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Do Insiders know best?

- A study of reported insider trades in the Norwegian and Swedish Stock Market.

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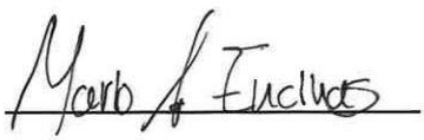
Preface

This thesis is written as a final part of our master's degree in Business with major in Finance at the BI Norwegian Business School. The thesis aims to empirically elucidate information value of reported legal insider trades in Norway and Sweden. Furthermore, the thesis aims to assess how the information value has changed after Sweden´s shortening of reporting deadline for insider transactions.

The topic of insider trading is chosen primarily on the basis of interest and actuality. Most of the time has been used to clean, verify and analyze data in Excel and Stata. As a result, we have gained deeper knowledge of how insider trading works and gained experience of structuring large amount of information. The process has been demanding, but we experience that we have acquired good knowledge of an important and relevant topic within finance.

First, we would like to thank Professor Samuli Knüpfer who early in our process helped us with our topic and throughout the thesis helped us with constructive input and answers. Knowing that we were always welcome to come to his office or send him an email has been reassuring. Further, we would like to thank Algirdas Veberas, analyst in Dovre Forvaltning for all the advices and data through the process.

Oslo, August 2018



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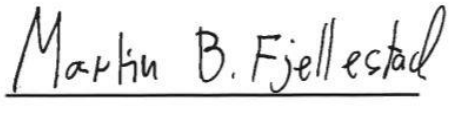

Martin Brenne Fjellestad

Abstract

In this thesis we investigate insider trading on Oslo and Stockholm stock market. We analyze 2515 insider trades in Norway from 21.09.2010 - 20.12.2017 and 3825 trades in Sweden from 01.01.2014 - 09.02.2017.

To observe the insider effects, we applied the same event study approach as MacKinlay (1997). From this we find that cumulative abnormal returns are significantly different from zero for both countries in the short term event window. Market value was shown to have a negative effect on CAR from buy transactions in both countries and to have an insignificant (Norway) or significantly positive (Sweden) effect on CAR from sell transactions. The effect of price to book value is somewhat negative for buy transactions in the shorter term in Norway and for all event windows in Sweden. Differences in CAR that can be attributed to insider position are generally small.

Our results indicate the speedier reporting in Sweden after the legislation change does not trigger any lager market reactions and thus not provide any more information value to the market. The main result of our study is that both mean and median cumulative abnormal returns are significantly higher than zero soon after the buy events and significantly lower than zero after the sell events. Overall, the conclusion is that there have been more opportunities for enjoying positive abnormal returns in Norway than in Sweden.

Contents

1.0 Introduction

Insider trading is a topic that has gained increasing attention in the media the last couple of years. First and foremost, this is due to increased focus on illegal insider trading as a form of economic crime. Insiders[1] are therefore more heavily regulated than other investors due to the edge that confidential information provided in the market. Being CEO, CFO or having another position within the firm gives you an advantage, at least intuitively, over non-informed investors outside the firm. This leads to information asymmetry, as people within a company get access to information before other market participants and use their information to gain advantages over outsiders[2]. Under the Norwegian, Swedish and European law, insiders cannot rely on inside information that significantly affects the price. Nevertheless, it is reasonable to assume that insiders have more accurate information compared to outsiders. Legislators have tried to find a balance between freedom and restriction, but a perfect balance in this case is practically impossible to achieve. The signals and the market imperfections that insider trading creates can therefore lead to abnormal returns for insiders.

1.2 Motivation

Our motivation for writing this thesis is that we wish to apply knowledge gained from our two-year Master program through subjects such as *Introduction to Asset Pricing*, *Investments* and *Advanced Corporate Finance.* Further, at the start of our research for information, we came across both Trygve Hegnar´s Finansavisen with its insider portfolio called *Innsideportefølje*[3] and Dovre Forvaltnings insider fund *Dovre Inside Nordic*. They both claim to be highly successful, in which Finansavisen posting as late as January 3. 2018 that their portfolio had beaten the Oslo Stock Exchange in 2017. The portfolio started in 1996 and have since outperformed the stock exchange 20 out of 22 years. This result can only be described as impressive and in conflict with some of the most acknowledged financial theories such as the efficient market hypothesis.

[1] An insider is a person within a company or organization that has information unavailable to others.
[2] An outsider is a private individual without more insight into the individual company than the rest of the market.
[3] Translates to: Insider portfolio

With the belief in the market efficiency theory, we are curious to whether it would be possible for insiders to earn abnormal returns from reported insider trades. To our knowledge, there has not been a study conducted at both Oslo and Stockholm Stock Exchange within the same time period and method to see if abnormal returns are possible. One motivation to why we wanted to focus on both Norway and Sweden, apart from the fact that they are neighboring countries, is that they have differences in the way they report insider trades. In the time period of our dataset Sweden also had a change in legislation related to insider trading.

1.3 Hypothesis

It is realistic to assume that primary insiders have better knowledge and information about "their" firm than outsiders. If this is the case, insiders should on average be able to predict future performance better than outsiders. If insiders know for a fact that their firm's intrinsic value differ from market expectations, insiders will be able to earn abnormal profits. This is an effect we are trying to determine with our first hypothesis. When investigating, we examine firm cumulative abnormal returns for 1, 5, 30, 60 and 120 days following insider trades for both buy and sell.

H1: Do insiders on average earn abnormal returns?

Previous researchers have revealed some interesting relationships between firm characteristics and abnormal returns earned by insiders. It especially seems like the abnormal returns earned by insiders are dependent on the level of informational asymmetries between insiders and outsiders. Firm characteristics such as market value and P/B-ratios could relate to the information asymmetry.

H2: Does market value and price to book ratio affect abnormal returns?

It is also natural to assume that the insiders position within the firm can affect the size of the abnormal return earned. The idea is that an insider´s position within the firm is likely to affect the size of the information asymmetries. Insiders with higher positions within the firm such as top management could have better information

than insiders in lower positions. We will therefore attempt to discover if there are any significant relationships between abnormal returns and insider positions.

H3: Do insider position within the firm earn abnormal returns?

Further, we want to focus on delays in reporting obligations in the two countries. Delays occur when the insiders report on trades in their own company with a delay in relation to the transaction date. Since Sweden for a long time has allowed five business days delay, while Norway has not, we seek to reveal whether late reporting affect the abnormal returns. In conclusion, we consider the impact on the information value of the inside trade after Sweden`s reporting deadline shortened to three business days as of 3. July 2016. This gives the following associated hypothesis:

H4: The value of abnormal returns is higher in the period following the change than before.

H5: Abnormal volume is higher in the period following the change than before.

2.0 Theory

In this chapter we will present relevant theory, which is related to insider trading and will further help us to understand the effect of information among insiders, investor and other market participants.

2.1 Asymmetric information

In theory, the explanation to why insiders might earn abnormal returns is because they have access to more information than outside investors. This non-public information place insiders in a stronger position to invest compared to ordinary investors since the insiders could be able to better assess future and current situations of a company. This asymmetric information between the market and insiders is seen as an essential factor behind abnormal returns for insiders. Asymmetric information can further be divided into moral hazard and adverse selection.

2.1.1 Moral hazard

The first type of asymmetric information is known as moral hazard or hidden action. Moral hazard occurs when a party to a transaction has not entered into the contract in good faith, has provided misleading information about its liabilities, assets or credit capacity, or has an incentive to take unusual risks in an attempt to earn a profit before the contract settles. The decision is based on what has the highest level of benefit and not on what is considered as the morally right thing to do.

Carlton and Fischel (1983) argues that insider trading is harmful since it creates a moral hazard by accepting insiders to profit on bad news. Further, they point out that in extreme scenarios, inside information alters the way managers act. The potential profit from bad information could make managers indifferent between working to make a company successful or bankrupt. They further debate other potential ways moral hazard could become a problem, such as insider's possibility to undo or unbundle compensation schemes already agreed with the company. By short-selling an equal quantity of stocks, insiders can undo the incentive effects of a stock ownership plan and in that way make themselves unaffected by how the company performs. Evidently, the insider has no preference on whether to contribute or sabotage.

2.1.2 Adverse selection

Another type of asymmetric information is adverse selection. Adverse selection occurs when information is purposely retained before an agreement is reached. The motive of withholding information is to improve your own position.

A central reference to adverse selection is *The Market for Lemons*, written by George A. Akerlof (1970). Akerlof address the difficulty of distinguishing good quality from bad in the business world using the used car market as an example. The buyer of a used car cannot easily distinguish between a peach and lemon, and the buyer is not going to find out what it is until after purchase. Despite the fact that the buyer is willing to pay the given amount for a peach, they will not take the risk of ending up with a lemon. The result is that peaches remain unsold, causing the sellers of the peaches to withdraw from the market. Akerlof with his used car example shows how the lack of precise information disrupts and distorts the market.

2.1.2 Connection between asymmetric information and insider trading.

Due to information asymmetry, one can assume that there is a relationship between transactions made by insiders and firm value. For instance, one can interpret that insiders selling assets would be a signal of a lower value for the company and buying would be a signal of higher value. Why is this so? Altering the amount of ownership in your own company or a company you work for can be interpreted as a sign that you as an insider is taking advantage of the unique information not known to outsiders. The insider has the possibility to invest in more or less any assets in the financial market, but chooses to alter ownership in this particular company.

However, when talking about a decrease in the ownership, there could be several reasons for an insider to do this. One reason could be for tax purposes, another could simply be that the insider needs money for private reasons. Due to the above reasoning, the relationship between selling assets because of inside information or due to other reasons is not as unambiguous as in the case of purchase transactions.

2.1 Random Walk

The random walk theory can be traced back to *Calcul des Chances et Philosophie de la Bourse* by Jules Regnault (1863), but was popularized through Burton Malkiels book *A Random Walk Down Wall Street* (1973). Information that can be used to predict the development of a company is in general considered to be reflected in today's stock price. According to the theory the marked should react immediately to new information that affects the pricing of a company, hence making it impossible to "beat" the market without taking on additional risk, and thus supporting the theory that markets are efficient. This forms the basis for the random walk theory, which suggests that the price of a stock is IID[4], hence the past movement of a stock cannot be used to predict future movement, or in other words, the stock takes a "random walk".

2.2 Market efficiency hypothesis

The efficient market hypothesis was developed by Eugene Fama (1970). The theory is one of the most well-known and possibly the most significant proven theory ever created to describe the financial market. The theory describes how asset prices fully reflect all available information in the market. To this day, many have tried to challenge the efficient market hypothesis, but the theory still stands as a valid description of how stock prices behave. It is important to remember that financial theories such as the efficient market hypothesis are not proven laws, but merely ideas that attempt to explain how the market works. Abnormal returns tend to occur on a frequent basis as new information is released.

According to Fama, the main role of the capital market is the allocation of ownership in the economy's capital stock. Further, he states that a perfect market is one in which prices fully reflect all available information. Fama defined three different subgroups of market efficiency based on the amount of information:

- Weak-form efficiency
- Semi-strong-form efficiency
- Strong-form efficiency

[4] Independent and identically distributed

2.2.1 Weak-form

The weak form of market efficiency states that equity prices reflect only information that lies in the historical prices and historical development of the shares and the market. The hypothesis implies that trend analyzes are of little value since any reliable signals will already be known in the market.

2.2.2 Semi-strong-form

The semi-strong form of efficiency requires prices to mirror all "obviously publicly available information" and not just past prices (Fama, 1970). This could consist of company's products, management, accounting figures, patents, mergers and other similar information. To test whether the semi-strong market efficiency holds, one would have to study the changes in stock prices before and after an announcement for a given price affecting event. One would have to see how quickly the price adjusts to the announcement. The faster the adjustment, the more efficient is the market. If the price had started to adjust before the announcement, this could be a sign of an information leak.

2.2.3 Strong-form

The strong form of market efficiency state that prices reflect all public information, information contained in the historical changes and all other available information that exists in the market, both private and public. This implicates that no investor can earn abnormal returns above what is expected. Evidence that insiders can obtain abnormal returns and that investors, traders, and funds who beat the market over time would go against the strong form of market efficiency.

2.2.4 Connection between efficient market hypothesis and insider trading.

In the strong form of market efficiency, insider trading would not earn any abnormal results. When looking at the semi-strong form of market efficiency it would be possible for an insider to earn abnormal results, however, not for an outsider. This is because the signal from the insider trade is already reflected in the price of the asset. If we find some irregularities in the market, this would be a violation of the semi-strong market efficiency.

Financial markets are constructed from both assumptions and regulations. The price of the asset is reliant on information transparency to ensure efficient and appropriate prices. There is a general perception that insider trading must be banned or regulated. The reasoning behind this is that the market is entirely dependent on investor´s confidence to function according to their prerequisites (Finansnorge, 2018). Just an assumption of insider trading can ruin the whole market since investors without insider information do not want to enter the market with capital or use the market as a capital source.

3.0 Insider trading

In this chapter we will discuss different motivations for an insider to trade as well as different regulations for insider trading in both countries.

3.1 Motivations for insider trading.

There could be many motivations for insiders to trade in their own company. Seyhun (2000) in his book *Investment intelligence from insider trading*, proposes three reasons for insiders to trade on inside information: Profit, liquidity, and manipulation.

The profit motive:

When insiders trade in their own company this could indicate a disbelief in the market value and implies that insiders have confidence in that the fundamental value of the firm is bigger/smaller than the value reflected in the market. Hence, insiders trade to earn profit. Seyhun claims that if this is true, one could observe insider trading until the market value of the firm would reflect the true value of the firm.

The liquidity motive:

Insiders, as other investors, can at some point need excess cash and sell assets. When insiders sell assets for liquidity purposes, one should not see any trading patterns.

The manipulation motive:

When insiders deliberately buy or sell assets in an attempt to change stock prices, this would be a manipulation of stock prices. An example could be that an insider would sell off assets to lower stock prices and later buy the stocks at a discount. One should discover a reversal in the trading patterns if this is the case.

Seyhun did find some evidence for the first motive, but no evidence for reversal patterns. An explanation for the latter could be insider regulation attempting to prevent market manipulation. He further finds that the main reason for insider trading is probably because insiders think that the true value of the company is not reflected in the share price, and therefore insiders buy or sell stocks. This would

indicate that insider trades would thus yield accurate and trustworthy signals to the market.

There are also other possible reasons for insiders to trade. One possible reason related to insiders buying stock within their own company is that they seek to increase their power within the company. Having a higher share of stock gives higher voting power. This is especially true for smaller firms and large shareholders.

Another possible reason when talking about motives for selling is the diversification motive (Lakonishok & Lee, 2001). Many firms use stocks and options in their incentive programs to employees. This could cause the proportional investment that insiders have in their own firm to be sub-optimal. Portfolio theory suggests that undiversified investors can increase their expected returns without taking on additional risk by diversifying. Having your savings in the company you work for can lead to potential problems. An example is the Enron scandal in which employees choose to place much of their savings in Enron stocks and losing their jobs in addition to their savings after the bankruptcy of Enron (Petrick & Scherer, 2003). One reason to sell would therefore be to decrease risk.

3.2 Insider regulation in Sweden and Norway

According to Battacharchya and Daouk (2002), 87 out of 103 countries with stock markets have laws specifically aimed at inside trading. An interesting aspect of these regulations is that they permit insider to trade in their company, provided that strict conditions are fulfilled. These trades are what is known as legal insider trading. Further, in this chapter, we will discuss regulation for Norwegian and Swedish securities trading respectively in relation to inside information, inside definitions and reporting obligations. This will give important background information for the rest of the thesis and provides a clearer picture of how insider laws in Norway and Sweden might lead to differences in abnormal returns when compared to each other.

3.3 Swedish Insider Laws

Because of Sweden's EU membership, insider trading is regulated through the European Parliament and Council Regulation No 596/2014, Market Abuse Regulation and European Commission Supplementary Regulation No 522/2016. In addition, the Swedish regulation (2016:1306) further complements the EU regulations.

3.3.1 Inside information

The definition of inside information is found in article 7 of the Market Abuse Regulation (Official Journal of the European Union, 2014): *Information of a precise nature, which has not been made public, relating, directly or indirectly, to one or more issuers or to one or more financial instruments, and which, if it were made public, would be likely to have a significant effect on the prices of those financial instruments or on the price of related derivative financial instrument*s.

The requirement for the precise nature is further explained in paragraph 2 of the article, where it is required that the information which relates to circumstances or events that have occurred or which can reasonably be expected to occur. In addition, the information must be so accurate that it is possible to draw conclusions about the effect of the circumstance or incident on pricing. It is also specified that situations of procedural nature will also count as inside information. This implies that, for example, acquisition or merger processes are to be regarded as information of precise nature, even though that the terms or contracts is not final at the time of the trading.

3.3.2 Insider

Article 8-4 of the Market Abuse Regulation states who is regarded as insiders in financial markets. The article applies to any person who possesses inside information as a result of:

- Being a member of the administrative, management or supervisory bodies of the issuer or emission allowance market participant.
- Having a holding in the capital of the issuer or emission allowance market participant.

