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Insider Trading on Swedish Multilateral Trading Facilities

Authors:
Sebastian Berlin
Harald Johansson

Supervisor:
Susanne Arvidsson

Abstract

Title	**Insider Trading on Swedish Multilateral Trading Facilities**
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Authors	Harald Johansson and Sebastian Berlin
Supervisor	Susanne Arvidsson
Five key words	Insider trading, Abnormal returns, MTF, Sweden, MAR
Purpose	The purpose of the thesis is to examine how insider transactions affect the share prices of stocks traded on Swedish MTFs. Furthermore, the authors intend to investigate which factors have the strongest impact on share price.
Methodology	Quantitative method in an event study framework. Multiple regressions used to determine potential relationships between independent and dependent variables.
Theoretical framework	Existing theories as well as previous international and domestic evidence of stock performance associated with insider transactions.
Conclusions	Insiders engaging in transactions in firms listed on Swedish MTFs generate abnormal returns.

Preface

The authors of this thesis started their four-year studies in Business and Economics at Lund University in the fall of 2013. In June 2016, they published their bachelor´s dissertation Det Våras för Indien on post-IPO performance on the Bombay Stock Exchange. In the fall of 2016, the authors started the Master´s programme in Accounting and Finance – Corporate Financial Management. This master´s dissertation is the authors' final academic contribution at Lund University and therefore they would like to thank the programme coordinators as well as their supervisor Ek. Dr. Susanne Arvidsson for assisting in the writing of the thesis. Finally, the authors would like to wish the reader of this dissertation a pleasant reading.

Sebastian Berlin Harald Johansson

Definitions

Abnormal return – Market adjusted return.

Finansinspektionen – The Swedish Financial Supervisory Authority (FI).

Insider – Person discharging managerial responsibilities (PDMR) and persons closely associated (PCA) with them.

Inside information – ”[…] 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 instruments […]” (Regulation (EU) No 596/2014).

MTF – Short for Multilateral trading facility, which is a less regulated trading platform than a regular stock exchange such as the Stockholm Stock Exchange.

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1. Introduction

In the introductory chapter, the authors present the background, problematisation and purpose of the thesis. Finally, delimitations and disposition is presented in order to provide the reader with a clear overview.

1.1 Background

As a corporate insider or a person discharging managerial responsibilities (PDMR), it is likely that you have direct access to *inside information* about your company´s business model and strategy. Yet, making use of such information in an illegitimate way can lead to legal consequences (Bromberg, Gilligan & Ramsay, 2017). A recent example of this, is the Swedish tech giant Hexagon's CEO who was arrested in Norway on insider trading charges (Financial Times, 2016). However, engaging in insider transactions, provided that the person is not in possession of inside information, is not illegal. As a matter of fact, insiders do engage in stock transactions on a regular basis and several studies have shown that they tend to be successful (Degryse, de Jong & Lefebvre, 2014; Huddart & Ke, 2007; Kallunki, Nilsson & Hellström, 2009; Lakonishok & Lee, 2001).

According to the strong form of efficient capital markets, insiders should not be able to generate abnormal returns, since the prices already fully reflect all available pricing-relevant information (Fama, 1970). Aussenegg & Ranzi (2008) explains that if this is the case, outside investors should put no value on the announcement of insider stock transactions and thereby have no impact on the share price development. However, several studies indicate that the market is *not* efficient in the strong sense (Fidrmuc, Goergen & Renneboog, 2006; Huddart & Ke, 2007; Seyhun, 1986; Shaker, 2013). Corporate insiders are indeed better informed and the market does react to the information content of insider trade announcements (Aussenegg & Ranzi, 2008; Degryse, de Jong & Lefebvre, 2014; Lakonishok & Lee, 2001).

1.2 Problem discussion

Insider trading is a well-studied phenomenon and while there are several studies suggesting that it is possible for insiders to generate abnormal returns (Degryse, de Jong & Lefebvre, 2014; Huddart & Ke, 2007; Lakonishok & Lee, 2001; Seyhun, 1986) there are also a few stating the opposite (Eckbo & Smith, 1998; Jenter, 2004). Seyhun (1986), Lakonishok and Lee (2001) and Huddart and Ke (2007) show evidence of the former on the US market, and that insider do possess better information than outsiders. Jenter (2005), on the other hand, argues that the private information held by top executives is exaggerated. He explains that executives, as a group, tend to follow a regular contrarian investment strategy. They are inclined to buy shares in companies that are small, pay high dividends and appear to be undervalued based on financial metrics, and they tend to sell shares for the opposite types of firms. Simply investing in a diversified portfolio, employing the same contrarian strategy, yields almost the same return as that of corporate executives, but to an even lower risk (Jenter, 2005).

As for Europe, most studies find that insiders' trades are successful, affecting the price movement of shares in a positive direction following purchases, and vice versa for sales transactions (Degryse, de Jong & Lefebvre, 2014; Dickgiesser & Kaserer, 2009; Fidrmuc, Goergen & Renneboog, 2006). Contradictory to these results, Eckbo and Smith (1998) find that this is not the case in Norway. They stress that a potential reasons for this, i.e. not observing abnormal returns, is the limited possession of insider information among insiders on the Oslo Stock Exchange. Regardless, their empirical results are rather outdated and based on insider transactions between the years 1985-1992.

While a number of theses have examined insider transactions on the Swedish stock market, only a few scientific studies have been published throughout the years. Wahlström's (2003) study on the Stockholm Stock Exchange show evidence that an insider mimicking strategy does generate abnormal returns, given that transaction costs are ignored. A more recent study by Kallunki, Nilsson and Hellström (2009), examining insiders' motives behind trades, find that sales transactions, among

insiders with the largest proportion of their wealth invested in insider stocks, are the trades conveying the greatest amount of information. However, there is still an important gap to be filled with regards to insider trades on the Swedish Multilateral Trading Facilities (MTF): First North, Aktietorget and NGM Nordic MTF.

In accordance with Regulation (EU) No 596/2014, insider transactions in Sweden that amount to 5,000 euro or more must be reported to the Swedish Financial Supervisory Authority (FI) within 3 business days. FI in turn, discloses this information to the public. On July 3, 2016, new rules by the European Parliament and the Council on Market Abuse entered force in Sweden. With this new regulation, reporting of insider transactions to FI now also include companies listed on MTF platforms, previously not comprised by the reporting rules (Finansinspektionen, 2016). This change has revealed an unexplored research area, comprising a market that is even less likely, in theory, to be efficient than larger stock exchanges, such as the Stockholm Stock Exchange. As argued by Jeng et al. (2003), analysts pay less attention to small firms than to large, and therefore the information advantage of insiders is even greater among small companies. Furthermore, Degryse, de Jong and Lefebvre (2014) find that insiders in markets with low liquidity earn higher returns than insiders in markets of high liquidity. Thus, according to theory, insider trades on the less liquid MTF platforms, consisting of much smaller firms than those listed on the Stockholm Stock Exchange, is expected to generate even larger abnormal returns than previously evidenced on the Swedish stock market.

1.3 Problem statement

With the previous discussion in mind, this thesis serves to answer the following questions:

- *Do insiders in Swedish companies listed on Multilateral Trading Facilities (MTF) generate abnormal returns?*
- *Which firm-, insider- and transaction-specific factors can explain the stock performance following an insider trade?*

1.4 Purpose statement

The purpose of the thesis is to examine how insider transactions affect the share prices of stocks traded on Swedish MTFs. Furthermore, the authors intend to examine which factors have the strongest impact on the share price.

The variables that the authors intend to investigate are *insider position*, *transaction size*, *firm size*, *book-to-market ratio* and *past performance*.

1.5 Delimitation and scope

Due to the recent changes in regulation regarding reporting of insider trades, the authors will exclusively examine insider transactions between 2016-07-03 and 2017-02-28 in companies listed on Swedish MTF platforms. Congruent to the majority of previous studies on insider trading, only transactions of common stock traded on the secondary market will be examined. Thus, a comparison with previous studies will be more meaningful.

1.6 Target audience

The target audience of the thesis is primarily students within business and economics with a background in finance. Researchers and financial institutions such as investment banks and proprietary trading firms may also find the thesis useful.

1.7 Disposition of the thesis

In addition to the introductory part, the thesis will consist of six chapters:

2. *Theoretical foundation and literature review*
3. *Methodology*
4. *Empirical results*
5. *Analysis*
6. *Conclusion*

In the theoretical foundation and literature review chapter, the authors will present the theoretical framework as well as previous research in the area. In the methodology-chapter, emphasis will be placed on how the thesis has been conducted. A step-by-step procedure will be presented in order to improve the transparency and overall understanding of the study. In the empirical results-chapter, empirical data will be presented complemented with comments regarding potential patterns and trends as well as the statistical results. The analysis-chapter will put emphasis on a deeper analysis of the empirical results based on the theoretical framework. Finally, the authors will present conclusions based on the results of the study, as well as suggestions of future research in the area.

2. Theoretical foundation and literature review

In this chapter, the authors begin with defining the theoretical framework and discuss its relation to the research questions. This is followed by a separate explanation of the theories. Thereafter, a review of the past research regarding insider trading and its impact on individual share prices will be presented. Finally, hypotheses are developed based on previous studies.

2.1 Theoretical framework

The theoretical framework mainly consists of three key concepts: *market efficiency* (Fama, 1970), *information asymmetry* (Akerlof, 1970) and *signaling effects* (Spence, 1973). The former is directly connected to the question whether or not it is possible for insiders to generate abnormal returns depending on the degree of efficiency in the market. The second concept provides an explanation to why market prices might not equal its true values, and how the information availability depends on the participant's position in the market place. Finally, the theory of signaling effects allows us to understand why an insider transaction can affect the price movement through the information it conveys.

Another related theory, though excluded from the theoretical framework, is the concept of the *random walk* of price series (Kendall, 1953). This theory is contradictory to the concept of signaling effects and instead suggests that price movements cannot be predicted. This also explains the reason for its exclusion – if the price movement is *only* a random walk, there is no relevance in studying insider transactions' effects on the share prices.

In order to give the reader a clear overview of the research field, previous studies, primarily focused on the U.S and European markets, are presented in the literature review-section. This will, furthermore, be used as a reference point in the analysis of the results on the Swedish MTF market. Not least, to be able to compare and draw conclusions of *why* insider trades influence the market prices.

2.1.1 Efficient Market Hypothesis

Fama's (1970) theory of efficient capital markets is one of the cornerstones in economic theory. Not least is it important when examining the effects of insider transactions, since it provides an indication of the market efficiency depending on the magnitude of abnormal returns. In his article *Efficient Capital Markets: A Review of Theory and Empirical Work*, Fama (1970, p. 383) defines an efficient market as "A market in which prices always 'fully reflect' available information is called 'efficient'.".

Fama (1970) examines the adjustment of security prices related to three information subsets, namely: *weak form*, *semi-strong form* and *strong form* efficiency. In the *weak form*, information includes only the historical prices of assets. In the *semi-strong form*, prices are influenced by other public information such as announcements of dividends or earnings, in addition to the historical prices of securities. Finally, in the *strong form* efficiency, prices also adjust to private information that is accessible only to a limited group of people, such as Chief Executive Officers (CEO), board members or similar (Fama, 1970). If it were assumed that the equity market was efficient in the *strong form*, insiders would not be able to earn abnormal returns. However, Fama (1970) only finds evidence of the *weak* and *semi-strong form* efficiency but no proof of the existence of a *strong form* efficient market, and he rather refers to this as an extreme benchmark.

