Master Thesis U.S.E.

Insider trading properties affect on information asymmetry

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Abstract

Previous research finds conflicting evidence for the effect of insider trading on an efficient stock market. It could be a tool for insiders to signal the performance of the company or a tool to make easy money off outsiders. In this paper we will try to identify which characteristics of the inside trade has the most effect on the stock market efficiency to help policy makers create effective regulations. This paper examines the effect of insider trading on the cumulative abnormal returns (CAR) and information asymmetry exchange trades shares. It does so with a simple OLS regression where the position of an insider within the firm and the volume traded by the insider is regressed on the bid-ask spread and the CAR. The regression finds no significant effect of position or volume on the CAR neither on the bid-ask spread. This contradicts previous research and shows further research on this topic is necessary.

JEL-codes: D04, B26
Keywords: insider trading, information asymmetry, bid-ask spread

Introduction

Both policy makers and market participants have put considerable effort in studying the stock market. Information asymmetry related to insider trading has been a subject of numerous studies. On the one hand it seems unfair that insiders can use their superior knowledge to trade in the market and on the other hand insiders should be able to trade for liquidity reasons. The results of previous studies have provided mixed results on whether insider trading is negative for the market. It could be that the insiders make gains on their inside information at the cost of outsiders. But some argue that insiders provide valuable information about the 'true' value of the company and that this could outweigh the cost for the outsiders. This paper will examine how information asymmetry measured, in the bid-ask spread, is affected by insider trading. This paper examined the stock market in the United States exclusively.

The focus will lie on the characteristics of the insider which could help policy makers with forming policies which balance the positives and negatives of insider trading. If it is possible to identify which characteristics have the most impact on market inefficiencies than perhaps regulations on inside trading can be adapted to these characteristics.

First, it is important to understand who the insiders are. Previous literature, like Lin and Howe (1990), Fidrmuc et al. (2006), and Betzer and Theissen (2009), identifies insiders in four groups. Namely, directors, officers, large shareholders and others. According to the information hierarchy hypothesis, there insiders like directors and officers will have a better understanding of the firm's performance which should make inside trade weigh more heavily. The literature finds different results on this hypothesis. This will be further discussed in the literature review.

The remainder of this paper is therefore structured as follows. First, we discuss previous literature. Next, the hypotheses are proposed. Which is followed by data collection and data analysis. After which the results of the data analysis are given. Which are discussed and concluded after that.

Literature review

In this chapter an overview of the previous literature is given. First, the regulations surrounding insider trading are discussed given by the security and exchange commission (SEC). Next, the pros and cons of insider trading is discussed. This explains why research on this subject is relevant and why the stock market is regulated by the SEC. Lastly, the bid-ask spread is explained. It is important to make the connection with the bid-ask spread and insider trading.

Since this paper focuses on the US stock market, the insider trading is regulated by the SEC. The SEC is the main government body that regulates the stock market. According to their site (What We Do, 2020) it is their mission to protect investors and maintain a fair and efficient market. Insider trading is the trading of a firm's stocks done by an insider of that same firm. According to the SEC (Insider Trading Policy, 2015), the insider must be an officer, director, 10% stockholder of the firm to fall under the regulations for insider trading therefore we will limit our research on these three groups. Insiders of a firm will have superior information on the firm's performance than the outsiders. Insiders can thus better estimate the stock price and thus use this superior information to buy (sell) underpriced (overpriced) shares on the market. The implications of insider trades have effects on the other stock market participants which we will discuss in more detail below.

According to Bainbridge (1998) The current US laws surrounding insider trading were created by courts under section 10(b) of the securities exchange act of 1934. But the modern federal insider prohibition began in 1969 in SEC v. Texas Gulf Sulphur Co. (TGS) which required insiders of TGS and all other companies to disclose any relevant nonpublic information before trading or abstaining from trading in the company's securities. To keep the provided information within the scope of this article a short overview is given of the important rules related to insider trading relevant to our research, in the next paragraph.

The following regulations are provided by the SEC (Insider Trading Policy, 2015). The first and most important rule set by the SEC is that it is not allowed to trade on material nonpublic information. This entails that insiders who have nonpublic information, which can be used to buy shares with a future profit or sell shares to prevent a loss, are not allowed to trade the company's shares. Insider traders cannot trade on nonpublic information, but they still have an information advantage to outsiders, something that we will discuss further in this article. The second rule stated by the SEC is that all directors and officers need to be cleared before occurrence by the company's CEO or CFO. This means that the CEO and CFO are aware of all inside trades within the company before they occur which gives them a potential informational advantage. Next, the window period, a period in which insiders are allowed to trade, is set after the release of significant information about the company, i.e. quarterly earnings. The window period starts two days after the information is made public and lasts for 20 days. An exception can be requested to trade outside the window period if there is an unexpected compelling reason. The insider can make this request to the CFO which has to state the reason for the trade. Lastly, insiders are not allowed to short sell the company's stock or from trading, writing or purchasing options in the company's stock.

