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Can an investor gain positive abnormal return by mimicking insider transactions?

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Preface

We are grateful for everyone who contributed and helped us to successfully accomplish this study. We especially want to thank our tutor Gert Sandahl for guiding us and providing us with tips and feedback. Further we would like to thank all the opposing groups for giving useful constructive criticism during the work.

Abstract

Title: Can an investor gain positive abnormal return by mimicking insider transactions?

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Background: The efficient market hypothesis is a theory that has been widely debated and studied during the years. Some agree with the theory, but some disagree. One way to study the efficient market hypothesis is by looking at the possibility to gain positive abnormal return on the stock market. A lot of studies have been made throughout the years but mainly in bigger countries and markets like USA and UK and the results vary. This makes it interesting to study the Swedish market to see to what extent insiders can exploit insider information and the markets efficiency to price these insider transactions.

The study is based on insider transactions in all companies on OMXS30 during the period 2015-01-01 to 2020-10-30. We also investigate if there is a correlation between abnormal return and transaction size, transaction type or the position of the insider.

Question at issue: Can an investor gain positive abnormal return by mimicking insider transactions of firms in OMXS30?

Methodology: An event study is done where the price of each stock is compared to OMXS30, when an insider transaction has been made, over a time period of 20, 60 and 120 business days. Further, we investigate if the results are statistically significant by doing a t-test with a 95% significance level. The study's null hypothesis and alternative hypothesis are the following:

H_0: It is not possible to gain positive abnormal return by mimicking insiders.

H_A: It is possible to gain positive abnormal return by mimicking insiders.

Results: The study shows that it is possible to gain positive abnormal return on OMXS30, but only by mimicking the sell transactions of insiders. It also shows that the mimicking of any chief officer position will generate the highest short-term return, also, the highest transaction size points to the highest short-term return.

Keywords: Nasdaq, OMX Stockholm, Insider Trading, Abnormal Return, OMXS30, Stock Market.

Contents

1. Background

The main reason that we became interested in researching this subject is because when looking at old studies we could distinguish a gap between theory and practice in this field. The efficient market theory is a well-established and accepted theory, and much of the economic theory is based on the efficient market theory. Contradictory to this, we found that some of the studies made on insider trading show that it is possible to gain positive abnormal return by mimicking insiders to some extent.

The stock markets primary purpose is to allocate capital for the listed companies, also, it creates the opportunity for investors to gain return on their invested capital. Nasdaq Stockholm is the biggest exchange for trading securities in Sweden and is owned by Nasdaq, inc. (Nasdaq, 2020). An efficient way to measure the return on the market is through market indexes, e.g., OMXSPI and OMXS30. OMXSPI is an all-share index with equally weighted returns. OMXS30 is the 30 most traded stocks on the Swedish Stock Market where all the stocks return is weighted by market cap size, the current firms included are listed in **attachment 1**.

A well covered topic in both media and academic studies is finding ways to gain positive abnormal return, i.e., excessive return compared to the benchmark index. Every day we are able to take part of huge information flows regarding the market from the media, the companies and from other investors. All the available information should be reflected in the price of the security, according to the Efficient Market Hypothesis (Fama, 1970). The efficient market hypothesis might not always stay true to reality since it takes some unrealistic assumptions into account. For instance, managers and members of the board have access to information that the market does not have. This information gap makes it possible for insiders to know if the stock is fairly priced or not. Insiders can, because of this asymmetric information, take advantage of their position. There are however regulations to mitigate this behaviour and reduce the effects of the asymmetric information.

According to FI (2020a) (Finansinspektionen), it is the firm's responsibility to determine who is considered an insider. All firms that are issuers on a stock exchange are obliged to keep a list of all the persons who has insider information at their disposal. This list must be shared with FI and updated as soon as there is a change in who has access to insider information. Generally, members of the board, chief officers, managers, as well as people closely associated with them are considered as insiders FI (2020a). When "chief officer" is mentioned throughout this study, we are referring to all sorts of chief officers, e.g., Chief Executive Officer, Chief Financial Officer, Chief Operating Officer etc.

FI is an authority whose task is to supervise the financial market in Sweden. FI (2020b) keeps a PDMR transaction register, PDMR stands for *Persons Discharging Managerial Responsibilities*, i.e., an insider. This register contains all security and debt instrument transactions executed by persons with discharging managerial responsibilities and people closely associated with them in the specific instrument they are considered insiders in. The PDMR register is public and its objective is to ensure transparency in the transactions executed by insiders and their related parties. One can search the register and follow changes in holdings of insiders and their related parties on the FI webpage. Because of EU's Market Abuse regulation (EU) 596/2014 the reported transactions on the FI webpage only go back to 3 of July 2016 (FI, 2020a). Older transactions are however stored at FI and go back as far as 1995.

According to FI (2020b) the PDMR register is continuously updated as new transaction data is received. To keep the transparency, FI requires every insider to report their transaction linked to the specific firm they are considered insider in. Also, the transaction must be reported within three business days from the day that it was made. FI (2020b) further states that it is prohibited for insiders to trade the specific security that they have insider information in within 30 days of an upcoming financial report. However, insiders are not obligated to report transactions if the total value of the bought instruments is less than the equivalent of EUR 5,000 during a calendar year.

There are several studies made through the years on insider's possibility to gain positive abnormal return but with different results. For instance, studies made by Jaffe (1974) and Seyhun (1986) showed positive correlation between insider transactions and excessive return. The mentioned researchers' conclusions were that gaining positive abnormal return was possible for an insider and that insiders often bought before positive announcements and sold before announcements that did not meet the markets expectations. The above-mentioned studies also examined the possibility of gaining positive abnormal return as an outsider mimicking the transactions of an insider. The results showed that it was possible to some extent, given that there were no transaction costs.

According to Jaffe (1974), the commission the broker received for every transaction was approximately 1 percent. This means that the return on the company's security has to be at least 2 percent more than the expected return on an investment with equivalent risk before it will be worthwhile. Compared to today, Avanza the largest stockbroker in Sweden when looking at numbers of transactions made on Stockholm Stock Exchange, receives a brokerage fee of 0,069%-0,25%, depending on the size of the transaction (Avanza, 2020b) (Avanza, 2020a). This means that the return on the company's security only has to exceed 0,138%-0,5% of an investment with equivalent risk before it will be worthwhile.

1.1 Problem discussion

Seyhun (1986), looked at different factors when studying excess returns for insiders. He examined if the size of the transaction, size of the company and position of the insider played any part in the amount of excess return gained by the insider. The conclusion was that positive abnormal return could be attained in all company sizes, but the largest return was found in the smaller company. Abnormal return was also higher when insiders had more insight in the company, such positions as CEO or board member. Another study, made by Jaffe (1974), investigating transactions from over 200 companies in the US, showed that transactions contain information and therefore it was possible for outsiders to profit by following these transactions. Jeng et al. (2003) found a correlation between abnormal return and transaction size, in their study they simulated a buy and a sell portfolio based on insider transactions, but it was only the buy portfolio that indicated positive abnormal return.

Since Seyhun (1986) published his study in 1986, the speed and availability of the transactions' publication has changed. According to FI (2020c) insiders have three business days to report their transaction, and FI publishes the transaction online the same day the insider reports the transaction. This is a substantial change since Seyhun (1986) mentioned that the time from an insider to report a transaction and to the day it was published was between 60 and 90 days. Therefore, it is easier to mimic an insider in today's circumstances.

Studies has shown that abnormal return through mimicking insiders has been possible to some extent. The most popular studies have been made on the American market and some of them were made over 30 years ago. With that in mind, it would be interesting to revisit this field of study and examine the possibility to gain abnormal return by mimicking insiders in Sweden, more specifically the 30 most traded stocks in Sweden, also known as OMXS30. The fact that we examine OMXS30 is what separates this study from the above mentioned, as well as the time period and the narrower choice of companies. We chose OMXS30 because of the fact that these firms are the most traded stocks is Sweden, therefore, we thought that these firms should be the most price efficient. This means that if our result shows that it is possible to gain abnormal return by mimicking insider transactions on OMXS30, we believe that it is most likely possible across all stocks in Sweden.

