5d	20d	120d	260d
Cum. Ret.	-77.5%	-49.6%	-74.7%	-123.3%	-122.8%
Avg Annual Ret.	-5.8%	-3.7%	-5.6%	-9.2%	-9.1%
St. Dev.	18.0%	19.5%	19.1%	20.0%	20.0%
InfoSharpe	-0.32	-0.19	-0.29	-0.46	-0.46
% Pos. Days	47%	47%	45%	45%	45%
% Pos. Months	22%	22%	21%	19%	18%
Kurtosis	0.38	0.19	0.22	-0.24	-0.14
Skewness	13.32	14.58	11.82	15.30	15.15

Table 19 – Insider Sales Replicating Strategies

	Combined Strategy		Threshold = 3			S&P 500
	1-Day	5-Day	20-Day	120-Day	260-Day	
Cum. Ret.	244.3%	293.9%	60.9%	92.5%	107.0%	92.5%
Avg Annual Ret.	20.9%	25.1%	5.2%	7.9%	9.1%	7.9%
St. Dev.	21.6%	24.1%	24.0%	20.6%	22.0%	13.9%
InfoSharpe	0.97	1.04	0.22	0.38	0.42	0.57
% Pos. Days	57%	55%	52%	53%	52%	54%
% Pos. Months	70%	70%	60%	62%	60%	64%
Kurtosis	-0.08	0.79	-0.98	-0.32	4.25	20.82
Skewness	153.94	32.87	22.07	21.06	127.62	0.13
Max. Drawdown	-30.5%	-45.1%	-101.6%	-59.6%	-62.3%	-23.2%

	Combined Strategy		Threshold = 3, w T.C.s			S&P 500
	1-Day	5-Day	20-Day	120-Day	260-Day	
Cum. Ret.	226.0%	274.8%	39.6%	77.3%	95.0%	92.5%
Avg Annual Ret.	19.3%	23.5%	3.4%	6.6%	8.1%	7.9%
St. Dev.	21.6%	24.1%	24.0%	20.6%	22.0%	13.9%
InfoSharpe	0.89	0.97	0.14	0.32	0.37	0.57
% Pos. Days	56%	55%	52%	52%	51%	54%
% Pos. Months	69%	70%	57%	60%	60%	64%
Kurtosis	-0.14	0.77	-0.99	-0.33	4.24	20.82
Skewness	154.68	32.90	22.09	21.10	127.64	0.13
Max. Drawdown	-30.5%	-45.6%	-102.8%	-60.0%	-62.7%	-23.2%

Table 20 – Out-of-Sample: Combined Strategy, with and without transaction costs