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Abnormal returns from insider trading

Does insider trading generate abnormal returns for the Swedish stock exchange and Large Cap Stockholm?

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Abstract

This paper studies insider trading and abnormal returns on the Large Cap list of the Swedish stock exchange using a sample of 119 firms and 10528 individual transactions between the period 2016-2022. The study is built on the theoretical framework of the efficient market hypothesis and information asymmetry. The research questions are answered using an event study combined with a regression model for hypothesis testing. The results imply that insider trading generates abnormal returns. Furthermore, the study finds a difference in the extent of abnormal returns when comparing buy- and sell transactions. However, similar results are not found when comparing insiders of different seniority. When considering individual days, the results indicate that abnormal returns occur the day before, one- and two days after the day of which news of insider transactions are published.

Keywords: Abnormal returns, Insider trading, The Efficient Market Hypothesis, Event study, Market Abuse Regulation, Market Abuse Directive, Day of publication, Day of transaction

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1. Introduction

The introduction section gives a background to insider trading and abnormal returns. Thereafter, the problematization of the topic is formulated which is then followed by the purpose and research questions of this paper.

1.1 Background

In publicly traded companies, insiders who trade financial instruments issued by their own company must report their transactions in accordance with the law of trade with financial instruments (SFS 1991:980). Information about the characteristics of the insider trades is then published for the public to take part of. The reasoning behind this is found in the information asymmetry between insiders and outside market participants where insiders such as a CEO, may possess non-published information (Finansinspektionen, 2022). Regulations are in place to restrict the possibility of insiders to personally profit from the information gap through insider trading. This can be illustrated by a situation where a CEO of a company possesses non-publicly available information about an upcoming deal that will have a positive effect on the stock price when the market receives the news. By buying shares in the company before the publication of the positive news, the CEO enjoys the increased stock price due to the news announcement.

Regulations are in place to restrict illegal behavior in regards to insider trading in the form of market abuse by insiders. As financial markets are developing, new legislation is needed to keep pace with the more globalized markets where new financial instruments and services are continuously introduced. The European Parliament and the European Council have developed two legislative acts to restrict market abuse in the form of illegal insider trading: the Market Abuse Regulation (MAR) and the Market Abuse Directive (MAD). In Sweden, MAR was implemented on July 3, 2016 and MAD on February 1, 2017. The purpose of MAR was to modernize the market abuse legislation of the member countries of the European Union. The purpose of MAD was to complement MAR and assure that proper enforcement mechanisms are in place to make MAD effective in practice. Additionally, the European Commission considered the previous legislation of the member countries to be unharmonized which provided loop-holes for market abuse. Together, the two legislative acts provide an updated legislation of market abuse which is more transparent and harmonized. In the two legislative

acts there are some distinctive and important changes in contrast to the earlier legislation. They cover a broader spectrum of financial instruments such as financial instruments traded on MTF- and OTF-platforms. Furthermore, the definition of illegal insider trading has been redefined. Previously within Swedish criminal law, the prosecutor needed to prove that a person "received" insider information but MAR redefined the definition which allowed the prosecutor to only prove that a person "had" insider information. Therefore, it is now easier to prosecute illegal insider trading. It is now also illegal to trade on recommendations or tips if the person in question realizes or should have realized that it is based on insider information. Furthermore, there are important changes in the legislation in relation to the issuer. The issuer of financial instruments must make insider information public as soon as possible and this information must be available on the issuer's website for a minimum of five years. In addition to this, the issuer must also spread the information via other news channels. In contrast to earlier legislation, the issuer could wait until the next trading day but not anymore as the legislation aims to avoid the situation where significant price-affecting information is held from the public for a long period and hence create illegal insider trading opportunities. The issuer is also obliged to have a list of insiders with the purpose of counteracting illegal insider trading by making it easier for investigations and providing the firm with a tool for controlling insider information and how it is spread within the firm. From earlier legislation, MTF-firms must also now oblige and clear guidelines on how the insider list is supposed to be formulated have been provided. When considering the time of which the insiders have to report their transactions, they now have three days compared to the earlier five days. A minimum amount of which the insider transactions amount to have been introduced which means that the insider transactions are only needed to be reported when the total amount of transactions made under a calendar year is above 5 000 euro. The definition of insiders has been broadened to include all persons who have regular access to insider information and are directly or indirectly related to the firm and that have the possibility to make decisions that can influence the future of the firm. An interesting change that has been made is that the reporting duty for holders amounting to more than 10% of the firm has been removed. This means that holders that are not members of the board of directors or involved in the firm's decision making are no longer considered insiders. There is legislation concerning reporting of changes in the holdings of large holders but it still provides a loophole as large owners that are not board members can place their holdings in endowment insurances and in this way they stay anonymous. The purpose of the two new updated

legislative acts is to cover earlier gray zones of illegal insider trading and provide a more harmonized and effective legislation (Sandahl, Erica 2017).

Insider trading on the stock market is a controversial subject amongst both academics and professionals. As mentioned, the main concern regarding insider trading is the information asymmetry between insiders and outside market participants. Logically, insider trading can work as a signaling indicator where insider buying may indicate a positive journey to be expected ahead. The logic works opposite for insider selling. In relation to insider trading is the issue of abnormal returns which is defined as the difference between the expected return and the actual return of an asset. If investors believe that insider buying is a positive signal, they may choose to act on the information and imitate the insider, in other words buy/sell the company's stock on the news of insider trading. In this way, news of insider trading may create a market reaction in the form of increased price action that may generate abnormal returns.

1.2 Problem

The main goal for many actors on the financial market is to achieve the highest possible return by trying to beat the market (Jensen, 1968). According to the efficient market hypothesis, Fama (1970) states that it should not be possible to beat the market over time if the market is sufficiently efficient. As all information is available, market actors act according to their interpretations and thereby, they collectively determine the asset price. Consequently, it should not be possible to achieve abnormal returns by trading on available information. However, if there is non-publicly available information, an information gap between market participants is existent which provides a possibility to achieve abnormal returns for the one possessing this exclusive information. The academic term that describes the imbalance of information is called information asymmetry which means that some persons may possess more/better information than others, giving them an advantage. In a firm, the insiders are in position to possess this kind of information. Several studies show that insiders indeed achieve abnormal returns due to their advantage of information (Seyhun, 1986 & 1998; Jeng, Metrick & Zeckhauser, 2003). Furthermore, those who possess non-public available information are generally insiders at senior positions such as the CEO and members of the board (Dierkens, 1991). According to Seyhun (1986) the information of a

company can be structured through an hierarchy of three levels. The hierarchy implies that the more senior position an insider has within the company, the more information he/she possesses, including non-public information.

This paper contributes to earlier research on the topic of abnormal returns and insider trading by studying the Swedish stock exchange and the Large Cap list for the period 2016-07-03 - 2022-04-27. Therefore, this study covers a relatively unexplored market and in addition, it covers a recent time period dating back to the date at which the updated legislative acts were introduced till today.

1.2 Purpose

The purpose of this study is to investigate and explain the behavior of the market in relation to insider trading. The study aims to unveil if insider trading triggers a market reaction in the form of abnormal returns. In addition, the timing of abnormal returns is investigated where isolated days are studied. Furthermore, the study investigates if the seniority of the insider and type of transaction matters affects the extent of abnormal returns.

1.3 Research question

Does insider trading generate abnormal returns and if so, when in time in relation to the day of publication? Does seniority of the insider and type of transaction affect the abnormal returns?

2. Theoretical framework

This section covers the relevant theoretical framework for the purpose and research questions of this paper. Firstly, an overview of the efficient market hypothesis is provided which is then followed by more detailed subsections. Secondly, the theory of information asymmetry is explained and how it is connected to the topic of this paper.

