

The Impact of CEO Insider Trading on Stock Performance

An event study of stock performance following CEO insider trading announcements on the
Nasdaq First North Growth Market

Filippa Lambert (25057) and Joel Berbres (25018)

Abstract

This study investigates the impact of CEO insider trading on short-term stock performance within the Nasdaq First North Growth Market. Utilising a dataset of 704 CEO insider transactions spanning the time period 2019 to 2023, this event study examines abnormal returns associated with insider trades by examining the factors transaction type, size, and the size of market capitalisation. Our findings reveal that insider transactions generate abnormal returns. In the shorter event windows acquisitions generate greater significant abnormal returns compared to disposals. Larger transactions produce higher abnormal returns, suggesting a stronger signalling effect to the market. This is especially prominent when relating the size of a transaction to the market value of equity of the firm. The size of market capitalisation of a company produces unambiguous results regarding the informativeness of trades, with indices that small firms are more informative in purchase transactions and less in sales. This study contributes to the existing literature by providing a focused analysis of insider trading within the less regulated and more volatile Nasdaq Firth North Growth Market. Future research could extend this study by further investigating sales transactions, or by conducting a comparative analysis examining how insider trading effects vary between more and less regulated markets.

Acknowledgements

We would like to thank our supervisor, Katerina Hellström at the Stockholm School of Economics, for continuously supporting us throughout the process.

Supervisor: Katerina Hellström

Keywords: event study, insider trading, abnormal returns, Nasdaq First North Growth Market

Table of Contents

1. Introduction	2
1.1 Background	2
1.2 Research Question and Purpose	4
1.3 Outline	5
2. Literature Review and Hypothesis	6
2.1 Efficient Market Hypothesis	6
2.2 Information Asymmetry and Signalling Theory	6
2.3 Insider Trading and Abnormal Returns	8
2.3.1 Influence of Transaction Type on Short-term Abnormal Returns	9
2.3.2 Influence of Transaction Size on Short-term Abnormal Returns	9
2.3.3 Influence of Company Size on Short-term Abnormal Returns	10
2.3.4 Regulatory Impact and Market Efficiency	10
2.4 Hypothesis Development	11
3. Methodology	13
3.1 Event Window	13
3.2 Estimation Window	14
3.3 Market Model	14
3.4 AR, AAR and CAR	15
3.5 Limitations of Study	16
4. Data Collection and Compilation	16
4.1 Share Prices, Market Indices and Market Capitalisation	16
4.2 Insider Transactions	17
4.3 Limitations to Data Set	18
4.4 Variable Construction	18
4.5 Final Data Sample	19
5. Results	20
5.1 Descriptive Statistics	20
5.2 Statistical Analysis	21
5.2.1 Abnormal returns by transaction type	21
5.2.2 Abnormal returns by transaction size	22
5.2.3 Abnormal returns by market value of equity	28
6. Discussion	31
7. Conclusion	33
8. References	35
8.1 Literature References	35
8.2 Digital Sources	36

1. Introduction

1.1 Background

Insider trading is a frequently discussed topic among investors, stakeholders, and within business media, often portrayed as a "signal to buy". A recent article in Dagens Industri underscores the potential value of insider trades as an information source for investors. Nonetheless, the article emphasises the importance of thorough analysis and consideration of other pertinent factors (Olsson, 2023). The article also discussed the signalling value that insider trades can have and claims that it is more common for insiders in smaller companies to try and give the market a confidence boost by buying shares in its own company.

There are two types of insider trading, legal and illegal. In this study, our analysis is restricted to the legal dimensions. Regulations have for long dictated how insiders can trade within their own company, aiming to prevent them from leveraging their informational advantage. These regulations regulate the timing of the purchases, the obligation to report on them, and more. The reporting obligation applies to all transactions once a total amount of 5,000 euro has been reached during a calendar year (Finansinspektionen, 2023). All transactions must be reported into the Swedish Financial Supervisory Authority's (Finansinspektionen, "FI") PDMR transactions register which is publicly available for all through Finansinspektionen's website. In June 2016, new rules regarding insider trading were issued. The changes included for example a shortened time frame in which insiders must report trades to three days after a transaction, extension of the types of instrument to be reported and a broadening of the notion "insider person" to "person discharging managerial responsibilities" (Finansinspektionen, 2016).

Insiders naturally have more access to information regarding the current state and the future outlook of its company which creates information asymmetry with the rest of the market. This imbalance can lead to adverse selection, where transactions benefit one party over another, potentially discouraging further market participation (Akerlof, 1970). To mitigate this, signalling theory, introduced by Michael Spence (1973), becomes crucial. It suggests that parties can communicate their private knowledge through signals and thereby restore trust in transactions. In financial markets, and specifically within the context of CEO insider trading, signalling is particularly relevant. Insider trading can act as a signal to the market,

indicating the insider's perspectives on the company's future, based on information not yet publicly available (Connelly et al., 2011). This form of signalling is influential, as it potentially guide investors' decisions.