While Fama (1970) suggests that the market is indeed efficient in the *weak-* and *semi-strong form*, there are several studies suggesting the opposite. For example, Shaker (2013) tested if the Finnish and Swedish stock markets were efficient, but found proof that so was not the case. According to Shaker (2013), only a few European markets are in line with the efficient market hypothesis. Furthermore, Jennergren and Korsvold (1974) suggest that it cannot be precluded that the Norwegian and Swedish stock markets are inefficient even in the *weak form*.

2.1.2 Information asymmetry

Akerlof (1970) introduces the information asymmetry problem by referring to the market of automobiles. He explains that there are two kinds of cars available in the market: good cars and bad cars, so called *lemons*. Since the seller, on average, have

more knowledge about the quality of the car than the buyer, there exists an information asymmetry between the two parties. Consequently, good cars and *lemons* sell at the same price because the buyer cannot separate between them. This in turn, causes the owners of good cars to leave the market since they will not be able to receive a fair price for their cars, leading to a market of *lemons* (Akerlof, 1970).

Applying the information asymmetry-theory to the insider trading phenomenon, it can be argued that the firm´s insiders, possessing inside information, are in fact more knowledgeable about the firm´s performance than the average market participant. Using the same terminology as Akerlof (1970), the average market participant would be analogous to the buyer and the average insider would be resembled as the seller.

To address the problems associated with information asymmetry, Akerlof (1970) suggests a couple of remedies: guarantees, licenses and brand names. For example, a guarantee can ensure the buyer that the specific good has a certain level of quality, which transfers the risk from the buyer to the seller. Another example is that of academic titles, which serves to indicate a certain level of proficiency (Akerlof, 1970). The signaling theory, which will be presented next, share similarities with Akerlof's (1970) remedies, as to how information asymmetry can be mitigated.

2.1.3 Signaling effect

Spence (1973) uses the job market to illustrate his theory about signaling effects. He explains that hiring a new employee is similar to frequently purchasing a lottery ticket. It takes time to learn about a person's capabilities and the fact that they are unknown beforehand makes the hiring process risky. When it comes to individual applicants' attributes, Spence (1973) makes a distinction between fixed attributes, referred to as *indices*, and alterable attributes, so called *signals,* which are subject to manipulation by the applicant herself.

Levy and Lazarovich-Porat (1995) explain, similarly to Akerlof's (1970) market of lemons, that the quality between firms differ. However, outsiders cannot distinguish between the high and low quality firms. Thus, managers, who possess greater

information about the firm's viability, can signal this information to outsiders in various ways, e.g. by adopting a certain dividend policy or by choosing a certain capital structure (Levy & Lazarovich-Porat, 1995). In the context of insider trading, the signal would refer to the transaction itself. When a person with access to inside information engages in a transaction, an information signal is sent to the market and depending on the effectiveness of the signal, there is a stock price adjustment. This is, moreover, one of the main motives for engaging in insider trading (Firth et al., 2001; Lakonishok & Lee, 2001) along with the *profit-seeking hypothesis* (Firth et al., 2001; Huddart & Ke, 2007).

2.4 Literature review

Below, the authors start off with presenting past evidence on the main question regarding insider trades' impact on stock returns. In section *2.5.2*, the authors extend the discussion with regards to each of the insider-, transaction- and firm-specific factors and their relationship to post-insider trade stock performance.

2.4.1 Evidence from the U.S.

Huddart and Ke (2007) find evidence that insiders earn abnormal returns in their examination of the relationship between insider stock transactions and the firm's information environment. Though the authors conclude that restrictions on insider trades complicates their trading strategies, it does not fully eliminate potential profits from having access to superior information.

Another topic that Huddart and Ke (2007) raise in their study is the motive behind insider trades. They suggest that there may be other motives for insider trading than just plain profits from the shares that they buy – for example an insider's compensation may be tied to the share price and therefore any signaling effect with a resulting share price increase may also affect the insider's overall compensation, which increases the motives to engage in insider transactions (Huddart & Ke, 2007).

In line with the findings of Huddart and Ke (2007), Seyhun (1986) show that insiders are good at predicting future movements in the share price in the companies that they

are working in. However, when it comes to outside investors' abilities to generate abnormal returns by using publicly available information of insider trades, Seyhun (1986) as well as Lakonishok and Lee (2001) conclude that such an investment strategy would not be beneficial.

2.4.2 Evidence from Europe

Eckbo and Smith (1998) examines insider transactions on the Norwegian stock market and their results contradict previous evidence from the U.S. market (Huddart & Ke, 2007; Lakonishok & Lee, 2001; Seyhun, 1986). Eckbo and Smith (1998) find that insiders are unable to generate abnormal returns and they suggest that one main explanation for this might be that insiders in a market like the Oslo Stock Exchange rarely possess inside information or that the value of maintaining corporate control benefits might offset the value of trades based on such information.

Fidrmuc, Goergen and Renneboog (2006) find differences between abnormal returns for insiders in the U.K. and the U.S. markets, with higher returns in the former. The authors suggest that the need for faster reporting of insider transactions in the U.K. may be one of the reasons to the observed larger abnormal returns in that market. Furthermore, Fidrmuc, Goergen and Renneboog (2006) find that news about insider transactions trigger immediate reactions in both the U.K. and the U.S. markets, which contrasts with evidence presented by Lakonishok and Lee (2001). However, the immediate reactions in the market are mitigated if the transactions are preceded by news about CEO replacements or mergers and acquisitions (Fidrmuc, Goergen & Renneboog, 2006).

Evidence from the German stock market indicates abnormal returns post-insider transactions. However, if transaction costs and bid/ask spreads are considered, the authors conclude that outside investors will hardly be able to profit from pursuing an insider mimicking strategy. (Dickgiesser & Kaserer, 2009)

2.4.3 Evidence from Sweden

Kallunki, Nilsson and Hellström (2009) study the motives behind insider transactions in the Swedish stock market and find that the main motive behind insider stock sales is diversification. Furthermore the authors show that many insiders tend to hold on to their stocks even when prices have declined, indicating presence of overconfidence among insiders (Kallunki, Nilsson & Hellström, 2009). The authors further suggest that insiders tend to be more cautious when timing their stock purchases than when timing their sales because of regulatory risks (Kallunki, Nilsson & Hellström, 2009).

Another study on the Swedish market was conducted by Wahlström (2003), suggesting it is possible to generate abnormal returns for outside investors, based on insider transactions, as long as the stocks are kept for at least three months after purchase. The abnormal returns, in his studied, amounted to 1,26% for insider transactions of companies listed on Stockholm Stock Exchange's former A-list. However, there is one important limitation to Wahlström's (2003) study, in terms of reaching a conclusion regarding the profitability of an insider mimicking strategy, and that is the presence of transaction costs, which is not accounted for. According to Dickgiesser and Kaserer (2009), transaction costs play an important role in determining if a mimicking strategy is beneficial or not for outside investors, hence the results in Wahlström's (2003) study should be interpreted with a hint of caution.

Since there is no recent published research on insider trading on the Stockholm Stock Exchange we summarize evidence from a Bachelor and a Master's theses in Table 1.

Table 1. Evidence from Bachelor and Master's theses

Author (year)	Empirical years	Stock exchange	Event window	Abnormal return
Jönsson and Rasmusson (2010)	2000-2010	Stockholm Stock Exchange	(-5, 10)	Purchase trades: 0,14%* Sales trades: -0,21%
			(-5, 61)	Purchase trades: 0,49%*** Sales trades: -1,34%***
Kyllenbeck and Ryrberg (2015)	2012-2014	Stockholm Stock Exchange, small cap	(0, 9)	Purchase trades: 1,17% Sales trades: -0,49%
			(0, 19)	Purchase trades: 0,85% Sales trades: -0,83%

*Evidence from Stockholm Stock Exchange. Significance level: *5%, **1%, ***0,1%*

2.4.4 Market conditions and liquidity

Degryse, de Jong and Lefebvre (2014) find that market conditions are important when looking at insiders' abilities to generate abnormal returns. They find that insiders in markets of low liquidity generate higher abnormal returns than insiders in markets of high liquidity. For sales transactions, the market liquidity has the opposite effect, resulting in lower abnormal returns for insiders engaging in transactions. Furthermore, Degryse, de Jong and Lefebvre (2014) find that insiders' purchases are more informed and strategic than insiders' sales, which according to the authors are conducted mainly to achieve diversification or generate liquidity in insiders' private portfolios.

Table 2. Selection of previous studies

Author (year)	Country	Empirical years	Conclusion
Seyhun (1986)	USA	1975 - 1981	Insiders generate abnormal returns, especially insiders in higher positions. Imitation strategy for outside investors is unsuccessful.
Lakonishok and Lee (2001)	USA	1975 - 1995	Insiders generate abnormal returns, especially in small-cap firms. Poor performance in imitation strategy.
Huddart and Ke (2007)	USA	1994 - 1997	Insiders generate abnormal returns and regulation may limit profits associated with insider transactions but do not fully eliminate insiders' abilities to generate abnormal returns.
Eckbo and Smith (1998)	Norway	1985 - 1992	Hypothesis of positive abnormal returns for insiders is rejected which is contradictory to many previous studies in the field.
Degryse, de Jong and Lefebvre (2014)	Netherlands	1999 - 2008	Insiders generate abnormal returns and the magnitude of these returns is larger for insiders of smaller firms and in markets of low liquidity.
Fidrmuc, Goergen and Renneboog (2006)	United Kingdom & USA	1991 - 1998	Evidence of abnormal returns for insiders in both the US and the UK but differences in returns due to regulatory differences on transaction reporting.
Dickgiesser and Kaserer (2009)	Germany	2002 - 2007	Insiders do generate abnormal returns, however outsiders pursuing a mimicking strategy will hardly outperform the market taking transaction costs and bid/ask spreads into account.

Author (year)	Country	Empirical years	Conclusion
Kallunki, Nilsson and Hellström (2009)	Sweden	2000 - 2005	Insiders sell stocks mainly for diversification purposes. Insider stock sales are more informative of future returns among insiders with large portions of private wealth allocated in the underlying stock.
Wahlström (2003)	Sweden	2000 - 2002	Mimicking insiders can be a successful strategy for outside investors to generate abnormal returns when transaction costs are not present.

Compilation of previous findings with respective studies' empirical country and years

2.5 Hypotheses

Below we present past research linked to studies on the abnormal returns following insider transactions as well as the specific factors potentially associated with the stock performance. Based on this, we then formulate the hypotheses that are being tested in the study.

2.5.1 Abnormal returns following insider transactions

Insider purchase and sales transactions earn abnormal returns (Aussenegg & Ranzi, 2008; Cheuk et al., 2008; Degryse, de Jong & Lefebvre, 2014; Dickgiesser & Kaserer, 2009; Fidrmuc, Goergen & Renneboog, 2006; Huddart & Ke, 2007; Lakonishok & Lee, 2001; Seyhun, 1986) and Firth et al. (2011, p. 505) expresses that "Inside purchases appear to signal and correct undervaluation and inside sales appear to signal and correct overvaluation". This would suggest that a buy trade would be followed by a positive abnormal return, while it would be negative in a sales transaction. It should be noted though, that a sales trade can be thought of in two ways: an insider saving money from selling a stock which drop in price *or* a short position earning the insider positive returns on the decreasing value of the underlying.