2.1 The efficient market hypothesis

The Efficient Market Hypothesis (EMH), first published by Farma (1970) is a fundamental theory within traditional finance and describes the process leading up to the equilibrium price of an asset. In practice, this process is described as a situation where market actors collectively interpret information which they act upon by selling or buying the asset. The equilibrium price is achieved when market actors have acted on according to their interpretations and therefore, have incorporated all information into the price of the asset.The theory can be described as a market ideal in the sense that it assumes all market participants can easily choose between different assets and be assured of a correct current price. According to the EMH, market efficiency is determined by how fast and accurately information is incorporated into the asset. If the market can be considered very efficient in processing information, achieving abnormal returns i.e betaning the market should not be possible. However, the theory states that if the market lacks efficiency, it can be possible. More specifically, if market actors possess and act on non-publicly available information, it should be possible to generate abnormal returns. Within a firm, insiders are likely to possess this kind of information which motivates the study of abnormal returns in relation to insider trading (Malkiel, 1973).

Fama (1970) states that a market can be more or less efficient and explains that it can be categorized into one of three categories: Weak, Strong, and Semi-strong form. The different categories of a market illustrates the ability of the market to accurately price information. It is also worth noting that the theory is founded on three assumptions that are needed to be fulfilled in order for the market to be efficient: no transaction costs, all information is available and the information is free to obtain.

2.1.1 Weak form

According to the EMH, the weak form assumes that the price of an asset only reflects all historical information. In this sense, historical information has already been incorporated and it is therefore considered insufficient information for determining future price movement. Annual reports and past price movements are examples of historical information. The weak form of market efficiency states that only new information leads to price movements.

2.1.2 Semi-strong form

The semi-strong form builds on the weak form but expands the assumptions by stating that the price reflects both historical and all publicly available information. In this case, both previously mentioned types of information are insufficient in creating price movements and generating abnormal returns. The information corresponding to this kind of information is new issues of stocks, reports, and public information. However, non-publicly available information has the potential of generating abnormal returns via creation of price movements.

2.1.3 Strong form

The strong form assumes that all information including historical, publicly- and non-publicly available information is incorporated into the price. According to the theory, this is the most efficient state of the market but Fama (1970) also argues that this is an ideal and not necessarily a realistic form but it can be used to investigate whether non-public information indeed generates price movements. Furthermore, the author states that this type of information belongs to insiders.

2.2 Information asymmetry

When different market actors have access to more or less information than one another, an information gap exists. This gap of information availability is called information asymmetry. From the perspective of outside a firm, the insiders usually possess more information about the firm than outsiders and within a firm, more senior insiders usually possess more information than junior insiders (Dierkens, 1991).

The information asymmetry of firms looks different depending on several factors. Firstly and as mentioned earlier, more senior insiders tend to possess more information. This phenomenon is described as an information hierarchy within a firm where the Chairman of

the board, members of the board and CEO are examples of insiders belonging to the top of the hierarchy (Seyhun, 1986). Secondly, size of the firm matters as an insider has a better overview of the firm as a whole and therefore easier access to information compared to a large international firm. Additionally, larger firms tend to be more monitored by news channels and financial analytics. Thirdly, depending on what type of operation the firm engages in the information asymmetry can look different. Companies that operate within research and development projects usually have a higher grade of information asymmetry. (Jeng et al, 2003; Seyhun, 1986; Lakonishok & Lee, 2001).

3. Literature review

This section covers the findings of earlier research on the topic of abnormal returns and insider trading. Firstly, a general overview of the findings regarding abnormal returns is provided. Thereafter, two more specific paragraphs regarding seniority of the insiders and type of transactions are presented.

3.1 Insider trading and abnormal returns

The issue of insider trading in relation to abnormal returns is a well-researched area. There is controversy amongst academics regarding if insider trading generates abnormal returns or not. Many studies show that insider trading indeed generates abnormal returns (Seyhun, 1986 & 1998; Lakonishok & Lee, 2001; Jeng *et al.*, 2003). Lakonishok and Lee (2001) examined the New York Stock Exchange between the years 1975-1995 and argues that the information advantage of insiders enables them to make more accurate decisions. Seyhun (1986) also highlights the importance of information in regards to the market reaction. The author discusses the observation by stating that high transaction costs and risk aversion might make investors hesitant to act if they are missing enough information. Jeng et al. (2003) also studied the american market by creating a portfolio which replicates buy- and sell transactions made by insiders and concludes that abnormal returns indeed are observed.

As mentioned, the opposite results are also found where abnormal returns are not observed. Eckbo and Smith (1998) studied the Norwegian stock exchange by creating a replicating portfolio consisting of insider transactions but could not conclude that it outperformed the market. The interesting part of the study is that two different methods were used and when comparing the results, they differed. The first method was in the form of an event study which indeed observed abnormal returns and the second one uses a combination of other different performance measures which did not show similar results. Therefore, they discuss the findings by raising the question whether the event study is valid in examining the field of insider trading and abnormal returns since this is the dominant method used.

Kim, Ng, Wang and Wang (2016) examined 44 countries and more than 24 000 companies and contributed to the topic by bringing the aspect of regulation. The results indicate that more regulation on insider trading makes insider trading itself more informative and therefore enhances market efficiency. The authors argue that further regulations might contribute to

more market efficiency. In contrast, Fidrmuc, Goergen and Renneboog (2006) questions regulation on insider trading. More specifically, the authors addressed the regulation prohibiting insiders from trading prior to the publication of annual and quarterly reports. They argue that this sort of regulation reduces market efficiency because once insiders finally are allowed to act on the information contained in the report, they act on other information than just the information that is related to the reports itself.

3.2 Seniority

Dardas and Guttler (2011) present evidence that an information hierarchy exists for the Swedish market, meaning that there is information asymmetry within a firm where the higher up in the hierarchy of a firm an insider is positioned, the more information the insider tends to possess. The results of Seyhun (1986) shows that a more senior insider generates larger market reactions and argues that this is due to the information hierarchy within a firm and can therefore make better decisions. Drobetz, Mussbach and Westheide (2019) come to the same conclusion in their study which shows that the most significant market reactions are indeed triggered by transactions made by a CEO. For other transactions made by other insiders within a firm, the authors finds little or no market reactions

On the other hand, Fidrmuc, Goergen and Renneboog (2006) found no relationship between information hierarchy and abnormal returns in their study. According to their results, purchases made by CEOs created a smaller market reaction compared to other managers, positioned lower in the alleged information hierarchy. In this sense, the authors rejected the relationship between seniority of insiders and the extent of market reactions since the CEOs the results indicate the contrary to what the theory of an information hierarchy states.

Hillier, Korczak and Korczak (2014) highlights another perspective in regards to the subject. Their results demonstrate abnormal returns when considering insider trading in regards to CEOs and CFOs but argue that it is the expertise of these insiders that enable them to make better decisions. In this case, the alleged information hierarchy is not the reason. Wang, Shin and Francis (2011) argue similarly and their results indicate that purchase transactions made by CFOs generated higher abnormal returns compared to the ones made by CEOs.

3.3 Buy versus sell transactions

Degryse et al. (2014) observed a difference in their results when comparing buy- and sell transactions. The results showed that purchase transactions resulted in significant abnormal returns but when considering sell transactions, they did not show similar extent nor significance. On the contract, the results of Inci, Lu and Seyhun (2010) did not observe a difference in return on the event day. They found that both types of transactions generate abnormal returns.