Previous research, Kwabi and Boateng (2021), Bainbridge (1998), and Healey (2001), shows that insider trading has both positive and negative effects on the market. First, we will

investigate the positive effects on the market. According to Healey (2001), insider trading is an important tool for management to signal the firm's performance to the market. When we assume that insiders are rational, insiders will trade shares when there is a positive gain from trading. Thus, informed trading will occur only when the insiders have an advantage over the outsider. But after the informed trade the market price of the security should move towards the price that the security would command if the inside information was publicly available according to Bainbridge (1998). Thus, the benefit of insider trading for society is market efficiency. Bainbridge (1998) argues that producing information by the insider should thus be incentivized by allowing insiders to make positive gains on inside trading. Kwabi and Boateng (2021) argue that insider trading has a negative effect on transaction costs in the stock market. They find that stricter insider trading laws reduce the transaction costs and thus create a more efficient market on the condition that the country has sufficient investor protection.

The first argument against insider trading is unfairness. Since insiders can better predict the price of the security, they can make a positive gain when trading their securities with outsiders using an unfair advantage. This in turn means that the outsiders will miss out on these gains. Torabzadeh, Davidson, and Asar (1989) find that scandalous insider trading has damaged the wealth of shareholders of the firm. Expected marked-adjusted stock returns were negative after major insider trading scandals became public in 1986.
Another argument against insider trading is that it has a negative effect on the earnings management. Sawicki and Shrestha (2008) find that insiders manage earnings downwards (upwards) when buying (selling) securities. This would mean that insiders are purposely hiding information for positive gains.

Previous literature states that insiders who are more familiar with the operations within the firm will have superior information about the future performance of the company. Therefore, insiders with better understanding of the company's performance are trading on significantly more valuable information. This hypothesis is called the information hierarchy but is inconsistent across previous studies. Lin and Howe (1990) find evidence in the over-the-counter market that unaffiliated large shareholders have a significantly lower impact on the cumulative abnormal return (CAR) of stocks relative to the other insiders (e.g., board members, directors and officers). This supports the information hierarchy hypothesis since unaffiliated large shareholders have decreased information on the company's performance and the market impact after trading is thus significantly less. On the other hand, Fidrmuc et al. (2006) and Betzer and Theissen (2009) find no evidence to support the information hierarchy hypothesis. This is explained by the fact that insiders who are relatively better informed about the company also face more scrutiny by the market and therefore are more cautious about insider trading. Li (2020) also finds evidence that insiders are less likely to trade on inside information, for fear of SEC enforcement actions, but only when the information asymmetry is low.

Next, we discuss the bid-ask spread of shares on the stock market. This spread is the difference between the price at which sellers are willing to sell the share minus the price at which buyers are willing to pay to buy the share. The bid-ask spread is in part formed by the insider trading. To explain the effect of insider trading on the bid-ask spread we first have to explain how the bid-ask spread is formed. According to Copeland and Galai (1983), there are two types of traders: informed traders and liquidity traders. Informed traders are in our case insiders that have superior knowledge about the share price relative to the market and thus trade based on

this knowledge. Liquidity traders trade without superior knowledge. Trading with informed traders will result in losses and trading with liquidity traders will result in profits for market makers. This means that market makers will have to set a bid-ask spread based on the expected informed traders and liquidity traders. The spread cannot be too wide since the market maker will miss out on revenue from trading with liquidity traders. But cannot be too narrow because then the losses will be too great from trading with informed traders.

Next, we will discuss the effect of insider trading on the liquidity (spread and depth) of a stock. Previous literature has given opposing results on the effect of insider trading on market liquidity. On the one hand many previous studies found that liquidity costs increased following inside trades; Cheng et al. (2006) found that the bid-ask spread significantly increases and volume traded significantly decreases on inside transaction days. On the other hand, several studies have shown that insider trading enhances market liquidity; For example, Pagano and Röell (1996) show that market liquidity increases from insider trading.

Previous literature has shown that insider trading has a negative effect on the liquidity of a stock. Cheng et al. (2006) find that the absolute and relative spread increases after insider trading while the volume traded decreases.