Based on the evidence described in section *2.4*, following hypotheses will be tested in the study:

H_0: *Insiders are unable to generate abnormal returns*

H_1: *Insiders are able to generate abnormal returns*

2.5.2 Independent variables

Seyhun (1998), among others, has shown that the magnitude of abnormal returns associated with insider transactions is impacted by factors specific to the firm, the insider and the transaction itself (Firth et al., 2011). The independent variables, presented in parenthesis, are categorized as follow:

- **Insider-specific** (*Insider position*)
- **Transaction-specific** (*Transaction size*)
- **Firm-specific** (*Firm size*, *Book-to-market ratio, Past-performance*)

Insider-specific characteristic

Insider position

According to Seyhun (1998) there exists an information hierarchy among the insiders of a company, where trades of top executives convey more information than trades of officers and directors. In Degryse, de Jong and Lefebvre's (2014) study of the Dutch market, they find the same pattern. When separating between insiders, top executives and others, they can only prove significant abnormal returns for the former category.

Hypothesis:

> H_0: *There is no association between the insider's position within the company and the abnormal return following an insider trade.*
>
> H_1: *There is an association between the insider's position within the company and the abnormal return following an insider trade.*

Transaction-specific characteristic

Transaction size

According to Firth et al. (2011), abnormal returns reflect market participants' perception of the quality of an insider's information - the higher the quality, the higher the abnormal returns, or vice versa for a sales trade. Karpoff (1987), in turn, found a positive relationship between the volume of a transaction and the quality of the insider's information. This would imply that *transaction size* would be positively

associated with abnormal returns, a relationship proven by several previous studies (Aussenegg & Ranzi, 2008; Huddart & Ke, 2007; Wong et al., 2000).

Hypothesis:

> ***H_0***: *There is no association between the size of a transaction and the abnormal return following an insider trade.*
>
> ***H_1***: *There is an association between the size of a company and the abnormal return following an insider trade.*

Firm-specific characteristics

Firm size

Aussenegg and Ranzi (2008) find that insiders' transactions in smaller firms convey more information to the stock market than in larger firms. Cheuk et al. (2006) further shows that they are also more likely to engage in trading activities to take advantage of their private information, resulting in positive abnormal returns. These finding are in line with earlier research showing greater information asymmetry among small companies (Seyhun, 1998). Jeng et al. (2003) explains how this phenomenon is consistent with intuition. The smaller the firm, the more likely it is for a manager to possess a greater portion of the relevant information. Furthermore, analysts pay less attention to smaller companies (Jeng et al., 2003).

Hypothesis:

> ***H_0***: *There is no association between the size of a company and the abnormal return following an insider trade.*
>
> ***H_1***: *There is an association between the size of a company and the abnormal return following an insider trade.*

Book-to-Market

Fama and French (1995) claim that the Book-to-Market (BtM) ratio can predict the stock price performance and argue that a low ratio indicates overvaluation while a high ratio indicates the opposite. If this is true, insiders would want to buy stocks when the BtM-ratio is high and sell stocks when it's low, a trading pattern confirmed by Seyhun (1998). Cheuk et al. (2006) further investigates and find evidence that the combination of the two factors, an insider trade and the information of the value of

the BtM-ratio, function as an even stronger indicator of the stock performance than an insider trade alone.

Hypothesis:

> ***H_0***: *There is no association between the Book-to-Market-ratio and the abnormal return following an insider trade.*
>
> ***H_1***: *There is an association between the Book-to-Market-ratio and the abnormal return following an insider trade.*

Past performance

Previous research shows that insiders tend to sell stocks after periods of high abnormal returns and purchase stocks following periods of declining share prices (Aussenegg & Ranzi, 2008; Firth et al., 2011). Given that insider transactions generate abnormal returns, as evident from numerous studies, there should be a significant negative relationship between the past performance of a stock and the price development post-insider trade. Degryse, de Jong & Lefebvre (2014) show evidence of such a pattern for purchases and sales made by insiders.

Hypothesis:

> ***H_0***: *There is no relationship between the past performance of a stock and the abnormal return following an insider trade.*
>
> ***H_1***: *There is a relationship between the past performance of a stock and the abnormal return following an insider trade.*

2.5.3 Summary

It is important to clarify and distinguish between purchase and sales transactions, in terms of above studies' prediction regarding the relationship between abnormal returns and each of the independent variables. As for the factors *insider position*, *transaction size* and *firm size*, the relationships for the sales transactions are opposite to those of the purchase trades, which intuitively makes sense – when an insider strategically trade upon information, the subsequent price development follow, i.e. a purchase trade is followed by positive returns and a sales trade is followed by negative returns. And, as discussed above, *insider position*, *transaction size* and *firm*

size all relates to information quality. However, as regards to *book-to-market* and *past performance*, the predicted relationships stay the same across transaction type. As argued by Fama and French (1995) a low BtM-ratio predicts overvaluation, and vice versa, regardless if insiders buy or sell shares. Likewise, the contrarian insider-trading pattern found by Degryse, de Jong & Lefebvre (2014) applies to both purchases and sales. Thus, the predicted relationship is negative for both types of transactions.

Table 3. Hypotheses

Independent variable	Hypothesis		
	Purchase transactions	**Sales transactions**	**Previous studies**
Insider position	There is an association between the insider's position and the abnormal returns.	There is an association between the insider's position and the abnormal returns.	Degryse, de Jong & Lefebvre (2014)
Transactions size	Positive relation to abnormal returns	Negative relation to abnormal returns	Aussenegg & Ranzi (2008); Huddart & Ke (2007); Wong et al. (2000)
Firm size	Negative relation to abnormal returns.	Positive relation to abnormal returns.	Aussenegg & Ranzi (2008)
Book-to-Market	Positive relation to abnormal returns.	Positive relation to abnormal returns.	Cheuk et al. (2006)
Past performance	Negative relation to abnormal returns.	Negative relation to abnormal returns.	Degryse, de Jong & Lefebvre (2014)

Compilation of the independent variables and their relationship to abnormal returns.

3. Methodology

In the following chapter, the authors outline the methodology and procedures of the study. First, the research design is being presented, followed by a description of the data. Thereafter, a step-by-step explanation of the event study methodology is delineated, as well as a description of the regression framework and the variables that are being studied. Finally, the authors end the chapter with a method discussion.

3.1 Research design

The study is based on a quantitative method in an event study framework. With a deductive approach, meaning that hypotheses based on previous research are being tested (Bryman & Bell, 2013), the authors reach conclusions regarding the stock performance following insider trades, as well as the potential determinants of the magnitude of abnormal returns.

3.2 Data

3.2.1 Selection criteria

Following the reasoning of Cheuk et al. (2008), arguing that open market transactions are the most interesting deals to investigate, we include all purchase and sales transactions made by insiders on Aktietorget, First North and NGM between 2016-07-03 and 2017-02-28, with the exception of subscription rights. Transactions of securities other than common stock has also been excluded, in accordance with the methodology of previous studies (Cheuk et al., 2008; Firth et al., 2011). Following are the inclusion and exclusion criteria:

Transaction has been included if:

- ✓ Buy and sale transaction made by an insider
- ✓ Firm listed on Aktietorget, First North or NGM Nordic MTF
- ✓ Transaction date between 2016-07-03 and 2017-02-28

Transaction has been excluded if:

- ☒ Security other than class A, B and C share
- ☒ Subscription right

The investigated period, 2016-07-03 to 2017-02-28, has been chosen due to the change in regulation for MTFs in July 2016. Furthermore, calculating the effect of insider trades has limited us to include February 2017 as the last month since the chosen methodology requires us to collect stock prices for the subsequent 20 trading days following the insider trade.

3.2.2 Defining the observations

The collected data can be divided into two levels of aggregation: *company-day* and *insider-day*. In the former, the transactions are aggregated on a company-specific basis, e.g. if there are two or more trades registered on a specific date, for the same company, they are totaled and accounted for as only one transaction. The total *netted* value of the aggregated transactions will then decide whether the trade is classified as a purchase or a sales transaction, e.g. if the number of shares bought exceeds the number of shares sold, it is treated as a purchase. As for insider-day aggregation, we instead total the transactions based on insiders. This procedure gives us a larger amount of observations since several insiders, in the same company, can trade on a given date.

Following Degryse, de Jong and Lefebvre (2014) we use the company-day aggregation for the univariate analysis and the insider-day aggregation for the multivariate, since we are interested in the relationship between abnormal returns and insiders' positions.

3.2.3 Sample

Given the inclusion and exclusion criteria, the sample, on a company-specific level, originally consisted of 897 observations. However, a total of 111 observations were excluded due to missing share prices during parts of the estimation period. The final

sample includes a total of 188 unique companies with the following number of companies and transactions divided according to aggregation level, platform, and transaction type:

Table 4. Sample

	Insider-specific aggregation				Company-specific aggregation			
	Aktietorget	First North	NGM	Total	Aktietorget	First North	NGM	Total
Purchase								
Number of companies	57	70	14	**141**	57	70	14	**141**
Number of observations	167	334	28	**529**	153	312	28	**493**
Sales								
Number of companies	39	50	9	**98**	39	50	9	**98**
Number of observations	123	164	22	**309**	115	156	22	**293**

Final sample divided according to aggregation level, trading platform and transaction type.

Exclusion of observations

Among the 111 excluded observations, 74 were buy transactions and 37 sales, which equals an exclusion of approximately 15% and 13%, respectively. We found no overrepresentation among the observations connected to any of the examined variables, e.g. a noticeably higher exclusion of CEO's trades than others. Neither were there indications that the observations would significantly influence the results up- or downward in regards to the magnitude of abnormal returns. At least not from observing the plain returns around the events. However, the decision to simply exclude the observations will be further argued for in section *3.3.3*.

3.2.4 Data collection

While transaction- and insider-specific data was provided by FI, share prices and firm-specific data was collected through Datastream. Data, such as book value of shares and all-share indexes for Aktietorget and NGM, which was not available through Datastream, was instead collected through Annual and Quarterly reports and Avanza, respectively.

Table 5. Data source

Financial Supervisory authority (FI)	Datastream	Annual and quarterly reports	Avanza
Company Insider position Transaction date Security type Number of shares bought/sold Share price of trade	Equity share prices First North index Firm market value	Book value of shares	Aktietorget all-share index NGM all-share index

Compilation of all data and its respective source, i.e. from where it has been collected

3.2.5 Data treatment

Microsoft Excel was employed for the event study itself, with calculations and transformations of the independent variables as well as the abnormal returns. The formal statistical testing was conducted in SPSS and Eviews.

3.3 Event study

Based on the event study methodology described by MacKinlay (1997) following step-by-step approach has been employed in this particular study:

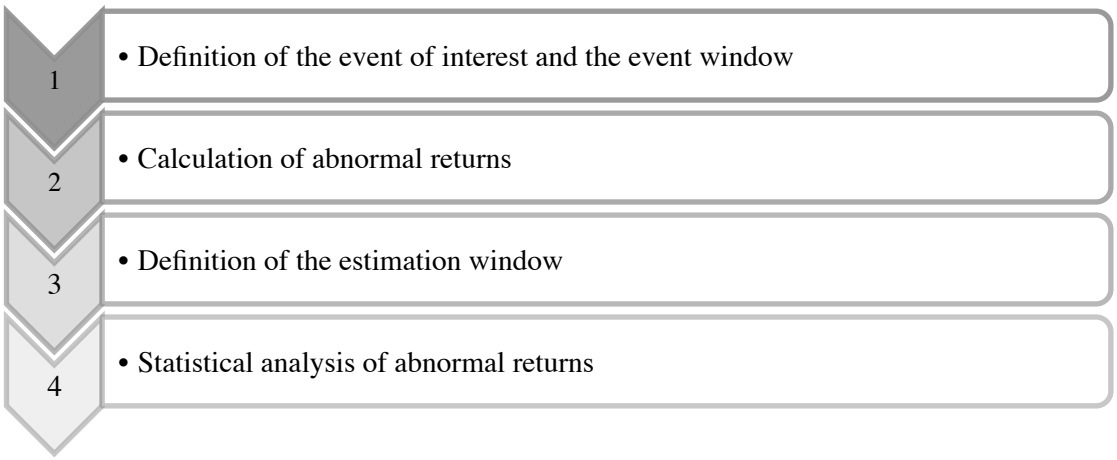

Figure 1. Structure of the event study

3.3.1 Event and the event window

In the first step we identify the *event of interest* as well as the *event window* over which the effect of that event will be investigated. In this case, there are two potential moments of interest, the transaction itself and the reporting of the transaction. These events do not coincide. Degryse, de Jong an Lefebvre (2014), among others, choose to use the insiders' trades instead of the reporting date, and this implies that the *total* effect of the trade is being captured. Furthermore, Lakonishok and Lee (2001) observe that the market starts reacting around the trading day, while the reaction is weaker around the announcement. Therefore, we choose to use the transaction itself as the event of interest, denoted T_E.