Kallunki, Nilsson and Hellström (2009) provides a perspective that gives a background to the two types of transactions. The authors argue that insiders might choose to sell shares for several different reasons, which affects the analysis of what may be the underlying reasons. The reasons behind sales transactions can be, for example, for diversification reasons, that insiders want to spread their holdings and reduce the individual company risk, or that the person is in need of a larger share of cash. Huddart and Ke (2007) and Kallunki et al. (2009) come to the same conclusion that insiders sell smaller amounts on average before a worse report. However, the results show that insiders who have invested a large part of their wealth in the company sell more in the face of a bad report and vice versa.

4. Method

The method section describes what sources have been used for collecting the data, what tools that have been used for the method and a description of the general method is presented. Thereafter, an explanation of the event study is provided together with the needed formulas for calculations.

4.1 Data and tools

For this study, data has been gathered from the Swedish Financial Supervisory Authority and NASDAQ OMX. The former source provides data on insider trading from July 3, 2016 and includes all reported transactions made by insiders in companies listed on the regulated Swedish trading markets (Finansinspektionen, 2022). The latter source provides historical data on stock prices of firms listed on Large Cap, and OMXSPI. The data is then processed in Excel for sorting and finally, regression analysis and hypothesis testing are implemented in STATA. Section 4.3.3 provides a detailed description of the data processing.

4.2 General method

This method used in this paper is built on a deductive approach i.e hypothesis are formulated through theory and are stated before the implementation of the practical tools through data processing and statistical tools (Descombe, 2017). A quantitative method in the form of an event study developed by CampBell, Lo & MacKinlay (1997) is used in this paper which is based on the market model. Much of earlier empirical research uses this approach and therefore, motivates the choice for this study. The results from the event study and regression analysis are then used for statistical hypothesis testing.

4.3 Event study

According to earlier research, the method of using event studies has dominated the empirical research of Corporate finance and especially, in regards to insider trading and abnormal returns. Within this framework, an event study highlights the market reaction in terms of abnormal returns for the event in question. Furthermore, it tries to unveil whether the event of interest is related to the (un)observed abnormal returns (CampBell, Lo, & MacKinlay, 1997).

If the efficient market hypothesis is believed to be accurate, the use of an event study is a default method when studying the effect of an event for shareholder's wealth (Binder, 1998).

4.3.1 Event definition and event window

In an event study, the event of interest and the event window are defined. In this study, the event of interest is defined as the day of publication which is the day of which information of an insider transaction is published. On this day, market actors are informed about the fact that a transaction has taken place, who made the transaction, to what price etc. The event window is determined to a total of five days to capture any potential premature or delayed market reaction. Hence, the event window is defined as a total of five days: the event day, two days before and two days after the event. The event window should not be too large since other factors could disrupt the study but nor too small in order to capture the wanted effect MacKinlay (1997).

4.3.2 Estimation procedure

In order to determine abnormal returns, an estimation period needs to be defined because calculating abnormal returns requires calculations of expected returns. According to MacKinlay (1997), an event study using daily data could be estimated over the 120 days prior to the event. In this study, the estimation period is determined to be 120 days.

Figure 4.3.2

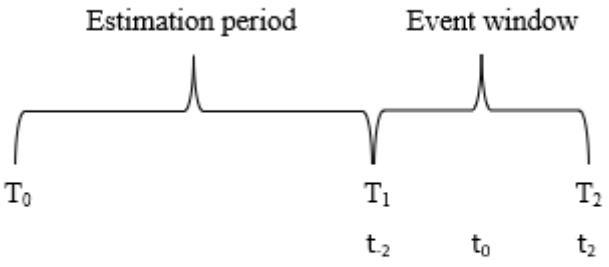


Figure 4.3.2 illustrates the 120-day estimation period and the five-day event window. T_0 represents the first day of estimation and T_1 represents the last day of the estimation period which is the same as the first day of the event window. The publication day is represented by t_0 and T_2 is the last day of the event window which occur two days after the publication day

4.3.3 Selection criteria - limitations

This study includes insider transactions and market data from companies listed on Large Cap and of the Swedish Stock Exchange from July 3, 2016 until April 27, 2022. Data prior to 2016 is not available and will therefore not be included in this study. The study examines both buy- and sell transactions of at least 50,000 SEK since regulations only require that reporting must be done if the transaction amounts to 5,000 EUR (SFS 2000:1087). Therefore, insider trades amounting to less than 50,000 SEK cannot be included.

Even though the legislative acts of MAD and MAR extend beyond Sweden, this paper does not cover any other countries since data availability regarding insider transactions is limited. Furthermore, a higher selection criteria amounting to more than 50,000 SEK is not considered because this could restrict the data availability. Transactions of other types than buy- or sell transactions have been excluded, such as options because this study aims to examine transactions made by insiders own will. Transactions made in other currencies than SEK and made on non-trading days have been excluded. In addition, transactions amounting to zero have been excluded. Firms which are missing data in the form of either insufficient days for the estimation period or missing insider trades made have been excluded. In addition, this study does not manage the issue of transactions overlapping each other in the event window which might affect the results. After sorting the data, 10,528 transactions are left amongst 119 firms.

When measuring the difference in the extent of abnormal returns between different insiders, a rough categorization has been made. The first group of insiders are either Chairmen of the board, board members or CEOs. The second group includes all other insiders which are not included in the previous group. The categorization has been made due to the lack of consistency of the reporting of the insider transactions made by the firms. As firms are allowed to label the insiders by their own definitions, there is no standard way of labeling and therefore, it is difficult to make more precise categorizations.

4.3.4 Market model

Since the focus of this study is abnormal returns, several calculations need to be considered. Abnormal return is defined as the difference between the actual- and expected return. (MacKinlay, 1997).

4.3.5 Actual return

The first step in calculating abnormal returns is to calculate the actual return.

$$R_{i,t} = ln(P_i/ + P_{i,t-1})$$

where

$$R_{i,t} = Actual\ return\ for\ security\ i\ at\ time\ t$$
$$P_{i,t} = Closing\ price\ for\ security\ i\ at\ time\ t$$
$$P_{i,t-1} = Closing\ price\ for\ security\ i\ at\ the\ day\ before\ time\ t$$

4.3.6 Expected Return

Calculations of the expected return are needed to compute the abnormal return.

$$E[R_{i,t}] = \alpha_{i,t} + \beta_i R_{m,t} + \varepsilon_{i,t}$$

where

$$E[R_{i,t}] = Expected\ return\ for\ security\ i\ at\ time\ t$$
$$\alpha_i = Unsystematic\ risk\ for\ security\ i$$
$$\beta_i = Systematic\ risk\ for\ security\ i$$
$$R_{m,t} = Return\ for\ market\ portfolio\ at\ time\ t$$
$$\varepsilon_{i,t} = Zero\ mean\ disturbance\ term$$

4.3.7 Abnormal return

Abnormal return is defined as the difference between actual and expected return. Return for the market portfolio corresponds to the return of OMXPI.