1.2 Question at issue

- Can an investor gain positive abnormal return by mimicking insider transactions of firms in OMXS30?

1.3 Purpose of the study

Our aim with this study is to investigate if there is a correlation between positive abnormal return and the publications of insiders' transactions on the 30 most frequently traded stocks in Sweden through statistical hypothesis testing. The hypothesis that we are going to test is: *Mimicking insiders' transactions generate positive abnormal return*.

To consistently beat the market return over time is known to be a tough task. Therefore, we wanted to examine the possibility of beating the market by strictly following a simple method. We hope that this study will contribute to a better understanding of the price efficiency in the most traded companies on the Swedish market.

2. Theoretical frameworks

2.1 Efficient Market Hypothesis

The traditional financial theory originates from the thesis about the efficient market. Harry Roberts coined the term "efficient market hypothesis" in 1967 and made a distinction between weak and strong forms tests (Sewell, 2011). In short terms *The Efficient Market Hypothesis*, EMH, says that the market is effective in its pricing of assets and all information about the market and the individual stock should be reflected in the price and when new information occurs it will instantly be reflected in the price (Malkiel, 2003).

There is an ongoing discussion in economic theory about EMH and it does not look like it is going to end soon. The evidence and opinions are unalike and in a study by Sewell (2011), where he goes through the history of EMH, approximately half of the articles in the study were showing evidence against EMH, but most of these articles were written in the 80s and 90s.

Fama (1970) in his article *Efficient Capital Markets: A Review of Theory and Empirical Work* discusses different factors that may affect the price of securities. Under ideal conditions the prices in a market perfectly reflect the current available information. To attain this efficiency, Fama, (1970) proposes three requirements that has to be fulfilled:

- No transaction cost
- All information is costlessly available
- All market participants agree on the implications of the available information on the price across all securities.

Further, Fama (1970) divides the test of the Efficient Market Hypothesis into three stages, which all take different assumptions into account. The first one is the *Weak form efficiency*; the market is said to be *weak form efficient* if the future price of securities cannot be predicted by past returns. This is, since all information about the price and volume in the past is incorporated in the current price.

The second aspect of the EMH is the *Semi-strong efficiency*, which suggests that prices of securities fully reflect the publicly available information and adjust to events such as, financial reports, stock splits, issuance of stocks, etc. The *Semi-strong efficiency* implies that acting on such news does not generate abnormal return.

The third, *Strong form efficiency*, assumes that prices of the securities reflect all available information, whether it is public or private. If this stays true, it is not possible to attain positive abnormal return through either fundamental or technical analysis.

The results from Fama's (1970) study indicates that there is support for the weak form efficiency and semi-strong efficiency and there is only restricted evidence for the strong form efficiency. In strong, and some form of semi-strong efficiency, it would not be possible to gain positive abnormal return and all sort of fundamental and technical analysis would be pointless. A committed proponent of the EMH is Jensen (1978) who implies that there is strong evidence for EMH and even says that EMH is the theory in economy with the strongest empirical evidence.

However, the criticism against EMH has increased together with the increase in popularity of behavioural finance. De Bondt et al. (1985) made a study and researched the psychology hypothesis that most people tend to overreact on unexpected and dramatic news. When looking at if this behaviour affects stock prices, they found empirical evidence consistent with the overreaction hypothesis. Which indicates weak form market efficiencies and violates EMH. Because they found that the market was reacting stronger than expected. De Bondt et al. (1985) came to the conclusion that the overreaction hypothesis also applies to the stock market, they found that coherent with the overreaction hypothesis, portfolios of prior "winners" will in the future be outperformed by prior "losers". They found that 36 months from the portfolio creation, the "losers" gained 25% more return than the "winners".

Two other researchers that found evidence against the weak form of EMH was Jegadeesh and Titman (1993), they tested the momentum strategy over the period 1965 to 1989. By momentum strategy they mean buying stocks with a positive momentum, i.e., buying stocks that have performed well in the past and selling stocks that performed poorly. Their conclusion was that this strategy will generate a positive abnormal return over a 3-12 months holding period. However, they found that after 12 months, the excessive return was diminishing and might be explained by prices overreacting.

2.2 Asymmetric information

A thorough explanation of asymmetric information is made by Akerlof (1970) in his article *The Market for "Lemons"*. Akerlof (1970) illustrates the phenomenon with the automobile market, which captures the essence of the problem. For instance, a car can either be a good buy or a "lemon", the individual who is in the market for a new car is unaware of the condition and will probably buy the car, nonetheless. After some time of ownership, the owner will form an idea of the condition of the car and can determine if it is a good car or a lemon, this is where the asymmetry of the information is developed. Generally, the seller has always more knowledge about the quality of the product. The market price of the product will roughly be the same regardless if it is a good buy or a lemon, since it is impossible for the buyer to know the condition. Due to the fact that cars have the same price despite the quality, Akerlof (1970) implies that only lemons will be for sale. This can be explained by the logic; *why would I sell my good car if I know that I would get the price of a lemon.*

This reasoning can also be applied to the stock market, insiders generally have a greater understanding of the real value of the firm than the outside investors. The insiders can therefore exploit the information asymmetry and gain abnormal return.

2.3 Signaling theory

Signaling theory was originally founded by Michael Spence in the paper (Spence, 1973) *Job Market Signaling* as a work on the information gap between potential employees and organisations. Due to its intuitive nature, it became adapted into other domains.

The theory was applied to the stock market by Levy H.& Lazarovich-Porat in 1995. In their paper they explain that signaling theory is a theory that means that insiders can, through signals, mediate information to the market (outsiders). This is only possible if there is asymmetric information between the insiders and the outsiders. Further he explains that managers often possess more information than the outsiders regarding investments viability, expected profits, risk exposure etc. Therefore, it is possible for insiders to send these signals to the outsiders. This can be done through different actions like repurchase of shares, changing the capital structure, changing the dividend policy etc. These signals can be both of positive and negative character. The signals are of no economic value if the information is spread evenly among all parties, but when asymmetric information prevails these signals can be very meaningful and change the value of the company.

According to Connelly et al. (2011) insiders obtain both negative and positive information, and they must decide if and how to communicate this information to the outsiders. Signaling theory is mostly focused on managers trying to deliberately communicate positive information to increase the value of the company. However, sometimes the managers send negative signals, like issuing new shares. This is often considered a negative signal because, according to Myers & Majluf (1984) managers often issue new equity when they believe the stock is overvalued. But insiders do not generally send these negative signals to reduce the information gap, it is more an unintended consequence of the action.

2.4 Studies about abnormal return through insider trading

As stated earlier, one of the earlier studies in this field is the paper made by Jaffe (1974). Jaffe (1974) looked at insider transactions from over 200 companies during the period 1962-1968 in the US market. The conclusion was that insiders have special information and was therefore able to gain abnormal return. This showed that the transactions contained information and by mimicking the insiders the investors were able to profit from the publication. However, when accounting for transaction costs, which were approximately 1% at this time, it eliminated all trading profits for outsiders except for intensive trading samples. With intensive trading samples (in this case) means that there is at least 3 more buy transactions than sell transactions during a period, vice versa.

Another study similar to the one made by Jaffe (1974), was made by Seyhun (1986). This study was investigating the availability of abnormal profits to insiders and to outsiders by mimicking insiders. The study was made with approximately 60 000 insider transactions from 1975 to 1981. Seyhun (1986) divided the data into categories of: type of transaction, position of the insider, size of the transaction and size of the firm to get a more significant result. The evidence presented in the study indicates that insiders can gain abnormal return by predicting future stock price changes. They tend to purchase before an abnormal rise in the stock price and sell the stock before an abnormal decline in stock price. Seyhun (1986) further implies that board members and officer-directors are more successful predictors of future abnormal stock price changes rather than officers and shareholders. Also, the size of the transaction had a positive correlation with the abnormal return, hence, the higher transaction size the higher abnormal return. Another important notation by Seyhun (1986), is that when the transaction cost such as commission and spread are taken into account it might cancel out the abnormal return. This is in line with the Efficient Market Hypothesis by Fama (1970).