MacKinlay (1997) argues that the event window should be defined as larger than the specific period of interest since the period both before and after the event may be relevant. The choice of event window differs between previous studies, partly because the purposes among the studies diverge and partly because they examine different markets with different regulations. Congruent with Degryse, de Jong and Lefebvre (2014) we choose an event window spanning from 20 trading days prior to the event, T_{-20}, to 20 trading days after, T_{+20}. This will allow us to investigate not only the abnormal returns following insider transactions but also the price pattern prior to the trades. Note, however, that in the regression analysis we will use the window T_E-T_{+20} for the dependent variable. Degryse, de Jong and Lefebvre (2014) argue that a shorter window would rather capture market reactions, which is affected by corporate governance and ownership structure, whilst the longer window is more likely to reveal the information content of the transactions. Though some studies employ an even longer event window, Degryse, de Jong and Lefebvre (2014) stresses that a too long window could *contaminate* the results by including other trades during the same period of time.

3.3.2 Calculating abnormal returns

To evaluate the effect of the event we need to calculate the abnormal return, *AR*, which is the actual return of the stock, *R*, minus the normal. MacKinlay (1997, p. 15) define the normal return as "[…] the expected return without conditioning on the

event taking place", $E(R \mid X)$, i.e. the expected stock price given that the insider trade never happened. The abnormal return for company i on event date t is (MacKinlay, 1997):

$$AR_{it} = R_{it} - E(R_{it} \mid X_t) \tag{1}$$

Actual return

Calculating the returns from a series of prices, there are two methods that can be used: *simple returns* and *continuously compounded returns*. According to Brooks (2014) the academic finance literature generally employs the latter for two key reasons. First, the assets are more easily comparable because the frequency of the compounds does not matter. Second, they are time-additive. Strong (1992) also stresses that logarithmic returns are more likely be normally distributed, which is an assumption that must be satisfied for the statistical t-tests that will be performed in this study. Based on these arguments, the continuously compounding returns method will be used and is calculated:

$$R_{it} = \ln\left(\frac{p_{i,t}}{p_{i,t-1}}\right) \tag{2}$$

where $p_{i,t}$ is the stock price at time t and $p_{i,t-1}$ the stock price at time t minus 1.

Normal return

Though there are several methods to estimate the normal return of a stock, the two most common choices are the *constant mean return model* and the *market model* (MacKinlay, 1997). The former model assumes a constant mean return of the stock, while the latter assumes a stable linear relation between the stock and market returns.

Among our reference studies (Aussenegg & Ranzi, 2008; Cheuk et al. 2008; Seyhun, 1998), the market model is by far the most commonly used method for estimating the normal return. Moreover, MacKinlay (1997) stresses that the market model, given a high R^2 of the regression, is more efficient than the constant mean return model in

measuring the effect of the event. Therefore, we employ the market model, estimating the normal returns as follow:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{3}$$

where R_{it} and R_{mt} are the returns of stock *i* and the market portfolio, respectively, β_i represent the systematic risk associated with stock *i*, α_i is stock i's return independent of the market, and ε_i is the zero-mean residual.

We estimate the market model parameters with Ordinary Least Square (OLS):

$$\beta_i = \frac{\sum (R_{it} - \bar{R}_i)(R_{mt} - \bar{R}_m)}{\sum (R_{mt} - \bar{R}_m)^2} \tag{4}$$

and

$$\alpha = \bar{R}_i - \beta_i \bar{R}_m \tag{5}$$

Since the benchmark for the market portfolio should be a broad stock index (MacKinlay, 1997) we use all-share indices for respective platform, e.g. observations on First North is benchmarked against the all-share index for that particular platform.

Aggregating the abnormal returns

From equation (1) we obtain the abnormal return of company *i* on time *t*. To draw a conclusion of the effect of the event we have to aggregate the observations, which is done in two dimensions – over time and across stocks (MacKinlay, 1997). For the individual company *i*, we calculate the cumulative abnormal return with following formula:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \tag{6}$$

i.e. the abnormal returns are added up from time t_1 to t_2 where $T_{-20} < t_1 \leq t_2 \leq T_{+30}$. Further, we need to derive the *average* cumulative abnormal return for all stocks in

the sample:

$$CAAR_i(t_1, t_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(t_1, t_2) \tag{7}$$

where N denotes the number of transactions. Observe the difference from the aggregation explained in section *4.4.2* though, where we only defined the *number* of observations in the sample.

3.3.3 Estimation window

To model the normal returns we have to define the estimation window – the period over which the parameters β and α will be estimated. As explained by MacKinlay (1997) the estimation window should not overlap with the event period because of its potential influence on the parameter estimates. Following Aussenegg and Ranzi (2008) we use a period of 120 trading days for the estimation, spanning from 140 days prior to the event until the day the event window starts. As explained in section *3.2.3*, a total of 111 observations were excluded because of missing share prices for several companies during parts of the estimation window. An alternative to excluding the observations would be to accept a shorter window. However, Brooks (2014) argue that the precision of parameter estimates are, in general, affected by the length of the estimation window – the longer the window, the better the estimates. Furthermore, non of our reference studies (Aussenegg & Ranzi, 2008; Cheuk et al. 2008; Degryse, de Jong & Lefebvre, 2014; Firth et al., 2011) employ an estimation window of less than 120 trading days. Therefore, we decided to exclude the observations instead of compromising the parameter estimates.

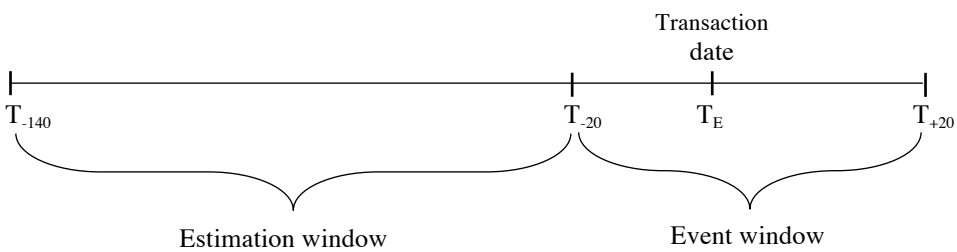

Figure 2. The timeline of the event study

3.3.4 Statistical treatment

To examine whether the average cumulative abnormal return is significant or not, we test the null hypothesis using (MacKinlay, 1997):

$$\theta = \frac{CAAR_i(t_1,t_2)}{var(CAAR_i(t_1,t_2))^{1/2}} \tag{8}$$

The t-test assumes normal distribution, yet abnormal returns in event studies do not always satisfy this assumption (Aussenegg & Ranzi, 2008). However, given our large sample size, θ can be considered ~N (0,1) according to *the central limit theorem* (Brooks, 2014; Körner & Wahlgren, 2006).

Though the event window, as a whole, spans from -20 days prior to the event until 20 days after, the abnormal returns have, in particular, been measured and tested for in three different spans:

- CAR (-20, -1): 20 days prior to the event, until the day before.
- CAR (0, 10): 10 days following the event, including the event day.
- CAR (0, 20): 20 days following the event, including the event day.*

*Note that event window (0, 20) is our primary measurement of insider trades' impact on abnormal returns. If otherwise not stated, we refer to this event window.

In the multivariate analysis, the variables *transaction size*, *book-to-market* and *firm size* have respectively been divided into three different portfolios: lowest, mid and highest 1/3 of the observations. The abnormal returns of each of these portfolios was separately tested for as to see if there were any differences in the stock performance pending on the factors. As for *insider position*, two portfolios were created: one consisting of CEOs' trades and one for the others.

3.4 Cross-Sectional Regression

In the regression analysis we investigate the relationship between the abnormal return y and the insider, firm and transaction-specific variables x_i. The relationship can be described with following linear equation:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \varepsilon \tag{9}$$

The regression line is estimated with OLS, which chooses α and β so that the vertical sum of squared distances between the data points and the fitted line is minimized (Brooks, 2014). Each beta coefficient is then tested against the null hypothesis that the β is equal to zero.

Given the chosen method, MacKinlay (1997) addresses heteroscedasticity and multicollinearity as potential risk factors. In *section 3.5* this will be further discussed and formally tested for.

3.4.1 Dependent variable

Congruent with Degryse, de Jong and Lefebvre (2014) we use CAR (0, 20), average cumulative abnormal return starting at day 0 and ending at day 20, as the dependent variable.

3.4.2 Explanatory variables

With the exception of *insider position*, the factors are expressed as continuous variables in the regression framework, and not grouped into the portfolios as explained in section *3.3.4*.

Insider position

As explained by Körner and Wahlgren (2006) the regression model is constructed for quantitative variables, why *insider position* has been transformed into a dummy variable:

1 = transaction by a CEO

0 = otherwise

Transaction size

This variable is measured as the logarithmic value of the number of traded shares multiplied by the price at which they were bought or sold.

Firm size

Following the methodology of previous studies (Cheuk et al., 2008; Degryse, de Jong & Lefebvre, 2014; Jeng et al., 2003) *firm size* is measured as the company's market capitalization, i.e. share price multiplied by the number of shares outstanding. The logarithm of this value has then been used in the regression.

Book-to-Market

The ratio has been calculated in its standard form:

$$\frac{Book\ value\ of\ shares}{Market\ value\ of\ shares} \tag{10}$$

Past performance

While Degryse, de Jong and Lefebvre (2014) only study insider-trading patterns of *past performance*, we have explicitly incorporated it in the regression as its own variable, using CAR (-20, -1).

3.4.3 Control variable

To verify the robustness of their results regarding abnormal returns of insider trades, Betzer and Theissen (2009) formally test the difference in CAR between their sample as a whole with only their clustered transactions, but find that the difference is negligible. However, Degryse, de Jong and Lefebvre (2014) control for trading clusters in their regressions by creating a dummy variable, anyways. Congruent with their procedures, we adopt a dummy that equals 1 whenever a trade is preceded or followed by another trade in the same company within a period of a week, and 0 otherwise. As explained by Degryse, de Jong and Lefebvre (2014) the dummy coefficient will indicate whether insiders cluster their trades to hide information, and thereby also convey more information than single trades, or if insiders cluster their transactions for liquidity reasons.