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t})$$

where

$$AR_{i,t} = Abnormal\ return\ for\ security\ i\ at\ time\ t$$
$$R_{i,t} = Actual\ return\ for\ security\ i\ at\ time\ t$$
$$\alpha_i = Unsystematic\ risk\ for\ security\ i$$
$$\beta_i = Systematic\ risk\ for\ security\ i$$
$$R_{m,t} = Return\ for\ market\ portfolio\ at\ time\ t$$

4.3.8 Cumulative abnormal return

Since this study aims to examine whether it is possible to achieve abnormal returns given the event window of five days, calculating the cumulative abnormal return is relevant.

$$CAR_i(t_1, t_2) = \sum_{t=1}^{T} AR_{i,t}$$

where

$CAR_i(t_1, t_2) = Cumulative\ abnormal\ return\ for\ security\ i\ for\ period\ t$

$AR_{i,t}$ = $Abnormal\ return\ for\ security\ i\ for\ period\ t$

4.3.9 Average cumulative abnormal return

Calculating the average cumulative abnormal return gives a more hands on illustration of how returns behave on a year-on-year basis rather than the standard cumulative abnormal return.

$$CAAR_{i,t} = \frac{1}{n} \sum_{t=1}^{T} CAR_{i,t}$$

where

$$CAAR_{i,t} = Average\ cumulative\ abnormal\ return\ for\ security\ i\ for\ period\ t$$

$$CAR_{i,t} = Cumulative\ abnormal\ return\ for\ security\ i\ for\ period\ t$$

4.4 Testing Procedure - Regression analysis

Regression analysis is used to answer the hypotheses whether abnormal returns occur or not. Furthermore, the study also aims to examine whether seniority of the insider and type of transaction matter for the extent of the potential abnormal returns. In this study, a significance level of 5% is implemented in the hypothesis testing.

4.4.1 OLS - Ordinary least square

The regression analysis used in this study is founded on the method of *Ordinary Least Squares*. However, in order to assure that the output is reliable, one must test for the underlying assumption for the method that should hold (Brooks, 2014).

1. *Breusch-Pagan/Cook-Weisberg test for heteroscedasticity* is used to control for heteroskedasticity. Homoscedasticity implies that the variance of the dependent variable is constant and infinite for all data.
2. *Shapiro-Wilk test of normality and test of skewness and kurtosis* is used to control for the normal distribution of the regression.
3. *Test of multicollinearity* is used to investigate whether multicollinearity exists. If so, it implies that several independent variables in the regression are correlated.

4.4.2 Dependent variable

The study defines the cumulative abnormal return as the dependent variable. The variable is chosen as the dependent variable because it is the most relevant measure in relation to the research question. More specifically, the cumulative version of the abnormal return is chosen in order to capture any premature or delayed market reaction. Therefore, the cumulative abnormal return captures abnormal returns for the total event window of five days.

4.4.3 Independent variables

The study aims to examine whether two specific characteristics concerning insider trading affect the extent of abnormal returns. Firstly, it examines the transaction type of the insider transaction which is either a buy- or sell transaction. Secondly, it investigates if the seniority of the insiders affects abnormal returns.

Regarding the seniority of insiders, a division into two groups is made. According to regulation, all insiders irrespective of their positions must report their trades (SFS 2000:1087). Furthermore, the study forms a hierarchy to reflect the theory of potential information asymmetry between different levels of insiders whereas the highest level has the potential to have more/better information of the firm than lower levels.

The variable seniority is coded as the following dummy variable:

0. All other
1. Chairman of the Board/Member of the board/CEO

The variable type of transaction is coded as the following dummy variable:

0. Sell
1. Buy

4.4.4 Coefficient of determination - R2

The coefficient of determination is a measure of how well the independent variables manage to explain the variation in the dependent variable. In other words, it tells how well the model predicts the outcome. The measure has a maximum value of 1 (100%) and a minimum value of 0 (0%) (Brooks, 2014).

4.4.5 Hypotheses

To answer the purpose and research questions of this study, statistical hypothesis testing is implemented where a main hypothesis and under hypotheses are formulated. The output of

the regression provides a P-value that is compared with the chosen significance level of 5% for this study.

4.4.5.1 Main hypothesis

The main hypothesis aims to explain the main purpose of this paper:

H_0 : Insider trading does not generate abnormal returns, CAR = 0
H_1: Insider trading does generate abnormal returns, CAR ≠ 0

If the hypothesis is rejected it implies that abnormal returns from insider trading are significantly different from zero.

4.4.5.2 Under hypothesis 1

The under hypotheses are formulated to answer the sub questions of this paper. Under hypothesis 1 investigates whether there is a difference in the extent of abnormal returns when the insider transaction is a buy- or sell transaction.

H_0 : There is no difference in abnormal returns between a purchase- and sell transactions
H_1: There is a difference in abnormal returns between purchase- and sell transactions

If the hypothesis is rejected it implies that there is a significant difference on the extent of abnormal returns between buy- and sell transactions.

4.4.5.3 Under hypothesis 2

Under hypothesis 2 investigates whether there is a difference in the extent of abnormal returns when the insider in question is a CEO/Board member/Chairman of the board or any other insider.

H_0 : There is no difference in abnormal returns if the insider is a CEO/Board member/Chairman of the board or not

H_1: There is a difference in abnormal returns if the insider is a CEO/Board member/Chairman of the board or not

If the hypothesis is rejected it implies that there is a significant difference on the extent of abnormal returns between the two groups of insiders.

4.4.5.4 Under hypothesis 3

Under hypothesis 3 aims to investigate whether abnormal returns occur before the day of publication.

H_0 : There is no abnormal returns between day -2 and -1 in the event window, CAR = 0
H_1: There is abnormal returns between day -2 and -1 in the event window, CAR ≠ 0

If the hypothesis is rejected it implies that abnormal returns from insider trading are significantly different from zero for two- and one day before the day of publication.

4.4.5.5 Under hypothesis 4

Under hypothesis 3 aims to investigate whether abnormal returns occur before the day of publication.

H_0 : There is no abnormal returns between day 1 and 2 in the event window, CAR = 0
H_1: There is abnormal returns between day 1 and 2 in the event window, CAR ≠ 0

If the hypothesis is rejected it implies that abnormal returns from insider trading are significantly different from zero for two- and one day after the day of publication. .

4.5 Reliability, validity and criticism of event studies

4.5.1 Reliability

Reliability tells to what extent the results can be reproduced if the study would be conducted at another occasion under the same conditions. It should be possible for others to conduct the same study and achieve similar results.

Since a large amount of data has been collected and sorted manually, there are risks that mistakes have been made. However, the data has been controlled several times and is therefore considered correct and. If mistakes are existent, they are considered to have minimal effect on the results.

4.5.2 Validity

Validity tells to what extent the results measure what they are supposed to measure. A lot of research has been done in the field of insider trading and abnormal returns via event studies which demonstrates high validity.

4.5.3 Criticism of event studies

The risk of using event studies is that other factors beyond the ones considered in study affects the variable of interest which could generate misleading results (McWilliam, 1997). To manage this, sorting of the data has been done which could indeed lead to misleading results and furthermore, it uses an established approach. However and despite this, there is earlier research that highlights the potential difference between using different methods which generates different results (Ekbo & Smith, 1998).

5. Results

In this chapter, the results of the event studies on insider trading made from July 3, 2016 until April 25, 2022 on companies listed on Large Cap, Swedish Stock exchange. First, descriptive statistics are provided and thereafter, the results of hypothesis testing are presented. Lastly, results of robustness testing are presented.

5.1 Descriptive statistics

When considering the total sample of 119 firms and 10528 individual transactions, a majority of buy transactions are observed as table 5.1.1 illustrates. Furthermore, the distribution between insider transactions made by CEOs/Chairmen of the board/Board members and all other insiders is fairly equal although

Table 5.1.1 Type of transaction and seniority

Seniority	Buy Transactions	Sell transactions	Total
CEO/Board member	3985	921	4906 (47%)
Other	3668	1954	5622 (53%)
Total	7653 (73%)	2875 (27%)	10528 (100%)

Table 5.1.2 illustrates statistics of the total sample in the form of observed abnormal returns for the individual days of the event window. On the event day, the lowest observed abnormal return amounts to -18.30% and the highest 13.40%. When considering the total event window of five days, the abnormal return ranges from -18.30% which is observed on the event day and 54.18% which is observed two days after the event day.