- Having access to the information through the exercise of an employment, profession or duties.
- Being involved in criminal activities.

Article 8-4 also applies to any person who possesses inside information under other circumstances than those referred to above in which that person knows or should know that it is inside information.

3.3.3 Insider trading and notification requirements

Sweden allows insiders to trade shares in companies where they hold an inside position pursuant to Articles 8-4. The trade can only occur in periods in which no inside information is available as described above, and never in the 30 last calendar days prior to the publication of the quarterly or annual report (Finansinspektionen, 2016).

Furthermore, there is a notification obligation for persons discharging managerial responsibilities, and to them closely associated to an insider trader. They are required to report their transactions no later than three business days after the transaction dates according to article 19-1 and 19-8 of the market abuse regulation.

The notification shall contain the name of the issuer, the issuing company's name, the instrument traded, the transaction type (purchase/sale), date and marketplace, as well as price and volume. The notification does not need to contain the insiders inventory after the transaction, as required in Norway. Before 3. July 2016 the deadline for filing reports of change in holdings for an insider person was five days. It would be reasonable to assume that the information value to the insider trades would increase in the wake of the legislation change.

3.4 Norwegian Insider Laws

In Norway, insider trading is regulated through the Securities Trading Act[5] §§ 3-2 to 3-6 and §§ 4-2 to 4-2 (Verdipapirhandelloven, 2007). The provisions pertain to what is defined as inside information (§3-2), which prohibitions are imposed on holders of such information (section 3-3 and 3-4) and what requirements are issued to the issuer of the securities (§3-5). In addition, there is a duty to investigate according to § 3-6, which is directly concerned directors, senior executives, control committee members and auditors.

3.4.1 Inside information

Inside information is defined as "precise information […], which is likely to have a significant effect on the prices and not been made public or commonly known in the market" (Verdipapirhandelloven, 2007). It is worth noting the precision requirement. The second paragraph of the provision states that the information must be linked to specific circumstances or events, which in turn could be assumed to have deterministic effect on the pricing of the financial instrument.

Furthermore, the information must be likely to have a significant effect on the price of financial instruments or related financial instruments. The third paragraph states that the information must be of a such nature in which the information must be such that a reasonable investor would be likely to use it as part of the basis of his investment decision.

The development of this phrasing over time is interesting. Until 2001, the law required the information to be able to influence the stock price significantly, but the essential requirement was then removed to tighten the provisions, since all information that was suitable to influence the stock price should fall under the definition. In 2005, the current marketability requirement was introduced as part of a harmonization with EU legislation under the Market Abuse Directive (MAD). However, the work indicates that it is only a linguistic change and not a "material change in Norwegian insider trading ban" (Finansdepartementet, 2004).

[5] In Norwegian: Verdipapirhandelloven, Hereafter vphl

3.4.2 Insider

An insider is considered as any person, physically or legally, who possesses inside information after vphl. §3-2. There is no requirement to hold a particular position in the issuing company; it is rather the access to inside information that is essential. The issuing company is obligated to have updated lists of people receiving inside information according to vphl. §3-5. The third paragraph of the provision intercepts any ignorance situations, as the issuing company is obligated to inform listed persons of the duty of confidentiality and the trade- and counseling ban. Further, the company´s implementation of such information should be documented to the Financial Supervisory Authority.

In addition, it should be mentioned that section §3-6 of the act specifically requires investigation duty for several company roles. This indicates that the board member, senior employee, members of control committee and auditor actively investigate their positions regarding inside information before any trade. The duty also includes the deputy board member, observer and secretary. This group is called primary insiders, and also for these, issuing company are responsible for having an updated list that is posted on Oslo Stock Exchanges website. This list must not be confused with the list of persons with access to inside information as regulated in §3-5 (Finanstilsynet, 2015).

3.4.3 Insider trading and notification requirements

The discussion has so far been linked to illegal insider trading, while we are now looking into the legal insider trading; trade made by persons defined as primary insiders but who, at the time of the trade, do not possess inside information pursuant to §3-2.

Any trade by a primary insider mentioned in §3-6, first paragraph, shall according to §4-2 immediately provide notice of the purchase, sale, exchange or subscription of shares issued by the company or by companies in the same group. This is a new practice that was implemented 1. April 2017. It indicates that issuers have a continuous duty of disclosure to publish all inside information, all day and regardless whether marketplace is open or not (Oslo Børs, 2017).

Other requirements for the notice of insider trading are governed by vphl. § 4-4, which must state the name of the notifier and issuer, type of transaction, which instrument it has traded in, price and volume, time and market place for trade, as well as inventory after the transaction. This rule is especially important as it might affect the efficiency of the market. Since other countries (such as Sweden) allow insiders to wait for a longer period before publicly announcing their trades, some of the information value might be lost.

4.0 Previous Research

With a good understanding of asymmetric information, insider trading and insider regulation, relevant existing literature were studied. There are numerous studies related to the features of insider trading, so a full coverage of the material is therefore impossible. We have therefore chosen to present the findings of the research papers that we believe are the most relevant to our thesis.

4.1 Foreign studies

One of the first acknowledges research ever made around an insider´s ability for excess return was based on the data from the US market by Glass and Rogoff (1966) in the 60´s. The return per share was measured in relation to the market return, which the monthly purchase and sales portfolios were established for each company. They created the cumulative abnormal returns by comparing the performance of the security towards the stock exchange. The results indicates that their portfolio has a significantly higher return than its benchmark. The study of Lorie and Niederhoffer (1968) was conducted by the same approach in which they took over 150 companies in the US market. Their results showes that during the month of purchase, market returns increased over the next six months. Thus, one could already conclude that the US market was not highly efficient.
As more knowledge about statistical testing and better market data were collected, Jaffe (1974) and Finnerty (1976) made an improved effort to study the significance of insider trading.

Jaffe (1974) focused on larger sample size using 200 companies in the period between 1962-1968. He took into account transaction costs and concluded an average excess return on insiders of 3%. Thus, he also rejected the hypothesis of strong market efficiency. Jaffe (1974) also explicitly looked at how much more outsiders can earn by replicating insiders. After transaction costs, his results indicate no significant excess return for the outsiders. Finnerty (1976) took the research further and concludes that strong form of efficiency does not exist. The reason why his study was more credible than previous studies was primly due to the correction for market risk. He avoided to focusing on the inside deals that most likely yielded more returns than the average inside trade. In this way, he managed to remove the bias that other studies were accused of. This conclusion is also

supported by Chan, Gup, & Pan (1997), which tested market efficiency against various inside trades in 18 different countries.

Based on earlier research, Seyhun (1986) wanted to test the ability to achieve excess return based on an outsider following a strategy that only replicates insiders on the NY Stock Exchange. He therefore updated and expanded earlier studies with over 60 000 insiders from the US. In this way, he wanted to test whether it was possible to reject the hypothesis of half-strong efficiency. By continuing earlier research, he categorized insiders after managers, directors, chairman and major investors to control for the positions in the companies. Seyhun concludes that a higher position in the job hierarchy, such as board member, was synonymous with higher levels of information and higher expectation of excess return.

Lakonishok and Lee (2001) finds in their study of the US stock exchange that their insider purchases represented positive signals about further price development, while the same could not be shown to apply for inside sales. According to themselves, this was due to the fact that insiders buy based on other motives than they sell. In particular, they linked incentives to sales against a diversification motive, as opposed to purchases in which the profit motivation was strongest.

Fidrmuc, Geoirgen and Renneboog (2006) investigate the market´s reaction to U.K. insider transaction and analyze whether the reaction depends on the firm´s ownership. They use the market model on the UK market from 1991 to 1998 and find positive significance CAR for one day and five days. They also test the information hierarchy of Seyhun (1986), but finds no support for this.

Inci, Lu and Seyhun (2010) use a large intraday transaction base with 177.000 observations to test whether transactions possess valuable information and included only the open market purchase and sales by corporate officers, directors, and large shareholders on the NYSE. By dividing into purchase and sales, they find that insider trading contributes to the informational efficiency of the stock market.

4.2 Norwegian and Swedish studies

Eckbo and Smith (1998) further addressed the problem of Seyhun (1986), but implemented a more statistically advanced model on Oslo Stock Exchange. By deviating from the traditional event study method, they conclude that it was not possible to achieve abnormal excess return by following insiders on the Oslo Stock Exchange. They further argued that the finding of any excess return could depend on the choice of research methods. Implementation of simpler methods as used in several previous studies, gave according to Eckbo and Smith incorrect positive excess returns.

Hjertstedt and Kinnader (2000) studied a sample between January 1996 and August 1999 on the Stockholm Stock Exchange. Their results indicate that insiders earn significant abnormal returns. In addition, they show that transactions done in smaller firms were more profitable than those in larger firms.

Kallunki, Nilsson, and Hellström (2009) took the research of Lakonishok and Lee (2001) further, but they had more personal information about the insiders. They find strong support for the view that insiders sell for diversification objectives. Their results show that insiders´ portfolio re-balancing objectives, tax consideration and behavioral biases played the most important role in their trading decisions. Moreover, it gave them a better basis for concluding that insider sales can be more closely linked to diversification and tax motives and not primary profit motive.

One of the recent studies done in the Swedish stock market is from Maritvold and Flaa (2015). They analyzed 6 627 insider trades between 2010 and 2014. Their results show that insiders are better informed about the overall future performance of their company, indicating a violation of the semi-strong form of market efficiency hypothesis. In addition, they show that they were able to gain risk-adjusted returns above the market, but when controlling for transaction costs the risk-adjusted return vanished.

5.0 Data

The following chapter presents sources used to obtain data, important criterions and the categorizing of the data as well as descriptive statistics. In the final section of the chapter, we present how we prepared the data for analysis.

5.1 Data collection

The main purpose of data collection has been to secure a large and wide database of inside trades in the Norwegian and Swedish stock market. Dovre Forvaltning provided us with a raw dataset of 3843 insider trades in Norway from 21.09.2011-22.12.2017 and 45499 trades in Sweden from 14.12.2000 - 08.02.2017. In addition, the dataset contained the trading and reporting date for each trade and the company in which the trade was carried out, the name on the insider, his position, number of shares, price, total transaction value, whether it was purchase or sale, inventory by transaction, and relative change in inventory. Inventory after transaction and relative change in inventory was available only for Norway, so this is excluded from the discussion. Dovre Forvaltning has obtained data on Norwegian insiders from Newsweb, which is Oslo Børs' online publishing portal for company-specific information. Data on Swedish insiders have been obtained from the Insynsregistret, as Sweden's insider database is reported to Finansinspektionen. A segment of the total return data can be found in Appendix 1.

When the trade date and / or reporting date is a weekend or holiday, the date is set to the next business day to match the price data. For reporting dates, such a displacement is natural. An insider announcement published on a Sunday cannot react to the market before the stock exchange opens the following trading day. For the transaction dates, it is not as obvious. Since many insider transactions are made between closely related parties, or between two different insiders, they are often out of the market and on days when the stock exchange is closed. Data on share prices, price to book value, and market value of all securities traded on the Norwegian and Swedish stock market were obtained from Thompsons Reuters Datastream.

We collected additional pricing factors for the Norwegian market from Professor Bernt Arne Ødegaards at the University of Stavanger (Ødegaard, 2018). The data is based on developments in the Norwegian market and is thus suitable for use in

our analysis. Pricing factors in the Swedish market is collected from the Swedish House of Finance Research Data Center at the Stockholm School of Economics (2018), Sweden's national research center in financial economics.

5.2 Data criteria

We have determined certain criterions to our final dataset, which lead to an exclusion of some trades and companies. Our goal is to achieve a general analysis, and this sets natural limitations to some of the firms in our dataset. At the same time this increases the possibility that the insider trades are of purely financial nature. The criterions can also isolate the signaling effect given to the market by insider trading. This will further elucidate our research question best as possible. Our following criterions are:

1. Companies listed on Oslo Axess and Merkur Market in the Norwegian market, and companies listed on Aktietorget, First North and Nordic Growth Market in the Swedish market, are typically younger and high-growth companies that are illiquid and of smaller size. The fact that they are illiquid can lead to less accurate normal returns that can further bias the abnormal returns. This argues to exclude these companies. We therefore chose to focus on companies listed on the main Oslo- and Stockholms Stock Exchange. Consequently, companies listed on Oslo Axess, Merkur Market, Aktietorget, First North and Nordic Growth Market are removed from the dataset.

2. We set the minimum transaction value to 25.000 NOK/SEK. The reasoning behind this is that trades less than 25.000 NOK/SEK do not contain enough financial risk to be seen as a clear signal to the market. The optimal criteria would be to calculate every insider's net fortune and determine minimum transaction value as a percent of net fortune. This would of course be difficult to obtain since this data is not public and also because some of the trades lack the name of the insider. We therefore choose to use 25.000 as a minimum trading value in both countries.

3. Insider trades in equity other than A (Voting shares) and B (Non-voting shares) have been removed. This include firm options, bonus program,

warrants or other derivatives.

4. When an insider performs multiple trades in one day and report them disaggregated on a later day, the trades has been aggregated by summing the number of shares traded. The volume weighted average price is calculated for each such case. For instance, if an insider buys 20.000 shares and then 5.000 shares on the same day, this is seen as one trade of 25.000 shares. This is done according to Betzer and Theissen (2010) to avoid double counting of trades.

5. For the event studies, trades are excluded if there is not sufficient price data prior to the event to estimate expected returns. Trades in which there are not enough price data after the trades are also excluded.

6. Our dataset for Sweden was reduced to data from 01.01.2014 – 09.02.2017. This was done for several reasons. By reducing the dataset, we avoid the chance of having structural breaks, which could lead to huge forecasting errors and unreliability of the model in general (Damodar, 2007). By also reducing the data we will have a more comparable testing period with Norway.

After applying the above criterions, we ended up with 3825 events in Sweden from 01.01.2014 - 09.02.2017 and 2515 events in Norway in the period from 21.09.2010 - 20.12.2017 (table 1).

Norway	n	Average	Median	25% - quantile	75%-quantile	Min	Max
Buy	2 003	1 793 542	219 240	100 477	582 170	25 057	621 417 740
Sell	512	6 129 568	674 755	186 373	2 451 609	25 000	521 417 740
Pooled	2 515	2 676 264	266 640	107 783	824 163	25 000	521 417 740

Sweden	n	Average	Median	25% - quantile	75%-quantile	Min	Max
Buy	2 286	20 938 582	240 500	84 496	1 032 645	25 051	13 530 880 000
Sell	1 539	56 295 437	486 000	140 953	3 723 885	25 100	39 746 997 015
Pooled	3 825	35 164 517	311 150	100 000	1 684 000	25 051	39 746 997 015

Table 1: Descriptive statistics

From the table above, we observe that the average transaction value is significantly higher in both Norway and Sweden compared to the median in both countries

making the distribution positively skewed due to outliers[6]. When investigating the 75 % quartile, we can observe that this is also quite much lower than the average for both countries.

5.3 Insider position

The original dataset we received had detailed data on insider positions. Given that we wanted to test the information asymmetry hypothesis, we decided to divide insiders into two categories. Primary insiders and secondary insiders. Secondary insiders are typically insiders that are in an indirect relationship with the company, such as spouses or children. As our objective of this thesis is to look at the signal made by the publication of primary insiders within the firm, we only consider primary insiders of interest.

We use Seyhun´s paper *Insiders' profits, costs of trading, and market efficiency* (1986) for inspiration when categorizing our primary insiders. Primary insiders are divided as an information hierarchy in the following five categories:

1. Top Management
2. Managers
3. Board Member
4. Large Shareholder
5. Other

In the first category, top management, we chose a combination of all CFO´s and CEO´s, as we believe these has the most accurate and recent information on the firm. Financial directors and chief accountants are also defined as top management. In the second group, managers, we gathered all managers and directors that are not CFO´s and CEO´s, as these are likely to have less information of the firm as a whole. For board members, we include all the people on the board, both board members and chairmen. The large shareholder category includes whose ownership exceeds the threshold to become notifiable, but where the shareholder does not hold other positions in the company. In the last category, other, we include all the insiders that does not directly work within the firm. It includes consultants, lawyers, secretaries and other senior executives. In the data we obtained from Dovre

[6] An outlier is an observation point that is distant from other observation.

Forvaltning, insiders had different roles within the company in some events. In these cases, we categorized in accordance to the information hierarchy (if an insider was both top management and large shareholder, the insider would be categorized as top management) making the insider positions mutually exclusive.

From the table 2 we can see that the category large shareholders clearly trade on the highest volume in which both the median and average is higher than all the other categories. On the contrary, we observe that managers have the lowest trade volume in Norway, while top management have the lowest trade in Sweden.