Next, we will discuss previous literature that has provided evidence showing decreased information asymmetry in a company's shares due to insider trading. Cao et al. (2004) analyze insider trading post IPO lockup expirations and find evidence that liquidity increases after insider trading. They find only a small increase in the bid-ask spread lasting a week. Over the long term the spread is unchanged and trade volume increases significantly over the whole horizon. According to the research of Pagano and Röell (1996), the bid-ask spread is decreased with informed trading on the condition that the market is transparent. They argue that a transparent market allows market makers to adapt their strategy on the order flows of insiders and thus make a profit on uninformed traders. With greater transparency, profits of a market maker trading with uninformed traders outweigh the costs of trading with informed traders and thus the spread decreases. Furthermore, Singh et al. (1994) and Miller and Mcconnel (1995) find no evidence that bid-ask spread increases following insider trading. This could mean that market makers do not adjust the spread following insider trading because their cost of trading with an informed trader is still outweighed by the profits of trading with an uninformed trader.

Manne (1966) argues that more frequent insider trading should increase the signal-to-noise ratio in the stock market. This should lead to a reduction in the volatility, and thus the information asymmetry, of the share prices if the variance of signals is low (mostly buys or mostly sells by the insider). Leland (1992) shows that while inside trading can cause a jump in the price, which raises price volatility, inside trading improves market efficiency overall. On the other hand, according to Du and Wei (2004), information asymmetry is increased with increasing frequencies of inside trading. Collin-Dufresne and Fos (2016) actually show that insider trading happens more frequently when information asymmetry is high. This makes sense if the insider is rational since the insider can trade with higher gains if the information asymmetry is larger.

Hypothesis

The main question of this paper is: which characteristics of an inside trade affect the information asymmetry? This could allow policy makers to write better regulations to improve the efficiency of the stock market. Therefore, a study will be done on the size and frequency of inside trades and the position of the insider within the firm. These variables will be used to investigate the relationship to the abnormal return and information asymmetry. This will provide an overview of properties that strongly affect the abnormal return and information asymmetry which could provide evidence to change specific regulations to increase market efficiency and decrease market unfairness. This could be stricter regulations on certain insiders or on certain volumes of shares.

Prior research by Lin and Howe (1990) shows that abnormal returns are significantly higher after an officer or board member bought securities relative to unaffiliated shareholders. Furthermore Kraft, Lee and Lopatta (2014) find that senior officers have superior information relative to the other insiders. Senior officers usually have more information about the firm and have more influence on the financial figures and stock prices (e. g., through earnings management or voluntary disclosures). So, the position of the insider within the firm should have a significant effect on the signal it gives to the outside market participants. An officer has more information and more influence on the firm's performance than board members and thus an officer trading securities should give a stronger signal about the firm's performance. This leads to the following hypothesis:

H1 A: If the insider has a more influential position within the firm the abnormal return will be higher (lower) after the insider buys (sells) shares.

H1 B: If the insider has a more influential position within the firm the information asymmetry will be higher (lower) after the insider buys (sells) shares.

If our hypothesis is true and the officers have a higher impact on share price due to more information than our results are relevant to the board members. Since board members have to negotiate with officers about stock-based compensation they should keep in mind their information disadvantage.

If we assume that insiders are rational then we can assume that an insider will buy (sell) more shares if future firm performance is higher (lower) or the expected risk is lower. Even for the insider with superior information buying shares still comes with risks, the insider has a more accurate prediction of future risk compared to the outsiders. Thus, a rational insider will only buy a relatively large amount of shares if he has more certainty about positive gains. This leads to the following hypothesis:

H2 A: A larger volume bought (sold) by an insider should give a signal to the outside market participants that the firm's performance will be greater (less) and thus the abnormal returns should increase (decrease) more relative to a small volume bought (sold).

H2 B: A larger volume bought or sold should give a stronger signal to the outside market participants and thus should decrease information asymmetry more relative to a small volume bought or sold.

Data

To test the hypotheses, we need data on the stock prices and insider trading. We will use stock prices from companies in the United States collected from FactSet. Data was collected on the companies of the Russell 1000 index which was used to create a market portfolio. Companies for which no insider trading was reported or no company data could be provided by FactSet were left out of the analysis. This left us with 603 different companies that were used in the analyses. For the calculations of abnormal returns share prices were used between 2015 and 2017 because this data was recent relevant and not affected by the recent covid crisis. The data on insider trading was collected using the EDGAR database of the SEC. A crawler was used to collect all the insider trading data of 2016 and transformed to be usable in the statistical analyses. The SEC provides information about volume, position and date required for our research. We collected a total of 5075 insider trades for the 603 companies in 2016. If multiple shares were traded by a single insider on a single date the amount was summed up.