One of the first studies to reach the conclusion that insider trading can be profitable is Lorie and Niederhoffer (1968). They examined insider transactions from January 1950 to December, 1960 of 105 random companies on the New York Stock Exchange. Their conclusion was that insiders tend to buy more frequently than usual prior to a large price incline and sell more frequently prior to a price decline, which points to the fact that insiders have more information.

Jeng et al. (2003) estimated the return of insiders when trading their own stock by creating a buy portfolio and a sell portfolio. They use a comprehensive sample of 558.229 insider transactions from 1975-1996 and concludes that the buy portfolio earns abnormal return of more than 50 basis points (0,5%), but the sell portfolio does not earn any abnormal return. Jeng et al. (2003) cannot see any differences in abnormal return when separating large firms and small firms, or between top executives and other insiders, they could however see a correlation between abnormal return and transaction volume. But for the biggest transactions this relation might not hold, because according to Jeng et al. (2003), it is likely that many of the absolute largest transactions are not of only monetary reasons. The biggest transactions may have motives like control or diversification and therefore not of only monetary purpose trying to exploit special information.

Eckbo & Smith (1998) studied the Oslo Stock Exchange (OSE) from January 1985 through December 1992 and studied over 18 000 transactions. Instead of using the traditional event-study approach, they used a new empirical methodology which mimics the insider's performance more accurately. However, they reached the conclusion that there was no evidence for abnormal return. They could also see that their fictive insider portfolio was outperformed by other managed mutual funds on the same stock exchange.

2.5 Conclusions of the theoretical framework

In summary, the results in the studies about abnormal return through insider trading vary. Jaffe (1974) concluded that it is possible to gain abnormal return through insider mimicking and the highest excess return was found when a lot of insiders bought or sold at the same time. Seyhun (1986) also concluded that it was possible to gain abnormal return, he also found that board members and officer directors gained the highest excess return of the insiders. His result also showed a positive correlation between transaction size and positive abnormal return. Lorie & Niederhoffer (1968) also found that it was possible to gain abnormal return through insider mimicking. Jeng et al. (2003) could only find evidence for positive abnormal return through buy transactions. Also, they found a positive correlation between transaction volume and positive abnormal return, up to a certain level. Eckbo & Smith (1998) could not show any positive abnormal return in their study.

The conclusion is that the majority of the studies we brought up did however show that there was a possibility to gain positive abnormal return through insider mimicking, which points to the fact that markets are being ineffective, or at least have characteristics of weak-form efficiency as Fama (1970) called it.

3. Method

3.1 Research approach

Patel & Davidson (2011) mean that the relation between theory and empirics tells if a study has a deductive or inductive approach. A deductive approach is when the researcher originates from already existing knowledge and theories in a field. From these existing theories one can derive one or several hypothesises which later are tested by analysing the gathered data. This means that a theory has already decided what data and information that are to be gathered, how to interpret the data and how to relate the results to the existing theory. Our study originates from *The Efficient Market Hypothesis* and the aim of the study is to test a hypothesis, therefore, we have applied a deductive approach.

3.2 Research strategy

According to Patel and Davidson (2011) social science methodology literature separates research strategies in quantitative and qualitative research strategy. The qualitative strategy is more focused on words rather than numbers when generating, processing and analysing the information. Quantitative research on the other hand is research that process numbers and includes statistical measurements. Further, Patel & Davidson (2011) imply that quantitative strategy is often characterised by a deductive approach and a qualitative strategy is characterised by an inductive approach. Our research strategy will be quantitative.

3.3 Data gathering

According to Collis and Hussey (2009) secondary data are data gathered by another part, examples of secondary data are publications, databases and internal records. The data gathered in this study can be characterised as secondary data, since the stock prices are from Nasdaq Nordic's data base and the insider transactions are from the register of FI. The problem with secondary data is that it might have been gathered for another purpose than what the researcher is going to use the data for and therefore the data might be less suitable. This is however not a problem for this study.

Every closing price from 2015-01-01 to 2020-10-31 of OMXS30 and each stock it contains was retrieved 2020-11-05. We chose to use the adjusted closing prices; this means that it is adjusted for any issuing of new stocks and any stock splits. Also, we did not consider the shares' dividend when calculating the return, only the stock price fluctuation.

We took a decision not to restrict us from the extraordinary period and market decline in Mars 2020, that was due to the Covid-19 pandemic. This will most definitely affect our result, but we think it will only strengthen the theory if the result is shown to be significant. Because under these big changes in the market, the price fluctuates and often overreacts which makes it more clear for an insider to trade on these overreactions. In a situation like this, the information gap is widening and therefore we chose to include this period. This is also a factor that makes this study unique, we aim to test a theory regardless of the market conditions.

The insider transaction data from FI was also retrieved 2020-11-05. Because of EU's Market Abuse regulation (EU) 596/2014 the reported transactions on the FI webpage only go back to 3 of July 2016. Older transactions are however stored at FI and go back as far as 1995 (FI, 2020a). Therefore, to get the remaining transactions we had to contact FI. By e-mail, FI sent us a Microsoft Excel file 2020-11-09 with all insider transactions on all companies listed on Stockholm Stock Exchange since 1995. The relevant data regarding the stocks on OMXS30 in the time frame, 2015-01-01 to 2020-10-31, was then filtered out. Also, we only considered the transactions that were made by the insider, that means that we filtered out all the transactions regarding heritage, options and allotment of shares. We did this because they do not involve any active choices for the insider at that time and are therefore of no relevance for this study. Also, we will not consider any commission fees and bid-ask spread. It is important for the reader to bear this in mind since in reality it is not possible to avoid these costs.

3.4 Outliers

When processing big sets of quantitative data there is always a risk for extreme values, also known as outliers. Osborne (2013) explains outliers as data observations that differs considerably from the rest of the data observations in the set in a way that makes it look like it does not belong in the analysis. We use the logarithmic value on the return of each separate transaction to mitigate some of the extreme values. We chose to, when separating into transactions size, instead of weighing the return by the size we separate the return into three groups: 0-99.999 SEK, 100.000-1.000.000 SEK, and more than 1.000.000 SEK. These three transaction groups were chosen to both sort out small transactions, 0-99.999 SEK, which in some cases just covered a few stocks, but also to mitigate the effect of any insider making a relatively large transaction. The groups were chosen to a degree where the transactions were almost evenly distributed.

3.5 Event study methodology and calculations

According to Mackinlay (1997), event studies are often used to measure an events impact on the market or the value of a specific security. The initial step of conducting a study of this sort is to define the event of interest, which in our case is a published insider transaction. Thereafter, we identify the time period over which the price of the security is to be examined. As Mackinlay (1997) mention is his article, to capture the price effect of an announcement the investigated time has to be at least a couple of days, the day of the announcement and the day after. However, because of the restrictions in Sweden, where insiders are not allowed to make transactions directly linked to unpublished price affecting information, we chose a period of interest to take the restrictions into consideration. Also, we figured that if the times periods over which the price movement is examined are too short, the result might depend too much on any market overreaction and if the time periods are too long, the price movement of each stock might be uncorrelated with the transaction of the insider. Therefore, we chose to examine the price of the stocks over 20, 60 and 120 trading days, which roughly transfers to one month, three months and six months respectively.

The return of each security in OMXS30 is calculated whenever information about an insider transaction concerning that specific security is published. The purpose is to simulate the return if you would have mimicked all the published insider transactions. Thus, if information that an insider bought stocks in the firm that he is considered insider in, is published, we simulate a purchase in that stock on the publication date and examine the return if one would sell the stock 20, 60 and 120 business days later. If information is published that an insider sold stocks in the firm he is considered insider in, we simulate a short sell in that specific stock and examine the return if one would buy it back 20, 60 and 120 business days later. The return of the stock is examined by using the close price on the publication date and the close price, 20, 60 and 120 business days from the publication date. This return is then compared to the benchmark index, OMXS30, during the exact same dates.

The information we took into consideration from the insider transaction data from FI was the publication date of the transaction, the position of the person who made the transaction, the type of transaction (buy/sell) and the transaction size. Further, the transactions that were made by the same position on the same date is bundled together which means that we use the net buy and sell amount each day, per firm. This means that if the number of shares bought and sold, in a specific firm by the same type of position a certain date, would be equal, they cancel each other out and would therefore not be considered.