Norway	n	Average	Median	25% - quantile	75%-quantile	Min	Max
BUY							
Top Management	649	805 170	190 200	97 689	462 500	25 800	43 500 000
Managers	400	453 519	173 847	73 638	338 673	25 350	47 850 000
Board Member	654	1 867 671	306 444	127 428	949 651	25 100	71 059 560
Large Shareholder	40	24 456 267	4 239 605	1 686 905	8 642 730	40 033	621 417 740
Others	260	3 037 109	249 443	101 194	613 425	25 057	368 950 000
SELL							
Top Management	121	4 481 548	669 960	213 031	3 651 000	31 780	65 088 005
Managers	124	1 629 557	732 896	196 092	1 784 475	25 000	26 234 604
Board Member	108	12 316 226	873 484	196 741	5 495 571	38 757	232 500 000
Large Shareholder	8	96 118 090	2 932 161	479 950	62 981 623	159 896	521 417 740
Other	151	1 953 042	484 500	101 450	1 307 716	25 860	79 814 078
Sweden	**n**	**Average**	**Median**	**25% - quantile**	**75%-quantile**	**Min**	**Max**
BUY							
Top Management	102	2 650 665	210 195	82 238	515 185	25 688	101 160 000
Managers	447	14 494 288	214 303	67 016	67 016	25 388	835 960 000
Board Member	708	33 336 848	277 640	99 955	1 146 250	25 051	13 530 880 000
Large Shareholder	328	38 015 154	628 508	107 993	3 502 560	25 563	4 033 640 000
Others	701	7 196 612	180 360	75 379	544 000	25 875	865 188 000
SELL							
Top Management	54	4 405 686	821 450	288 756	3 541 725	26 126	85 950 000
Managers	245	93 351 768	475 000	119 000	2 414 330	25 680	17 434 640 003
Board Member	525	88 553 506	618 008	220 800	4 422 010	25 872	39 746 997 015
Large Shareholder	139	101 396 620	1 103 804	252 000	4 422 010	26 632	1 861 725 000
Other	576	5 112 616	299 389	101 974	2 475 889	25 100	387 600 000

Table 2: Trades according to position and value

5.4 Choose of index

To execute our event study, we need a market index for each of the countries to calculate abnormal returns. Given that our dataset contains many companies of different size, we want to use indexes that reflect the broad stock market in both Norway and Sweden. For Norway, we have chosen to use the Oslo Stock Exchange All Share Index (OSEAX), which is a broader index that includes all the shares on the Oslo Stock Exchange. For Sweden, we use Nasdaq OMX Stockholm GI (OMXSGI). Both indexes are adjusted for capital events and dividend payments and include all companies on the respective main lists of the stock exchanges.

5.5 Data preparation

Since different databases were used to obtain information, company names were not 100% consistent. We therefore had to use Excel's lookup add-in (Microsoft, 2018) to match company names correctly (e.g., in one database the name of a company could end with "Limited", while in another – with "Ltd"), which minimize the proportion of wrong matches.

To perform the event study in Stata, we used Princeton Universitys *Event Studies with Stata* as a guideline (Princeton University Library, 2008). First, we prepared two raw datasets for each of the two countries. The first one called *eventdates_"country name".dta* (Appendix 2) contained daily event characteristics such as date, company and insiders' position. The second dataset *stockdata_"country name".dta* (Appendix 3) contained daily information on the stock and market returns, as well as Fama and French factors, liquidity and in addition, market value and price-to-book value for each company.

By merging these two datasets and expanding them so that company specific stock data is repeated as many times as there are events related to this company, we obtained a single dataset with all the necessary information.

6.0 Methodology

In this chapter we will explain the methodology used to conduct the analysis. In our research paper, we use a deductive approach. The purpose is to arrive at a specific conclusion through given logical premises. We base our thesis on existing research and form our own hypothesis, which is then tested. To get an overview of the deductive procedure, we choose to explain this in the figure below:

Figure 1: Deductive approach

6.1 Theoretical Framework

To look at the ability of insiders gaining abnormal returns, we need a method to measure the effect of these signals. The first part is about revealing whether reporting of notifiable insiders have information value for the stock-market in Norway and Sweden. In this case we place ourselves in the framework of Mackinlay (1997) to conduct the event study.

In the attempt to measure the effect of the new regulation in Sweden we studied the paper *Information content of insider trades before and after the Sarbanes-Oxley Act*[7] by Brochet (2010) for inspiration. We wish to see if the change in legislation increase information value of the insider trade notifications. However, it is important to emphasize that it is hard to determine for a fact that an increase will solely due to changes in legislation and no other unobserved factor, hence the results must be interpreted carefully as bias can exist as a result of omitted variables.

We will implement all of our event studies using the statistical software program STATA/SPSS, and in some cases, we supplement the use of STATA with Excel.

[7] The Sarbanes-Oxley Act (SOX) is an act passed by U.S. Congress in 2002 to protect investors from the possibility of fraudulent accounting activities by corporations

6.2 Event Studies

We will use the same approach as described by MacKinlay (1997) when we calculate normal returns, abnormal returns (AR) and cumulative abnormal returns (CAR) using daily data. The purpose of event studies is to use financial data to measure the effect of a specific event (an earnings announcement) on the company´s value (change in its stock price), similar to what we will do. In a rational market, the benefit of such studies will arise from the fact that the effect of this event will immediately appear in the price of the company´s shares. Event studies are thus effective when measuring how new information is interpreted by the public.

McKinley (1997) suggest a general procedure for conducting an event study;

1. **Event definition:** Decide the event of interest, and in which period will the security prices of the firms involved be examined?
2. **Selection criteria:** Which firms are included in the study?
3. **Normal and abnormal return measurement:** Which method to use when calculating normal and abnormal returns?
4. **Estimation window:** Given the selection of a normal performance model, we need to decide the estimation window of normal returns.
5. **Testing framework:** Design the testing framework for abnormal returns and aggregating the individual securities abnormal returns.
6. **Hypothesis testing:** Present the empirical results and how they can be interpreted.

In the following sub-chapters, this procedure is described in detail.

6.3 Event definition

The event of interest is the publication of the insider trade. This is the day when the market is made aware of the insider trade.

The event window will consist of days and months following the trades by insiders. Our event windows measured are [0,1], [0,5], [0,30], [0,60] and [0,120]. The estimation window was chosen so that it is nearby the event, but to avoid any overlap. These event windows are chosen to both see the short term and long term market reactions allowing us to measure performance also in the months following

the insider trades. This provide us with a better understanding about the size of the information asymmetry than what just immediate abnormal return does.

6.4 Selection Criteria

After identifying the event, it is necessary to determine the selection criteria for the inclusion of a given firm in the study (MacKinlay, 1997). The criteria may involve restrictions imposed by data availability or restrictions such as membership in a specific industry. For a more detailed explanation on selection criteria see chapter 5.2 Data Criteria.

6.5 Method for calculating normal and abnormal returns

Appraisal of the event´s impact requires a measure of the abnormal return (MacKinlay, 1997). The normal return is defined as the expected return that a security would earn without an insider trade taking place. We define the abnormal returns as the difference between expected return and the real return.

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau}|X_{\tau})$$

Where:

$AR_{i\tau}$= Abnormal return for time period τ.

$E(R_{i\tau}|X_{\tau})$ = Normal return for time period τ.

$R_{i\tau}$ = Actual return for time period τ.

X_{τ} = Conditioning information for the normal return model.

A challenge when doing event studies is to calculate normal return. MacKinlay (1997) states that a number of approaches are available to calculate the normal return for a given security. Furthermore, he groups the approaches loosely into two categories, economic and statistical models.

Economical Models

Two common economical models are the *Capital Asset Pricing Model (CAPM)* and the *Arbitrage Pricing Theory (APT)*. CAPM explains the relationship between risk and expected return and is used theoretically to determine the price of shares. CAPM is based on strict theoretical assumptions, such as a perfect capital market with full information without tax or transaction costs. CAPM was commonly used

in event studies in the 1970s, but has fallen out of favor due to the discovery of deviations from the model. Fama and French (1996) discuss the validity of studies, arguing that the studies could be too sensitive due to CAPM restrictions.
Today, CAPM is almost never used for such purposes (MacKinlay 1997). The criticisms include the ignore of transaction costs (H. Nejat Seyhun, 1986) and CAPM's assessment of the market portfolio (Richard, 1977).

The APT model, developed by Ross (1976), is a model that considers the expected return based on a linear function of various macroeconomic factors. It is not limited to just one factor, such as CAPM, but can include a variety of variables. The drawbacks are due to the difficulty of choosing which factors for estimating normal return. A general finding is also that the most important factor in an APT model acts as a kind of market factor and that the other factors give minimal or no additional explanation for the model. For this reason, the gain of using APT compared to the market model is small (MacKinlay, 1997). However, MacKinlay argues if one use economic models in practice, it is necessary to add statistical assumption. Thus, the potential advantages of economic models are not the absence of statistical assumptions, but the opportunity to calculate more precise measures of the normal return using economic restrictions.

Statistical Models

MacKinlay (1997) present *The Market Model, Constant Mean Return Model*, and *Multifactor Models* as the most frequent used models. These models differ from the economic models by observing statistical assumptions about a share´s movement, and not economic interpretations of an investors behavior. The market model assumes there is a stable linear relationship between the returns of a security and the market return (Sharpe, Alexander, & Bailey, 1999). The constant mean return model instead calculates that the expected return is constant over time (Campbell & Wesley, 1993). The advantages of using the market model is that it removes the portion of the return related to variation in the market´s return. It therefore presents a potential improvement over the constant mean return model by reducing the variance of the abnormal returns. The market model has been used in the majority of previous studies in the field, including MacKinlay (1997). Brown and Warner (1985) conclude that the market model is best suited for event studies and shows that it is not beneficial to use another model.

MacKinlay (1997) argues that multifactor models are motivated by the benefits of reducing the variance of the abnormal return by explaining more of the variation in the normal return. However, he argues that there are limited gains from employing multifactor models for event studies since the explanatory power of additional factors to the market is small. In cases where the sample firms have common characteristics, such where they are all members of one industry or they are all firms concentrated in one market capitalization group, the variance reduction could still be significant.

We will therefore estimate normal returns using the market model in addition to the liquidity augmented Fama and French model (multifactor model). All model´s estimation procedure is described in 6.5 testing framework.

6.4 Estimation window

Given the selection of a normal performance model, the estimation window needs to be defined. We define the estimation window as the time period prior to the event. It is important that the estimation window is long enough to give a precise picture of the volatility of the security, while still being relevant when the event occurs. MacKinlay (1997) argues that the optimal window is between 180 and 250 days, while Peterson (1989) claims that a typical length of the estimation period range from 100 to 300 days. We therefore decide to use 200 days: the period from the 5h to the 205th day before the event (figure 2). The estimation window was chosen so that it is nearby the event, but to avoid any overlap. To estimate normal- and abnormal returns, we need price data from the 205 trading days prior to the insider trades, and data for the whole estimation window. We do not vary estimation window depending on the event window, because we assume that the "normal" relationship between stock return and market return is relatively stable in the short run and we should avoid using data near the event as much as we can.

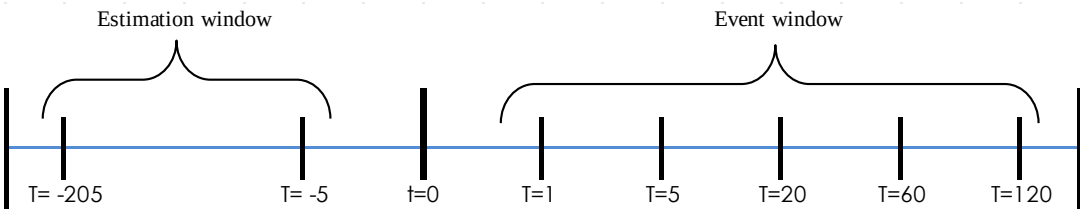

Figure 2: Time-horizon for our event study

6.5 Testing framework

Next comes the design of the testing framework for the abnormal returns. In the following calculations, all return data are in logarithmic form. The logarithmic returns are calculated using the following formula:

$$R_{i,t} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

Equation 1: Logarithmic return

Where:

$P_{i,t}$ = Represents the security close price on time

There are several positive effects associated with using logarithmic form rather than arithmetic returns, both theoretically and empirically. First, accumulated returns can be calculated by simple summing, which simplifies the calculation of accumulated returns. Secondly, it has been shown empirically that the return on logging is easier to be normally distributed that arithmetic returns (Henderson Jr, 1990).

The Market Model

The market model is an application of simple linear regression to portfolio management. The model is a one-factor model and it is based on the relationship between the return on a single stock and the return on an index. It is often expressed as (Sharpe et al., 1999):

$$R_{it} = \alpha_i + \beta_{it} R_{mt} + \varepsilon_{it}$$

Equation 2: Market Model

Where:

R_{it} = Return on stock i at time t.

R_{mt} = Return on the market portfolio M at time t.

α_i = Intercept (return of R_i if R_m equals zero).

β_{it} = Slope (estimate of the systematic risk of asset i).

ε_{it} = Error term (firm specific risk).

Due to the fact that the residual (ε_{it}) includes all variations that the rest of the model do not explain, this eliminates some of the variance in the abnormal change in the price of the share (Bodie, Kane, & Marcus, 2014).

The estimation of alpha, beta and error variance is found using the ordinary least square method (OLS), which is the best linear unbiased estimator (BLUE), given that these assumption holds (Brooks, 2008):

1. The expected value of the error term is zero: $E(u_{it} = 0)$.
2. The variance of the error term is constant and finite over all values: $var(u_{it}) = \sigma^2 < \infty$.
3. The errors are linearly independent of one another: $cov(u_i, u_j) = 0$.
4. There is no relationship between the error and the corresponding x variate $cov(u_t, x_t)$.

To fulfill the first assumption, a constant term will be included in our regression. This will make the expected error term equal zero, and thus the assumption will never be violated. The next assumption assumes no heteroscedasticity and no autocorrelation. Autocorrelation in event studies can be caused by the fact that patterns are similar for the same company (and each company has several events). To control for this, we will use cluster-robust standard errors.

The OLS estimators will be calculated by the following formulas (MacKinlay, 1997):

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_{i,M}\hat{\mu}_M$$

Equation 3: Alpha Market Model

$$\hat{\beta}_i = \frac{\sum_{t=T_{-205}}^{T-5} (R_{i,t} - \hat{\mu}_i)(R_{mt} - \hat{\mu}_m)}{\sum_{t=T-205}^{T-5} (R_{mt} - \hat{\mu}_m)^2}$$

Equation 4: Beta Market Model

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L_1 - 2} \sum_{t=T_{-205}}^{T-5} (R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt})^2$$

Equation 5: Variance of the error term Market Model

Furthermore, $\hat{\mu}_i$ and $\hat{\mu}_m$ are given by:

$$\hat{\mu}_i = \frac{1}{L_1} \sum_{t=T_{-205}}^{T-5} R_{it}$$

$$\hat{\mu}_m = \frac{1}{L_1} \sum_{t=T_{-205}}^{T-5} R_{mt}$$

Where:

$R_{it} and\ R_{mt}$ = Return in event period t for security i and the market respectively.

L_1= Represents the length of trading days in the estimation window (200 days).

Multifactor model

The multifactor model is based upon the study done by Fama and French (1993), and Carhart (1997). Fama and French argues that CAPM has a number of anomalies, but that their three-factor model captures them. The three-factor model extends the CAPM model by two new factors. In addition to the market portfolio, the model includes one control factor for size effects SMB (small minus big), and one that controls for the book-to-market effect HML (high minus low). Furthermore, they argue that SMB and HML not necessarily are obvious variables to include as risk factors. However, they could work as fundamental variables in which investors demand compensation.

Most successor studies to Fama and French (1993) aim to conceptualize market anomalies by adding an extra factor to their original three-factor model. Carhart (1997) constructed a Four-Factor-Model using Fama and French model plus an additional factor, momentum. Momentum might be interpreted as the risk factor mimicked by the return on a portfolio of winner stocks minus the return on a portfolio of loser stocks. However, Al-Mwalla (2012) empirically provide that Fama and French´s (1993) three factor model is superior to the momentum factor-augmented model in the Amman Stock Exchange.

Liquidity is another factor frequently suggested to explain return variation. Chan and Faff (2005) examine the asset-pricing role of liquidity in the context of the Fama and French (1993) three-factor model in data from 1990 to 1998. Their results

support the overall favorability of the liquidity-augmented Fama-French model. In addition, they find that the asset-pricing performance of the liquidity factor is generally very robust to a wide range of sensitive checks. Sehgal, Subramaniam, and De La Morandiere (2012) further empirically show that the liquidity-augmented Fama-French model is better than the CAPM and three-factor models when tested using Bombay Stock Exchange data.

It will therefore be important to control for liquidity in the multifactor model since controlling for this additional risk factor will allow us to make better inferences. If not, this could lead us to overestimate abnormal returns for the illiquid stocks as they often are traded on a premium.

Our empirical multifactor model is therefore a liquidity augmented Fama and French model:

$$R_{it} = \alpha_i + \beta_{i,M} R_{Mt} + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \beta_{i,LIQ} LIQ_t + \varepsilon_{it}$$

Equation 6: Multifactor model

Where:

$\beta_{i,SMB}$ = Coefficient for SMB (estimate of the size risk for asset i).

SMB_t = Small Minus Big Factor.

$\beta_{i,HML}$ = Coefficient for HML (estimate of the value risk for asset i).

HML_t = High Minus Low Factor.