Methodology

To test our hypotheses we will make two regression models, for abnormal return and bid-ask spread after an inside trade. As previously stated insiders are only allowed to trade in shares and not in options. Therfor the model can be limited to the prices of shares. We use bid-ask spread as a proxy for information asymmetry which is in line with previous studies on information asymmetry, among others Frankel and Li (2004). Using the model from Boone and Raman (2001), who used it to test the effect of R&D intensity on bid-ask spread, we will test our hypothesis. In accordance with the model of Fama and French (2017) we use the size, measured in outstanding share value, and high minus low (HML) as control variables. HML is created from the book to market value ratio. Both size and HML are ordinal variables. Where size is measured in two categories and HML in three categories. According to Fama and French (2017) it is expected that both size and HML have a negative affect on the return and spread. Khang and King (2006) show that dividend yield is negatively correlated to abnormal returns after insider trading and information asymmetry. This will give us the following regression model:

$$spread = inpos + invol + price + size + HML + div$$

spread = the bid ask spread
inpos = vector of dummies for the four positions within the company. (director, officier, 10 percent owner and other)
invol = insider volume traded relative to shares held by insider. Positive (negative) when the insider is buying (selling) shares
buy = dummy variable, 1 if insider buys shares
HML = High minus low
size = size of the firm
div = dividend yield

To make our model for abnormal returns we first need to calculate the abnormal returns. To do this we use the capital asset pricing model to calculate the expected return of the stock and then we subtract it from the actual return.

*AR i = Ri - Return Market * Beta i*

Ri = daily return of stock i
Rm = daily return of the market portfolio
Beta i = Beta of stock i

To capture the abnormal returns over a period after the inside trading we will sum them up to create the cumulative abnormal returns (CAR) for a stock.

CAR = inpos + invol + price + size + HML + div

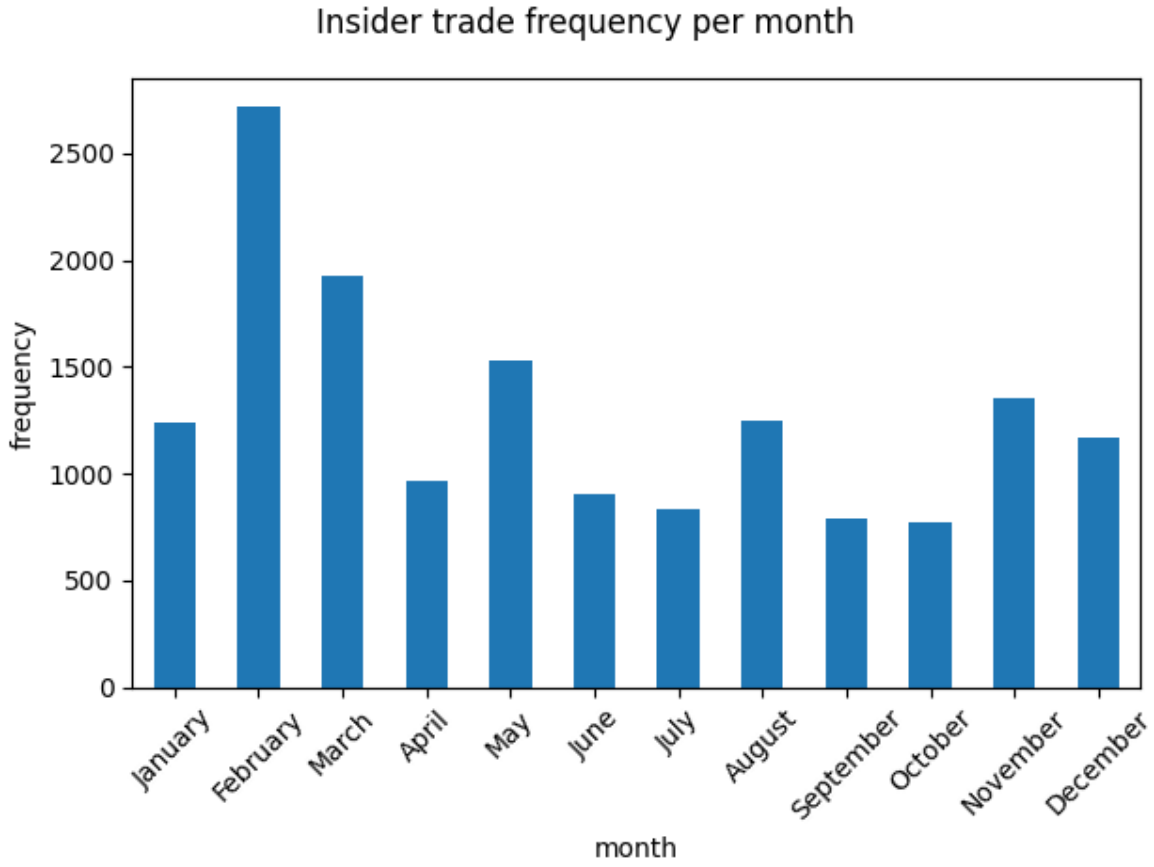
CAR = cumulative abnormal return
inpos = vector of dummies for the four positions within the company. (director, officier, 10 percent owner and other)
invol = insider volume traded relative to shares held by insider. Positive (negative) when the insider is buying (selling) shares
buy = dummy variable, 1 if insider buys shares
HML = High minus low
size = size of the firm
div = dividend yield