3.4.4 Regression equation

The specification of the regression is as follow:

$$CAR_i = \alpha_0 + \beta_1 CEO + \beta_2 \ln(Vol) + \beta_3 \ln(Fsize) + \beta_4 BtM + \beta_5 PastPerf + \beta_6 Cluster$$

In Table 6 the independent variables are compiled with their respective notation as well as the expected signs of the beta coefficients in the regressions.

Table 6. Independent variables

Independent variable	Measured as	Notation	Expected coefficients	
Insider position	Dummy, CEO = 1	CEO	+	(-)
Transaction size	ln (transaction volume)	ln (Vol)	+	(-)
Firm size	ln (market value)	ln (Fsize)	-	(+)
Book-to-Market	Book-to-Market ratio	BtM	+	(+)
Past performance	CAR (-20, -1)	PastPerf	-	(-)

Compilation of independent variables, how they are measured and which signs we expect the coefficients to take in the regressions. The signs in parentheses represent the sales transactions.

3.5 Diagnosis of data

3.5.1 Normal distribution

With the exception of the dummies, all variables were tested for normal distribution using the formal statistical Shapiro-Wilks test. In all cases, the null hypotheses of normal distribution were rejected and following this we used the natural logarithmic values of market size and transaction volume, reducing the skewness of the data. As for the other variables, the CARs and BtM, we employed box-plots to identify the most extreme outliers, which were later winsorized in an effort to restrict the non-normality. According to Brooks (2014) the decision whether to adjust the sample in an attempt to reduce the skewness can be seen as a *trade-off* between the valuable information content of the outliers and the non-normality's impact on the estimates. Based on this, we chose to use winsorization, meaning that the outliers are kept in the data but are given less extreme values, e.g. an outlier being winsorized gets its value

changed to the second most extreme value in the sample. Thereby, the observation still represents a relatively low or high value. Following changes were made:

Sample of buy transactions

- CAR (0, 20): 2 extreme outliers winsorized.
- CAR (-20, -1): 4 extreme outliers winsorized.

Sample of sales transactions

- CAR (0, 20): 3 extreme outliers winsorized.
- CAR (-20, -1): 4 extreme outliers winsorized.
- BtM: 3 extreme outliers winsorized.

Sensitivity analysis

Though we couldn't fully meet the assumption of normal distribution, we accepted this based on the central limit theorem (Brooks, 2014; Körner & Wahlgren, 2006). However, a sensitivity analysis was conducted to validate the results of the statistical tests. First, we ran all t-tests, as well as the regressions, both before *and* after winsorization and the impact on the results were negligible. Second, besides from using standard t-tests, we also ran the non-parametric Wilcoxon Signed-rank test, for all three event windows, for the sales transactions portfolio comprising the CEOs trades. This portfolio only consisted of 37 observations, while all other portfolios comprised more than 100. However, the Wilcoxon Signed-rank tests indicated the same outcome as the standard t-tests, and thereby, the sensitivity analysis only strengthened the results.

3.5.2 Heteroscedasticity

As expected in an event study (MacKinlay, 1997) we rejected the hypothesis of homoscedasticity, i.e. detecting presence of heteroscedasticity in the data, using the Breusch Pagan Godfrey test (Appendix 3 and 4). According to Brooks (2014) this could lead to incorrect standard errors, influencing the inference. As a remedy to the problem, we used *heteroscedasticity-consistent standard error estimates*, as suggested by Brooks (2014). He explains that this makes the hypothesis testing more *conservative*, meaning that more evidence needs to be present against the null hypothesis for it to be rejected.

3.5.3 Multicollinearity

Multicollinearity arises whenever two or more explanatory variables are highly correlated, leading to inefficient estimates (Körner & Wahlgren, 2006). Using Spearman's correlation (Appendix 5 and 6) as well as a Variance Inflation Factor (VIF) test (Appendix 7 and 8), we detected no evidence of high correlation between our independent variables. According to Gujarati and Porter (2009) multicollinearity might be an issue whenever the VIF score exceeds 10, or if the correlation between two variables is greater than 0.8. The highest scores indicated by our tests were 0.463 and 1.364 for the Spearman's correlation and VIF, respectively, i.e. well below the rule of thumb stated by Gujarati and Porter (2009).

3.5.4 Compilation of diagnosis

Assumption of data	Formal test	Outcome	Remedy
Homoscedasticity	Breusch-Pagan-Godfrey	☒ Rejected	Using heteroscedasticity-robust standard errors
Absence of multicollinearity	Correlation matrix, VIF	☑ Not rejected	
Normal distribution	Shapiro-Wilks	☒ Rejected	Accepted based on the central limit theorem (Brooks, 2014; Körner & Wahlgren, 2006). However, a sensitivity analysis was conducted to validate the results.

Table 7. Compilation of formal statistical diagnosis of data

3.6 Validity and reliability

To achieve a high validity in the study, i.e. ensure that the results indeed measure and provide answers to the intended purpose, the authors have employed the well-established methodology developed by MacKinlay (1997), which likewise is frequently used in previous published studies as well as unpublished dissertations. Thus, we are confident that the overall method is valid. As regards to the examined independent variables, they have been carefully chosen from the existing evidence on other markets. Thus, no variable have been randomly chosen on merely intuition, but

indeed has a previous recognized relationship to abnormal returns following insider trades.

Throughout the process, we have encountered minor setbacks, particularly in terms of statistical issues. However, instead of merely accepting such issues and, in turn, tolerated uncertainties regarding the results, we have validated the statistics through the sensitivity analysis, e.g. using several formal statistical tests to verify the outcomes.

To ensure the reliability of the study, the authors have described each step taken in the process, from data collection to data treatment. Consequently, the study is replicable. Furthermore, subjectivity was avoided to the extent that was possible. However, one part of the process was particularly exposed to the authors' discretion, namely the data collection from FI. While FI is a Swedish governmental authority, and thus assumed reliable by the authors, the transaction-specific data available at their website was not fully standardized. Insiders themselves register their transactions to FI, and consequently errors were found in the data, e.g. transactions that were accounted for twice, incorrectly stated ISIN numbers etc. This led to certain discretion in this part of the process, since we had to interpret incorrectly registered trades. However, this only applied to a vast minority of the transactions.

Another element of uncertainty was the human risk factor associated with the collection of the BtM-ratios of the examined firms. This variable was calculated based on manually collected data from the latest available annual reports. Furthermore, a firm's book value of equity includes reported earnings, which might be subject to earnings management (Ronen & Yaari, 2008). Hence, it cannot be precluded that this distorts the results to some extent.

Due to the recent change in regulation, 3rd of July 2016, we were limited to a research period 8 months. While a longer period, and hence more observations, would improve the inference (Körner & Wahlgren, 2006) the sample nonetheless amounted to a total of 838 observations in the insider-specific aggregation.

4. Empirical results

In the following chapter, the authors present the empirical results. Starting off with the company-specific aggregated data, the statistical tests of the sample as a whole is presented, accompanied with an illustration of the trends of CAAR, in an attempt to reveal trading patterns. Thereafter, the data is grouped in portfolios to expose differences in CAAR according to the chosen independent variables. This is followed by a presentation of the cross-sectional regressions.

4.1 Univariate data

Figure 3 and 4 illustrates the development of CAAR starting at day -20 cumulated by each day until day +20, e.g. at day +20 the figures reflect the CAARs of the whole event window, (-20, 20).

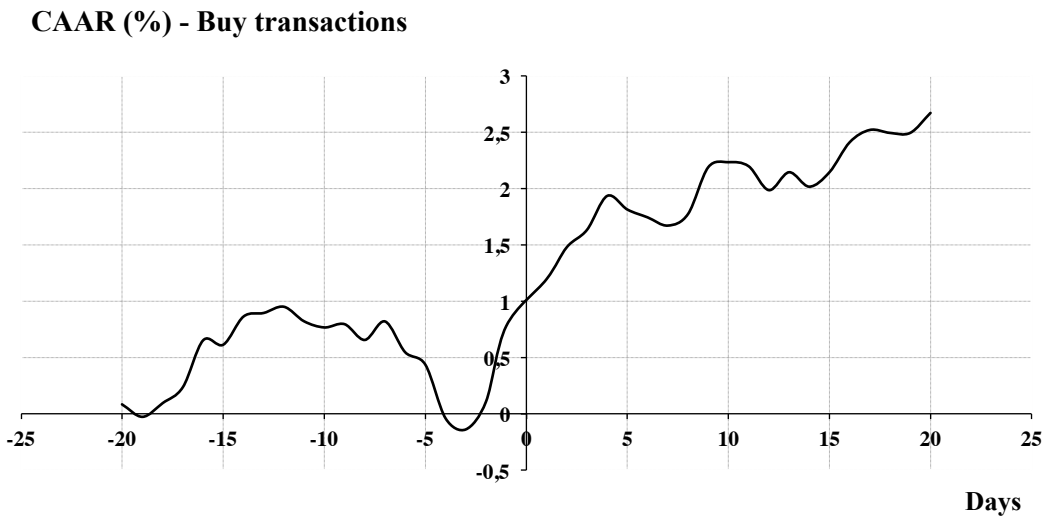

Figure 3. Cumulative average abnormal returns (%) for buy transactions starting at day -20 and cumulated until day +20.

The cumulative average abnormal return, for the buy transactions, is insignificant the whole period leading up to the event. From there, we observe an upward trend with significant CAARs from day 2 and onwards, with the exception of an event window spanning from day -20 to +7.

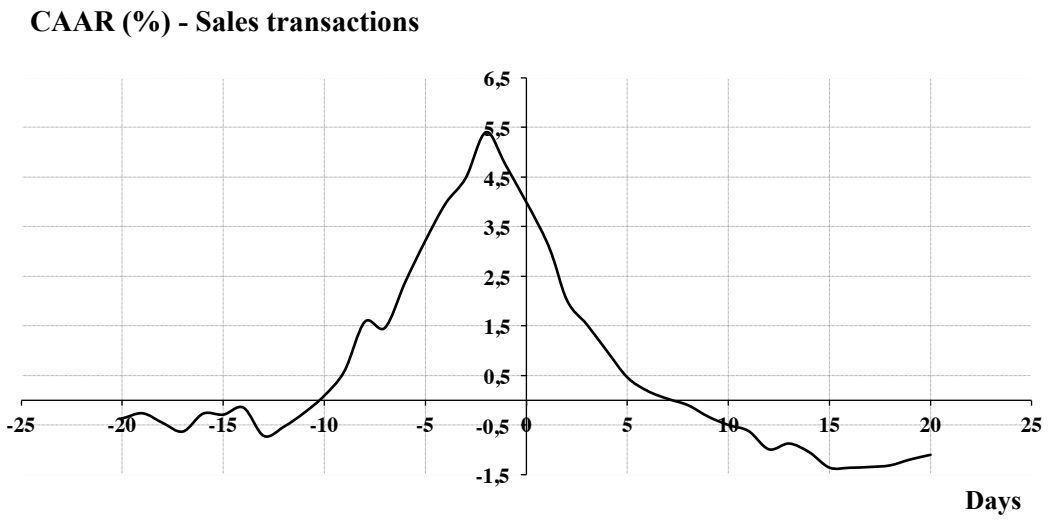

Figure 4. Cumulative average abnormal returns (%) for sales transactions starting at day -20 and cumulated until day +20.

The pattern for the sales transactions is much clearer than that of the buy transactions. The CAAR circles around 0 percent until day -10, but then trends upwards until the day before the event. From there, it drops to become negative after day 7. Note though, that the daily average abnormal returns are actually negative each subsequent day of the event before this, illustrating an immediate negative impact on the stock price following the event.