Table 5.1.2 Abnormal returns for the event window

	Min.	Avg.	Max.
-2	-16,98%	-0,09%	12,10%
-1	-15,41%	-0,03%	16,98%
0	-18,30%	0,05%	13,96%
1	-13,66%	0,02%	24,43%
2	-12,95%	-0,04%	54,18%

Table 5.1.3 specifies the minimum and maximum values of the observed abnormal returns. Of the total sample, the lowest observed abnormal return of -18.30% is observed on the event day and corresponds to a buy transaction made by an insider other than a CEO/Chairman of the board/Board member. The highest abnormal return is observed two days after the event and corresponds to a buy transaction made by an insider other than a CEO/Chairman of the board/Board member amounting to 54.18%. When considering the highest observed abnormal return for the event day specifically, the transaction corresponds to a buy transaction made by either a CEO/Chairman of the board/Board member and amounting to 13.40%

Table 5.1.3 Min. and max. abnormal returns

	Day	Return	Type of transaction	Seniority
Min.	0	-18,30%	Buy	Other
Max.	2	54,18%	Buy	Other
Max.	0	13,96%	Buy	CEO/Board member

Figure 5.1.1 illustrates the average abnormal returns for all five days of the event window. The lowest average abnormal return of -0.09% is observed two days before the event day and the highest of 0.05% is observed on the event day. On average, positive abnormal returns are observed within an interval of approximately 0.7 days before and 1.4 days after the event.

Figure 5.1.1 Average abnormal returns for the event window

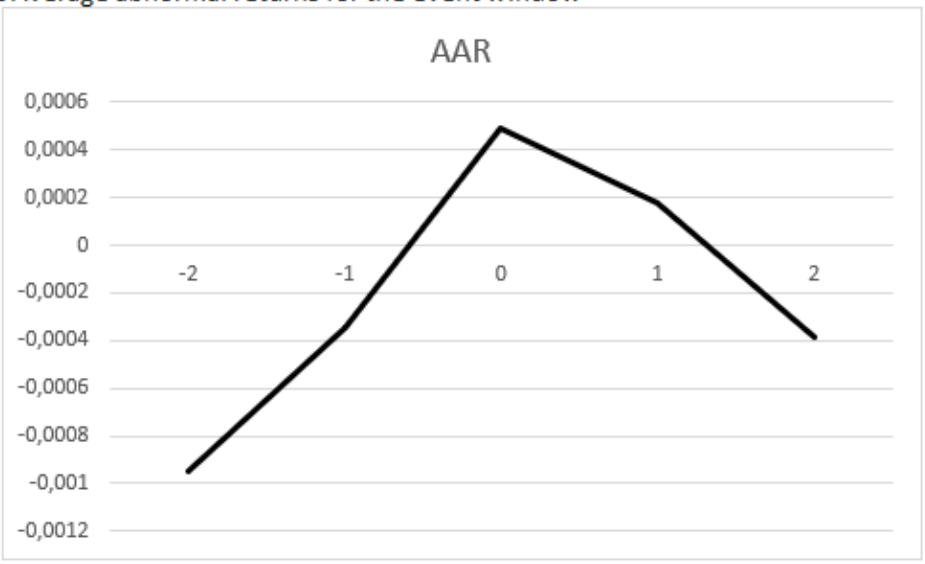
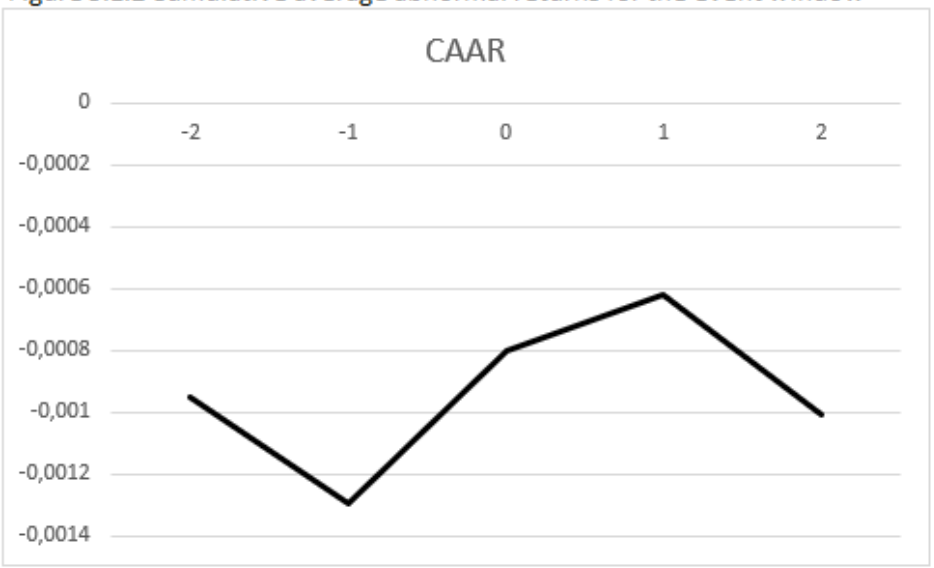


Figure 5.1.2 illustrates the cumulative average abnormal returns for the total event window of five days. For all five days included in the event window, the observed CAAR is nonzero and furthermore, negative.

Figure 5.1.2 Cumulative average abnormal returns for the event window



5.2 Statistical hypothesis testing

The market reaction is measured by the abnormal returns which is calculated as the difference between expected- and actual return. The cumulative abnormal return gives the cumulative version of the abnormal returns for the chosen days. The hypotheses are tested via statistical hypothesis testing where a 5% significance level is used.

According to section 5.3.1, the data used for the hypothesis testing is not normally distributed, determined by the Shapiro-Wilk test of normality and test of skewness and kurtosis. However, when considering a sufficiently large data sample, one can assume that the data is normally distributed as even the smallest deviations from the null hypothesis that the data is normally distributed can affect the test. In this case, logical reasoning and other methods need to determine whether the data can be assumed to be normally distributed (Pallant, 2016). In this study, normality is assumed due to a large enough sample size and graphic illustration according to figure 5.3.1.

5.2.1 Report of results for main hypothesis

H_0: Insider trading does not generate abnormal returns, CAR = 0

H_1: Insider trading does generate abnormal returns, CAR ≠ 0

The main hypothesis studies whether abnormal returns occur when considering the event window of five days. As table 5.2.1 illustrates, a P-value below 5% is observed and therefore, the null hypothesis is rejected. In this case, it can be statistically assured that insider trading generates abnormal returns. Furthermore, the results are significant at both a 1% and 10% significance level.

Table 5.2.1 Result of main hypothesis test

Cumulative abnormal return	Coefficient	P-value	95% conf. Interval		Number of obs	R-squared
Purchase	-0.0068049	0.000	-0.008611	-0.0049988	10528	0.0046
CEO/Board member	0.0037630	0.668	-0.0013457	0.0020983		
Constant	0.0037623	0.000	0.0022073	0.0053174		

5.2.2 Report of results for under hypothesis 1

H_0: There is no difference in abnormal returns between a purchase- and sell transactions

H_1: There is a difference in abnormal returns between purchase- and sell transactions

By looking at the independent variable *Purchase* from table 5.2.1, the result of testing whether there is a difference between purchase- and sell transactions shows a significance level below 5%. This indicates that there is a difference in the extent of abnormal returns between the two types of transactions. The null hypothesis is rejected, and it can be statistically assured that there is a difference.

5.2.3 Report of results for under hypothesis 2

H_0: There is no difference in abnormal returns if the insider is a CEO/Board member or not

H_1: There is a difference in abnormal returns if the insider is a CEO/Board member or not

By looking at the independent variable *CEO/Board member* from table 5.2.1, the result of testing whether there is a difference in the extent of abnormal returns when comparing the

two groups of insiders generates a significance level above 5%. In this case, the null hypothesis can not be rejected and it can not be concluded that there is a difference between the two groups of insiders.