The events impact on the security is measured through its abnormal return, $AR_{i\tau}$, which is the difference between firm i's actual return at time period τ, $R_{i\tau}$, and its normal return, X_{τ}. The normal return is measured as the expected return if the event would not occur, and the expected return is interpreted as the market return. In the market model mentioned by Mackinlay (1997), X_t is the market return during time period τ and it is represented by OMXS30 in this study. The time period for which the return of the stock is measured is the same time period for which the return of the market is measured.

$$AR_{i\tau} = R_{i,\tau} - X_{\tau}$$

The return is calculated by taking the natural logarithm of the close price of the firm at time τ ($\tau = 20, \tau = 60, \tau = 120$) divided by the close price the day the announcement of the transaction was made. The logarithmic value is used to mitigate the effects of any extreme values. $P_{i,\tau}$, stands for the security price of firm i at time τ.

$$\log_e\left(\frac{P_{i,\tau+20}}{P_{i,\tau}}\right) \quad \log_e\left(\frac{P_{i,\tau+60}}{P_{i,\tau}}\right) \quad \log_e\left(\frac{P_{i,\tau+120}}{P_{i,\tau}}\right)$$

For instance, the 20-day abnormal return of mimicking an insider in a specific firm is [$R_{i,\tau} = \log_e\left(\frac{P_{i,t+20}}{P_{i,t}}\right)$ (the 20-day return of the stock)], minus [$X_{\tau} = \log_e\left(\frac{P_{t+20}}{P_t}\right)$ (the 20-day return of the market, i.e., OMXS30)], $= AR_{i\tau}$. One test will however not contribute with any useful information. To draw any statistical conclusion out of this, the aggregated abnormal return across all securities must be calculated, Cumulative Abnormal Return, CAR. The cumulative abnormal return is categorized into transaction type, transaction size and position of the person who performed the transaction.

$$CAR_{i,\tau} = \sum_{\tau=1}^{\tau_n} AR_{i,\tau}$$

Furthermore, the average of all excess return is to be calculated. This is done by dividing the cumulative abnormal return in each category (size, position, type) with total number of transactions in each category. The cumulative average abnormal return, CAAR, can be written as:

$$CAAR_{\tau} = \frac{1}{N}\sum_{N=1}^{N} CAR_{\tau}$$

The N stands for the total number of transactions in each category.

Further, the study aims to investigate if and which factors affect the CAAR. The factors which we are going to test are transaction type, transaction size, position of the insider and event window. These factors are listed in **Table 1** below.

Transaction type:	Buy	Sell	
Transaction size:	0 – 99.999 SEK	100.000 SEK – 1.000.000 SEK	1.000.001 SEK and more
Position of the insider:	Member of the board	Chief Officer	Other position
Event window:	20 business days	60 business days	120 business days

Table 1: The first factor is transaction type, i.e., if the insider either bought or sold stocks within the firm. The second factor is transaction size, i.e., the total value of the transaction in SEK, its either 0-99.999 SEK, 100.000SEK-1.000.000 SEK or 1.000.001 SEK and more. The third factor is the type of position the person executing the transaction has, i.e., member of the board, chief officer or other position. The fourth factor is the time period over which the return is calculated, its either 20, 60 or 120 business days.

3.6 Hypotheses and t-test

After doing the calculations, we must test if they are statistically significant or if they arise due to coincidence. To find out if the calculations are statistically significant, we will use a t-test. According to Cortinhas & Black (2012), t-test is a statistical test in which two means of separate samples are compared. If the means of the samples do not differ significantly the samples points to the fact that the null hypothesis (H_0) stays true and we would not be able to reject the null hypothesis. The null hypothesis is the default assumption which claims that the means equal each other. If, however, the means of the samples differ significantly, the null hypothesis can be rejected and one can claim that the alternative hypothesis (H_a) is true with a specific percentage certainty, depending on which significance level (alpha) is being used. This would make it possible to reject our null hypothesis. The t-test will generate an *observed significance level*, also known as the p-value, Cortinhas & Black (2012) defines this as the smallest value of alpha for which the null hypothesis can be rejected. In other words, if the observed p-value is lower than the set alpha, the null hypothesis can rightfully be rejected. Cortinhas & Black (2012) further mentions that because a sample is being used, one is not able to draw any conclusions for the population with 100% certainty. Thus, it is possible to make incorrect decisions about the null hypothesis. That is, to either reject a true null hypothesis or fail to reject a false null hypothesis. These errors are called Type I and Type II errors respectively. The probability of committing a Type I error is equal to the level of significance (alpha) and the probability of committing a Type II error is called beta (β). Cortinhas & Black (2012) states that these parameters are inversely related, if alpha is increased the beta will decrease and vice versa. The Type II error will however not be considered in this study.

The null hypothesis and the alternative hypothesis are formulated as following:

- H_0 = Mimicking insiders does not generate positive abnormal return. $\mu_1 = \mu_2$.
- H_a = Mimicking insiders generate positive abnormal return. $\mu_1 > \mu_2$
    - μ_1 = Actual mean of the insiders' transaction return
    - μ_2 = Actual mean of OMXS30 return

To test the hypothesis above we will use a one tailed T-test. Even though there is a possibility that the examined return of the insiders is both higher and lower than the benchmark index, this study aims to investigate if there is positive abnormal return to be gained for mimicking insiders. The above hypothesis is to be tested with a level of significance (alpha) of 5%, in other words we will be able to claim that the hypothesis is true with 95% certainty, this alpha is also a commonly used level of significance (Cortinhas & Black, 2012). In this study, the null hypothesis will be rejected if the p-value is lower than 5%. An important assumption we make while using a t-test is that the data of both the insiders' transaction return and the OMXS30 return is following a normal distribution.

3.7 Quality of the study

According to Collis and Hussey (2009), there are two things that decide the quality of a study in the business economic quantitative field. These two things are reliability and validity. According to Bryman and Bell (2003), replicability is also a key variable for a high-quality study. The study should contain a high reliability and a high validity, and it should be easy to replicate. The reliability and validity are important for the study to be relevant and trustworthy. The replicability needs to be high in favour for future studies who want to re-create the exact study.

3.7.1 Reliability

According to Patel and Davidson (2011), the reliability in a study impacts the accuracy of the result and depends on the stability in the measurements and how measurement error is handled in the study. In a quantitative study, the reliability is of extra importance because results easily can be doubted if the same test gives different results every time. We have presented every step of the calculations and handling of data in the **3. Method** to increase the reliability of this study. The data is gathered from well-known and accredited sources and if all companies are following the laws, we have no reason to not trust the numbers collected. Also, to minimize the risk of errors, we directly imported the data to Microsoft Excel and calculated everything in there to minimize errors derived from the human factor. As all the information we gathered is public and the **3. Method** explains the crucial steps we consider this study to be highly replicable.

3.7.2 Validity

The validity of a study is to which extent the researcher's findings reflect what it claims to investigate (Collis & Hussey, 2009). This study aims to investigate the possibility to gain positive abnormal return by mimicking transactions of insiders. We believe we can increase the validity by only focusing on the active transactions and not include the transactions like allotment, options etc. that were not really meant to generate abnormal return by exploiting asymmetric information. Also, since we are investigating this phenomenon from an outsider's perspective, all transactions were measured from the closing price that specific day and not the actual price that the insider bought or sold at. This is because if an outsider wants to mimic the insider, we assume the outsider is going to buy or sell any time during the publishing day, and to make it consistent we use the closing price.

All the stock prices in this study are adjusted. This means they were adjusted for any stock splits and issuance of new stocks. We chose to use the adjusted stock prices because we think this will increase the validity of the study and make our result more reliable.

The research period for this study is 2015-01-01 to 2020-10-30. We chose a timespan long enough with the aim to cover both a rise in the market and a decline in the market. We wanted to include both market conditions because we do not want the results to rely on either one of them.

4. Data and result

To clearly present our findings and calculations we compiled everything of relevance from the attachments into the below charts. The charts are separated into variables (transaction size, transaction type, insider position) on the vertical axis and number of business days on the horizontal axis. We chose to present CAAR, Cumulative Average Abnormal Return, the t-value and the p-value from the t-test. The charts are separated with one chart with all buy and sell transactions in the first chart, the insider positions in the second chart and transaction size in the last chart.