For robustness we will test the bid - ask spread and the CAR in different time periods after the inside trade, namely 3 days, 5 days and 2 weeks.

Results

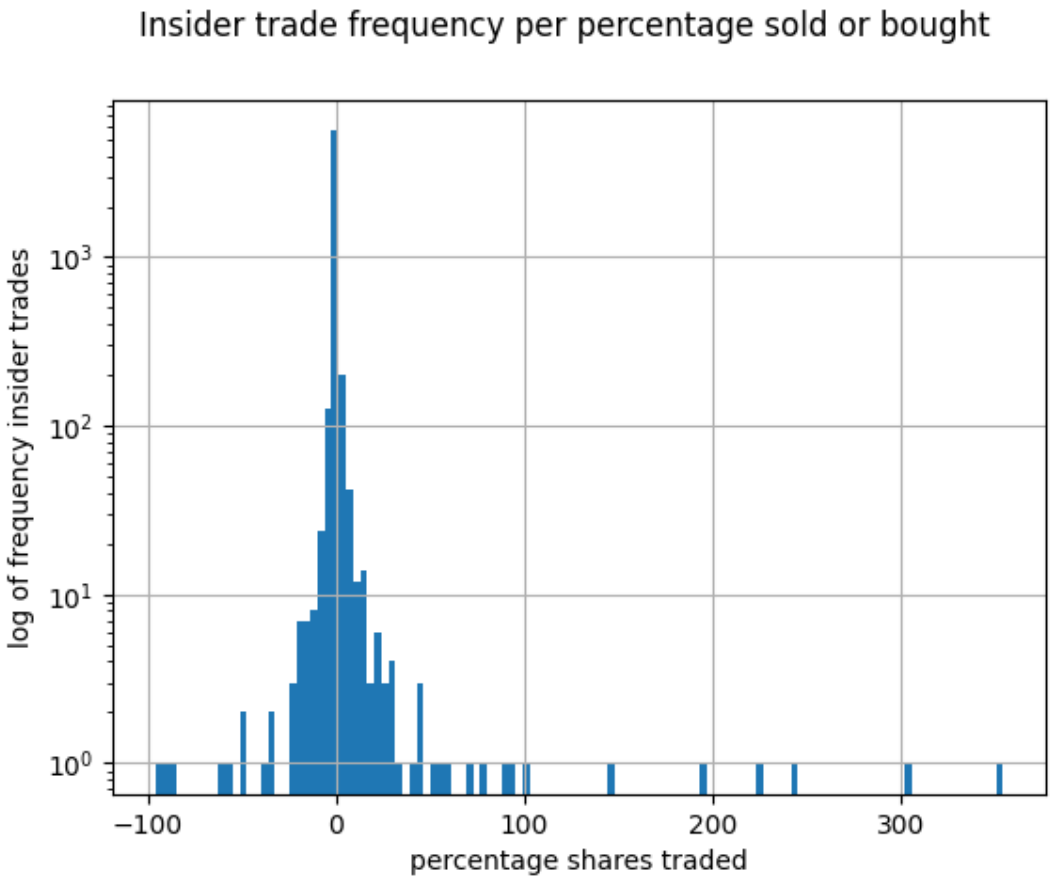
First, the results are shown in this chapter which will be discussed later on in this chapter. In the first few figures some descriptive results are shown of the data used in the analysis. In figure 1 the insider trades are plotted against the months of the 2016.

Figure 1: The frequency of inside trades per month.



In figure 2 the insider trade percentages are shown. It is shown that most trades relatively small relative to the pre-trade shares owned by the insider.

Figure 2: The log of the frequency insider trades for each percentage sold or bought. The percentage traded is based on the amount traded relative to the amount owned by the insider before trading. Negative percentages show sales.



In the tables 1-6, shown below, the correlation between the dependent and independent variables is shown.