Table 8. CAAR – Company specific aggregation

	Purchase		**Sales**	
(Event window)	CAAR (%)	t-stat	CAAR (%)	t-stat
(-20,-1)	0,84	1,06	4,21	2,98**
(0, 10)	1,46	2,53*	-5,22	-6,22***
(0, 20)	1,89	2,81**	-5,77	-5,44***

*Cumulative average abnormal returns (%) of the company-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

The t-tests for the purchase transactions indicate positive abnormal returns for all event windows. However, the CAAR for the pre-event window cannot be statistically proven. In contrast to the purchase transactions, the CAARs take on opposite signs post- and pre-event window for the sales transactions. Furthermore, we find strong evidence of abnormal returns in all three cases.

4.2 Multivariate data

As evident from table 8, we find significant abnormal returns following insider trades. The purpose of the multivariate data, however, is to expose potential group effects on the CAARs, i.e. differences in the abnormal returns depending on the firm-insider- and transaction-specific characteristics. If otherwise not stated, we focus on event windows (0, 10) and (0, 20) when commenting on below tables, since (-20, -1) explain patterns of insider trades rather than the event's impact on share price development.

4.2.1 Breakdown by variable

Insider position

Table 9. Breakdown by insider position

Portfolio	**Purchase**		**Sales**	
(Event window)	CAAR (%)	t-stat	CAAR (%)	t-stat
CEO				
(-20,-1)	-2,46	-1,75	19,87	3,80***
(0, 10)	-0,10	-0,11	-14,91	-4,28***
(0, 20)	-1,15	-1,18	-18,43	-5,38***
Others				
(-20,-1)	1,38	1,55	3,58	2,51*
(0, 10)	1,97	3,02**	-4,56	-5,41***
(0, 20)	2,60	3,38***	-4,78	-4,45***

*Cumulative average abnormal returns (%) of the insider-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

There are differences in CAAR between the groups of insiders for purchase transactions. While trades of CEOs seem to impact the stock price negatively, though not statistically proven, we find evidence that the group *others* generate positive abnormal returns. In regards to sales transactions, the groups also diverge. Though they both show positive CAARs, the magnitude of the abnormal returns differs by 1365 basis points in the longer event window.

Transaction size

Table 10. Breakdown by Transaction volume

Portfolio	**Purchase**		**Sales**	
(Event window)	CAAR (%)	t-stat	CAAR (%)	t-stat
Lowest 1/3				
(-20,-1)	-0,14	-0,09	-0,34	-0,17
(0, 10)	0,29	0,25	-3,70	-3,32**
(0, 20)	2,01	1,43	-4,66	-2,87**
Mid 1/3				
(-20,-1)	0,83	0,62	11,43	4,12***
(0, 10)	1,46	1,88	-7,97	-4,20***
(0, 20)	1,05	1,17	-7,93	-3,85***
Highest 1/3				
(-20,-1)	0,95	0,87	5,51	2,21*
(0, 10)	2,82	3,37***	-5,72	-4,12***
(0, 20)	2,30	2,36*	-6,66	-3,70***

*Cumulative average abnormal returns (%) of the insider-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

Only small differences can be observed between the portfolios for both purchase and sales transactions. What stands out the most though, is the sample of the purchases where CAR(0, 10) is highly significant in the high volume portfolio while insignificant in the others.

Firm size

Table 11. Breakdown by Market value

Portfolio	**Purchase**		**Sales**	
(Event window)	CAAR (%)	t-stat	CAAR (%)	t-stat
Lowest 1/3				
(-20,-1)	-1,63	-1,03	9,41	2,68**
(0, 10)	1,36	0,98	-11,82	-5,65***
(0, 20)	3,50	2,29*	-10,28	-4,63***
Mid 1/3				
(-20,-1)	0,99	0,84	3,38	1,86
(0, 10)	-0,21	-0,35	-3,89	-3,70***
(0, 20)	-0,31	-0,36	-5,94	-3,34**
Highest 1/3				
(-20,-1)	2,29	2,00*	3,81	2,29*
(0, 10)	3,43	5,39***	-1,68	-1,86
(0, 20)	2,18	2,73**	-3,03	-2,25*

*Cumulative average abnormal returns (%) of the insider-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

While the high and low market value portfolios of the purchase transactions show significant positive CAARs, the mid portfolio ambiguously, since it is not significantly separated from zero, indicate the opposite. The portfolios of the sales transactions all generate significant negative abnormal returns. However, there is a clear pattern in the abnormal returns depending on the firm size, with CAARs of -10,28%, -5,94% and -3,03% for the low, mid and high value portfolios, respectively.

Book-to-Market

Table 12. Breakdown by Book-to-Market ratio

Portfolio	**Purchase**		**Sales**	
(Event window)	CAAR (%)	t-stat	CAAR (%)	t-stat
Lowest 1/3				
(-20,-1)	3,98	2,39*	5,26	2,09*
(0, 10)	-0,21	-0,23	-7,79	-4,36***
(0, 20)	-2,36	-2,21*	-7,69	-3,62***
Mid 1/3				
(-20,-1)	-2,26	-1,94*	8,94	3,53**
(0, 10)	1,96	1,97	-5,86	-4,23***
(0, 20)	4,99	3,82***	-7,65	-4,64***
Highest 1/3				
(-20,-1)	0,25	0,24	2,40	1,01
(0, 10)	2,81	3,07**	-3,74	-2,91**
(0, 20)	2,72	3,19**	-3,91	-2,32*

*Cumulative average abnormal returns (%) of the insider-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

The portfolios of the purchase transactions diverge in terms of which direction insider trades seem to impact the stock prices. Insider trades of firms with low BtM-ratios have negative CAARs, while the other portfolios generate positive abnormal returns. As for sales transactions, the observed differences are small and all portfolios share the attribute of significant negative CAARs.

4.2.2 Cross-sectional regression

Table 13. Cross-sectional regression results

Dependent variable CAR (0, 20)	**Purchase**		**Sales**	
	Coefficient	t-stat	Coefficient	t-stat
Intercept	1,66	0,35	-4,97	-0,97
CEO	-3,50	-2,65**	-8,93	-3,17**
ln(Vol)	-0,09	-0,27	-0,55	-1,22
ln(Fsize)	-0,15	-0,33	1,36	2,18*
BtM	2,57	2,85**	3,31	1,30
PastPerf	-0,17	-4,18***	-0,24	-3,69***
Cluster	1,44	1,00	-0,84	-0,30
Observations	***529***		***309***	

*Cross-sectional regressions (see appendix 1 and 2) of the insider-specific aggregated data, which has been winsorized. Significance level: *5%, **1%, ***0,1%*

In the regression of the purchase transactions we find statistically significant relationships between CAR (0,20) and three of the independent variables, *CEO*, *book-to-market* and *past performance*. The relationship with BtM is positive, i.e. the higher the ratio, the higher the abnormal returns. As for the others, the relationships are negative.

The regression of the sales transactions also indicates three statistically proven relationships. While the relationships are negative for *CEO* and *past performance*, it is positive for the *firm size* variable.

In neither of the regressions the control variable, cluster, is significantly different from zero. Interpreting the coefficient congruent to Degryse, de Jong and Lefebvre (2014) we, therefore, do not reject the null hypothesis that insiders trade for liquidity reasons rather than hiding information from other market participants.

4.2.3 Summary of statistical outcome

To provide the reader with a clear overview of the statistical outcomes, the results are summarized in table 14. As can be seen, three relationships are statistically proven in each regression, and all significant coefficients, except for the insider position dummy in the purchase regression, are in line with expectations.

Table 14. Statistical outcomes

	Purchase transactions			**Sales transactions**		
Independent variable	Expected relation	Actual relation	Statistically proven	Expected relation	Actual relation	Statistically proven
Insider (CEO)	(+)	Negative	☑	(-)	Negative	☑
Transaction size	(+)	Negative	☒	(-)	Negative	☒
Firm size	(-)	Negative	☒	(+)	Positive	☑
Book-to-Market	(+)	Positive	☑	(+)	Positive	☒
Past performance	(-)	Negative	☑	(-)	Negative	☑

Summary of the statistical outcomes with respective variables expected relationship.

5. Analysis

In the following chapter the interpretation of the empirical results is presented based on previous theories and evidence introduced in chapter 2. First, the overall performance of the company-specific data is analyzed. Thereafter, the specific independent variables' impact on performance is investigated.

5.1 Stock performance following insider trades

Similar to the majority of previous studies we find evidence of positive abnormal returns following purchase transactions and negative abnormal returns following sales transactions on the Swedish MTF platforms. Thus, insiders earn abnormal returns for both types of trades. As described in section *2.5.1*, the negative abnormal returns of sales trades should be interpreted as insiders saving money by selling shares that drop in price, or earning money on a short position.

Hypothesis test outcome:

- ✗ H_0: *Insiders are unable to generate abnormal returns*
- ✓ H_1: *Insiders are able to generate abnormal returns*

There are several perspectives, in terms of explanations, to why insiders engage in trading activities. While the profit-seeking hypothesis (Firth et al., 2011) suggests that insiders trade to earn profits from their private information, the signaling hypothesis (Huddart & Ke, 2001) proposes that insiders trade to reveal information that help correct the mispricing of a stock. However, the implications of the hypotheses are the same, namely a mispricing because of the information asymmetry between insiders and outsiders. And while the purpose of this study is not to answer the question of insiders' motives, the results do indicate evidence of a mispricing due to information asymmetry. Otherwise, we would not have observed significant abnormal price adjustments following insider trades. Furthermore, similar to past evidence on other markets (Fidrmuc, Goergen & Renneboog, 2006; Huddart & Ke, 2007; Seyhun, 1986; Shaker, 2013), the results imply that Swedish MTF platforms are indeed not strong form efficient. If they were, the prices would already fully reflect the private information of insiders, in accordance with Fama's (1970)

definition. Instead, the market does react to insider trades – purchase transactions signal and convey positive information to the market and consequently influences the price development upwards, and vice versa for sales transactions.

Comparing the magnitude of abnormal returns with past research on the Stockholm Stock Exchange, Wahlström's (2003) study as well as the findings of Jönsson and Rasmusson (2010) and Kyllenbeck and Ryrberg (2015), our results are significantly higher. However, this was expected. The MTF platforms are less liquid and comprise smaller companies than the Stockholm Stock Exchange, which according to Degryse, de Jong and Lefebvre (2014) and Jeng et al. (2003), respectively, are factors that affect the information asymmetry between insiders and outsider.

A more unexpected finding is the difference between purchase and sales transactions. While buy trades generate abnormal returns of 1,89%, sales transactions amount to -5,77%. According to Degryse, de Jong and Lefebvre (2014) the results should rather be the opposite, i.e. greater abnormal return for purchase transactions, since they argue that insiders mainly trade for liquidity and diversification purposes when engaging in sales trades. Purchase transactions, on the other hand, are more strategic and informed (Degryse, de Jong & Lefebvre, 2014). Our results, however, suggest that this is *not* the case.

5.2 Factors determining the stock performance

Insider-specific characteristic

5.2.1 Insider position

Observing a significant relationship between an insider's position and the abnormal returns following purchases as well as sales, we reject the null hypotheses of no association between the variables.