$\beta_{i,LIQ}$ = Coefficient for Liquidity.

LIQ_t = Liquidity Factor.

ε_{it} = Error term

The regression follows the same assumption and the method as the Market Model. Estimators of the multifactor model will therefore be:

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_{i,M} \hat{\mu}_M + \hat{\beta}_{i,SMB} SMB_t + \hat{\beta}_{i,HML} HML_t + \hat{\beta}_{i,LIQ} LIQ_t$$

Equation 7: Alpha Multifactor model

$$\hat{\beta}_{i,SMB} = \frac{\sum_{t=T_{-205}}^{T-5} (R_{i,t} - \hat{\mu}_i)(SMB_t - \widehat{SMB})}{\sum_{t=T-205}^{T-5} (SMB_t - \widehat{SMB})^2}$$

$$\hat{\beta}_{i,HML} = \frac{\sum_{t=T_{-205}}^{T-5} (R_{i,t} - \hat{\mu}_i)(HML_t - \widehat{HML})}{\sum_{t=T-205}^{T-5} (HML_t - \widehat{HML})^2}$$

$$\hat{\beta}_{i,LIQ} = \frac{\sum_{t=T_{-205}}^{T-5} (R_{i,t} - \hat{\mu}_i)(LIQ_t - \widehat{LIQ})}{\sum_{t=T-205}^{T-5} (LIQ_t - \widehat{LIQ})^2}$$

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L_1 - 2} \sum_{t=T_{-205}}^{T-5} (R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} - \hat{\beta}_{i,SMB} SMB_t - \hat{\beta}_{i,HML} HML_t - \hat{\beta}_{i,LIQ} LIQ_t)^2$$

Equation 8: Variance of the error term Market Model

Abnormal returns (AR)

Given the market model parameter estimates, we can measure and analyze the abnormal returns. We let AR_{it} denote abnormal return for share i in the event period $t = T_1 + 1, \dots, T_2$ and calculate it by the following equations:

$$\boldsymbol{AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}}$$

Equation 9: Abnormal return - Market Model

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} - \hat{\beta}_{i,SMB} SMB_t - \hat{\beta}_{i,HML} HML_t - \hat{\beta}_{i,LIQ} LIQ_t$$

Equation 10: Abnormal return - Multifactor Model

Variance of abnormal returns

The abnormal returns will be jointly distributed with a zero conditional mean and conditional variance equal to:

$$\sigma^2(AR_{it}) = \sigma_\varepsilon^2 + \frac{1}{L_1}\left[1 + \frac{(R_{mt} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right]$$

Equation 11: Conditional Variance

Equation 11 consists of two components. The first component is the disturbance variance σ_ε^2 calculated from the estimation model (in our case market model or multifactor model). The second part is additional variance due to sampling error in

α_i and β_i. MacKinlay (1997) argues that as the estimation window L_1 increase, then the second term will converge to zero as the sampling error of the parameters vanish. As we use large estimation window, is it reasonable to assume that the second component, $\frac{1}{L_1}\left[1+\frac{(R_{mt}-\hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right]$, is equal to zero.

Cumulative abnormal returns (CAR)

To draw any overall conclusion of abnormal returns we need to aggregate all the abnormal returns for the event of interest, both through time and across shares/firms to obtain CAR:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it}$$

Equation 12: Cumulative abnormal returns (CAR)

Asymptotically (as L_1increase), the variance of CAR_i is:

$$\sigma_i^2(t_1, t_2) = (t_2 - t_1 + 1)\sigma_\varepsilon^2$$

Equation 13: Variance of CAR

Average abnormal return (AAR)

We also need to aggregate abnormal returns of all insider trades as tests with one event observation are not likely to be useful. This is done by calculating abnormal returns for day t across all N events with corresponding variance:

$$\overline{AR}_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

Equation 14: Average abnormal return (AAR)

And for large L_1, its variance is

$$var(\overline{AR}_t)\frac{1}{N^2}\sum_{i=1}^{N}\sigma_{\varepsilon,i}^2$$

Equation 15: Variance AAR

Cumulative average abnormal returns (CAAR)

The average abnormal returns can then be aggregated over the event window using the same approach as used to calculate the CAR measure, which the average abnormal return is accumulated over time by summation:

$$\overline{CAR}(t_1,t_2) = \sum_{t=t_1}^{t_2} \overline{AR}_t$$

Equation 16: Cumulative average abnormal return

The variance of the cumulative average abnormal return is found as:

$$var\left(\overline{CAR}(t_1,t_2)\right) = \sum_{t=t_1}^{t_2} var(\overline{AR}_t)$$

Equation 17: Variance average cumulative abnormal returns

Statistical testing:

To test whether the abnormal returns are significant, that is, if an abnormal return actually exist, a two-sided t-test will be employed:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\bar{\mu}_1 - \bar{\mu}_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Equation 18: Two-sided t-test

Where:

x_i = cumulative abnormal return in asset i.

u_i= Expected cumulative abnormal returns

σ_i^2 = Variance of CARs

n_i = Number of observations

This test statistics will be compared with the critical value of a two-sided test with 0,01, 0,05 and 0,001 significance level. When the absolute value of the test- statistic is larger than the positive critical value, the null hypothesis will be rejected.

Using a two-sided test implies that we test for positive and negative abnormal returns both when insiders buy and sell shares in their own company. By our way of reasoning one can argue that one should only test for positive abnormal returns from buy transactions and negative abnormal returns for sell transaction. However, we cannot know beforehand what kind of results we will obtain. We will therefore also test for negative abnormal returns for buy transactions and positive abnormal returns for sell transactions.

6.6 Multiple Regression Analysis Abnormal Returns

To better understand what factors the market reacts to, we use a multiple regression. From our descriptive data we found that our factors are confounding. In our data, top management and board members in Norway have a tendency to trade in larger volumes than managers. In Sweden, managers and board members tend to trade in larger volumes than top management. To control these factors, we run a multiple regression equation so that multiple factors are controlled for.

$$y = \beta_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_k x_k + \varepsilon_k$$

Equation 19: Multiple regression

Where:

y = Dependent variable

$x_2, x_3, \ldots, x_k$ = Independent variables

β_1 = Constant

$\beta_2, \beta_3, \ldots \beta_k$ = Coefficient of independent variables

ε_k = Error term

Variables x2, x3,...,xk are a set of k−1 explanatory variables which are thought to influence y, and the coefficient estimates β1, β2,...,βk are the parameters which quantify the effect of each of these explanatory variables on y. The coefficient interpretations are somewhat altered in the multiple regression context. Each coefficient is now known as a partial regression coefficient, interpreted as representing the partial effect of the given explanatory variable on the explained variable, after holding constant, or eliminating the effect of, all other explanatory variables (Brooks, 2008).

7.0 Results

In this chapter, we describe the results of our analysis. First, we give a brief overview of how we test each hypothesis, and then we present tables related to each hypothesis being tested. We report buy and sell transactions for Norway and Sweden separately and point out all the commonalities and differences in the results of hypotheses testing. The results of MV and PTBV will be presented with three decimals due to some small results.

A series of OLS regressions with cluster-robust standard errors (accounting for the fact that some events correspond to the same company), aimed at explaining the variation of cumulative abnormal returns, were built to test the hypotheses. This approach makes our analysis methodologically more accurate compared to research that used simple t-tests. We refer to results as highly significant if they are statistically significant at a 1% level and significant if they are significant at a 5% level. For convenience, even though originally, CAR was measured in fractions, we multiplied them by 100% so they are presented in %.

The distribution of CAR for various event windows is rather symmetric, but also very disperse, this increases the influence of outliers, which is why in the robustness check section of the paper we will verify the results using a technique that is robust to outliers – median regression (Parente & Silva, 2016).

For consistency, we report all results in the form of regression tables. Regression analysis is a generalization of many other statistical inference methods (such as t-tests, ANOVAs), but unlike them also allows reporting t-statistics and significance based on robust standard errors and accounting for the multiple independent variables (including continuous variables) simultaneously whenever it is necessary.

7.1 Hypothesis 1: Abnormal return

H1: Do insiders earn abnormal return?

When testing our first hypothesis, cumulative abnormal returns (CAR) were regressed on a constant, which is equivalent to testing that CAR equal zero but gives us an opportunity to use cluster-robust standard errors accounting for the multilevel nature of our data (events are nested within companies). Market models (MM) and multifactor model (MF) yield almost identical OLS estimates regarding the magnitude and significance of CAR earned after insider trades. Constant parameter estimates correspond to mean CAR for each of the event window.

Hereinafter, our interpretation will be based primarily on MF results, while MM results will be used to check for the sensitivity of the results.

Norway:

Table 3: OLS regressions (Hypothesis 1, Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	**1.30*** **	**1.38*** **	0.98	0.82	-1.16	**1.33*** **	**1.36*** **	0.97	0.75	-1.64
	(4.50)	(4.34)	(1.44)	(0.69)	(-0.48)	(4.54)	(4.29)	(1.42)	(0.64)	(-0.72)
= n	1931	1929	1921	1910	1826	1931	1929	1921	1910	1927
R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	-0.13	-0.58	**-3.81****	**-10.15****	**-18.09*****	-0.17	-0.65	**-3.58****	**-9.08****	**-16.06*****
	(-0.22)	(-0.89)	(-2.94)	(-3.20)	(-4.02)	(-0.30)	(-0.98)	(-2.74)	(-3.02)	(-3.81)
= n	499	499	491	478	453	499	499	491	478	493
R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return for the different event windows.

In Norway, CAR observed in periods [0,1] and [0,5] were approximately 1.3% and 1.4% correspondingly for buy transactions indicating that the insider trading can lead to positive abnormal profits only immediately after the event. Further, as time increases we observe a declining return rate, where at [0,120] the return is negative, but not significant. A possible explanation might be a result of mean reversion, in which the stock price returns back to previous levels. If mean reversion explains these patterns, then the market indicates that buy transactions made by insiders don't carry any long-lasting value to the stock price. This would suggest that the value of insider information is somewhat limited.

When testing for sell transactions we observe that both models are consistent in their outcomes in which they both show insignificant results for the [0,1] and [0,5] event window. However, for [0,30], [0,60] and [0,120] event window, we obtain somewhat surprising results. For example, in the [0,30] event window we obtain a significant abnormal return of –3.58%, which is further decreasing at a higher rate. This could suggest that the market reaction to negative events has a stronger impact on future returns over time than purchases and serious negative consequences of insider selling for investors in the longer term. We can also observe a correlating pattern in the significant CAR between the two models. For instance, in the MF we see that the CAR is decreasing as longer the event windows become, this pattern is similar for the MM model. It is also worth mentioning that we have fewer transactions for sell than for buy, and that the high abnormal return of -18.09% for [0,120] can indicate that it is some outliers in the selection that leads to the extreme value.

Result Discussion

Our results for buy transactions in Norway point in the same direction as Aktas, De Bodt and Van Oppenes (2008) with abnormal returns in both one day and five-day window, and Jeng, Metrick and Zeckhauser (2003) positive five-day abnormal returns. The results suggest that buyers have a good feel for near-term developments within their firm and that the insider thinks that the company is undervalued in the market. Our results are further supported by Fidrmuc, Geoirgen and Renneboog (2006). They use the market model on the UK market from 1991 to 1998. Aligned with our results, they find a significant positive CAR of 1.16 % and 1.65 % for one day and five days respectively.

However, our results contradict the results found by Eckbo and Smith (1998) on the Oslo Stock Exchange. They conclude that the performance analysis rejects the hypothesis of positive abnormal performance by insiders. The difference between our results and Eckbo and Smiths could be explained by the difference in approached to measure abnormal returns. Eckbo and Smith point out that their more general performance measures appear to eliminate evidence of abnormal performance produced by the classical event-study approach. It is worth mentioning that Eckbo and Smith test the classical technique to their dataset and find some abnormal returns following trades, primary from sale transactions.

Results from other master thesis on the Norwegian stock market are also in line with our results. Holen (2008) tested for abnormal return in the time period 01.01.05- 31.10.07. He finds significant positive abnormal return of 1.36 % in a five-day event window and significant negative. Langli (2015) looking at insider buy transactions from 01.01.12 – 31.12.13 also find evidence supporting that insiders earn abnormal return. Using the three-factor model he finds significant abnormal return of 1.88 % for the event window [0,1].

Sweden:

Table 4: OLS regressions (Hypothesis 1, Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	**0.52****	0.39	0.31	0.74	0.78	**0.52****	0.39	0.31	0.72	0.96
	(2.91)	(0.88)	(0.53)	(0.96)	(0.71)	(2.91)	(0.88)	(0.53)	(0.94)	(0.89)
= n	2286	2286	2286	2286	2281	2286	2286	2286	2286	2286
R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Market Model (MM)					**Multifactor Model (MF)**				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	**-0.48***	**-0.83***	**-1.71***	**-4.42****	**-5.77****	**-0.48***	**-0.83***	**-1.72***	**-4.44****	**-5.70****
	(-2.03)	(-2.59)	(-2.47)	(-2.93)	(-2.64)	(-2.03)	(-2.59)	(-2.48)	(-2.94)	(-2.69)
= n	1539	1538	1522	1520	1517	1539	1538	1522	1520	1537
R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return for the different event windows.

The results for Sweden show that the market reaction is only significant for the [0,1] event window, both for the MF and MM model. Further, as the event window increase, the CAR decrease and becomes insignificant. Hence, the value of insider information is somewhat more limited in contrast to the Norwegian Market.

The statistics for Sweden indicate negative consequences of insider selling. It shows that the null hypothesis of no abnormal returns is rejected in the event window [0,1], [0,5] and [0,30] at 5% significance level. The negative consequences are more pronounced for the periods of [0,60] and [0,120] at 1% level. The significant results over the event windows and across models can imply negative longer-term abnormal returns after insider selling transaction.

Result Discussion

Our results are in line with the findings from Sjöholm and Skoog (2006) on the Swedish stock market between 1990 and 2004. When looking at buy and sell transactions, their statistics show that the null hypothesis of no abnormal returns is rejected for all the event windows for sell transactions, similar to our result.

However, these findings are contrary to some previous literature finding largest abnormal returns following insider purchase. Lakonishok and Lee (2001) and Jeng et al (2003) finds evidence of abnormal return from insiders purchase transactions in the US market, but nothing for the sell transactions. In contrast, (Hjertstedt & Kinnader, 2000) finds that insider make abnormal returns both when they are purchasing and selling.

Our findings for both Norway and Sweden are rather surprising and could be interpreted as a sign that the insiders reason for selling stocks in their own company is the same as their reason for buying stock, namely to earn a profit. Other motives for insider trading brought up in chapter 3.1, such as the liquidity motive may not be needed to be considered since all insiders seek to maximize return. Our results also indicate that insiders selling sends a stronger signal to the market than when they are buying stocks.

7.2 Hypothesis 2: Firm Characteristics

H2: Does market value and price to book ratio affect abnormal returns earned by insiders?

To test for the impact of MV and PTBV on CAR, MV and PTBV were used as explanatory variables in the OLS regressions with CAR for different event windows as the dependent variables. For buy transactions in Norway the negative effect of MV is statistically significant only for the [0,5] event window and the PTBV effect is highly significantly positive for event window [0,120] according to both MM and MF. Company's MV is not an influential factor for sell transactions, while, other things equal, PTBV significantly increases CAR for event windows starting from [0, 30].

Table 5: OLS regressions (Hypothesis 2, Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
MV	-0.005	**-0.008*** **	-0.005	-0.002	0.004	-0.006	**-0.009*** **	-0.008	-0.009	-0.007
	(-1.52)	(-4.22)	(-0.94)	(-0.23)	(0.26)	(-1.82)	(-4.89)	(-1.74)	(-1.43)	(-0.62)
PTBV	-0.003	-0.002	0.006	0.046	**0.089***	-0.003	-0.002	0.006	**0.052***	**0.111*** **
	(-1.32)	(-0.74)	(0.43)	(1.95)	(2.45)	(-1.55)	(-0.52)	(0.44)	(2.41)	(3.35)
Constant	**1.41*** **	**1.59*** **	1.09	0.97	-1.01	**1.44*** **	**1.58*** **	1.13	0.99	-1.48
	(4.42)	(4.60)	(1.46)	(0.75)	(-0.38)	(4.48)	(4.59)	(1.52)	(0.78)	(-0.61)
= n	1894	1892	1884	1873	1790	1894	1892	1884	1873	1890
R^2	0.001	0.003	0.000	0.001	0.001	0.002	0.003	0.001	0.002	0.002
Adjusted R^2	0.000	0.002	-0.001	0.000	-0.000	0.001	0.002	-0.000	0.001	0.001

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
MV	-0.001	0.003	0.000	0.007	0.012	-0.001	0.003	-0.003	-0.001	0.011
	(-0.42)	(0.78)	(0.00)	(0.49)	(0.40)	(-0.37)	(0.80)	(-0.40)	(-0.08)	(0.40)
PTBV	0.148	0.062	**0.545*** **	**1.600*** **	**1.916*** **	0.137	0.036	**0.508*** **	**1.538*** **	**1.703*** **
	(1.12)	(0.75)	(8.47)	(6.05)	(5.20)	(1.05)	(0.44)	(7.85)	(6.27)	(5.75)
Constant	-0.22	-0.71	**-3.97*** **	**-11.05*** **	**-19.43*** **	-0.26	-0.72	**-3.56** **	**-9.61*** **	**-17.10*** **
	(-0.30)	(-0.91)	(-3.59)	(-5.67)	(-5.72)	(-0.35)	(-0.93)	(-2.96)	(-4.81)	(-4.51)
= n	493	493	485	472	447	493	493	485	472	487
R^2	0.012	0.002	0.059	0.160	0.084	0.011	0.001	0.050	0.156	0.053
Adjusted R^2	0.008	-0.002	0.055	0.156	0.080	0.007	-0.003	0.046	0.153	0.049

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The tables reports MV and PTBV as explanatory variables with CAR for different event windows as the dependent variable.