Table 1. Correlation of the car 3 model

	Car 3	Transaction amount	Size dummy	High minus low	Dividend yield
Car 3	1	0.010009285	-0.039642068	-0.03909	0.098885702
Transaction amount	0.010009	1	0.013186739	-0.01536	-0.003540441
Size dummy	-0.03964	0.013186739	1	0.045171	0.168579511
High minus low	-0.03909	-0.015359714	0.045170687	1	-0.230516651
Dividend yield	0.098886	-0.003540441	0.168579511	-0.23052	1

Table 2. Correlation of the car 5 model

	car 5	transaction amount	size dummy	High minus low	dividend yield
car 5	1	0.008073533	-0.038652604	-0.04721	0.103424487
transaction amount	0.008074	1	0.013186739	-0.01536	-0.003540441
size dummy	-0.03865	0.013186739	1	0.045171	0.168579511
High minus low	-0.04721	-0.015359714	0.045170687	1	-0.230516651
dividend yield	0.103424	-0.003540441	0.168579511	-0.23052	1

Table 3. Correlation of the car 14 model

	car 14	transaction amount	size dummy	High minus low	dividend yield
car 14	1	0.013805042	-0.069435642	-0.06436	0.079877108
transaction amount	0.013805	1	0.013186739	-0.01536	-0.003540441
size dummy	-0.06944	0.013186739	1	0.045171	0.168579511
High minus low	-0.06436	-0.015359714	0.045170687	1	-0.230516651
dividend yield	0.079877	-0.003540441	0.168579511	-0.23052	1

Table 4. Correlation of the spread 3 model

	spread 3	transaction amount	size dummy	High minus low	dividend yield
spread 3	1	-6.33E-05	0.028520055	-0.003465129	0.016338583
transaction amount	-6.33E-05	1	0.014555877	-0.017400397	-0.003619197
size dummy	0.0285201	0.014555877	1	0.048005364	0.168421214
High minus low	-0.003465	-0.017400397	0.048005364	1	-0.236956708
dividend yield	0.0163386	-0.003619197	0.168421214	-0.236956708	1

Table 5. correlation of the spread 5 model

	spread 5	transaction amount	size dummy	High minus low	dividend yield
spread 5	1	0.000795153	0.008102661	-0.050548289	0.046607116
transaction amount	0.0007952	1	0.014555877	-0.017400397	-0.003619197
size dummy	0.0081027	0.014555877	1	0.048005364	0.168421214
High minus low	-0.050548	-0.017400397	0.048005364	1	-0.236956708
dividend yield	0.0466071	-0.003619197	0.168421214	-0.236956708	1

Table 6. Correlation of the spread 14 model

	spread 14	transaction amount2	size dummy	High minus low	dividend yield
spread 14	1	-0.000502597	-0.049205938	0.022129449	-0.030403459
transaction amount	-0.0005026	1	0.014555877	-0.017400397	-0.003619197
size dummy	-0.0492059	0.014555877	1	0.048005364	0.168421214
High minus low	0.02212945	-0.017400397	0.048005364	1	-0.236956708
dividend yield	-0.0304035	-0.003619197	0.168421214	-0.236956708	1

In the table below we see the results from the OLS regression on the CAR of different periods of time.

table 7. Results from OLS regression on CAR of 3 days after insider trading. R^2 = 0.021

Variables	coef	P>|t|	Expected sign
director	-0.0012	0.332	+
officer	-0.0059	0	+
Ten percent owner	0.0064	0.003	+-
other	-0.0043	0.158	+-
transaction amount	5.41E-12	0.391	+
Size dummy	-0.0034	0	-
High minus low	-0.0003	0.518	-
Dividend yield	0.0019	0	-

table 8. Results from OLS regression on CAR of 5 days after insider trading. R^2 = 0.020

Variables	coef	P>|t|	Expected sign
director	-0.0021	0.135	+
officer	-0.0056	0	+
Ten percent owner	0.0067	0.006	+-
other	-0.0017	0.634	+-
transaction amount	4.45E-12	0.537	+
Size dummy	-0.0039	0	-
High minus low	-0.0007	0.209	-
Dividend yield	0.0023	0	-

table 9. Results from OLS regression on CAR of 14 days after insider trading. R^2 = 0.024

Variables	coef	P>|t|	Expected sign
director	-0.0038	0.07	+
officer	-0.0119	0	+
ten_percent_owner	0.0033	0.359	+-
other	-0.0063	0.222	+-
transaction amount	1.15E-11	0.28	+
Size dummy	-0.0086	0	-
High minus low	-0.0025	0.004	-
Dividend yield	0.0026	0	-

table 10. OLS regression on relative bid-ask spread in 3 days after insider trading. R^2 = 0.001