Hypothesis test outcome:

- ✗ H_0: *There is no association between the insider's position within the company and the abnormal return following an insider trade.*
- ✓ H_1: *There is an association between the insider's position within the company and the abnormal return following an insider trade.*

Congruent with Degryse, de Jong and Lefebvre (2014) we find differences in the information content associated with different insider groups' trades. However, looking at the purchase transactions, the results are surprising. We, unexpectedly, find that insiders in the group *others* generate significant positive abnormal returns following purchases as opposed to the group *CEO* which, although not significant, seem to generate negative abnormal returns. Thus, while the results are consistent with the previously proven fact that there exists an information hierarchy among insiders within a firm (Seyhun, 1998), the relationship is contradictory to what we expected. CEOs seem to fail to generate significant positive abnormal returns following stock purchases in their own firms. And this is surprising, since we would expect them to have a good understanding of the viability of their companies. This, in turn, would predict their purchases to convey a positive signal to the market. Yet, the results for the purchase transactions do not confirm this pattern. However, this would not lead us to conclude that *other* insiders have an informational advantage compared to CEOs. Particularly not since the relationship between abnormal returns and *insider position* following sales trades indicate the opposite pattern, namely that CEOs outperform other insiders. And this result is line with our expectations, and suggests that CEOs' stock sales have a significantly stronger signaling value than purchases. However, to comment on the original question to why CEOs' purchase transactions underperform *others*, we speculate that it might lie in their motives to trade in the first place rather than an informational disadvantage.

Transaction-specific characteristic

5.2.2 Transaction size

While previous studies (Aussenegg & Ranzi, 2008; Huddart & Ke, 2007; Wong et al., 2000) show that *transaction size* has a positive effect on the abnormal returns following insider trades, our results cannot strengthen this. We find no statistical evidence of a relationship between *transaction size* and abnormal returns, for neither purchase nor sales transactions, on Swedish MTFs.

Hypothesis test outcome:

- ✓ ***H_0**: There is no association between the size of a transaction and the abnormal return following an insider trade.*
- ✗ ***H_1**: There is an association between the size of a company and the abnormal return following an insider trade.*

Comparing the abnormal returns in the portfolio breakdown, there are minor indications of differences depending on the *transaction size*. However, the differences are too small to draw conclusions of a relationship. Thus, different from Karpoff (1987), we find no evidence that the volume of a transaction would be associated with a higher quality of the insider's information.

Firm-specific characteristics

5.2.3 Firm size

As evident in the cross-sectional regression for the sales transactions, as well as the clear pattern in the portfolio breakdown, we find a significant positive relationship between abnormal returns and the size of a firm.

Hypothesis test outcome:

- ✗ ***H_0**: There is no association between the size of a company and the abnormal return following an insider trade.*
- ✓ ***H_1**: There is an association between the size of a company and the abnormal return following an insider trade.*

In line with the findings of Aussenegg and Ranzi (2008), insider sales trades on Swedish MTFs seem to convey more information to the market than trades by insiders in larger companies, since the magnitude of the negative abnormal returns is greater the smaller the firm gets. This is indicative of a greater information advantage of insiders of small companies, consistent with Seyhun's (1998) findings. A possible explanation to this large information asymmetry, as stressed by Jeng et al. (2003), is the role of analysts, who pay less attention to companies that are smaller.

While we find differences in CAAR between the portfolios of the purchase transactions as well, the relationship does not even closely resemble a linear one. It is rather the mid portfolio that differs from the others, why a conclusion regarding the informational advantage between insiders in large versus small firms is hard to distinguish.

5.2.4 Book-to-market

The cross-sectional regression shows evidence of a positive linear relationship between the BtM-ratio and the abnormal returns following purchase transactions on Swedish MTFs.

Hypothesis test outcome:

- ✗ ***H_0**: There is no association between the Book-to-Market-ratio and the abnormal return following an insider trade.*
- ✓ ***H_1**: There is an association between the Book-to-Market-ratio and the abnormal return following an insider trade.*

Our results are further strengthened seeing that insiders of firms with medium and high BtM-ratios generate significant positive abnormal returns post purchases meanwhile insiders of firms with low ratios generate negative abnormal returns. This is, furthermore, consistent with Fama and French's (1995) claim that the BtM-ratio indicates whether the stock is over- or undervalued. Moreover, in the company-specific aggregation we found that purchase transactions generated a CAAR of 1,89%. The mid and high *book-to-market* portfolios display CAARs that are even greater, 4,99% and 2,72% respectively. Therefore, congruent to the findings of Cheuk et al. (2006), we conclude that the combination of the facts, an insider purchase and a high BtM-ratio, is an even stronger predictor of share price development, than an insider purchase alone.

When examining the sales transactions, we find that all portfolios generate significant negative abnormal returns. Likewise, no relationship is proven in the regression analysis. However, the magnitude of the negative returns is greater for the firms with lower ratios than for the firms with higher ratios, which is consistent with previous

studies (Seyhun, 1998). Nevertheless, we limit our conclusion regarding a relationship to purchase transactions, since the differences are too small within the sales trades sample to be statistically valid.

5.2.5 Past performance

As evident from the cross-sectional regression analyses there are significant negative relationships between *past performance* and the price development following purchase as well as sales transactions.

Hypothesis test outcome:

- ✗ ***H_0**: There is no relationship between the past performance of a stock and the abnormal return following an insider trade.*
- ✓ ***H_1**: There is a relationship between the past performance of a stock and the abnormal return following an insider trade.*

According to Jenter (2005) insiders, as a group, tend to follow a contrarian investment strategy, which is consistent with Firth et al. (2011) and Aussenegg and Ranzi's (2008) findings that insiders sell stocks after periods of high abnormal returns, and vice versa after periods of lower returns. Our results confirm this pattern for sales trades, with significant positive CAAR in the pre-event period. Figure 4 further illustrates this pattern, showing a clear turning point for the rising abnormal returns on the event day. However, in regards to buy trades, the pattern is not as obvious. While the negative relationship between *past performance* and abnormal returns is significant, the company-aggregated data indicate positive CAAR for the event window (-20, -1). These results might be associated with the findings that insider buy transactions on Swedish MTFs indeed does not seem to be more strategic than sales trades, but rather the opposite.

6. Conclusion

In this final chapter, the authors present their conclusions based on the results of this study. Finally, potential topics in future studies on insider trading are suggested.

6.1 Conclusion

Legal insider trading is a frequently recurring phenomenon, domestically as well as internationally. The purpose of this thesis has been to examine if insider transactions affect the share price of stocks traded on Swedish MTF platforms. Congruent with previous evidence on the U.S. and European markets (Degryse, de Jong & Lefebvre, 2014; Dickgiesser & Kaserer, 2009; Fidrmuc, Goergen & Renneboog, 2006; Huddart & Ke, 2007; Lakonishok & Lee, 2001; Seyhun, 1986), we find that this is the case. Insiders, as expected, generate abnormal returns on the Swedish MTF market. However, our results diverge from earlier studies in terms of the information content of purchase versus sales trades and with regards to the magnitude of abnormal returns following insider transactions. Different from the findings of Degryse, de Jong and Lefebvre (2014), insiders' sales transactions affect the price development to a greater extent, and thus convey more information to the market, than purchase trades. Secondly, our results show that the magnitude of the abnormal returns is greater among insiders on Swedish MTFs compared to those on the Stockholm Stock Exchange (Wahlström, 2003; Jönsson & Rasmusson, 2010; Kyllenbeck & Ryrberg, 2015).

The second purpose of this thesis was to determine which insider-, transaction- and firm-specific characteristics that potentially explain the share price development following insider trades. Among the examined factors, we find evidence that all independent variables, except for *transactions size*, have statistically proven relationships to abnormal returns. As for the *past performance* variable the relationships are negative for purchase as well as sales trades. This indicates that insiders' contrarian investment strategies are successful. For the *insider position* variable, the results are contradictory between purchase and sales trades. For the former type of transactions, CEOs earn lower returns than others, whilst in the latter,

the results are opposite. Along with the finding of a significant relationship between *firm size* and abnormal returns following sales transactions, the results indicate that information advantage and information asymmetry, depend on *insider position* and *firm size*, respectively.

Congruent to Cheuk et al. (2006), we find that the *book-to-market* ratio is positively related to abnormal returns following purchase transactions. Thus, the combination of the informational content of a buy trade and a high BtM-ratio provides a good prediction of a positive share price development.

Our results indicate that the Swedish MTF market, according to Fama's (1970) definition, is not strong form efficient. The fact that insiders, as evident, earn abnormal returns implies that the share prices do not reflect all available pricing-relevant information. Thus, it can be presumed that there exists an information asymmetry in the market, where insiders seem to have an informational advantage compared to other market participants.

There are at least two perspectives of an equity market: the investor's perspective and the company's perspective. While investors use the market to speculate and invest capital, companies turn to the market for financing. They are, to some extent, each other's opposites. For this reason, one might presume that information asymmetry would lead to one parts advantage at the expense of the other. However, information asymmetry could potentially affect both parties negatively. Investors' informational disadvantage increases the risk associated with investments if investors cannot distinguish between low and high quality firms. Consequently, congruent to Akerlof's (1970) theory of *market of lemons*, security prices would rather be reflected by the low quality firms, which, in turn, could limit high quality companies to obtain correctly priced financing. From a macroeconomic perspective, it is therefore important to mitigate information asymmetry, and hence increase market efficiency. Thus, revealing information about inefficiencies in the capital market, in our case the Swedish MTF market, is highly meaningful. The authors of this thesis agree that a well-functioning capital market is an essential factor for economic growth.

6.2 Future studies

From an investor's point of view it might be beneficial to pursue an investment strategy based on the announcements of insider trades. Although it is evidenced from this study that insiders generate abnormal returns on the Swedish MTF market, it cannot be concluded that such an investment strategy would be beneficial since bid/ask-spreads and transaction costs might have a valuable impact on the returns. Thus, the authors would find such an examination interesting.

Another interesting research topic is the impact of the recent implementation of Regulation (EU) No 596/2014 in Sweden. Since this study only has examined transactions that were made after the 3rd of July 2016, a future study could evaluate differences in insiders' abilities to generate abnormal returns pre- and post the regulatory changes, to give an indication of whether regulations influence the degree of efficiency in capital markets.