The following formula was used to calculate every return: $AR_{i\tau} = R_{i,\tau} - X_{\tau}$. That is, the difference between the change in the specific stock and the change in the index during the same period. For all the sell transactions we multiplied the $AR_{i\tau}$ with (-1) to get the correct return. This is also the reason why the t-values for the sell transactions are negative even though the abnormal return is positive. In other words, the t-value is positive when the CAAR is positive regarding the buy transactions and the t-value is negative when the CAAR is positive regarding the sell transactions, vice versa. The total number of observations of the insiders' transactions amounted to 3520, 2466 of them was insider purchases and 1054 was insider sell transactions, see **attachment 2** and **attachment 3**.

Event windows	20 Days			60 Days			120 Days		
	CAAR	t-value	p	CAAR	t-value	p	CAAR	t-value	p
Buy	0,212%	1,032	0,151	0,047%	0,152	0,439	0,371%	0,854	0,197
Sell	**1,081%**	**-3,628**	**0,000**	**1,103%**	**-2,650**	**0,004**	**1,519%**	**-2,751**	**0,003**

Table 2: Presenting CAAR, Cumulative Average Abnormal Return, for the buy and sell transactions with t-value and p-value. Statistically significant CAARs (p-value below 0,05) are marked with bold figures. See attachment 2 and attachment 3.

In **Table 2** the total buy and sell transactions are presented, independent of the variables, transaction size and position of the insider. Looking at the CAAR we can see that it is positive for all event windows for both buy and sell. When looking at the buy transactions, the abnormal return is relatively small. According to our calculations, the highest abnormal return can be achieved by holding the investment for 120 days. There is a more substantial positive CAAR for the sell transactions. When looking at all sell transactions, we can see that we have over 1% positive CAAR for all event windows and the highest is 1,519% when short selling the stock for 120 days.

Further, we check if the tests are statistically significant. For buy, all the p-values are greater than our Alpha on 0,05. This means the buy transactions are not statistically significant. When we look at the significance for the sell transaction, we can see that alpha is greater than all of the p-values. Making the sell transaction statistically significant for all event windows.

Event windows	20 Days			60 Days			120 Days		
Buy	CAAR	t-value	p	CAAR	t-value	p	CAAR	t-value	p
Member of the Board/EC	-0,122%	-0,263	0,396	-1,006%	-1,406	0,080	-0,346%	-0,361	0,359
Chief Officer	0,280%	0,531	0,298	0,604%	0,762	0,223	0,177%	0,165	0,435
Other Position	0,615%	1,186	0,118	0,929%	1,250	0,106	1,057%	1,000	0,159
Sell									
Member of the Board/EC	0,781%	-0,760	0,224	1,007%	-0,759	0,224	1,814%	-1,079	0,141
Chief Officer	**1,908%**	**-1,904**	**0,029**	2,092%	-1,636	0,052	1,482%	-0,918	0,180
Other Position	**0,836%**	**-1,829**	**0,034**	0,684%	-0,915	0,180	1,398%	-1,332	0,092

Table 3: Presenting CAAR, Cumulative Average Abnormal Return, for the buy and sell transactions and divided into position of the insider with t-value and p-value. Statistically significant CAARs (p-value below 0,05) marked with bold figures. See attachment 4, 5, 6, 7, 8 and 9.

In **Table 3** we add one variable, we divide the buy and sell transactions into position of the insider. Both buy of the chief officer and buy of other position have positive CAAR for all event windows. With the biggest CAAR in other position. However, none of the positions on buy are statistically significant for an alpha of 5%. Looking at sell, all positions generated positive CAAR regardless of position and event window. chief officer sell had the highest total CAAR. Although the only statistically significant result was chief officer on 20 days with a CAAR on 1,908% and Other position on 20 days with a CAAR on 0,836%.

Event windows	20 Days			60 Days			120 Days		
Buy	CAAR	t-value	p	CAAR	t-value	p	CAAR	t-value	p
X<100000	0,467%	0,867	0,193	0,042%	0,047	0,481	0,874%	0,679	0,249
100000=>X<=1000000	0,458%	1,095	0,137	0,644%	1,004	0,158	0,269%	0,311	0,378
X>1000000	-0,370%	-0,650	0,258	-0,930%	-1,186	0,118	-0,296%	-0,283	0,389
Sell									
X<100000	0,726%	-0,642	0,261	2,802%	-1,513	0,067	1,631%	-0,630	0,265
100000=>X<=1000000	0,928%	-1,492	0,068	0,859%	-0,961	0,169	1,651%	-1,328	0,093
X>1000000	**1,292%**	**-1,987**	**0,024**	0,888%	-1,034	0,151	1,383%	-1,281	0,101

Table 4. Presenting CAAR for the buy and sell transactions and divided into the different transaction sizes with t-value and p-value. Statistically significant CAARs (p-value below 0,05) are marked with bold figures. See attachment 10, 11, 12, 13, 14 and 15.

In **Table 4** the transactions are divided into size. The buy transactions over 1.000.000 SEK showed a negative CAAR for all time periods and the rest showed a positive CAAR. On the buy transactions, it was transactions below 100.000 SEK on 120 business days that showed the highest CAAR. **Table 4** also tells us that all sell transactions, regardless of the size of the transaction or time period it is calculated, shows a positive CAAR. However, only the sell transactions above 1.000.000 SEK over a 20-day period are significant.

5. Analysis

The result suggest that it is possible to gain abnormal return on the firms in OMXS30 by mimicking insider transactions to some extent. To be more precise, the mimicking of insider sell transactions will, according to our result, generate positive abnormal return while the buy transactions show no sign of significant excess return. We can therefore reject the null hypothesis: *Mimicking insiders does not generate positive abnormal return.* The rejection of the null hypothesis is however only applicable for the sell transactions. This is not in line with either Seyhun (1986), Jeng et al. (2003), Eckbo & Smith (1998) or Jaffe's (1974) research. Both Seyhun (1986) and Jaffe (1974) suggested that there is a significant level of positive abnormal return to be gained by mimicking insiders regardless if it was a buy or sell transaction. Jeng et al. (2003) on the other hand suggested that only the buy transactions proved to be an indication of possible abnormal return while Eckbo & Smith (1998) could not prove any significant result of abnormal return in the mimicking of insiders.

The results of our work indicates that there is, what Fama (1970) calls a weak-form efficiency on OMXS30 in Sweden. This is because there is a possibility, through the insider sell transactions, to generate abnormal return on published information. On the other hand, we could not see any abnormal return linked to the buy transactions, so they indicate on a semi-strong efficiency. Although, we cannot know if the abnormal return arises due to that insiders are exploiting information or if the market overreacts on the transactions' publication which lead to an abnormal price movement.

This study indicates that insiders exploit asymmetric information to gain abnormal return by selling stocks in the firm before a decline in the stock price. Thus, the sell transactions seem to be more informative than the buy transactions. However, one can argue that a buy transaction should be more informative than a sell transaction. This is because a buy transaction is primary for the purpose of return while a sell transaction can be of other reasons than economic purposes, for instance, covering personal expenditures, liquidity reasons or for diversifying. On the other hand, an argument that might support our result is the norm that management should, to some extent, own shares in their company to show that they believe in the company and for them to have some "skin in the game" i.e., personal incentives to make a good job. This might affect the decisions that insiders make when buying or selling stocks in their own company.

Consistent with Levy H.& Lazarovich-Porat (1995), we think that considering the signal it sends, insiders are more willing to buy than to sell stocks in their own company and only sell stocks when they believe the company is substantially overvalued. This means that insiders do not want to send negative signals by selling stocks just to make a relatively small profit, but the other way around, to rather send positive signals to the market even if they do not necessarily believe the stock is undervalued. Under this study's time period, we could see that there is almost 2,5 times more buy than sell transactions (2466 respectively 1054) and this can to some extent strengthen our theory that insiders are more selective and cautious when selling their stock than when buying. This is also in line with Akerlof (1970), if you draw the parallel that the insider is the seller, who possesses the information about the stock, the insider will only sell if he considers the stock to be a "lemon". Moreover, the result of our study suggests that the market is aware of the asymmetric information of the insider because the market act in line with the insider and boost the price movement.