Variables	coef	P>|t|	Expected sign
director	0.0089	0.876	+
officer	0.1031	0.081	+
Ten percent owner	0.002	0.984	+-
other	-0.2294	0.102	+-
transaction amount	4.92E-11	0.851	+
Size dummy	0.0586	0.129	-
High minus low	-0.0113	0.633	-
Dividend yield	0.008	0.481	-

table 11. OLS regression on relative bid-ask spread in 5 days after insider trading. R^2 = 0.009

Variables	coef	P>|t|	Expected sign
director	0.0244	0.639	+
officer	0.168	0.002	+
Ten percent owner	-0.0698	0.455	+-
other	-0.2653	0.038	+-
transaction amount	7.74E-11	0.746	+
Size dummy	-0.0104	0.767	-
High minus low	-0.0727	0.001	-
Dividend yield	0.0256	0.014	-

Table 12. OLS regression on relative bid-ask spread in 14 days after insider trading. R^2 = 0.023

Variables	coef	P>|t|	Expected sign
director	-0.0182	0.83	+
officer	0.0379	0.666	+
Ten percent owner	-0.0925	0.544	+-
other	-0.023	0.912	+-
transaction amount	2.61E-11	0.947	+
Size dummy	-0.1867	0.001	-
High minus low	0.0502	0.154	-
Dividend yield	-0.0141	0.407	-

Discussion and Conclusion

In tables 7 to 9 we can see that neither the position nor the amount of shares trades has a significant effect on the CAR. Our results indicate that the position of the insider within the company has no significant effect on returns after the insider has traded measured over all the three time periods. Furthermore, the number of shares traded relative to the number of shares owned before the insider trade had no significant effect on the CAR.

In table 10 to 12 the OLS regression on the relative bid-ask spread is shown. All the dummies for the position of the insider within the firm have no significant effect on the spread. These results thus indicate that the position of the insider within the company has no significant effect on the spread after insider trading. Furthermore there is no significant effect from the relative amount of shares traded by the insider on the spread.

In all the regressions there is a relative low R-squared. Meaning that the variance of the exogenous variables has only a small explanatory power on the endogenous variable. This could indicate that the variables used in these models are lacking and perhaps more or other control variables must be added to give stronger results.

In conclusion this paper provides no evidence to support the first hypothesis:

- *If the insider has a more influential position within the firm the abnormal return will be higher (lower) after the insider buys (sells) shares.*

- *If the insider has a more influential position within the firm the information asymmetry will be higher (lower) after the insider buys (sells) shares.*

There is no evidence that the position of the insider within the firm has any significant effect on the abnormal returns. Similar to Fidrmuc et al. (2006) and Betzer and Theissen (2009) I found no evidence to support the theory on information hierarchy. Since the papers of Lin and Howe (1990) and Kraft et al. (2014) provide evidence in support of the information hierarchy further research should be done. The paper of Chung and Chareonwong (1998) only analyzes the spreads in periods where a high number of insiders are only buying or only selling which in theory should increase the amount of informed trades done by the insiders relative to the liquidity trades. Another reason that there was no evidence found could be explained by the SEC. The SEC puts the officers and directors under more scrutiny which could deter these insiders to make trades on any significant insider information.

There was no evidence found for the second hypothesis:

- *A larger volume bought (sold) by an insider should give a signal to the outside market participants that the firm's performance will be greater (less) and thus the abnormal returns should increase (decrease) more relative to a small volume bought (sold).*

- *A larger volume bought or sold should give a stronger signal to the outside market participants and thus should decrease information asymmetry more relative to a small volume bought or sold.*

The relative volume traded by the insider had no significant effect on the abnormal returns or the information asymmetry. As explained before this could be due to the small explanatory power or the fact that the insiders were liquidity trading instead of informed trading. Another improvement to this model could be to use volume traded by the insider relative to the outstanding shares instead of volume traded relative to the shares owned by the insider. Because a rational market maker, who has to balance the cost of trading with informed traders with the gains of trading with liquidity traders, is less deterred by insider trading if the outstanding shares are relatively high compared to the shares traded by the insider. This is because then the chance for a market maker to trade with an informed trader decreases. Which in turn should make the market makers less sensitive to insider trading and therefore the spread should be affected less.

This paper has provided no decisive evidence on the effect of insider trading on the abnormal returns and information asymmetry. Further research could be improved with a different model and perhaps different endogenous variables.