5.2.4 Report of results for under hypothesis 3

H_0 : There is no abnormal returns between day -2 and -1 in the event window

H_1: There is abnormal returns between day -2 and -1 in the event window

From table 5.2.4.1, the results show a significance level above 5% given by the constant. Therefore, the null hypothesis can not be rejected and hence, it can not be statistically stated that abnormal returns occur two days before the event day.

Table 5.2.4.1 Result of underhypothesis 3, t = -2

Cumulative abnormal return	Coefficient	P-value	95% conf. Interval		Number of obs	R-squared
Purchase	-0.0017835	0.000	-0.0026003	-0.0009667	10528	0.0017
CEO/Board member	0.0006139	0.111	-0.0001407	0.0013684		
Constant	0.0000615	0.863	-0.0006357	0.0007587		

Figure 5.2.4.2, states the opposite when testing for abnormal returns the day before the event. With a significance level of below 5%, the null hypothesis is rejected and in this case, it can be concluded at the 5% significance level that abnormal returns occur the day before the event day.

Table 5.2.4.2 Result of underhypothesis 3, t = -1

Cumulative abnormal return	Coefficient	P-value	95% conf. Interval		Number of obs	R-squared
Purchase	-0.0037138	0.000	-0.0046181	-0.0028094	10528	0.0067
CEO/Board member	-0.0003907	0.330	-0.0011771	0.0003957		
Constant	0.0025389	0.000	0.0016907	0.003387		

5.2.5 Report of results for under hypothesis 4

H_0 : There is no abnormal returns between day 1 and 2 in the event window

H_1: There is abnormal returns between day 1 and 2 in the event window

When considering one day after the event day, the result shows a significance level below 5% according to table 5.2.5.1. In this case, the null hypothesis can be rejected and it can be concluded that abnormal returns occur the day after the event has occurred.

Table 5.2.5.1 Result of underhypothesis 4, t = 1

Cumulative abnormal return	Coefficient	P-value	95% conf. Interval		Number of obs	R-squared
Purchase	0.0005874	0.153	-0.0002181	0.0013928	10528	0.0017
CEO/Board member	0.0010444	0.006	0.0003063	0.0017825		
Constant	-0.0007379	0.042	-0.0014503	-0.0000254		

When testing whether abnormal returns occur 2 days past the event day, the observed significance level is below 5%, given by table 5.2.5.2 and the constant variable. Therefore, the null hypothesis can be rejected at the given significance level and it can be concluded that abnormal returns occur two days after the event has taken place.

Table 5.2.5.2 Result of underhypothesis 2, t = 2

Cumulative abnormal return	Coefficient	P-value	95% conf. Interval		Number of obs	R-squared
Purchase	-0.0025067	0.000	-0.0033193	-0.0016941	10528	0.0057
CEO/Board member	-0.0016078	0.000	-0.0023721	-0.0008436		
Constant	0.0021846	0.000	-0.0014746	0.0028946		

5.3 Results of robustness testing

5.3.1 Shapiro-Wilk test of normality and test of skewness and kurtosis

In general, when the data shows a skewness level between -2 to 2 and a kurtosis level between -7 to 7, it can be considered to be normally distributed. from table 5.3.1.1, the level of skewness fulfills the criteria but the kurtosis level fails. Therefore, the data can not be considered to be normally distributed when using the test of skewness and kurtosis

Table 5.3.1.1 Results of test of skewness and kurtosis

Residuals

	Percentiles	Smallest		
1%	-.1365169	-.3828598		
5%	-.065094	-.3305964		
10%	-.0444869	-.2971916	Obs	10,528
25%	-.0232616	-.2908187	Sum of wgt.	10,528
50%	.0008619		Mean	-1.34e-10
		Largest	Std. dev.	.0441323
75%	.0224874	.2854641		
90%	.0481898	.2854641	Variance	.0019477
95%	.0652732	.2854641	Skewness	.1931274
99%	.1182006	.7703076	Kurtosis	17.20971

From table 5.3.1.2, the Shapiro-Wilk test of normality shows a P-value less than 5% which indicates that the error term is not normally distributed. The null hypothesis that the error terms are normally distributed is rejected. However, if the sample size is large enough even the smallest deviations from normality will be detected which will cause a type I error i.e rejecting the null hypothesis when it is actually true.

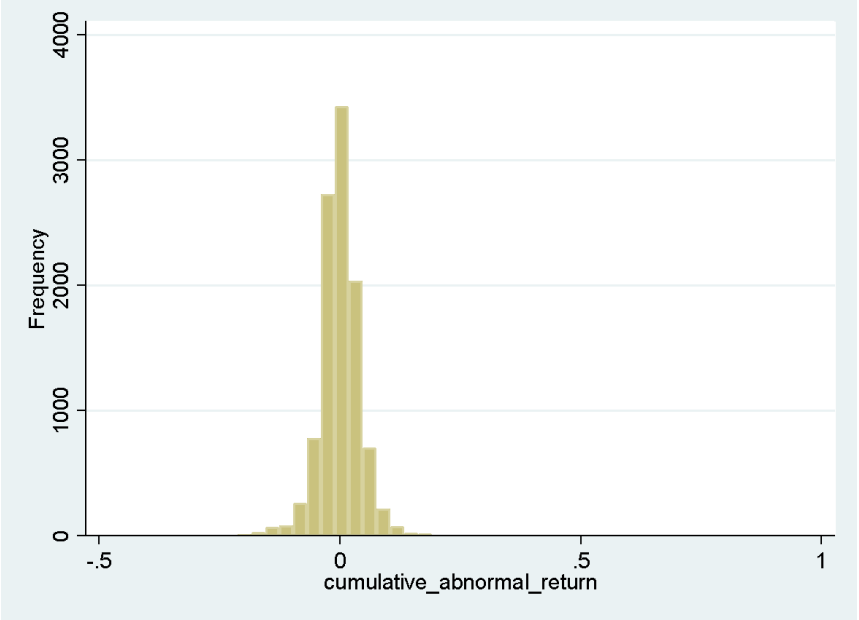
Table 5.3.1.1 Results of Shapiro-Wilk test of normality

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
resid	10,528	0.91952	418.877	16.185	0.00000

From the two tests previously conducted, the data cannot be considered normally distributed. However, if the data is composed of a sufficiently large sample size, these tests will detect the smallest deviation from normality. In the case of the Shapiro-Wilk test, this means that the P-value may be lower than the chosen significance level even if the data is in fact normally distributed. When considering the potential outliers, a more logical approach is needed. In this paper, a sufficiently large sample size of 10.528 observations is used and by figure 5.3.1 the data can in fact be considered normally distributed.

Figure 5.3.1, graphic representation of the distribution of the data



5.3.2 Breusch-Pagan/Cook-Weisberg test for heteroscedasticity

According to table 5.3.2, the P-value for the test is below 5% and therefore the null hypothesis of homoscedasticity is rejected. In this study robust standard errors are used to address the violation of the regression model.