Another argument for the sell transactions to be more informative is because of the restrictions FI sets. Insiders are limited in their way of trading their own stock, it is for example illegal to trade on non-public price affecting information. Arguably, it is easier to prove that an insider purchase is connected to not public information than to prove that a sell transaction is connected to non-public information. This is because, as mentioned before, there are more motives for a sell transaction, such as personal expenditures, which can be used as a reason for not directly acting on the non-public price affecting information. This also suggest that insiders might be exploiting asymmetric information to a greater extent in sell transactions.

Looking at **Table 3,** we can see that all sell transactions during all three time periods showed a positive CAAR, regardless of position. However, only the sell transactions by chief officers and people in Other position on a 20-day time period are statistically significant. chief officer showed a positive abnormal return of 1,908% and people in other position showed 0,836%. This result is either an indication that the market reacts in line with the published insider-transaction and boosts the price movement, thus increases the short-term return, or it is an indication that there is an information advantage for the chief officers and people in other position. This result differs a bit from what Seyhun (1986) showed evidence for. He came to the conclusion that Officer Directors and Chairmen of the Board traded on more valuable information, thus indicates that they possessed an advantage in the information quality over people in other positions. Jeng et al. (2003), Jaffe (1974) and Eckbo & Smith (1998) on the other hand, could not show any correlation between abnormal return and different insider positions.

Seyhun (1986) showed evidence for that higher positions, e.g., chief officers and board members, have an information quality advantage in relation to people in other positions by showing higher rate of return. However, members of the board showed no significant result in our study, despite the CAAR being 1,814% in sell transactions for 120 days. Also, members of the board were the only position to have a negative CAAR on all buy transactions. This contradict what was mentioned before, even though members of the board might have an advantage in the information quality, this information might not be used to gain abnormal return. Buy transactions can be done in the purpose of gaining more control of the company and not primarily to gain short-term return.

Our study indicates that chief officers gain a higher abnormal return than board members, which tells us that chief officers might possess an advantage in the information quality in relation to board members. One reason for this could be because chief officers are often more involved in the day-to-day business than board members, also, it is possible that board members might be members of several boards and have other full-time activities.

Moving on to **Table 4**, where we want to examine if the transaction size is an indication of excess return. The only significant result was the sell transactions over 1.000.000SEK in the event window of 20 days. The CAAR for this transaction was 1,292%. This could be because of a short-term overreaction in the market. Also, in the 20-day sell transaction window we can see that the CAAR increases with the transactions size of the insider trade. Which indicates that the reaction from the market increases as the volume of the transaction size increases. It is nonetheless insufficient to draw any conclusion from this since two of the three cases are not statistically significant.

Jeng et al. (2003) and Seyhun (1986) saw a positive correlation between abnormal return and transaction size. However, Jeng et al. (2003) says that this correlation is only applicable to a certain level of transaction size and claims that the largest transactions might have other motives than gaining short-term excessive return. The purpose of these transactions could be gaining/keeping control of the company or diversifying the portfolio. Contradictory to this, studies made by Eckbo & Smith (1998) and Jaffe (1974) could not show any correlation between positive abnormal return and transaction size.

The abnormal return for total sell transactions were 1,081% on 20 days, 1,103% on 60 days and 1,519% on 120 days. With that in mind, there is technically room for transactions fees and still gain abnormal return, as long as the fees do not exceed 0,5% per transaction which would make the total cost for the investment 1%. For instance, when taking today's commission fees from Avanza (2020b) into account, 0,069%-0,25%, it leaves us still with an abnormal return from $[1{,}519\% - (0{,}25\% * 2) = \mathbf{1,019}\%]$ to $[1{,}519\% - (0{,}069\% * 2) = \mathbf{1,381}\%]$ on the sell transactions on 120 business days.

6. Conclusions

We can, with a certainty of 95%, reject the null hypothesis: *It is not possible to gain positive abnormal return by mimicking insiders*. However, it was only the sell transactions that showed evidence to reject the null hypothesis.

- H_0 = Mimicking insiders does not generate positive abnormal return.
- H_a = Mimicking insiders generate positive abnormal return.

If we look back at our purpose of the study, we wanted to see if we could distinguish any difference in abnormal return by looking at four different variables, transaction size, transaction type, position of insider and time period. Our result shows that transaction type matters. We could only find evidence for positive abnormal return through sell transactions and non through buy transactions. Looking at transaction size, we could not really find any correlation, the results were vague and not statistically significant. Regarding the position of the insider, we could see that chief officer's sell transactions gained the highest CAAR, but it was only statistically significant on the event window of 20 days. This indicates an information quality advantage for the chief officers, or that the market reacts stronger when chief officers take action, hence, the market at least believes that chief officers possess an information advantage.

Finally, this study shows evidence for that OMX30 is not completely efficient because it is possible to gain abnormal return on already published information, even when today's commission fees are taken into consideration.

7. Further study proposal

During the work of this study, we have developed new ideas for further studies, we think it would be interesting to investigate the following:

- Separating for bear and bull markets.
- More variables, if there is data, how big the transaction is in relation to the size of the insiders already existing holding in that company.
- The possibility to positive abnormal return in other countries and markets, preferably in other regions with different laws and cultures. Would be interesting to compare markets in Asia with markets in Europe.
- Studying periods with high volume of transactions, i.e., a period where a lot of (more than average) different insiders buy or sell. Would these high frequency periods generate a higher abnormal return?

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9. Attachments

The attachments below contain all the information needed to create the tables in the **4. Data and Result** section. The blue coloured attachments represent the insiders' purchases, and the red coloured attachments represent the insiders' sell transactions. The headings are of different colour to more easily separate them from each other.

The two first attachments show information for all buy and sell transactions respectively while the rest are divided into either type of position of the insider or size of the transaction. The result of each event window of 20, 60 and 120 business days are shown in each separate attachment.

Variable 1 represents the stocks, the mean of *variable 1* is the cumulative average return, CAR, of all the stocks that was bought together with a publishment of an insider purchase and examined over 20, 60 and 120 business days. The mean of *Variable 2* represents the CAR of the index during the exact same period. The CAR of *variable 1* minus the CAR of *variable 2* is the cumulative average abnormal return, CAAR, which is stated at the bottom of each attachment.

The rest is information gathered when making the t-test, the relevant information there is the number of observations, degrees of freedom, the t-value, the p-value for one tailed test and the critical t-value for one tailed test.

Attachment 1.

ABB Ltd	Essity B	Securitas B
Alfa Laval	Getinge B	Skanska B
Assa Abloy B	Hennes & Mauritz B	SKF B
AstraZeneca	Hexagon B	SSAB A
Atlas Copco A	Investor B	Swedbank A
Atlas Copco B	Kinnevik B	Swedish Match
Autoliv SDB	Nordea Bank	Svenska Handelsbanken A
Boliden	Sandvik	Tele2 B
Electrolux B	SCA B	Telia Company
Ericsson B	SEB A	Volvo B

Attachment 1: Companies in OMXS30 as of **November 5th, 2020.**

https://omxs30.com

Attachment 2

TOTAL								
BUY								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00548337	0,00336835	Mean	0,01383342	0,01336405	Mean	0,02880253	0,025089019
Variance	0,0071049	0,00326092	Variance	0,01745965	0,00577434	Variance	0,03269523	0,009177777
Observations	2466	2466	Observations	2446	2446	Observations	2212	2212
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	4334		df	3903		df	3362	
t Stat	1,03159868		t Stat	0,15229424		t Stat	0,85351386	
P(T<=t) one-tail	0,15115886		P(T<=t) one-tail	0,43948137		P(T<=t) one-tail	0,1967176	
t Critical one-tail	1,64520529		t Critical one-tail	1,64524413		t Critical one-tail	1,64530699	
P(T<=t) two-tail	0,30231772		P(T<=t) two-tail	0,87896274		P(T<=t) two-tail	0,39343521	
t Critical two-tail	1,9605115		t Critical two-tail	1,96057198		t Critical two-tail	1,96066985	
CAAR:	0,212%		CAAR:	0,047%		CAAR:	0,371%	