The negative effect of MV is more pronounced in Sweden (Table 6). CAR significantly decrease ($p<0.01$) as MV increases for event windows [0,60] and [0,120]. The effect of PTBV is not statistically significant for buy transactions. The effect of MV is significantly positive in the short term for sell transactions ($p<0.01$). The effect of PTBV is rather weak, but still there is evidence of its negative impact on CAR after insider selling for some event windows ($p<0.05$).

Table 6: OLS regressions (Hypothesis 2, Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
MV	-0.003	0.001	-0.009	**-0.041*** **	**-0.062*** **	-0.003	0.001	-0.009	**-0.041*** **	**-0.062*** **
	(-1.93)	(0.27)	(-1.25)	(-3.62)	(-5.03)	(-1.92)	(0.27)	(-1.24)	(-3.63)	(-4.84)
PTBV	0.097	0.130	0.041	0.098	-0.079	0.097	0.130	0.041	0.099	-0.182
	(1.45)	(1.36)	(0.27)	(0.41)	(-0.27)	(1.45)	(1.36)	(0.27)	(0.42)	(-0.61)
Constant	0.31	0.01	0.36	1.24	2.01	0.31	0.01	0.36	1.22	2.46
	(1.50)	(0.02)	(0.46)	(1.09)	(1.24)	(1.50)	(0.02)	(0.46)	(1.08)	(1.52)
= n	2281	2281	2281	2281	2277	2281	2281	2281	2281	2281
R^2	0.009	0.003	0.002	0.027	0.039	0.009	0.003	0.002	0.027	0.038
Adjusted R^2	0.008	0.001	0.000	0.025	0.038	0.007	0.001	0.000	0.025	0.036

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
MV	**0.004** **	**0.003** **	0.004	-0.016	-0.036	**0.004** **	**0.003** **	0.003	-0.016	-0.035
	(2.88)	(2.67)	(0.57)	(-0.88)	(-1.12)	(2.87)	(2.66)	(0.56)	(-0.89)	(-1.10)
PTBV	-0.001	**-0.018***	-0.002	**-0.038***	**-0.176*** **	-0.001	**-0.018***	-0.002	**-0.038***	**-0.061***
	(-0.32)	(-2.22)	(-0.29)	(-2.54)	(-3.46)	(-0.32)	(-2.22)	(-0.30)	(-2.54)	(-2.51)
Constant	**-0.64***	**-0.91***	**-1.89***	**-3.48***	-3.31	**-0.64***	**-0.91***	**-1.89***	**-3.49***	**-3.80***
	(-2.55)	(-2.53)	(-2.31)	(-2.22)	(-1.77)	(-2.55)	(-2.53)	(-2.31)	(-2.22)	(-2.10)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534
R^2	0.018	0.015	0.001	0.015	0.061	0.018	0.015	0.001	0.015	0.047
Adjusted R^2	0.015	0.012	-0.002	0.012	0.058	0.015	0.012	-0.002	0.012	0.044

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The tables reports MV and PTBV as explanatory variables with CAR for different event windows as the dependent variable.

Result discussion

In general, our result for the effect of MV and PTBV are rather weak, but there is some evidence of affect in both Norway and Sweden for buy and sell transactions. It could be reasonable to expect a weak result as MV and PTBV normally does not change a lot over smaller periods of time. Hence, we do not expect to see significant effect in the lower CAR, which is the case for MV buy five-day CAR in Norway and MV sell one day and five-day CAR as well as PTBV sell five-day CAR in Sweden. However, the results are rather weak and is likely to be non-systematic and due to other non-relevant explications. We found some significant results in CAR 30-120 for both Norway and Sweden, which is more expected, but overall the results are weak and indicate low effect of MV and PTBV.

7.3 Hypothesis 3: Insider Position

H3: Do different insider position within the firm earn abnormal returns?

In regressions of CAR on dummy variables indicating various insider´s positions, the constant indicated average CAR for the reference category – board member, while other parameters estimate indicate differences between corresponding positions and the reference category. The reasoning behind this is that board member was the largest category in both countries.

Norway:

From the buy transactions we can observe that the category "other" is significant ($p<0.05$) in the event window [0,1] with a negative abnormal return of –0.95% in the MF. The MM shows the similar pattern with a negative abnormal return of –0.96% at the same level. One explanation could be that these investors have less understanding of the core business than the other categories and hence misapprehend the business and the signals. A parallel in everyday life would be an average person on the street who pick stocks based on thoughts made by reading financial papers.

Table 7: OLS regressions (Hypothesis 3, Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Large Shareholder	-0.85	-1.85	-6.16	-2.09	-9.44	-0.98	-2.28	-6.60	-4.45	-15.40
	(-0.84)	(-1.04)	(-1.22)	(-0.26)	(-0.30)	(-0.99)	(-1.42)	(-1.47)	(-0.75)	(-0.65)
Manager	-0.78	-0.78	-2.03	-3.12	-2.85	-0.72	-0.73	-2.11	-2.66	-2.20
	(-1.73)	(-1.32)	(-1.48)	(-1.21)	(-0.56)	(-1.63)	(-1.25)	(-1.54)	(-1.05)	(-0.46)
Other	**-0.96***	-0.15	-1.22	-1.32	-3.51	**-0.95***	-0.14	-1.41	-1.41	-3.43
	(-2.37)	(-0.22)	(-0.96)	(-0.58)	(-0.83)	(-2.45)	(-0.23)	(-1.09)	(-0.62)	(-0.82)
Top Management	0.13	0.75	-0.08	0.97	0.42	0.16	0.71	-0.07	1.32	-0.96
	(0.18)	(1.03)	(-0.05)	(0.44)	(0.10)	(0.22)	(1.01)	(-0.05)	(0.59)	(-0.23)
Board Member	**1.56*****	**1.35*****	**1.67***	1.32	-0.12	**1.56*****	**1.34*****	**1.71***	1.10	-0.16
	(4.83)	(3.44)	(1.98)	(0.88)	(-0.04)	(4.79)	(3.53)	(1.98)	(0.72)	(-0.05)
= n	1931	1929	1921	1910	1826	1931	1929	1921	1910	1927
R^2	0.003	0.004	0.003	0.002	0.001	0.003	0.004	0.004	0.002	0.001
Adjusted R^2	0.001	0.002	0.001	0.000	-0.001	0.001	0.002	0.002	0.000	-0.001

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Large Shareholder	-1.94	4.38	12,42	33.44	41.50	-1.68	5.29	17.17	32.13	59.72
	(-0.99)	(1.06)	(1.23)	(1.51)	(0.99)	(-0.83)	(1.14)	(1.35)	(1.41)	(1.20)
Manager	-0.29	0.22	-0.07	10,37	3.01	-0.12	0.25	-1.43	7.39	4.52
	(-0.25)	(0.11)	(-0.02)	(1.03)	(0.22)	(-0.10)	(0.12)	(-0.37)	(0.77)	(0.38)
Other	-1.71	-0.44	4.52	19.35	24,06	-1.78	-0.80	2.49	15.54	22.32
	(-0.83)	(-0.19)	(1.23)	(1.92)	(1.72)	(-0.88)	(-0.35)	(0.68)	(1.62)	(1.84)
Top Management	1.05	0.93	3.65	17.00	21.79	1.07	0.93	3.03	15.48	19.79
	(0.64)	(0.42)	(1.01)	(1.65)	(1.70)	(0.65)	(0.41)	(0.87)	(1.58)	(1.76)
Board Member	0.23	-0.79	**-6.16***	**-23.03***	**-31.76****	0.15	-0.76	-4.91	**-19.70***	**-29.26****
	(0.21)	(-0.43)	(-2.07)	(-2.42)	(-2.71)	(0.14)	(-0.39)	(-1.68)	(-2.17)	(-2.87)
= n	499	499	491	478	453	499	499	491	478	493
R^2	0.008	0.003	0.012	0.045	0.037	0.009	0.005	0.014	0.037	0.030
Adjusted R^2	0.000	-0.005	0.004	0.037	0.028	0.001	-0.003	0.006	0.029	0.022

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns for different insider positions.
Board Member is used as referance category due to the largest amount of transactions.

Moreover, board members systematically earn positive cumulative abnormal returns of 1.3-1.7% for the event windows [0,1] - [0,30] after buy transactions and

negative CAR of 19.7%-29.3% for event window [0,60] and [0,120] after sell transactions. However, the abnormal returns generated by board members are only significant in the short run for buy transactions and negative in the long run for sell transactions. This can indicate that the information value for buy vanish in the long run and opposite for sell transactions.

Sweden:

In Sweden board members systematically earn positive cumulative abnormal returns of 0.48% for the event window [0,1] after buy transactions and negative CAR in almost all event windows after sell transactions. In Sweden, like Norway, differences among insider positions are minimal and mostly insignificant expect for an interesting effect: insider selling by large shareholders is not associated with significantly lower CAR in [0,30] event window.

Table 8: OLS regressions (Hypothesis 3, Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Large Shareholder	0.97	0.39	1.79	2.52	3.80	0.98	0.40	1.78	2.48	3.75
	(1.74)	(0.59)	(1.50)	(1.46)	(1.67)	(1.74)	(0.60)	(1.49)	(1.44)	(1.66)
Manager	-0.32	-0.39	0.50	-0.08	-0.84	-0.32	-0.39	0.51	-0.08	-0.59
	(-0.98)	(-0.52)	(0.60)	(-0.08)	(-0.63)	(-0.98)	(-0.52)	(0.60)	(-0.07)	(-0.44)
Other	0.17	0.22	0.92	1.05	1.23	0.17	0.22	0.91	1.01	1.39
	(0.57)	(0.53)	(1.30)	(0.84)	(0.76)	(0.57)	(0.53)	(1.28)	(0.81)	(0.85)
Top Management	-0.38	-0.80	0.48	-0.17	-4.10	-0.37	-0.80	0.50	-0.16	-2.49
	(-1.01)	(-0.83)	(0.34)	(-0.08)	(-1.55)	(-1.00)	(-0.82)	(0.35)	(-0.07)	(-0.89)
Board Member	**0.48***	0.44	-0.27	0.23	0.51	**0.48***	0.44	-0.27	0.24	0.51
	(2.31)	(1.19)	(-0.47)	(0.27)	(0.37)	(2.31)	(1.19)	(-0.47)	(0.27)	(0.37)
= n	2281	2281	2281	2281	2277	2281	2281	2281	2281	2281
R^2	0.015	0.003	0.004	0.005	0.014	0.015	0.003	0.004	0.005	0.010
Adjusted R^2	0.011	-0.001	0.000	0.001	0.014	0.011	-0.001	0.000	0.001	0.006

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Large Shareholder	0.66	1.11	**4.84***	5.29	6.61	0.66	1.12	**4.83***	5.28	6.59
	(1.04)	(1.08)	(2.16)	(1.58)	(1.09)	(1.04)	(1.09)	(2.16)	(1.58)	(1.09)
Manager	0.61	0.49	0.68	1.13	-0.46	0.62	0.49	0.69	1.14	-0.34
	(1.22)	(0.76)	(0.73)	(0.58)	(-0.29)	(1.23)	(0.76)	(0.74)	(0.59)	(-0.22)
Other	0.67	0.37	0.88	-0.26	-4.32	0.67	0.37	0.87	-0.26	-4.19
	(1.49)	(0.56)	(0.83)	(-0.12)	(-1.50)	(1.50)	(0.56)	(0.82)	(-0.12)	(-1.49)
Top Management	0.84	1.14	1.47	1.19	0.60	0.84	1.14	1.47	1.21	0.67
	(1.23)	(1.53)	(0.83)	(0.24)	(0.14)	(1.22)	(1.52)	(0.83)	(0.24)	(0.16)
Board Member	**-0.92***	-1.18	**-2.52***	**-4.96***	**-4.61***	**-0.92***	-1.18	**-2.53***	**-4.97***	**-4.63***
	(-1.98)	(-1.94)	(-2.42)	(-2.35)	(-2.18)	(-1.99)	(-1.94)	(-2.42)	(-2.35)	(-2.30)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534
R^2	0.017	0.007	0.017	0.011	0.033	0.017	0.007	0.017	0.011	0.032
Adjusted R^2	0.011	0.001	0.011	0.005	0.027	0.012	0.002	0.011	0.005	0.026

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns for different insider positions.
Board Member is used as referance category due to the largest amount of transactions.

Result discussion

In both countries, differences across different insider position are negligible except for large shareholders associated with somewhat fewer negative consequences of insider selling compared to board members. The results are not as straightforward as we originally expected. There could be more explanations than information asymmetry that may explain our results.

Comparison to other studies other studies can be problematic, as they have different categories of the insiders. Seyhun (1986) divided his sample into officers, directors, officer-directors, chairman of board of directors, large shareholders and all insiders. He finds that insiders who are expected to have more knowledge with the overall affairs of the firm, such as chairman of board of directors, are more successful predictors of future abnormal stock price changes than officer or shareholders alone, which is kind of similar to some of the results we find in Norway and Sweden.

An important factor to mention is that different insiders, especially in higher positions within a firm, experience being more controlled by governmental regulators as well as increased media attention. This is especially true for top management and managers in general as they are prone to higher level of scrutiny since they are more visible for outsiders. This will affect how insider trade within their own firm and make them less willing to make dubious trades, and only trade cautiously and at less informative moments. This idea is supported by Fidrmuc, Goergen and Renneboog (2006) who fail to find support for the information hierarchy hypothesis. This could explain why we fail to find significant abnormal return for top management and managers in both Norway and Sweden.

Management bias or irrational insiders suggest an alternative explanation to why it's not as straight forward as just assuming that the persons higher up in the hierarchy make better decisions. As pointed out in Baker and Wurgler (2013), management may believe that he or she is close to maximizing his own value, while the opposite is actually happening. Weinstein (1980) finds that people believe themselves more likely than average to experience positive future life events and less likely to experience negative events, hence illustrating overconfidence in one's own skills, and possibly optimism as well. Baker and Wurgler also claim that

overconfidence leads naturally to more risk-taking. This idea is supported by Nilsson and Hellström (2009). In their paper, *why do insiders trade* they point out that behavioral biases such as the disposition effect and overconfidence also hold true for insider investors. The idea of irrational insiders can be an explanation to why neither top management or managers in both Norway and Sweden are not able to earn any abnormal return.

7.4 Hypothesis 4: Absolute value after the abbreviation

H4: The absolute value of cumulative abnormal returns is higher in the period after the abbreviation in reporting deadline from five to three business days

The absolute values of cumulative abnormal returns were regressed on the binary indicator for period after the change (=1 for the time period after July, 3, 2016 and 0 otherwise), thus essentially testing whether the volatility of abnormal returns (independent of the sign) is impacted by the abbreviation. Indeed, the longer-term (event window [0,120]) volatility decreased in Sweden for both buy and sell types of transactions (Table 10). In Norway this effect was significant only for buy transactions, but not for sell transactions (Table 9), which is natural as the Swedish abbreviation in reporting deadline should not have impacted Norway stock market in a systematic fashion. The results in Norway seems likely to be non-systematic and due to the presence of an influential observation in either of the two periods.

Table 9: OLS regressions (Hypothesis 4, Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.64	-0.32	**-2.92***	**-7.06*****	**-17.12*****	-0.60	-0.14	**-2.63***	**-6.73*****	**-18.35*****
	(-1.39)	(-0.51)	(-2.39)	(-3.50)	(-4.65)	(-1.26)	(-0.22)	(-2.14)	(-3.38)	(-5.39)
Constant	**4.07*****	**5.45*****	**12.79*****	**21.81*****	**42.36*****	**4.10*****	**5.40*****	**12.58*****	**21.51*****	**40.84*****
	(11.67)	(14.11)	(17.56)	(15.59)	(14.02)	(11.48)	(14.02)	(17.31)	(15.51)	(14.47)
= n	1931	1929	1921	1910	1826	1931	1929	1921	1910	1927
R^2	0.001	0.000	0.007	0.014	0.015	0.001	0.000	0.006	0.012	0.023
Adjusted R^2	0.001	-0.000	0.007	0.013	0.014	0.001	-0.000	0.005	0.012	0.022

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	2.90	1.73	2.57	3.01	-3.70	2.87	1.70	3.19	3.00	-7.19
	(1.42)	(0.98)	(0.81)	(0.37)	(-0.39)	(1.40)	(0.98)	(1.00)	(0.40)	(-0.88)
Constant	**3.71*****	**5.27*****	**11.96*****	**22.10*****	**39.78*****	**3.79*****	**5.32*****	**11.71*****	**21.20*****	**39.99*****
	(6.10)	(6.44)	(9.63)	(9.85)	(8.68)	(6.28)	(6.44)	(9.30)	(10.32)	(9.03)
= n	499	499	491	478	453	499	499	491	478	493
R^2	0.016	0.005	0.004	0.002	0.001	0.016	0.004	0.006	0.002	0.004
Adjusted R^2	0.014	0.003	0.002	0.000	-0.001	0.014	0.002	0.004	0.000	0.002

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports whether the volatlity of abnormal returns is impacted by the abbreviation,
by regressing the absolute value of cumulative abnormal returns on the binary indicator for the period after the change.