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Appendix

Results from OLS regression on CAR of 3 days after insider trading. R^2 = 0.021

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.0028	0.002	1.762	0.078	0	0.006
director	-0.0012	0.001	-0.97	0.332	-0.004	0.001
officer	-0.0059	0.001	-4.597	0	-0.008	-0.003
Ten percent owner	0.0064	0.002	2.945	0.003	0.002	0.011
other	-0.0043	0.003	-1.411	0.158	-0.01	0.002
transaction amount	5.41E-12	6.31E-12	0.858	0.391	-6.96E-12	1.78E-11
Size dummy	-0.0034	0.001	-3.963	0	-0.005	-0.002
High minus low	-0.0003	0.001	-0.646	0.518	-0.001	0.001
Dividend yield	0.0019	0	8.008	0	0.001	0.002

Results from OLS regression on CAR of 5 days after insider trading. R^2 = 0.020

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.0033	0.002	1.854	0.064	0	0.007
director	-0.0021	0.001	-1.496	0.135	-0.005	0.001
officer	-0.0056	0.001	-3.819	0	-0.008	-0.003
Ten percent owner	0.0067	0.002	2.724	0.006	0.002	0.012
other	-0.0017	0.003	-0.477	0.634	-0.009	0.005
transaction amount	4.45E-12	7.21E-12	0.617	0.537	-9.69E-12	1.86E-11
Size dummy	-0.0039	0.001	-3.979	0	-0.006	-0.002
High minus low	-0.0007	0.001	-1.257	0.209	-0.002	0
Dividend yield	0.0023	0	8.161	0	0.002	0.003

Results from OLS regression on CAR of 14 days after insider trading. R^2 = 0.024

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.0114	0.003	4.294	0	0.006	0.017
director	-0.0038	0.002	-1.81	0.07	-0.008	0
officer	-0.0119	0.002	-5.525	0	-0.016	-0.008
ten_percent_owner	0.0033	0.004	0.918	0.359	-0.004	0.01
other	-0.0063	0.005	-1.222	0.222	-0.016	0.004
transaction amount	1.15E-11	1.06E-11	1.081	0.28	-9.35E-12	3.23E-11
Size dummy	-0.0086	0.001	-6.059	0	-0.011	-0.006
High minus low	-0.0025	0.001	-2.891	0.004	-0.004	-0.001
Dividend yield	0.0026	0	6.292	0	0.002	0.003

OLS regression on relative bid-ask spread in 3 days after insider trading. R^2 = 0.001

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.9159	0.072	12.714	0	0.775	1.057
director	0.0089	0.057	0.157	0.876	-0.103	0.121
officer	0.1031	0.059	1.748	0.081	-0.013	0.219
Ten percent owner	0.002	0.102	0.02	0.984	-0.199	0.203
other	-0.2294	0.14	-1.636	0.102	-0.504	0.045
transaction amount	4.92E-11	2.62E-10	0.188	0.851	-4.65E-10	5.63E-10
Size dummy	0.0586	0.039	1.519	0.129	-0.017	0.134
High minus low	-0.0113	0.024	-0.477	0.633	-0.058	0.035
Dividend yield	0.008	0.011	0.705	0.481	-0.014	0.03

OLS regression on relative bid-ask spread in 5 days after insider trading. R^2 = 0.009

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.8625	0.066	13.116	0	0.734	0.991
director	0.0244	0.052	0.47	0.639	-0.078	0.126
officer	0.168	0.054	3.119	0.002	0.062	0.274
Ten percent owner	-0.0698	0.093	-0.747	0.455	-0.253	0.113
other	-0.2653	0.128	-2.073	0.038	-0.516	-0.014
transaction amount	7.74E-11	2.39E-10	0.323	0.746	-3.92E-10	5.47E-10
Size dummy	-0.0104	0.035	-0.296	0.767	-0.079	0.059
High minus low	-0.0727	0.022	-3.365	0.001	-0.115	-0.03
Dividend yield	0.0256	0.01	2.463	0.014	0.005	0.046

OLS regression on relative bid-ask spread in 14 days after insider trading. R^2 = 0.023

Variables	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.099	0.107	10.255	0	0.889	1.309
director	-0.0182	0.085	-0.214	0.83	-0.184	0.148
officer	0.0379	0.088	0.432	0.666	-0.134	0.21
Ten percent owner	-0.0925	0.152	-0.607	0.544	-0.391	0.206
other	-0.023	0.209	-0.111	0.912	-0.432	0.386
transaction amount	2.61E-11	3.90E-10	0.067	0.947	-7.39E-10	7.91E-10
Size dummy	-0.1867	0.057	-3.254	0.001	-0.299	-0.074
High minus low	0.0502	0.035	1.425	0.154	-0.019	0.119
Dividend yield	-0.0141	0.017	-0.83	0.407	-0.047	0.019