Attachment 2: Showing the mean and variance for OMXS30 and total buy transactions on 20, 60 and 120 business days. Showing total buy observations separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 3

TOTAL								
SELL								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0110445	-0,0002363	Mean	-0,0122028	-0,0011764	Mean	-0,0209191	-0,00572863
Variance	0,00664502	0,00270855	Variance	0,01348413	0,00469528	Variance	0,02372469	0,007486038
Observations	1054	1054	Observations	1050	1050	Observations	1024	1024
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	1789		df	1701		df	1610	
t Stat	-3,6281516		t Stat	-2,6499733		t Stat	-2,7514897	
P(T<=t) one-tail	0,00014673		P(T<=t) one-tail	0,0040622		P(T<=t) one-tail	0,00299949	
t Critical one-tail	1,64570581		t Critical one-tail	1,64574993		t Critical one-tail	1,64580062	
P(T<=t) two-tail	0,00029347		P(T<=t) two-tail	0,00812441		P(T<=t) two-tail	0,00599899	
t Critical two-tail	1,9612909		t Critical two-tail	1,96135959		t Critical two-tail	1,96143853	
CAAR:	1,081%		CAAR:	1,103%		CAAR:	1,519%	

Attachment 3: Showing the mean and variance for OMXS30 and total sell transactions on 20, 60 and 120 business days. The table shows the total sell observations separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 4

Member of the Board/EC								
BUY								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00315126	0,00437621	Mean	0,00597955	0,01603808	Mean	0,02121691	0,024679856
Variance	0,00720394	0,00365712	Variance	0,01884461	0,00643736	Variance	0,03338034	0,009688918
Observations	501	501	Observations	494	494	Observations	467	467
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	904		df	795		df	716	
t Stat	-0,263088		t Stat	-1,4060231		t Stat	-0,3605958	
P(T<=t) one-tail	0,39627136		P(T<=t) one-tail	0,08005398		P(T<=t) one-tail	0,359254	
t Critical one-tail	1,64654095		t Critical one-tail	1,64677257		t Critical one-tail	1,64698457	
P(T<=t) two-tail	0,79254271		P(T<=t) two-tail	0,16010797		P(T<=t) two-tail	0,718508	
t Critical two-tail	1,96259164		t Critical two-tail	1,96295244		t Critical two-tail	1,96328273	
CAAR:	-0,122%		CAAR:	-1,006%		CAAR:	-0,346%	

Attachment 4: Showing the mean and variance for OMXS30 and buy transactions from members of the board for 20, 60 and 120 business days. The table shows the total observations for buy transactions by members of the board separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 5

Member of the Board/EC SELL								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0179834	-0,0101754	Mean	-0,0114599	-0,0013874	Mean	-0,0121975	0,005942652
Variance	0,00870575	0,004911	Variance	0,01637481	0,00600784	Variance	0,02911927	0,005920438
Observations	129	129	Observations	127	127	Observations	124	124
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
Df	238		df	207		df	171	
t Stat	-0,7599766		t Stat	-0,7587205		t Stat	-1,079125	
P(T<=t) one-tail	0,22401036		P(T<=t) one-tail	0,22444139		P(T<=t) one-tail	0,14102589	
t Critical one-tail	1,65128116		t Critical one-tail	1,65224809		t Critical one-tail	1,65381332	
P(T<=t) two-tail	0,44802073		P(T<=t) two-tail	0,44888278		P(T<=t) two-tail	0,28205178	
t Critical two-tail	1,96998153		t Critical two-tail	1,97149039		t Critical two-tail	1,97393395	
CAAR:	0,781%		CAAR:	1,007%		CAAR:	1,814%	

Attachment 5: Showing the mean and variance for OMXS30 and sell transactions from members of the board for 20, 60 and 120 business days. The table shows the total observations for sell transactions by members of the board separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 6

Chief Officer BUY								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00706466	0,00426186	Mean	0,02713014	0,02108545	Mean	0,03966282	0,037892877
Variance	0,00726501	0,00338678	Variance	0,01786841	0,00597572	Variance	0,03348747	0,008200533
Observations	382	382	Observations	379	379	Observations	362	362
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	673		df	605		df	528	
t Stat	0,53077791		t Stat	0,76208413		t Stat	0,16493356	
P(T<=t) one-tail	0,2978739		P(T<=t) one-tail	0,22315339		P(T<=t) one-tail	0,4345297	
t Critical one-tail	1,64712091		t Critical one-tail	1,64737614		t Critical one-tail	1,64774465	
P(T<=t) two-tail	0,59574779		P(T<=t) two-tail	0,44630678		P(T<=t) two-tail	0,8690594	
t Critical two-tail	1,96349514		t Critical two-tail	1,96389282		t Critical two-tail	1,96446706	
CAAR:	0,280%		CAAR:	0,604%		CAAR:	0,177%	

Attachment 6: Showing the mean and variance for OMXS30 and buy transactions from chief officers for 20, 60 and 120 business days. The table shows the total observations for buy transactions by chief officers separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 7

SELL			Chief Officer					
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,018996	8,2567E-05	Mean	-0,0176479	0,00326852	Mean	-0,0251169	- 0,01029997
Variance	0,01021946	0,00253302	Variance	0,01572711	0,00503867	Variance	0,02394657	0,00810369
Observations	127	127	Observations	127	127	Observations	123	123
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	185		df	199		df	196	
t Stat	-1,9039266		t Stat	-1,6357429		t Stat	-0,9178976	
P(T<=t) one-tail	0,02923595		P(T<=t) one-tail	0,05173704		P(T<=t) one-tail	0,17990029	
t Critical one-tail	1,65313187		t Critical one-tail	1,65254675		t Critical one-tail	1,65266506	
P(T<=t) two-tail	0,0584719		P(T<=t) two-tail	0,10347408		P(T<=t) two-tail	0,35980058	
t Critical two-tail	1,97286995		t Critical two-tail	1,97195654		t Critical two-tail	1,97214122	
CAAR:	1,908%		CAAR:	2,092%		CAAR:	1,482%	

Attachment 7: Showing the mean and variance for OMXS30 and sell transactions from chief officers for 20, 60 and 120 business days. The table shows the total observations for sell transactions by chief officers separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail t-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 8

BUY	Other position							
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00709576	0,00095046	Mean	0,01052014	0,00122866	Mean	0,01841616	0,007844465
Variance	0,00682595	0,00257106	Variance	0,01489528	0,00443845	Variance	0,02932948	0,00877375
Observations	350	350	Observations	350	350	Observations	341	341
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	579		df	540		df	527	
t Stat	1,18599513		t Stat	1,25014714		t Stat	1,00009461	
P(T<=t) one-tail	0,11805534		P(T<=t) one-tail	0,10589364		P(T<=t) one-tail	0,15886185	
t Critical one-tail	1,64748959		t Critical one-tail	1,6476803		t Critical one-tail	1,64775015	
P(T<=t) two-tail	0,23611068		P(T<=t) two-tail	0,21178729		P(T<=t) two-tail	0,3177237	
t Critical two-tail	1,9640696		t Critical two-tail	1,96436678		t Critical two-tail	1,96447563	
CAAR:	0,615%		CAAR:	0,929%		CAAR:	1,057%	

Attachment 8: Showing the mean and variance for OMXS30 and buy transactions from other positions for 20, 60 and 120 business days. The table shows the total observations for buy transactions by other positions separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 9

SELL		Other position						
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0040152	0,0043454	Mean	-0,0099993	-0,0031605	Mean	-0,0230517	-0,00906812
Variance	0,0039592	0,0017031	Variance	0,01119419	0,00395272	Variance	0,02128494	0,007916013
Observations	271	271	Observations	271	271	Observations	265	265
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	466		df	440		df	437	
t Stat	-1,8290419		t Stat	-0,914749		t Stat	-1,3321143	
P(T<=t) one-tail	0,03401611		P(T<=t) one-tail	0,18041223		P(T<=t) one-tail	0,09175846	
t Critical one-tail	1,64813007		t Critical one-tail	1,64832409		t Critical one-tail	1,64834796	
P(T<=t) two-tail	0,06803222		P(T<=t) two-tail	0,36082445		P(T<=t) two-tail	0,18351692	
t Critical two-tail	1,96506772		t Critical two-tail	1,96537012		t Critical two-tail	1,96540733	
CAAR:	0,836%		CAAR:	0,684%		CAAR:	1,398%	