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Appendices

Appendix 1 – Regression – Buy transactions

Dependent Variable: CAR
Method: Least Squares
Date: 05/06/17 Time: 11:38
Sample: 1 529
Included observations: 529
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.660974	4.714884	0.352283	0.7248
BTM	2.565061	0.901429	2.845548	0.0046
CEO	-3.502233	1.323836	-2.645519	0.0084
FSIZE	-0.146242	0.443709	-0.329590	0.7418
VOL	-0.093486	0.352668	-0.265083	0.7910
PASTPERF	-0.173084	0.041446	-4.176099	0.0000
CLUSTER	1.441922	1.441674	1.000172	0.3177

R-squared	0.070583	Mean dependent var	1.786171
Adjusted R-squared	0.059900	S.D. dependent var	14.78428
S.E. of regression	14.33465	Akaike info criterion	8.176381
Sum squared resid	107261.8	Schwarz criterion	8.232897
Log likelihood	-2155.653	Hannan-Quinn criter.	8.198504
F-statistic	6.607102	Durbin-Watson stat	0.130920
Prob(F-statistic)	0.000001	Wald F-statistic	7.188754
Prob(Wald F-statistic)	0.000000		

Appendix 2 – Regression – Sales transactions

Dependent Variable: CAR
Method: Least Squares
Date: 05/06/17 Time: 11:45
Sample: 1 309
Included observations: 309
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.970662	5.135611	-0.967881	0.3339
BTM	3.309133	2.547782	1.298829	0.1950
CEO	-8.931134	2.821533	-3.165349	0.0017
FSIZE	1.360880	0.625683	2.175032	0.0304
VOL	-0.553758	0.452982	-1.222472	0.2225
PASTPERF	-0.235544	0.063848	-3.689132	0.0003
CLUSTER	-0.838067	2.826426	-0.296511	0.7670

R-squared	0.181472	Mean dependent var	-6.416045
Adjusted R-squared	0.165210	S.D. dependent var	18.62490
S.E. of regression	17.01699	Akaike info criterion	8.528695
Sum squared resid	87452.53	Schwarz criterion	8.613269
Log likelihood	-1310.683	Hannan-Quinn criter.	8.562508
F-statistic	11.15914	Durbin-Watson stat	0.292820
Prob(F-statistic)	0.000000	Wald F-statistic	6.976710
Prob(Wald F-statistic)	0.000001		

Appendix 3 – Breusch-Pagan-Godfrey – Buy transactions

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	10.22815	Prob. F(6,522)	0.0000
Obs*R-squared	55.64943	Prob. Chi-Square(6)	0.0000
Scaled explained SS	121.5193	Prob. Chi-Square(6)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/06/17 Time: 11:37
Sample: 1 529
Included observations: 529

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	805.0465	112.0083	7.187385	0.0000
BTM	-66.74841	28.91131	-2.308730	0.0213
CEO	-162.0048	44.52660	-3.638383	0.0003
FSIZE	-61.06681	13.71850	-4.451419	0.0000
VOL	-20.71091	10.50585	-1.971369	0.0492
PASTPERF	-1.716297	1.022821	-1.678003	0.0939
CLUSTER	-23.75987	44.16522	-0.537977	0.5908

R-squared	0.105197	Mean dependent var	202.7633
Adjusted R-squared	0.094912	S.D. dependent var	429.8260
S.E. of regression	408.9197	Akaike info criterion	14.87806
Sum squared resid	87286396	Schwarz criterion	14.93457
Log likelihood	-3928.247	Hannan-Quinn criter.	14.90018
F-statistic	10.22815	Durbin-Watson stat	0.287596
Prob(F-statistic)	0.000000		

Appendix 4 – Breusch-Pagan-Godfrey – Sales transactions

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	6.362404	Prob. F(6,302)	0.0000
Obs*R-squared	34.67603	Prob. Chi-Square(6)	0.0000
Scaled explained SS	70.72916	Prob. Chi-Square(6)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/06/17 Time: 11:44
Sample: 1 309
Included observations: 309

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	653.1898	195.0297	3.349182	0.0009
BTM	-83.72261	78.56445	-1.065655	0.2874
CEO	-185.5481	100.8314	-1.840183	0.0667
FSIZE	-60.28136	20.34392	-2.963114	0.0033
VOL	15.55959	16.48674	0.943764	0.3460
PASTPERF	4.785595	1.307904	3.658979	0.0003
CLUSTER	-286.3892	77.70244	-3.685717	0.0003

R-squared	0.112220	Mean dependent var	283.0179
Adjusted R-squared	0.094582	S.D. dependent var	585.8264
S.E. of regression	557.4340	Akaike info criterion	15.50696
Sum squared resid	93841262	Schwarz criterion	15.59153
Log likelihood	-2388.825	Hannan-Quinn criter.	15.54077
F-statistic	6.362404	Durbin-Watson stat	0.921728
Prob(F-statistic)	0.000003		

Appendix 5 – Correlation matrix – Buy transactions

		CEO	Cluster	PastPerf	ln (Vol)	ln (Fsize)	BtM
CEO	Pearson Correlation	1	-,039	-,085	,029	-,030	-,216
Cluster	Pearson Correlation	-,039	1	-,001	-,216	-,105	,081
PastPerf	Pearson Correlation	-,085	-,001	1	,061	,103	-,025
ln (Vol)	Pearson Correlation	,029	-,216	,061	1	,463	,126
ln (Fsize)	Pearson Correlation	-,030	-,105	,103	,463	1	,000
BtM	Pearson Correlation	-,216	,081	-,025	,126	,000	1

Appendix 6 – Correlation matrix – Sales transactions

		CEO	Cluster	PastPerf	ln (Vol)	ln (Fsize)	BtM
CEO	Pearson Correlation	1	-,015	,183	,086	-,091	,061
Cluster	Pearson Correlation	-,015	1	-,007	-,205	-,153	-,166
PastPerf	Pearson Correlation	,183	-,007	1	,094	-,095	-,037
ln (Vol)	Pearson Correlation	,086	-,205	,094	1	,451	,027
ln (Fsize)	Pearson Correlation	-,091	-,153	-,095	,451	1	-,139
BtM	Pearson Correlation	,061	-,166	-,037	,027	-,139	1

Appendix 7– VIF – Buy transactions

	CEO	Cluster	PastPerf	ln (Vol)	ln (Fsize)	BtM
CEO		1,066	1,057	1,059	1,062	1,011
Cluster	1,063		1,063	1,019	1,063	1,050
PastPerf	1,012	1,020		1,020	1,014	1,018
ln (Vol)	1,356	1,308	1,364		1,081	1,323
ln (Fsize)	1,287	1,291	1,283	1,023		1,284
BtM	1,034	1,078	1,088	1,057	1,084	

Appendix 8 – VIF – Sales transactions

	CEO	Cluster	PastPerf	ln (Vol)	ln (Fsize)	BtM
CEO		1,058	1,031	1,044	1,045	1,056
Cluster	1,083		1,083	1,064	1,073	1,049
PastPerf	1,039	1,066		1,046	1,044	1,060
ln (Vol)	1,326	1,319	1,318		1,058	1,335
ln (Fsize)	1,342	1,345	1,331	1,071		1,312
BtM	1,070	1,037	1,066	1,065	1,035	

Appendix 9 – t-tests – Buy transactions

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
CEO (0,20)	-1,178	114	,241	-1,15124	-3,0878	,7853
CEO (-20,-1)	-1,752	114	,082	-2,45624	-5,2331	,3206
CEO (0,10)	-,112	114	,911	-,09951	-1,8540	1,6550
Others (0,20)	3,375	413	,001	2,60212	1,0867	4,1175
Others (-20,-1)	1,547	413	,123	1,38047	-,3733	3,1342
Others (0,10)	3,019	413	,003	1,97235	,6880	3,2567
BtM High (0,20)	3,187	176	,002	2,72016	1,0358	4,4045
BtM High (-20,-1)	,240	176	,811	,24970	-1,8066	2,3060
BtM High (0,10)	3,066	176	,003	2,80995	1,0015	4,6184
BtM Low (0,20)	-2,208	175	,029	-2,35789	-4,4651	-,2507
BtM Low (-20,-1)	2,394	175	,018	3,97761	,6978	7,2574
BtM Low (0,10)	-,229	175	,819	-,21130	-2,0310	1,6084
BtM Mid (0,20)	3,818	175	,000	4,99093	2,4112	7,5707
BtM Mid (-20,-1)	-2,256	175	,025	-2,58641	-4,8491	-,3237
BtM Mid (0,10)	1,971	175	,050	1,95986	-,0029	3,9226
MV High (0,20)	2,726	175	,007	2,17887	,6016	3,7561
MV High (-20,-1)	1,997	175	,047	2,28586	,0267	4,5450
MV High (0,10)	5,393	175	,000	3,42732	2,1730	4,6817
MV Low (0,20)	2,289	175	,023	3,49737	,4815	6,5132
MV Low (-20,-1)	-1,027	175	,306	-1,63494	-4,7777	1,5078
MV Low (0,10)	,983	175	,327	1,35863	-1,3694	4,0867
MV Mid (0,20)	-,360	176	,719	-,30584	-1,9831	1,3714

MV Mid (-20,-1)	,836	176	,404	,98580	-1,3414	3,3130
MV Mid (0,10)	-,351	176	,726	-,21029	-1,3933	,9728
Vol High (0,20)	2,361	175	,019	2,29758	,3768	4,2183
Vol High (-20,-1)	,868	175	,387	,95291	-1,2144	3,1202
Vol High (0,10)	3,374	175	,001	2,82238	1,1712	4,4736
Vol Low (0,20)	1,430	175	,154	2,01036	-,7640	4,7847
Vol Low (-20,-1)	-,093	175	,926	-,14176	-3,1391	2,8556
Vo Low (0,10)	,245	175	,807	,28875	-2,0403	2,6178
Vol Mid (0,20)	1,172	176	,243	1,05473	-,7211	2,8305
Vol Mid (-20,-1)	,623	176	,534	,82647	-1,7927	3,4457
Vol Mid (0,10)	1,881	176	,062	1,45507	-,0716	2,9817

Appendix 10 – t-tests – Sales transactions

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
CEO (0,20)	-5,384	36	,000	-18,43460	-25,3790	-11,4902
CEO (-20,-1)	3,801	36	,001	19,86574	9,2672	30,4642
CEO (0,10)	-4,278	36	,000	-14,91084	-21,9804	-7,8413
Others (0,20)	-4,448	271	,000	-4,78117	-6,8972	-2,6651
Others (-20,-1)	2,509	271	,013	3,58497	,7717	6,3983
Others (0,10)	-5,409	271	,000	-4,55628	-6,2146	-2,8980
BtM High (0,20)	-2,319	102	,022	-3,90682	-7,2483	-,5653
BtM High (-20,-1)	1,010	102	,315	2,40196	-2,3170	7,1209
BtM High (0,10)	-2,906	102	,004	-3,73977	-6,2921	-1,1875
BtM Low (0,20)	-3,619	102	,000	-7,69232	-11,9084	-3,4763
BtM Low (-20,-1)	2,093	102	,039	5,26268	,2746	10,2507
BtM Low (0,10)	-4,356	102	,000	-7,79318	-11,3414	-4,2449
BtM Mid (0,20)	-4,637	102	,000	-7,64900	-10,9208	-4,3772
BtM Mid (-20,-1)	3,529	102	,001	8,93868	3,9145	13,9629
BtM Mid (0,10)	-4,232	102	,000	-5,85549	-8,5997	-3,1113
MV High (0,20)	-2,245	102	,027	-3,03182	-5,7107	-,3530
MV High (-20,-1)	2,289	102	,024	3,81353	,5091	7,1180
MV High (0,10)	-1,859	102	,066	-1,68037	-3,4731	,1123
MV Low (0,20)	-4,629	102	,000	-10,28072	-14,6856	-5,8758
MV Low (-20,-1)	2,682	102	,009	9,41134	2,4518	16,3709
MV Low (0,10)	-5,654	102	,000	-11,81828	-15,9641	-7,6724
MV Mid (0,20)	-3,343	102	,001	-5,93560	-9,4575	-2,4137

MV Mid (-20,-1)	1,859	102	,066	3,37846	-,2259	6,9828
MV Mid (0,10)	-3,696	102	,000	-3,88979	-5,9773	-1,8022
Vol High (0,20)	-3,698	102	,000	-6,65876	-10,2308	-3,0867
Vol High (-20,-1)	2,208	102	,029	5,50874	,5606	10,4569
Vol High (0,10)	-4,123	102	,000	-5,72320	-8,4764	-2,9700
Vol Low (0,20)	-2,870	102	,005	-4,65989	-7,8804	-1,4394
Vol Low (-20,-1)	-,169	102	,866	-,33951	-4,3132	3,6342
Vo Low (0,10)	-3,320	102	,001	-3,69727	-5,9061	-1,4885
Vol Mid (0,20)	-3,852	102	,000	-7,92948	-12,0122	-3,8467
Vol Mid (-20,-1)	4,122	102	,000	11,43409	5,9321	16,9361
Vol Mid (0,10)	-4,203	102	,000	-7,96798	-11,7284	-4,2075