Table 10: OLS regressions (Hypothesis 4, Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	0.10	1.34	0.27	-1.68	**-4.94*** **	0.10	1.34	0.28	-1.66	**-5.23*** **
	(0.33)	(1.81)	(0.31)	(-1.39)	(-3.54)	(0.34)	(1.82)	(0.32)	(-1.37)	(-3.63)
Constant	**1.81*** **	**2.47*** **	**5.68*** **	**8.94*** **	**12.68*** **	**1.81*** **	**2.47*** **	**5.67*** **	**8.93*** **	**12.98*** **
	(7.72)	(10.25)	(10.91)	(9.62)	(10.55)	(7.72)	(10.23)	(10.85)	(9.54)	(10.36)
= n	2281	2281	2281	2281	2277	2281	2281	2281	2281	2281
R^2	0.000	0.015	0.000	0.010	0.053	0.000	0.015	0.000	0.010	0.057
Adjusted R^2	-0.001	0.014	-0.000	0.009	0.052	-0.001	0.014	-0.000	0.009	0.056

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	0.03	-0.26	-1.93	-0.90	**-6.36** **	0.33	-0,26	-1.92	-0.91	**-6.37** **
	(0.10)	(-0.52)	(-1.35)	(-0.52)	(-2.82)	(0.09)	(0.52)	(-1.34)	(-0.53)	(-2.86)
Constant	**1.67*** **	**2.84*** **	**6.96*** **	**10.09*** **	**15.66*** **	**1.67*** **	**2.85*** **	**6.51*** **	**10.11*** **	**15.41*** **
	(7.98)	(6.75)	(6.17)	(15.55)	(7.87)	(7.97)	(6.80)	(6.13)	(15.54)	(7.80)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534
R^2	0.000	0.002	0.022	0.002	0.073	0.000	0.002	0.022	0.002	0.074
Adjusted R^2	-0.001	0.000	0.021	0.001	0.072	-0.001	0.000	0.020	0.001	0.072

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports whether the volatlity of abnormal returns is impacted by the abbreviation,
by regressing the absolute value of cumulative abnormal returns on the binary indicator for the period after the change.

7.5 Hypothesis 5: Abnormal return after the abbreviation

H5: Cumulative abnormal returns are higher in the period following the change than before.

Cumulative abnormal returns were regressed on the binary indicator *period2* (=1 for the time period after July, 3, 2016 and 0 otherwise). Quite naturally, the expected CAR in Norway were not impacted by the abbreviation in reporting deadline in Sweden (Table 11), while for Sweden (Table 12) there is some evidence supporting the decreased CAR after the change: more specifically, for buy transactions, CAR decreased by 3% for event window [0,60] and for sell transactions - by 0.9% for event window [0,1].

Table 11: OLS regressions (Hypothesis 5, Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.50	-0.63	-0.72	-0.09	-2.39	-0.51	-0.63	-0.78	-0.32	0.83
	(-1.07)	(-0.98)	(-0.51)	(-0.04)	(-0.52)	(-1.07)	(-0.96)	(-0.53)	(-0.14)	(0.20)
Constant	**1.41*** **	**1.52*** **	1.14	0.84	-0.71	**1.44*** **	**1.50*** **	1.15	0.82	-1.83
	(4.09)	(4.18)	(1.42)	(0.59)	(-0.25)	(4.12)	(4.14)	(1.43)	(0.59)	(-0.67)
= n	1931	1929	1921	1910	1826	1931	1929	1921	1910	1927
R^2	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
Adjusted R^2	0.000	0.000	-0.000	-0.001	-0.000	0.000	0.000	-0.000	-0.001	-0.000

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-2.46	-1.50	-3.49	-8.11	-12.19	-2.33	-1.12	-3.37	-7.90	-5.95
	(-1.44)	(-1.01)	(-1.24)	(-0.95)	(-1.11)	(-1.37)	(-0.74)	(-1.21)	(-1.00)	(-0.66)
Constant	0.57	-0.16	**-2.80***	**-7.78** **	**-14.78*** **	0.48	-0.33	-2.61	**-6.77** **	**-14.36** **
	(1.13)	(-0.21)	(-1.98)	(-3.30)	(-3.47)	(0.96)	(-0.43)	(-1.75)	(-2.83)	(-3.01)
= n	499	499	491	478	453	499	499	491	478	493
R^2	0.010	0.003	0.005	0.010	0.009	0.009	0.002	0.005	0.011	0.002
Adjusted R^2	0.008	0.001	0.003	0.008	0.006	0.007	-0.000	0.003	0.008	-0.000

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns after Swedens abbreviation i reporting deadline for reported insider trades.

Table 12: OLS regressions (Hypothesis 5, Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.48	-0.38	-1.18	**-3.11***	-3.05	-0.47	-0.37	-1.15	**-3.05***	-3.39
	(-1.41)	(-0.46)	(-1.09)	(-2.13)	(-1.38)	(-1.41)	(-0.46)	(-1.07)	(-2.09)	(-1.56)
Constant	**0.79** **	**0.60***	0.96	**2.46***	2.48	**0.78** **	**0.60***	0.94	**2.42***	2.85
	(3.15)	(2.41)	(1.41)	(2.27)	(1.30)	(3.15)	(2.41)	(1.39)	(2.23)	(1.51)
= n	2281	2281	2281	2281	2277	2281	2281	2281	2281	2281
R^2	0.006	0.001	0.005	0.018	0.011	0.006	0.001	0.004	0.018	0.013
Adjusted R^2	0.005	-0.000	0.004	0.017	0.010	0.005	-0.000	0.003	0.017	0.012

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	**-0.89***	-1.00	-0.70	-0.05	3.86	**-0.89***	-1.00	-0.67	-0.02	3.99
	(-2.18)	(-1.66)	(-0.46)	(-0.02)	(0.98)	(-2.17)	(-1.66)	(-0.44)	(-0.01)	(1.04)
Constant	0.05	-0.25	-1.30	**-4.39***	**-8.04***	0.04	-0.25	-1.32	**-4.43***	**-8.05***
	(0.18)	(-0.59)	(-1.14)	(-2.59)	(-2.15)	(0.18)	(-0.59)	(-1.16)	(-2.61)	(-2.22)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534
R^2	0.034	0.016	0.002	0.000	0.015	0.033	0.016	0.002	0.000	0.016
Adjusted R^2	0.032	0.015	0.000	-0.002	0.013	0.032	0.015	0.000	-0.002	0.015

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns after Swedens abbreviation i reporting deadline for reported insider trades.

Result discussion

In general, our results indicate that speedier reporting in Sweden do not trigger any larger market reactions and thus not provide any more information value to the market even though we found reduction in variance in the CAR [0,120] for hypothesis 4 and negative CAR by -3% for event window [0,60] and for sell transactions - by 0.9% for event window [0,1]. We find these results somewhat surprising as it would be reasonable to assume that both the absolute value of CAR and the CAR in general would be higher after the abbreviation. Both Fidrmuc, Georgen and Renneboog (2006) and Brochet (2010) support the idea that speedier reporting should give higher abnormal return.

Fidrmuc, Georgen and Renneboog (2006) when testing market reactions to UK compared to the US market conclude that insider trades in the UK are likely to be more informative and hence trigger larger market reactions. He concludes that UK insider trades are likely to be more informative on the announcement day than US trades due to the fact that a trade must be made public within at most 6 business days in the UK, compared up to 40 days in the United states between 1991-1998.

Brochet (2010) examined the introduction of the Sarbanes-Oxley Act of 2002 (SOX) in the US in which he finds a significant increase in abnormal return for buy transactions after SOX. The SOX caused insiders to report their trade within two days against the tenth day of trading in the subsequent month.

However, it is somewhat difficult to compare their study with our as they both examine larger changes in reporting days. One explanation might be that Sweden's change in legations from five to three days may not be large enough to give significant impacts to the market.

7.6 Multiple regression analysis

To check the stability of the hypotheses testing results we included all factors to a single multiple regression equation so that multiple factors are controlled for and omitted variable bias is prevented as much as possible. All major effects revealed by "shorter" regressions were confirmed.

For buy transactions in Norway (Table 13):

- The effect of MV is somewhat negative in the shorter term ([0,5]).
- The effect of PTBV is somewhat positive in the longer term ([0, 120]).
- Differences in insider positions are negligible.
- Swedish abbreviation in reporting deadline from five to three business days was not influential.

For sell transactions in Norway (Table 13):

- The effect of MV is insignificant.
- The effect of PTBV is positive for 30-, 60- and 120-days event windows.
- Differences in insider positions are negligible.
- Swedish abbreviation in reporting deadline from five to three business days was not influential.

Table 13: OLS regressions (Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.65	-0.86	-1.05	-0.79	-4.60	-0.65	-0.85	-1.18	-1.12	-1.57
	(-1.38)	(-1.30)	(-0.73)	(-0.35)	(-1.01)	(-1.37)	(-1.27)	(-0.81)	(-0.49)	(-0.38)
Large Shareholder	-1.07	-2.18	-6.57	-1.61	-8.81	-1.20	-2.65	-7.22	-4.22	-14.87
	(-1.03)	(-1.17)	(-1.26)	(-0.19)	(-0.27)	(-1.17)	(-1.60)	(-1.58)	(-0.68)	(-0.61)
Manager	-0.78	-0.78	-1.89	-3.01	-2.17	-0.72	-0.73	-1.87	-2.36	-0.91
	(-1.71)	(-1.30)	(-1.36)	(-1.15)	(-0.43)	(-1.58)	(-1.22)	(-1.36)	(-0.93)	(-0.19)
Other	**-0.94***	-0.06	-1.15	-0.20	-1.85	**-0.91***	-0.05	-1.20	0.02	-1.28
	(-2.48)	(-0.09)	(-0.90)	(-0.09)	(-0.45)	(-2.52)	(-0.08)	(-0.93)	(0.01)	(-0.31)
Top Management	-0.05	0.49	-0.21	0.87	0.68	-0.03	0.43	-0.19	1.19	-0.47
	(-0.07)	(0.67)	(-0.15)	(0.39)	(0.15)	(-0.04)	(0.60)	(-0.14)	(0.54)	(-0.12)
MV	-0.005	**-0.008*****	-0.004	0.000	0.004	-0.005	**-0.008*****	-0.008	-0.008	-0.008
	(-1.61)	(-4.19)	(-0.86)	(0.04)	(0.28)	(-1.97)	(-4.95)	(-1.70)	(-1.22)	(-0.71)
PTBV	-0.003	-0.003	0.005	0.045	**0.087***	-0.003	-0.002	0.005	**0.051***	**0.110****
	(-1.39)	(-0.97)	(0.39)	(1.93)	(2.42)	(-1.62)	(-0.75)	(0.39)	(2.37)	(3.26)
Board Member	**1.85*****	**1.82*****	**2.02***	1.47	0.47	**1.87*****	**1.83*****	**2.11***	1.36	-0.33
	(5.13)	(4.06)	(2.01)	(0.84)	(0.15)	(5.13)	(4.21)	(2.12)	(0.80)	(-0.10)
= n	1894	1892	1884	1873	1790	1894	1892	1884	1873	1890
R^2	0.004	0.007	0.004	0.003	0.002	0.005	0.008	0.005	0.004	0.003
Adjusted R^2	0.001	0.003	0.000	-0.001	-0.002	0.001	0.004	0.001	0.000	-0.001

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-1.48	-0.99	-0.37	2.40	2.09	-1.39	-0.73	-0.58	1.88	5.52
	(-1.20)	(-0.72)	(-0.14)	(0.52)	(0.28)	(-1.13)	(-0.53)	(-0.19)	(0.38)	(0.68)
Large Shareholder	-2.73	4.82	9.11	23.34	31.33	-2.39	6.15	14.57	22.20	55.51
	(-1.21)	(1.11)	(0.84)	(1.02)	(0.69)	(-1.07)	(1.28)	(1.07)	(0.94)	(1.02)
Manager	-1.88	-0.37	-2.91	-0.96	-12.33	-1.61	-0.09	-4.06	-3.75	-7.85
	(-1.17)	(-0.17)	(-0.94)	(-0.16)	(-1.24)	(-1.00)	(-0.04)	(-1.30)	(-0.60)	(-0.67)
Other	-3.41	-1.24	-1.39	4.64	6.34	-3.35	-1.29	-2.96	1.50	8.51
	(-1.11)	(-0.45)	(-0.39)	(0.70)	(0.57)	(-1.09)	(-0.47)	(-0.79)	(0.22)	(0.68)
Top Management	-0.66	0.22	-1.03	4.40	6.61	-0.53	0.48	-1.56	2.89	7.88
	(-0.31)	(0.09)	(-0.33)	(0.73)	(0.84)	(-0.25)	(0.19)	(-0.48)	(0.47)	(0.71)
MV	-0.002	0.003	0.003	0.016	0.037	-0.002	0.003	0.001	0.009	0.036
	(-0.50)	(0.87)	(0.44)	(1.02)	(1.05)	(-0.51)	(0.92)	(0.16)	(0.62)	(1.13)
PTBV	0.165	0.055	**0.567*****	**1.572*****	**1.905*****	0.154	0.031	**0.546*****	**1.551*****	**1.700*****
	(1.15)	(0.64)	(4.04)	(4.05)	(3.45)	(1.09)	(0.36)	(3.76)	(4.07)	(3.39)
Board Member	1.83	-0.08	-2.68	**-14.42****	**-21.35*****	1.66	-0.31	-1.43	**-10.89***	**-22.29***
	(1.09)	(-0.03)	(-1.15)	(-3.22)	(-3.48)	(0.99)	(-0.14)	(-0.57)	(-2.32)	(-2.19)
= n	493	493	485	472	447	493	493	485	472	487
R^2	0.029	0.007	0.065	0.170	0.104	0.027	0.008	0.065	0.167	0.073
Adjusted R^2	0.015	-0.007	0.051	0.158	0.090	0.013	-0.007	0.051	0.155	0.060

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns from a single mutiple regression to control for mutiple factors and to avoid bias.

For buy transactions in Sweden (Table 14):

- The effect of MV is somewhat negative for most event windows.
- The effect of PTBV is insignificant.
- Differences in insider positions are negligible.
- Swedish abbreviation in reporting deadline from five to three business days significantly decreased CAR for the 60-day event window.

For sell transactions in Sweden (Table 14):

- The effect of MV is significantly positive for the 1-day event window.
- The effect of PTBV is significantly negative for most event windows.
- Insider selling by large shareholders is associated with significantly higher CAR compared to insider selling by board members.

- Swedish abbreviation in reporting deadline from five to three business days significantly decreased CAR for the 1-day event window.