Attachment 9: Showing the mean and variance for OMXS30 and sell transactions from other positions for 20, 60 and 120 business days. The table shows the total observations for sell transactions by other positions separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 10

BUY			X<100000					
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00850656	0,0038381	Mean	0,01098315	0,01056206	Mean	0,01522873	0,00649226
Variance	0,00515722	0,00234578	Variance	0,01509099	0,00532302	Variance	0,03166144	0,008098811
Observations	259	259	Observations	253	253	Observations	240	240
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	452		df	410		df	354	
t Stat	0,86737358		t Stat	0,04687754		t Stat	0,67876091	
P(T<=t) one-tail	0,1930988		P(T<=t) one-tail	0,48131683		P(T<=t) one-tail	0,24886643	
t Critical one-tail	1,64823176		t Critical one-tail	1,6485786		t Critical one-tail	1,64916941	
P(T<=t) two-tail	0,38619759		P(T<=t) two-tail	0,96263365		P(T<=t) two-tail	0,49773286	
t Critical two-tail	1,96522622		t Critical two-tail	1,96576684		t Critical two-tail	1,9666879	
CAAR:	0,467%		CAAR:	0,042%		CAAR:	0,874%	

Attachment 10: Showing the mean and variance for OMXS30 and buy transactions smaller than 100.000SEK for 20, 60 and 120 business days. The table shows the total observations for buy transactions smaller than 100.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 11

SELL	X<100000							
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0070878	0,00016871	Mean	-0,0192497	0,00877328	Mean	-0,0112521	0,0050605
Variance	0,00586543	0,00205959	Variance	0,0176687	0,00359058	Variance	0,0332594	0,007006986
Observations	62	62	Observations	62	62	Observations	60	60
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	99		df	85		df	83	
t Stat	-0,6418336		t Stat	-1,5133396		t Stat	-0,6296924	
P(T<=t) one-tail	0,26123231		P(T<=t) one-tail	0,06695147		P(T<=t) one-tail	0,26531272	
t Critical one-tail	1,66039116		t Critical one-tail	1,6629785		t Critical one-tail	1,66342017	
P(T<=t) two-tail	0,52246462		P(T<=t) two-tail	0,13390293		P(T<=t) two-tail	0,53062545	
t Critical two-tail	1,98421695		t Critical two-tail	1,98826791		t Critical two-tail	1,98895978	
CAAR:	0,726%		CAAR:	2,802%		CAAR:	1,631%	

Attachment 11: Showing the mean and variance for OMXS30 and sell transactions smaller than 100.000SEK for 20, 60 and 120 business days. The table shows the total observations for sell transactions smaller than 100.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 12

BUY	100000<=X<=1000000							
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	0,00863566	0,00405127	Mean	0,02148047	0,01504403	Mean	0,03175303	0,029059397
Variance	0,0069951	0,00358665	Variance	0,0189023	0,00587702	Variance	0,03436563	0,009356133
Observations	604	604	Observations	603	603	Observations	581	581
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	1093		df	943		df	874	
t Stat	1,0952712		t Stat	1,0040596		t Stat	0,31051149	
P(T<=t) one-tail	0,13681956		P(T<=t) one-tail	0,15780373		P(T<=t) one-tail	0,37812303	
t Critical one-tail	1,64624893		t Critical one-tail	1,6464711		t Critical one-tail	1,64659893	
P(T<=t) two-tail	0,27363913		P(T<=t) two-tail	0,31560746		P(T<=t) two-tail	0,75624605	
t Critical two-tail	1,96213677		t Critical two-tail	1,96248283		t Critical two-tail	1,96268195	
CAAR:	0,458%		CAAR:	0,644%		CAAR:	0,269%	

Attachment 12: Showing the mean and variance for OMXS30 and buy transactions between 100.000SEK and 1.000.000SEK for 20, 60 and 120 business days. The table shows the total observations for buy transactions between 100.000SEK and 1.000.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 13

100000<=X<=1000000								
SELL								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0102639	-0,0009873	Mean	-0,0133573	-0,0047717	Mean	-0,029018	-0,01250704
Variance	0,00530989	0,00276556	Variance	0,01207955	0,00453648	Variance	0,02423392	0,007291798
Observations	209	209	Observations	208	208	Observations	204	204
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	378		df	343		df	315	
t Stat	-1,4923776		t Stat	-0,9605961		t Stat	-1,3281742	
P(T<=t) one-tail	0,06821715		P(T<=t) one-tail	0,16871597		P(T<=t) one-tail	0,09254104	
t Critical one-tail	1,64889472		t Critical one-tail	1,6493082		t Critical one-tail	1,64970533	
P(T<=t) two-tail	0,1364343		P(T<=t) two-tail	0,33743195		P(T<=t) two-tail	0,18508208	
t Critical two-tail	1,96625964		t Critical two-tail	1,96690428		t Critical two-tail	1,96752353	
CAAR:	0,928%		CAAR:	0,859%		CAAR:	1,651%	

Attachment 13: Showing the mean and variance for OMXS30 and sell transactions between 100.000SEK and 1.000.000SEK for 20, 60 and 120 business days. The table shows the total observations for sell transactions between 100.000SEK and 1.000.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 14

			X>1000000					
BUY								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,0017788	0,00192469	Mean	0,00323382	0,01253536	Mean	0,02419125	0,027151933
Variance	0,00861868	0,00338757	Variance	0,01662231	0,00594486	Variance	0,02921478	0,009090556
Observations	370	370	Observations	367	367	Observations	349	349
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	620		df	598		df	545	
t Stat	-0,6501353		t Stat	-1,186176		t Stat	-0,2826019	
P(T<=t) one-tail	0,25792283		P(T<=t) one-tail	0,11801192		P(T<=t) one-tail	0,38879467	
t Critical one-tail	1,64731502		t Critical one-tail	1,64740571		t Critical one-tail	1,64765432	
P(T<=t) two-tail	0,51584566		P(T<=t) two-tail	0,23602385		P(T<=t) two-tail	0,77758934	
t Critical two-tail	1,96379758		t Critical two-tail	1,9639389		t Critical two-tail	1,96432629	
CAAR:	-0,370%		CAAR:	-0,930%		CAAR:	-0,296%	

Attachment 14: Showing the mean and variance for OMXS30 and buy transactions larger than 1.000.000SEK for 20, 60 and 120 business days. The table shows the total observations for buy transactions larger than 1.000.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.

Attachment 15

X>1000000 SELL								
	20	OMXS30 20		60	OMXS30 60		120	OMXS30 120
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*		*Variable 1*	*Variable 2*
Mean	-0,01264	0,00027877	Mean	-0,0095478	-0,0006628	Mean	-0,0165958	-0,00276312
Variance	0,00797884	0,00284307	Variance	0,01373627	0,00510121	Variance	0,02117314	0,007760821
Observations	256	256	Observations	255	255	Observations	248	248
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	416		df	420		df	407	
t Stat	-1,9869654		t Stat	-1,0337445		t Stat	-1,2806422	
P(T<=t) one-tail	0,02379086		P(T<=t) one-tail	0,15092525		P(T<=t) one-tail	0,10052433	
t Critical one-tail	1,64852475		t Critical one-tail	1,64848971		t Critical one-tail	1,64860612	
P(T<=t) two-tail	0,04758172		P(T<=t) two-tail	0,30185049		P(T<=t) two-tail	0,20104867	
t Critical two-tail	1,9656829		t Critical two-tail	1,96562828		t Critical two-tail	1,96580974	
CAAR:	1,292%		CAAR:	0,888%		CAAR:	1,383%	

Attachment 15: Showing the mean and variance for OMXS30 and sell transactions larger than 1.000.000SEK for 20, 60 and 120 business days. The table shows the total observations for sell transactions larger than 1.000.000SEK separated by the different event windows. Further it shows the T-value and P-value for both one-tail and two-tail T-test. In the bottom of the table the total CAAR for each event window is presented.