Table 5.3.2 Result of the Breusch-Pagan/Cook-Weisberg test for heteroscadasticity

```
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of cumulative_abnormal_return

H0: Constant variance

    chi2(1) =  70.29
Prob > chi2 = 0.0000
```

5.3.3 Test of multicollinearity

As no pair of variables show an absolute correlation coefficient larger than 0.7 given ba table 5.3.3, it can be concluded that the dataset does not suffer from multicollinearity

Table 5.3.3 Results of test of multicollinearity

	cumula~n	purchase	Topman~t
cumulative~n	1.0000		
purchase	-0.0678	1.0000	
Topmanagem~t	-0.0080	0.1790	1.0000

5.3.4 Goodness-of-fit test, R-squared

The coefficient of determination, the R-squared for the model is 0.0046% tells that the variables type of transaction and seniority of the insider fails to properly explain the variation of the cumulative abnormal return in the event window. More specifically, the remaining 99.54% depends on other factors that are not considered in the model.

6. Analysis

In the following section, the results of the study are discussed and contrasted with the theoretical framework of the study and earlier studies.

6.1 Analysis of results

The results of the event study shows that insider trading indeed generates abnormal returns. More specifically, when considering the total event window of five days where the event day is defined as the day where the insider transaction is published to the public and including two days before and after the event day, abnormal returns are observed amounting to 0.38%. In addition, the results indicate that type of transaction affects the extent of abnormal returns where a buy transaction has a negative effect of approxamitely -0.69%. Furthermore, the results can not conclude that the seniority of the insider per the study's definition affects the abnormal returns. In detail, whether the insider transaction is either a CEO or board member shows no significant difference as to if the insider transaction was made by any other position within the firm. Furthermore, abnormal returns are observed for all days within the event window except for two days before the publication of the transaction to the public.

The results of testing the main hypothesis of this study corresponds to the results found by Seyhun (1986 & 1998), Lakonishok & Lee (2001) and Jeng et al (2003). The results of Seyhun's studies (1968 & 1998) conclude that insider trading indeed generates abnormal returns. In these studies, the level of information is important for the extent of the market reaction which is in line with the theory of information asymmetry and Fama's Efficiency market hypothesis (EMH). In this sense, the larger the information gap between market actors the larger market reaction is to be expected and in terms of EMH the Large Cap list of the Swedish Stock exchange does not seem to be in the strong form but rather Semi-strong form. Lakonishok & Lee (2001) gives a complementary perspective and argues that insiders seem to be able to predict market movements by acting against the crowd or the current trend. According to the results of this study and earlier studies where abnormal returns can be observed the market in question can not be defined as having the strong form attribute. If that would be the case, no abnormal returns would be observed as even non-publicly available would be incorporated into the asset price and therefore would not generate any price movements beyond the normal.The results of this study contradicts the findings of other

studies which argues the opposite. Ekbo & Smith (1998) studied abnormal returns for the Norwegian Stock exchange and conducted two different methods. The first method was in the form of an event study and the second one used other performance methods. In the case of the event study, abnormal returns were observed but the second method did not. This raises the question whether an event study is preferable or if other methods should be used instead or in combination. Even in the case of comparing methods, the difficulty of determining which method is preferable arises.

The results testing whether type of transaction affects abnormal returns lead to the rejection of the null hypothesis. Consequently, it was concluded that there is indeed a difference between purchase- and sell transactions in terms of the extent of abnormal returns. The results are consistent with what the authors Drobetz, Mussbach & Westheide (2019) and Degryse et al. (2014) found in their studies. More specifically, the results of this study indicate that a purchase transaction corresponds to a negative market reaction. According to Dargenidou, Tonks and Tsoligkas (2017), managers in firms possess an information advantage and hence could act contrary to existing trends. In practice, they highlight the example of selling after a good report and buying after a bad one. The authors argue that due to the information advantage they have the ability to judge the significance of a short-term change in the firm's fundamentals and therefore, might decide to buy as the short-term change should not affect the long-term price of the stock. The results from this study is contrary to the belief that a purchase transaction is informative of a positive outlook for the firm but a possible explanation is provided by Dargenidou, Tonks and Tsoligkas (2017). In addition, Kallunki, Nilsson & Hellström. (2009), provides a background to the types of transactions and argues that there are several reasons why insiders may sell. For example, the authors argue that it could be for personal liquidity or diversification purposes. In combination with the findings of Dargenidou *et al.* (2017), this is a possibility of why the results of this study indicate that purchase transactions generate negative abnormal returns In contrast to these results, Inci *et al. (2010)* did not find any significant difference between the two types of transactions in terms of abnormal returns. Considering the findings by Fama (1970), the results indicate that the Large Cap list on the Swedish stock Exchange can not be characterized as being strong-form as the results would otherwise not show a significant difference between purchase- and sell transactions. In this sense, the market is not efficient enough in processing non-public information. According to Dargenidou *et al.* (2017)

managers do have an information advantage that they can utilize. In addition, Drobetz *et al.* (2019) found that the CEO of a firm with a large degree of information asymmetry has a greater impact on the market reaction. The results of this study shows that the firm's listed on Large Cap on the Swedish stock exchange do not coincide fully with the efficient market hypothesis.

Regarding seniority of the insider, the results of this study could not reject the null hypothesis that there is a difference in abnormal returns when the transaction in question is made by insiders of different seniority. In the study, an insider was defined by two categories where the first category includes the CEO and board of directors and the second, all other insiders. Therefore, it could be concluded that there is a significant difference in abnormal returns. The result opposes much of the earlier studies which shows that there is indeed a difference in the market reaction in terms of abnormal returns between more junior and senior insiders. Seyhun (1986) shows that this is the case and argues that it is due to an information hierarchy that exists within firms meaning that the more senior insiders are more likely to possess more/better information as they are more involved in important decision making of the firm. The results of this study are also contradictory with the findings of Drobets, Mussbach & Westside (2019) which shows that the CEO generates the largest market reaction while other positions showed little or none. The results of this study therefore indicate that there is no connection between an information hierarchy and the occurrence and extent of abnormal returns. The conclusion is consistent with the findings of Fidrmuc, Geoergen & Renneboog (2006) which shows that the market reaction corresponding to transactions made by the CEO actually was smaller compared to transactions made by other managers. The authors of this study are aware that the division of insiders is very rough and therefore might be a reason why the results are not in line with the consensus in the study's literature review. However, by the definition made for this study, there is no statistical significance supporting the hypothesis that there is a difference in abnormal returns when transactions are made by an CEO/Board member or any other position. Furthermore, as the study only considers the Large Cap list of the Swedish Stock exchange a larger number of samples including other lists and countries might generate different results.

According to the results, abnormal returns exist for four out of the total five days of the event window. There was no statistical evidence supporting that abnormal returns occur two days

before the day of publication. That abnormal returns are observed one and two days after the day of publication is in line with the earlier review literature which supports the conclusion that insider trading generates abnormal returns. As the publication of insider trading provides the market with possible non-publicly available information due to information asymmetry they may choose to act accordingly to the insider and in this way a market reaction is generated, resulting in abnormal returns. The interesting part is that abnormal returns are observed one day before the day of publication. There may be several reasons for this. First off, the insider trades are to be reported within three days after the transaction has taken place. According to Brunnermeier & Pedersen (2005), market participants may detect unusually large transaction volumes and high liquidity which may indicate that a market participant is increasing or decreasing his/her position. They argue that it could be possible to recognize large insider transactions this way. Therefore, the observed abnormal returns one day before the day of publication might be due to the insider making transactions of significant volumes him/herself on the transaction day that occurs before the day of publication. It can also be due to market participants identifying the unusual activity and therefore might recognize insider trading which they act upon and hence generate abnormal returns for the asset. Another possibility is that the insiders leak information as they have incitament to do so. Liu et al. (2019) studied incentives for leaking information in relation to insiders and concluded that there are indeed situations where insiders have incentives to do so. However, as there was no statistical significance for two days before the day of publication, it is difficult to draw any reasonable conclusion. Widening the event window to include a total of seven days would allow the study to draw a better conclusion as the day of transaction also would be included. In that case, testing could be done from the day of transaction until three days after the day of publication and therefore, better conclusion of potential leakage of information or identifying of insider trading could be drawn.