Table 14: OLS regressions (Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.41	-0.39	-1.46	**-3.92****	-3.17	-0.40	-0.39	-1.44	**-3.87***	-3.68
	(-1.26)	(-0.52)	(-1.41)	(-2.61)	(-1.46)	(-1.25)	(-0.52)	(-1.39)	(-2.58)	(-1.69)
Large Shareholder	0.91	0.23	1.46	1.45	2.61	0.92	0.24	1.47	1.43	2.31
	(1.63)	(0.33)	(1.15)	(0.84)	(1.09)	(1.63)	(0.35)	(1.16)	(0.84)	(0.97)
Manager	-0.23	-0.32	0.98	1.13	0.37	-0.23	-0.32	0.98	1.12	0.77
	(-0.74)	(-0.47)	(1.23)	(1.15)	(0.34)	(-0.73)	(-0.47)	(1.23)	(1.14)	(0.66)
Other	0.13	0.13	0.76	0.85	1.36	0.13	0.13	0.75	0.82	1.43
	(0.47)	(0.29)	(1.10)	(0.71)	(0.87)	(0.47)	(0.29)	(1.10)	(0.69)	(0.91)
Top Management	-0.29	-0.74	0.85	0.86	-2.94	-0.28	-0.74	0.86	0.85	-1.27
	(-0.75)	(-0.80)	(0.60)	(0.41)	(-1.26)	(-0.74)	(-0.80)	(0.60)	(0.40)	(-0.50)
MV	**-0.004***	0.000	-0.011	**-0.046*****	**-0.067*****	**-0.004***	0.000	-0.011	**-0.046*****	**-0.067*****
	(-2.38)	(0.10)	(-1.61)	(-4.39)	(-5.42)	(-2.37)	(0.11)	(-1.60)	(-4.38)	(-5.16)
PTBV	0.121	0.150	0.091	0.233	0.053	0.120	0.150	0.091	0.232	-0.042
	(1.70)	(1.35)	(0.59)	(0.92)	(0.18)	(1.69)	(1.35)	(0.58)	(0.91)	(-0.14)
Board Member	0.44	0.26	0.45	2.46	2.99	0.44	0.26	0.43	2.43	3.53
	(1.52)	(0.70)	(0.60)	(1.75)	(1.20)	(1.51)	(0.69)	(0.58)	(1.73)	(1.43)
= n	2274	2274	2274	2274	2267	2274	2274	2274	2274	2274
R^2	0.030	0.007	0.013	0.058	0.063	0.030	0.006	0.013	0.057	0.061
Adjusted R^2	0.023	-0.000	0.006	0.051	0.057	0.023	-0.000	0.006	0.050	0.054

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	**-0.86***	-1.01	-0.15	-0.57	2.62	**-0.86***	-1.02	-0.12	-0.53	2.93
	(-2.03)	(-1.51)	(-0.09)	(-0.22)	(0.82)	(-2.03)	(-1.51)	(-0.08)	(-0.20)	(0.94)
Large Shareholder	0.27	0.46	**4.58***	4.40	6.47	0.27	0.47	**4.58***	4.40	6.63
	(0.50)	(0.49)	(2.12)	(1.42)	(1.14)	(0.50)	(0.49)	(2.12)	(1.42)	(1.17)
Manager	0.75	0.65	0.72	1.15	-1.03	0.75	0.65	0.73	1.16	-0.83
	(1.42)	(0.99)	(0.72)	(0.56)	(-0.63)	(1.42)	(0.99)	(0.73)	(0.56)	(-0.52)
Other	0.39	0.02	0.72	-0.00	-3.01	0.39	0.02	0.72	-0.00	-2.77
	(1.01)	(0.03)	(0.74)	(-0.00)	(-1.52)	(1.02)	(0.04)	(0.74)	(-0.00)	(-1.43)
Top Management	1.05	1.34	1.57	0.91	-0.56	1.04	1.34	1.57	0.92	-0.51
	(1.54)	(1.78)	(0.88)	(0.18)	(-0.13)	(1.54)	(1.78)	(0.87)	(0.18)	(-0.12)
MV	**0.003****	0.002	0.004	-0.016	-0.030	**0.003****	0.002	0.004	-0.016	-0.028
	(3.10)	(1.35)	(0.60)	(-0.77)	(-1.00)	(3.09)	(1.34)	(0.59)	(-0.77)	(-0.97)
PTBV	-0.000	**-0.017***	-0.001	**-0.038***	**-0.177*****	-0.000	**-0.017***	-0.001	**-0.038***	**-0.064****
	(-0.11)	(-2.28)	(-0.10)	(-2.30)	(-3.75)	(-0.11)	(-2.28)	(-0.11)	(-2.31)	(-2.75)
Board Member	-0.44	-0.51	-2.57	-3.72	-4.29	-0.45	-0.51	-2.59	-3.76	-5.09
	(-1.15)	(-0.76)	(-1.83)	(-1.66)	(-1.50)	(-1.16)	(-0.76)	(-1.84)	(-1.68)	(-1.87)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534
R^2	0.059	0.035	0.017	0.023	0.087	0.059	0.035	0.017	0.023	0.073
Adjusted R^2	0.049	0.025	0.007	0.013	0.077	0.049	0.025	0.007	0.013	0.064

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal returns from a single mutiple regression to control for mutiple factors and to avoid bias.

7.7 Robustness checks

Stepwise regressions

When running regressions for each estimation window, we noticed that only some of the factors from the multifactor model were significant each time. That is why we allowed for the fact that the exact model specification can vary from in time and across firms by letting the stepwise regression procedure to decide which factors to retain in the model of normal returns. To keep the risk of omitting a significant explanatory variable, we used stepwise regression settings that favored less restricted (i.e. longer) models over short models: p-value for entry=0.1, p-value for removal=0.2. The prediction of normal returns was done in SPSS.

The results of these regressions were almost 100% identical to the results we obtained by forcing all factors to enter our regression models, which is why we omit these results.

Nonparametric regressions

CAR is not normally distributed, and their distribution is very dispersed, which is why predicting median CAR may be not less meaningful than mean CAR. Therefore, we calculated estimates that are non-parametric. Non-parametric tests can be used without assuming normality. There are many potential non-parametric tests to choose from, but we decided on using the median regression as it allows including covariates just like the ordinary least squares regression model does. Mann-Whitney and similar nonparametric tests are suitable only for comparison of independent samples, when we have a single grouping variable of categorical nature. In addition, the version of the median regression we use allows to estimate cluster-robust standard errors. The standard errors were also corrected for heteroskedasticity.

Overall, median regression results confirm those obtained using the OLS estimation method. More specifically, according to the median regressions in Norway positive CAR exist for 1- and 5-days event windows after buy transactions, while negative CAR – for 30-, 60- and 120-days windows (Table 15). An interesting new observation is that insider buying by large shareholders systematically leads to lower abnormal returns compared to insider buying by board members (Table 16).

The effect of PTBV is generally positive for both buy and sell transactions, while the effects of MV are somewhat controversial and generally negligible (Table 16)

Table 15: Median regression-1 (Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	**0.49*** **	**0.68*** **	**0.69***	0.73	-0.70	**0.49*** **	**0.73*** **	0.14	0.36	-1.06
	(6.33)	(5.89)	(2.02)	(1.57)	(-0.79)	(6.58)	(5.50)	(0.42)	(0.82)	(-1.56)
= n	1931	1929	1921	1910	1826	1931	1929	1921	1910	1927

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	-0.23	-0.32	**-2.10*** **	**-4.72*** **	**-10.92*** **	-0.17	-0.30	**-1.86*** **	**-3.50*** **	**-7.50*** **
	(-1.82)	(-1.27)	(-3.56)	(-4.84)	(-6.36)	(-1.16)	(-1.24)	(-3.31)	(-3.57)	(-5.39)
= n	499	499	491	478	453	499	499	491	478	493

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return using median regressions with cluster robust standard errors.

Table 16: Median regression-2 (Norway)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	**-0.49*** **	**-0.64***	-0.43	-0.43	-2.43	**-0.36***	-0.69	-0.38	-0.60	0.22
	(-3.40)	(-2.20)	(-0.54)	(-0.46)	(-0.95)	(-2.03)	(-1.12)	(-0.56)	(-0.63)	(0.08)
Large Shareholder	-0.53	-1.42	**-10.41** **	**-13.55*** **	**-31.85***	-0.61	-1.16	**-9.12*** **	**-12.94*** **	**-25.72***
	(-1.41)	(-1.47)	(-3.05)	(-5.63)	(-2.49)	(-1.38)	(-0.54)	(-3.68)	(-5.95)	(-2.06)
Manager	-0.39	-0.37	-1.41	**-3.48*** **	**-6.34***	-0.34	-0.41	-1.57	**-3.23***	-4.17
	(-1.57)	(-0.91)	(-1.72)	(-3.42)	(-2.48)	(-1.29)	(-0.82)	(-1.87)	(-2.51)	(-1.41)
Other	**-0.41** **	-0.08	0.08	**-2.30***	**-5.76** **	**-0.42***	-0.12	0.48	-1.40	-2.92
	(-2.70)	(-0.33)	(0.07)	(-2.24)	(-2.60)	(-2.06)	(-0.25)	(0.45)	(-1.21)	(-1.10)
Top Management	0.34	0	-0.33	-0.22	-5.45*	0.28	0.17	-1.07	-0.67	-2.73
	(1.65)	(0.00)	(-0.43)	(-0.19)	(-2.52)	(1.34)	(0.44)	(-1.33)	(-0.59)	(-1.33)
MV	**-0.002** **	**-0.005*** **	**0.003***	**0.004***	**0.017*** **	-0.001	-0.006	0.000	**-0.006** **	0.000
	(-2.79)	(-7.30)	(2.27)	(2.32)	(4.49)	(-1.55)	(-1.77)	(0.08)	(-2.75)	(0.02)
PTBV	-0.001	-0.001	**0.018*** **	**0.043*** **	**0.102*** **	-0.001	-0.001	**0.017*** **	**0.042*** **	0.107
	(-0.20)	(-0.39)	(5.70)	(8.53)	(22.45)	(-0.25)	(-0.00)	(3.82)	(9.66)	(0.03)
Board Member	**0.77*** **	**1.13*** **	1.05	**1.88***	2.48	**0.71*** **	1.22	1.04	**1.99***	1.53
	(5.12)	(4.29)	(1.75)	(2.11)	(1.45)	(4.35)	(1.09)	(1.69)	(2.31)	(0.27)
= n	1894	1892	1884	1873	1790	1894	1892	1884	1873	1890

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	0.03	-0.89	0.32	1.28	-1.37	-0.01	**-1.14***	0.10	2.26	-2.01
	(0.10)	(-1.76)	(0.23)	(0.53)	(-0.33)	(-0.02)	(-2.34)	(0.07)	(1.18)	(-0.66)
Large Shareholder	-0.52	**8.34*** **	12,24	26.54	**56.15*** **	-0.06	6.80	**23.27*** **	27.45	**85.74*** **
	(-1.06)	(4.56)	(1.45)	(1.85)	(3.39)	(-0.13)	(1.46)	(3.41)	(1.84)	(5.43)
Manager	-0.46	-0.23	-0.16	-0.02	-1.87	-0.39	0.19	-0.28	-1.75	-2.54
	(-1.37)	(-0.25)	(-0.12)	(-0.01)	(-0.31)	(-0.97)	(0.25)	(-0.20)	(-0.70)	(-0.58)
Other	-0.46	-0.23	-1.78	-2.91	-0.93	-0.45	-0.03	-3.13	-3.32	-4.51
	(-1.36)	(-0.28)	(-0.94)	(-0.99)	(-0.17)	(-1.09)	(-0.04)	(-1.67)	(-1.53)	(-0.97)
Top Management	-0.76	-0.93	-1.64	-0.44	3.52	**-1.20***	-0.30	-2.12	-2.71	-0.47
	(-1.47)	(-1.02)	(-1.02)	(-0.15)	(0.74)	(-2.24)	(-0.39)	(-1.35)	(-1.00)	(-0.12)
MV	-0.000	0.002	-0.001	0.001	0.001	-0.000	0.003	-0.002	-0.005	-0.015
	(-0.19)	(0.59)	(-0.08)	(0.14)	(0.46)	(-0.00)	(1.00)	(-0.25)	(-0.74)	(-1.30)
PTBV	**0.113** **	**0.066***	**0.627*** **	**1.744*** **	**1.122***	**0.118***	**0.032***	**0.575*** **	**1.487*** **	0.864
	(2.94)	(2.58)	(21.24)	(5.35)	(2.14)	(2.44)	(2.28)	(19.88)	(5.10)	(1.95)
Board Member	0.00	-0.07	**-2.90***	**-7.19*** **	**-12.46** **	0.01	-0.22	-1.79	**-4.44** **	-5.63
	(0.01)	(-0.10)	(-2.52)	(-3.45)	(-2.96)	(0.02)	(-0.38)	(-1.57)	(-2.61)	(-1.64)
= n	493	493	485	472	447	493	493	485	472	487

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return using median regression with cluster robust standar errors for the period after the abbreviation, insider position, MV and PTBV.

According to the median regressions, in Sweden positive CAR exist for 5- and 60-days event windows after buy transactions, while for sell transaction we observe negative CAR for the 1-120-days event window (table 17). While for insider buying the differences among different insider positions are insignificant (table 18), there is some evidence that large shareholders, managers and top management are associated with somewhat higher CAR compared to board members with the difference between large shareholders and board members being the most pronounced, which agrees with the OLS regressions.

Table 17: Median regressions-1 (Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	0.01	**0.21****	0	**0.60****	0.24	0.01	**0.21****	0	**0.62****	0.27
	(0.18)	(2.82)	(0.00)	(2.92)	(1.02)	(0.25)	(3.01)	(0.00)	(2.97)	(1.13)
= n	2286	2286	2286	2286	2281	2286	2286	2286	2286	2286

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Constant	**-0.29*****	**-0.59*****	**-0.76****	**-2.16*****	**-4.23*****	**-0.28*****	**-0.60*****	**-0.77****	**-2.06*****	**-4.08*****
t-stat	(-4.97)	(-4.77)	(-2.66)	(-4.33)	(-6.84)	(-4.70)	(-4.58)	(-2.70)	(-4.10)	(-7.33)
= n	1539	1538	1522	1520	1517	1539	1538	1522	1520	1537

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return using median regressions with cluster robust standard errors.

Table 18: Median regression-2 (Sweden)

	Market Model (MM)					Multifactor Model (MF)				
BUY	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	-0.07	-0.22	**-1.17****	**-2.79*****	**-2.24****	-0.062	-0.21	**-1.04***	**-2.80*****	**-2.16****
	(-0.61)	(-1.26)	(-2.62)	(-4.36)	(-2.84)	(-0.55)	(-1.23)	(-2.30)	(-4.42)	(-2.70)
Large Shareholder	0.30	-0.34	-0.29	0	0.64	0.34	-0.30	-0.27	-0.03	0.76
	(1.15)	(-0.88)	(-0.37)	(0.00)	(0.36)	(1.33)	(-0.77)	(-0.37)	(-0.02)	(0.42)
Manager	-0.07	0	0.03	0.37	0.28	-0.08	0	0.00	0.35	0.25
	(-0.64)	(-0.00)	(0.07)	(0.72)	(0.43)	(-0.69)	(0.00)	(0.01)	(0.70)	(0.38)
Other	0.13	-0.02	0.03	0	0.20	0.13	-0.03	0.01	-0.03	0.45
	(0.96)	(-0.12)	(0.06)	(0.00)	(0.25)	(0.96)	(-0.18)	(0.02)	(-0.03)	(0.52)
Top Management	0	0'.28	0.63	1.16	0.11	0	0.29	0.61	1.22	0.62
	(0.00)	(1.18)	(0.62)	(1.29)	(0.06)	(0.00)	(1.19)	(0.61)	(1.35)	(0.47)
MV	0.000	**0.003*****	-0.002	**-0.031****	**-0.049****	0.000	**0.002*****	-0.002	**-0.030****	**-0.048****
	(0.35)	(3.82)	(-0.62)	(-2.83)	(-3.21)	(0.47)	(3.53)	(-0.44)	(-2.91)	(-3.22)
PTBV	0.009	-0.012	-0.001	0.045	-0.029	0.009	-0.011	-0.000	0.033	-0.057
	(0.97)	(-0.42)	(-0.01)	(0.32)	(-0.50)	(0.94)	(-0.35)	(-0.00)	(0.23)	(-1.00)
Board Member	0.06	0.33	**1.14***	**2.78*****	**2.68*****	0.06	0.31	1.04	**2.82*****	**2.70*****
	(0.52)	(1.59)	(2.08)	(4.18)	(3.38)	(0.46)	(1.50)	(1.89)	(4.26)	(3.34)
= n	2274	2274	2274	2274	2267	2274	2274	2274	2274	2274

	Market Model (MM)					Multifactor Model (MF)				
SELL	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120	CAR 1	CAR 5	CAR 30	CAR 60	CAR 120
Period2	**-0.61*****	**-0.66***	**2.36*****	**3.47****	**3.80****	**-0.59*****	**-0.66***	**2.33*****	**3.58****	**2.98***
	(-4.34)	(-2.29)	(5.00)	(3.29)	(3.02)	(-4.11)	(-2.35)	(4.36)	(3.28)	(2.55)
Large Shareholder	0.05	0.12	**6.55***	**6.35***	1.02	-0.07	0.12	**6.57***	**6.49***	0.14
	(0.18)	(0.11)	(2.13)	(2.34)	(0.42)	(-0.25)	(0.12)	(2.14)	(2.32)	(0.06)
Manager	**0.98*****	**0.97****	**1.61***	1.49	1.84	**0.87*****	**0.93****	**1.70***	1.90	0.99
	(4.95)	(2.83)	(2.12)	(1.22)	(1.41)	(4.36)	(2.79)	(2.14)	(1.53)	(0.76)
Other	**0.50****	-0.24	**1.28***	1.43	0.85	0.39*	-0.27	1.35	1.47	0.00
	(2.90)	(-0.57)	(2.48)	(1.23)	(0.57)	(2.23)	(-0.64)	(1.85)	(1.25)	(0.00)
Top Management	0.94	**1.17*****	1.38	2.06	1.21	0.83	**1.16*****	1.47	2.12	0.44
	(1.69)	(3.87)	(1.05)	(0.83)	(0.55)	(1.51)	(4.04)	(1.08)	(0.85)	(0.23)
MV	**0.002****	0.002	**0.001*****	0.002	-0.015	**0.002****	0.001	**0.009*****	0.002	-0.019
	(3.03)	(1.47)	(5.94)	(0.56)	(-0.90)	(2.86)	(1.57)	(3.40)	(0.57)	(-1.16)
PTBV	0.000	0.001	0.000	-0.104	-0.140	0.000	0.001	0.000	-0.104	-0.143
	(0.00)	(0.02)	(0.01)	(-0.87)	(-0.60)	(0.00)	(0.02)	(0.01)	(-0.87)	(-0.94)
Board Member	-0.39	-0.52	**-4.06*****	**-5.47*****	**-6.32*****	-0.29	-0.50	**-4.13*****	**-5.65*****	**-4.57*****
	(-1.72)	(-1.46)	(-5.93)	(-3.88)	(-4.04)	(-1.28)	(-1.45)	(-6.02)	(-3.91)	(-3.44)
= n	1536	1535	1519	1517	1514	1536	1535	1519	1517	1534

T-statistics in parentheses: *p<0.05, **p<0.01, ***p<0.001. Significant results are highlighted in bold.
The table reports cummulative abnormal return using median regression with cluster robust standar errors for the period after the abbreviation, insider position, MV and PTBV.

General discussion of empirical results

Results obtained using a series of OLS regressions with robust standard errors, which explained cumulative abnormal returns using the characteristics of deals and companies, were shown to be resistant to a number of robustness checks, including, but not limited to, the change of the estimation technique (from OLS to median regression). Overall, results are somewhat similar for Sweden and Norway in that cumulative abnormal returns are significantly different from zero for some short-term event windows (1- and 5-days event windows in Norway and 1-day window in Sweden) and significantly lower than zero after the sell events (for 30-,60- and 120-days event windows in Norway and all event windows in Sweden). MV was shown to have a negative effect on CAR from buy transactions in both countries and to have an insignificant (Norway) or significantly positive (Sweden) effect on CAR from sell transactions. The effect of PTBV was shown to be somewhat negative for buy transactions in the shorter term (5-day window) in Norway and for all event windows in Sweden. The effect of PTBV in sell transactions is somewhat controversial and unstable. Differences in CAR that can be attributed to insider position are generally small but are stable for Swedish sell transactions: large shareholders were shown to be associated with higher CAR compared to board members at least for the 30-days event window.

Our results generally agree with some previous studies based on similar data. Unlike most other studies we account for 3 factors (SMB, HML, LIQ) in addition to using market returns and risk-free rate, but we also presented the results of the simpler market model and have shown that our results are mostly model-invariant. It could still be the case that large cumulative abnormal returns and their dependence on firm and event characteristics is found more often in studies using more restricted models of expected returns.

8.0 Weaknesses

Overlap between event windows

The main weakness of event studies in general applies to our research as well: the overlap between the estimation period of a particular event and event windows of one or several other events. That is, estimation windows contain other events that prevent estimates of normal returns from being really clean. It is especially true when there is a high frequency of insider trades, which is the case in our study. Nevertheless, this limitation is largely neglected, because event studies models are somewhat more predictive rather than explanatory, and statistically significant results can still be considered to be useful for extracting abnormal return.

Modeling normal returns

In our analysis we control for many factors when modeling normal returns, but they are relatively hard to compute on a daily basis. Another limitation is the fact that we use a traditional – linear – model of normal returns, and, in addition, the specification is the same for all estimation windows. We suggest using more flexible - machine learning methods – in future research to account for the heterogeneity of the relationships, nonlinearity and interactions between explanatory variables that are hard to account using traditional regression models.

Big data

Such type of event studies where events occur frequently use large datasets (thousands of events, the analysis in which requires processing a total of several million data points). Big data technologies would make it possible to analyze even larger datasets that we used in our study faster thanks to parallel processing, cloud computing, MapReduce, etc.

Selection bias

In chapter 6 about data, we have set some certain criterions to the data to answer our hypothesis in the best possible way. With these criterions, there is a certain threat that there is selection bias in the dataset. The reason is that certain criterions could have resulted in transactions that should have been excluded are included, and vice versa. This can result that the selection does not represent the reality well enough and that the results are weakened. In an effort to prevent this as much as

possible, significantly time have been used in reviewing and cleaning the dataset. Another way to avoid selection bias is to include all trades. In our thesis this would have had little purpose, since trades without financial motive would have been included.

Control for past returns

We control for many factors in our thesis, but we do not control past return. Controlling for past return could explain patterns such as reversals. Checking for past returns can explain if the trades are driven by the insider trading or is this just coming from the way in which insider are timing their trades as a functional past return.

9.0 Propositions to further studies

Beyond the scope of this research there is several problems that would be interesting to investigate further. One idea could be to categorize the firms in different sectors and combine them with the different inside positions to see whether this would give different results. It would be interesting to see whether different sectors earn abnormal returns and if there is any connection between firm sectors and insider position. Secondly, this thesis does not examine the volume of trading, hence it would be interesting to see if any difference in the size of the trade affect the abnormal return.

It could also be interesting to add more countries in the study to see whether there is any difference in the ability to earn abnormal return. Dovre Forvaltning invests in listed companies in Finland and Denmark in addition to Norway and Sweden in their fund *Dovre Inside Nordic*. It would be interesting to use data from all four countries to see whether it is possible to earn abnormal returns.

Other researchers could also control for certain market anomalies to see whether these affect the results of insider return. It would be interesting to see if the weekday or the small-firm anomaly affect the results when looking at insider trading.

Our research topic has been researched on several occasions in which different researches have gotten different results. As previously mention, there is a possibility that large cumulative abnormal returns and their dependence on firm and event characteristics is found more often in studies using more restricted models of expected returns. This proposition can be tested in future research by using meta-analysis techniques for a systematic literature review.

10 Conclusions

Even though cumulative abnormal returns remain largely unexplained, there are a number of effects that are robust to the choice of specification and estimation techniques. The main result of our study is that both mean and median cumulative abnormal returns are significantly higher than zero soon after the buy events (event windows [0,1] and [0,5]) in Norway and [0,1] in Sweden) and significantly lower than zero after the sell events (for 30-,60- and 120-days event windows in Norway and all event windows in Sweden). The magnitude of CAR is about 2-3 times higher in Norway compared to Sweden. Overall, the conclusion is that there have been more opportunities for enjoying positive abnormal returns in Norway than in Sweden in the last few years. A possible reason is a higher frequency of insider trading and volume in Sweden, which eliminates abnormal returns due to the constant presence of insider trades in the stock market, which makes them less unusual. Another possible explanation could be due to speedier reporting in Norway compared to Sweden.

The new legislation according to which insider trades in Sweden had to be reported to the government within 3 days of the trade (as opposed to 5 days) somewhat decreased the variance of cumulative abnormal returns in Sweden for the 120-days event window, as indicated by significantly lower absolute abnormal returns in the period after the change. There is also some evidence of a drop in CAR themselves for some event windows after the abbreviation of reporting deadlines.

CAR is very dispersed and somewhat skewed across events, which makes the use of traditional regressions for explaining the variation in CAR somewhat disputable. We encourage other researchers to check the robustness of their findings using robust nonparametric approaches such as quantile regressions. Whereas we used median regressions for robustness checks, the potential of quantile regressions is higher as the 50^{th} percentile (median) is not the only one that can be of interest for researchers. The results for Sweden and Norway are rather different, suggesting that stock market studies conducted based on one country's data are unlikely to be highly externally valid.

11. References

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12. Appendix

Appendix 1

Example of our dataset we received from Dovre Forvaltning and an example of an insider trade (Olav Thon Eiendomsselskap ASA) reported to Oslo Børs News Web.

Date	Ticker	Company	Name	Position	Price	Shares	Value In NOK	Change
2016.12.30	HBC	Hofseth BioCare ASA	Angelika Florvaag	Quality manager	1,20	10 000		100 %
2016.12.30	ITE	Itera ASA	Arne Mjøs	CEO	5,04	483 700	2 435 720	2 %
2017.01.02	SER	Serodus ASA	Ole Peter Nordby	Member of the Board of Directors	2,40	50 000	119 835	88 %
2017.01.03	ROM	RomReal Ltd.	Arne Reinemo	Director	3,00	1 000 000	3 000 000	62 %
2017.01.03	ZAL	Zalaris ASA	Richard Schiørn	VP Strategic Projects	33,79	1 514	51 158	100 %
2017.01.09	PGS	Petroleum Geo-Services ASA	Espen Grimstad	employee elected Board Member	22,50	134	3 015	15 %
2017.01.09	SDSD	Hanekamb Invest AS	Martin Nes	Board member	0,90	500 000	450 000	18 %
2017.01.09	STORM	Storm Real Estate ASA	Kim Mikkelsen	Managing Director	4,75	340	1 615	0 %
2017.01.11	STORM	Storm Real Estate ASA	Kim Mikkelsen	Managing Director	5,00	21 584	107 920	1 %
2017.01.13	STORM	Storm Real Estate ASA	Kim Mikkelsen	Managing Director	5,00	2 200	11 000	0 %
2017.01.16	NAVA	Navamedic ASA	Patrik Hellström	Board Member		10 000	0	100 %
2017.01.16	TOM	Tomra Systems ASA	Jan Svensson	CEO	86,76	140 000	12 146 400	0 %
2017.01.16	NAVA	Navamedic ASA	Patrik Hellström	Board Member	12,95	10 000	129 500	100 %
2017.01.17	STORM	Storm Real Estate ASA	Kim Mikkelsen	Managing Director and Board Member	5,00	23 499	117 434	1 %
2017.01.24	OLT	Olav Thon Eiendomsselskap ASA	Lars Løseth	Special advisor	157,78	6 000	946 680	86 %
2017.02.06	UMS	Unified Messaging Systems ASA	Leon Roy Hausmann	Head of business development	1,25	660 000	825 000	100 %
2017.02.07	LINK	Link Mobility Group ASA	Siw Ødegaard	Executive Vice President	150,00	63 745	9 561 750	32 %
2017.02.07	LINK	Link Mobility Group ASA	Søren Sundahl	Board member	149,00	2 720	405 280	0 %
2017.02.09	NSG	Norske Skogindustrier ASA	Paul R. Kristiansen	Member of the Board	2,52	15 500	39 060	25 %
2017.02.10	PRS	Prosafe SE	Stig H. Christiansen	CEO	37,55	26 500	994 990	100 %
2017.02.10	GJF	Gjensidige Forsikring ASA	John Giverholt	Board member	134,20	3 500	469 700	100 %
2017.02.10	TGS	TGS-NOPEC Geophysical Company ASA	Mr. Amundsen	Primary insider	190,00	2 250	427 500	100 %
2017.02.10	SSO	Scatec Solar ASA	Roar Haugland	Executive Vice President	37,50	150 000	5 625 000	39 %

OSLO BØRS
OSLO STOCK EXCHANGE

NewsWeb

MessageId: 418520	
Published date:	24.01.2017 13:20
IssuerID:	OLT
Issuer:	Olav Thon Eiendomsselskap ASA
Instrument:	OLT - Olav Thon Eiendomsselskap
Market:	XOSL
Category:	MANDATORY NOTIFICATION OF TRADE PRIMARY INSIDERS
Mandatory notification:	Yes
OAM announcements:	Yes
Attachment:	
Title:	MELDEPLIKTIG HANDEL
Text:	LL Holding AS, et selskap kontrollert av Lars Løseth, spesialrådgiver i Olav Thon Eiendomsselskap ASA, har idag 24. januar 2017 kjøpt 6.000 aksjer i Olav Thon Eiendomsselskap ASA til kurs 157,78. LL Holding AS eier etter transaksjonen 7.000 aksjer i Olav Thon Eiendomsselskap ASA. For Olav Thon Eiendomsselskap ASA Arne B. Sperre Konserndirektør finans

Appendix 2

Print screen from STATA with daily characteristics for each company.

country	company_id	event_date	date	delay	position
Norway	AF Gruppen ASA	2.01e+07	2.01e+07	0	Top Management
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Top Management
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Board Member
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Top Management
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	AF Gruppen ASA	2.02e+07	2.02e+07	0	Others
Norway	Arendals Fossekompani ASA	2.01e+07	2.01e+07	0	Top Management
Norway	Arendals Fossekompani ASA	2.01e+07	2.01e+07	0	Top Management
Norway	Arendals Fossekompani ASA	2.01e+07	2.01e+07	0	Top Management
Norway	Arendals Fossekompani ASA	2.01e+07	2.01e+07	0	Top Management
Norway	Arendals Fossekompani ASA	2.01e+07	2.01e+07	0	Top Management

Appendix 3

Print screen from STATA containing daily information for each company.

country	date	company_id	index	ret	market_ret	SMB	HML	LIQ	rf_1	MV	PTBV
Norway	2.01e+07	Kongsberg Gruppen ASA	356.13	.0154563	.0210265	-.0069868	.0102976	-.0310246	.0000732	327.78	.92
Norway	2.01e+07	Kongsberg Gruppen ASA	362.22	.1238993	.0169559	-.0051931	-.0336497	-.0203168	.0000712	371.44	1.05
Norway	2.01e+07	Kongsberg Gruppen ASA	357.86	-.0081633	-.0121099	.0183036	.0193339	.0158564	.000072	368.18	1.04
Norway	2.01e+07	Kongsberg Gruppen ASA	347.07	.0838187	-.0306154	.02537	-.0192549	.0159386	.0000708	400.76	1.13
Norway	2.01e+07	Kongsberg Gruppen ASA	351.72	.0321412	.0133089	-.0086757	.0030754	-.0123432	.0000712	413.79	1.17
Norway	2.01e+07	Kongsberg Gruppen ASA	337.14	-.037179	-.0423371	.0499004	-.0008148	.0484242	.0000624	398.81	1.12
Norway	2.01e+07	Kongsberg Gruppen ASA	340.59	.0249389	.0101811	-.0211693	.010696	-.0264604	.0000636	408.58	1.15
Norway	2.01e+07	Kongsberg Gruppen ASA	341.71	.004914	.003283	.0001232	.0072877	-.0031409	.0000632	410.53	1.16
Norway	2.01e+07	Kongsberg Gruppen ASA	320.72	-.0502618	-.063394	.039443	.0207191	.051259	.0000652	390.33	1.1
Norway	2.01e+07	Kongsberg Gruppen ASA	319.6	-.007762	-.0034983	-.005251	-.0070148	-.0069041	.000066	387.73	1.09
Norway	2.01e+07	Kongsberg Gruppen ASA	328.97	-.0026008	.0288963	-.0202909	.0027895	-.0219429	.0000624	386.42	1.09
Norway	2.01e+07	Kongsberg Gruppen ASA	325.88	.0103628	-.0094373	.0174268	.0163244	.0086815	.0000616	390.99	1.1
Norway	2.01e+07	Kongsberg Gruppen ASA	330.45	.0102565	.0139261	-.0023026	-.0077606	.010646	.0000664	394.24	1.11
Norway	2.01e+07	Kongsberg Gruppen ASA	334.52	.0101524	.0122413	-.0136425	-.0173303	-.0258913	.0000672	398.81	1.12
Norway	2.01e+07	Kongsberg Gruppen ASA	333.08	.049271	-.004314	.020185	-.0042692	.0105061	.0000636	418.35	1.18
Norway	2.01e+07	Kongsberg Gruppen ASA	338.3	.0260988	.0155504	-.0130679	-.0029327	-.0070081	.0000616	429.43	1.21
Norway	2.01e+07	Kongsberg Gruppen ASA	331.99	.0502389	-.0188282	.0210488	-.0050432	.0219589	.0000636	451.59	1.27
Norway	2.01e+07	Kongsberg Gruppen ASA	330.69	.1234586	-.0039235	-.002331	.003742	-.0118153	.0000632	510.89	1.44
Norway	2.01e+07	Kongsberg Gruppen ASA	318.33	.0830666	-.0380928	.0376731	.0126105	.034838	.00006	555.2	1.56
Norway	2.01e+07	Kongsberg Gruppen ASA	318.32	.0036166	-.0000314	.0037284	-.0091928	-.0033569	.0000628	557.81	1.57
Norway	2.01e+07	Kongsberg Gruppen ASA	313.47	.0284717	-.0153535	.0121404	-.0043165	.0244737	.0000592	574.1	1.62
Norway	2.01e+07	Kongsberg Gruppen ASA	316	.0310906	.0080386	-.0137346	.0021101	-.0072175	.00006	592.34	1.67
Norway	2.01e+07	Kongsberg Gruppen ASA	309.72	-.0434473	-.0200736	.0132539	.0071161	.0341195	.000064	566.93	1.6
Norway	2.01e+07	Kongsberg Gruppen ASA	314.12	-.0161149	.0141064	-.0096685	-.0025464	-.0310901	.0000632	557.81	1.57
Norway	2.01e+07	Kongsberg Gruppen ASA	321.23	-.0182154	.0223823	-.0214119	.001522	-.0162787	.0000624	547.38	1.54
Norway	2.01e+07	Kongsberg Gruppen ASA	330.41	.0466871	.0281769	-.0260261	.0102362	-.0210294	.000058	574.1	1.62
Norway	2.01e+07	Kongsberg Gruppen ASA	329.18	-.0633696	-.0037296	.0045432	-.0050568	.0132342	.0000628	538.26	1.52