As the result of this study points out, abnormal returns are observed which according to Fama (1970) should not be the case if the market is considered efficient and in the strong-form. As the study covers data from the introduction of the Market Abuse Regulation (MAR) in (MAR) 2016 until April 2022, the conclusion is that abnormal returns are observed even after the regulation was introduced. This observation is not in itself automatically problematic as insider trading can be informative about future outlooks for the firm. However, the fact that the results indicate that insider trading indeed generates abnormal returns might give insiders a tool and incentive to be involved in the different types of market abuse. The results found

by Kim, Ng, Wang & Want (2016) supports the view that regulation on insider trading promoted market efficiency by making insider trading more informative. More transparency of insider trading gives market actors more accurate information for decision making and hence efficiency by generating an equilibrium price and simultaneously minimizes the risk of market abuse from insiders. Overall, they argue that more regulation on insider trading promoted market efficiency. However, according to the results of this study, the introduction of MAR has not affected the Large Cap list of the Swedish Stock exchange in such a way that it could be defined as being in the Strong-form but rather Semi-strong form according to Fama (1970).

7. Conclusion

In the following section, the paper's research question and purpose are discussed together with the findings in the result and analysis. The section also includes a discussion of self-criticism against the authors and proposals for further research.

7.1 Summary and discussion

The purpose of this paper is to investigate and explain the behavior of the market reaction in relation to insider trading. The study aims to study whether publication of information of insider trading triggers abnormal returns. Furthermore, it aims to investigate whether the seniority of the insider and type of transaction affect the extent of the potential abnormal returns. In addition, it tries to unveil when abnormal returns are observed in relation to the day of publication of insider trading.

The results indicate that insider trading generates positive abnormal returns for the Large Cap list of the Swedish stock exchange between the period 2016-2022. The authors conclude that the introduction of the Market Abuse Regulation has not eliminated the occurrence of abnormal returns. The fact that abnormal returns occur in relation to insider trading is explained by information asymmetry between insiders and outsiders of the firms. Consequently, the results indicate that the market can be defined as being semi-strong, meaning that insiders can utilize non-publicly available to affect the stock price. Furthermore, the study did find a significant difference in the extent of abnormal returns when comparing buy- and sell transactions where purchase transactions generated negative abnormal returns. The authors find this conclusion ambiguous and indicate that there are several ways market participants might interpret the two types of transactions. In contrast, the study did not find a significant difference in the extent of abnormal returns when comparing transactions made by insiders of different seniority levels. This points to the conclusion that there is no information hierarchy for the Large Cap list on the Swedish stock exchange. When considering the timing of abnormal returns, the results show that abnormal returns also occur for separate days including the day before, one - and two days after the day of publication. Abnormal returns were not significant for two days before. The authors find the fact that abnormal returns occur the following days logical as the information needs time to be digested and reach market participants. However, as the results indicate that abnormal returns occur before the day of

publication the authors interpret this as either information leakage or that market participants might recognize insider trading via unusual trading activity.

7.2 Self-criticism

The study has included a vast amount of data both in the sorting procedure in excel and the implementation of the event study in STATA. Sorting has been done according to the authors pre-determined criterias which might have resulted in lost or wrongly included data. In detail, transactions made by insiders belonging to the same firm on the same day have not been managed which could have had an effect on the results.

A rough categorization of insiders was made where two categories were defined. The first category included transactions made by CEOs and Board members while the second included all other insiders. As several earlier studies who have made more specific distinctions regarding seniority levels of insiders point to the opposite of the results found in this study, the authors believe that the categorization made can be seen as problematic.

The study has used an event study and a set of statistical methods which implies a risk of misleading results as the results are subject for interpretation or that the used methods are not preferable for what the study aims to investigate.

7.3 Proposals for further research

A lot of studies have been done concerning insider trading and abnormal returns however, there is a lack of studies made on the Swedish and in general, the Nordic markets. The authors propose some aspects for further research.

Firstly, issues addressed in the self-criticism section can be addressed. Transactions made by insiders belonging to the same firm on the same day could be combined into one single transaction but then the seniority of the insider needs to be defined. A more specific categorization would be preferable to investigate more precise differences.

Secondly, more variables could be defined as such to consider size of the firm, leverage of the firm, liquidity of the stock. Another perspective is to consider macro economic variables such as market conditions to compare periods of bull- and bear markets or economic rise and recession or different interest rates.

Thirdly, a lot of studies made on abnormal returns in regards to insider trading have been done through event studies. Therefore, it can be useful to implement other methods to compare the results.

Fourthly, this study defined the day of publication as the event day. As insiders have three days to report the insider transaction, the day of transaction does not always, if even rarely, coincide with the day of publication. Therefore, it would be interesting for further research to investigate and contrast abnormal returns when taking both days into account.

Fifthly, as the study includes data from the introduction or the MAR, 2016-2022, it is recommended to investigate earlier research to see if there is a difference in the occurrence of abnormal returns. This could lead to more specific conclusions concerning the effect of the introduction of the MAR.

APPENDIX

Appendix 1: Regression analysis for main hypothesis, under hypothesis 1 and 2

Linear regression

Number of obs	= 10,528
F(2, 10525)	= 27.69
Prob > F	= 0.0000
R-squared	= 0.0046
Root MSE	= .04414

cumulative_~n	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
purchase	-.0068049	.0009214	-7.39	0.000	-.008611	-.0049988
Topmanagement	.0003763	.0008785	0.43	0.668	-.0013457	.0020983
_cons	.0037623	.0007933	4.74	0.000	.0022073	.0053174

Appendix 2: Regression analysis for under hypothesis 3: t-2

Linear regression

Number of obs	= 10,528
F(2, 10525)	= 9.35
Prob > F	= 0.0001
R-squared	= 0.0017
Root MSE	= .01919

CAR2	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
purchase	-.0017835	.0004167	-4.28	0.000	-.0026003	-.0009667
Topmanagement	.0006139	.000385	1.59	0.111	-.0001407	.0013684
_cons	.0000615	.0003557	0.17	0.863	-.0006357	.0007587

Appendix 3: Regression analysis for under hypothesis 3: t-1

Linear regression

Number of obs	10,528
F(2, 10525)	33.43
Prob > F	0.0000
R-squared	0.0067
Root MSE	.02067

CAR1	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
purchase	-.0037138	.0004614	-8.05	0.000	-.0046181	-.0028094
Topmanagement	-.0003907	.0004012	-0.97	0.330	-.0011771	.0003957
_cons	.0025389	.0004327	5.87	0.000	.0016907	.003387

Appendix 4: Regression analysis for under hypothesis 4: t2

Linear regression

Number of obs	10,528
F(2, 10525)	31.74
Prob > F	0.0000
R-squared	0.0057
Root MSE	.01966

CAR22	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
purchase	-.0025067	.0004145	-6.05	0.000	-.0033193	-.0016941
Topmanagement	-.0016078	.0003899	-4.12	0.000	-.0023721	-.0008436
_cons	.0021846	.0003622	6.03	0.000	.0014746	.0028946

Appendix 5: Regression analysis for under hypothesis 4: t1

Linear regression

Number of obs	10,528
F(2, 10525)	5.67
Prob > F	0.0034
R-squared	0.0011
Root MSE	.01901

CAR11	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
purchase	.0005874	.0004109	1.43	0.153	-.0002181	.0013928
Topmanagement	.0010444	.0003765	2.77	0.006	.0003063	.0017825
_cons	-.0007379	.0003635	-2.03	0.042	-.0014503	-.0000254

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