Research on insider trading has received significant attention, examining its impact on share prices and whether insiders outperform the market. Early studies by Jaffe (1974) and Finnerty (1976) demonstrate that insiders can identify mispricing and generate abnormal returns. Several researchers (e.g. Seyhun, 1986; Lin and Howe, 1990) conclude that there is an information hierarchy within firms, making executives closer to the operations of the firm's trades more informative than other insiders. Beyond the difference of insider's positions, many observe a difference in the informational content between acquisitions and disposals, arguing for a higher informational values in insider's purchases (see Lakonishok and Lee, 2001; Fidrmuc et al., 2013; Kallunki et al., 2009). Reasons for this are for example the homogene reason to acquire a share, to generate return, and the diverse reasons to divest one, such as portfolio diversification and tax implications (Fidrmuc et al., 2013; Kallunki et al., 2009). Jeng et al. (2003) argue that larger transactions have higher informational content than smaller ones. This aligns with Akerlof's (1970) signalling theory in the sense that a large transaction carries more signalling value to the market. Moreover, trades in smaller firms tend to generate higher abnormal returns compared to their larger counterparts (e.g. Seyhun, 1986; Lakonishok and Lee, 2001).

The Swedish stock exchange comprises various lists, each housing different types of listed companies. On the Nordic Large Cap list, you find the largest and most well known companies in Sweden such as Volvo, AstraZeneca and Atlas Copco. Many smaller companies are listed on the Nasdaq First North Growth Market (First North) which contains approximately 550 traded companies (Nasdaq, n.d.). First North offers a unique landscape for the study of insider trades due to its distinctive characteristics as a Multilateral Trading Facility (MTF). Unlike traditional trading exchanges, the First North MTF operates as an alternative trading venue where companies are subject to specialised segment rules of the First North MTF but are not bound by the requirements for admission and ongoing compliance of regulated markets. This framework provides a more accessible platform for growing companies, which may influence the nature and implications of insider trading activities (Nasdaq, n.d.). As an MTF, First North is governed by the rules set forth in the Markets in Financial Instruments Directive (MiFID) of the European Union. This ensures a

regulated trading environment, despite the more relaxed admission criteria compared to traditional exchanges (Corporate Finance Institute, n.d.).

1.2 Research Question and Purpose

Our study aims to contribute to existing literature by investigating abnormal returns associated with CEO insider transactions in publicly listed Swedish companies on the less regulated and more volatile Nasdaq First North Growth Market. We build upon previous research on insider trading, including studies by Jeng et al. (2003) and Dardas and Güttler (2011), by examining various factors such as transaction type, size and size of market capitalisation. Earlier studies have mainly concentrated on larger and more regulated markets and there are limited studies exploring less regulated markets in Sweden, such as First North. Unlike traditional stock exchanges, First North typically accommodates smaller and growing companies, often characterised by increased volatility. Building upon the previous literature that highlights the company size effect on insider trading, this market presents a unique opportunity to explore the significance of abnormal returns. Moreover, given the indication from prior studies that executive trades carry greater informational value, narrowing our focus to CEO trades is a logical step. This focused approach helps us investigate the impact of CEO insider trading on short-term stock performance within the Nasdaq First North Growth Market, giving us the following research question:

- Are there any short-term abnormal returns associated with CEO insider trades on the Nasdaq First North Growth Market?

To address this question, we will explore three sub-questions, each testing a hypothesis that contributes to our overall understanding of the main research question:

- Does the type of transaction, i.e. acquisition or disposal, have an impact on short-term abnormal returns associated with CEO insider trades on the Nasdaq First North Growth Market?
- Does the size of transactions have an impact on short-term abnormal returns associated with CEO insider trades on the Nasdaq First North Growth Market?

- Does the size of market capitalisation of a firm have an impact on short-term abnormal returns associated with CEO insider trades on the Nasdaq First North Growth Market?

Each of these sub-questions aims to examine different dimensions of the main question, enabling a nuanced synthesis of how various factors influence abnormal returns following CEO insider trading activities.

The method used for this study is an event study, as described by MacKinlay (1997). The data sample consists of 704 CEO insider transactions on First North between the years 2019-2023. The results suggest that insider transactions on First North generate abnormal returns. Acquisitions generate larger abnormal returns during the shorter event windows, however, disposals generate larger abnormal returns during the longest event window. Larger transactions result in greater abnormal returns, both when analysed in absolute values and more significantly when related to the market capitalisation of the company. The analysis based on the size of market capitalisation of a company shows that acquisitions in small and mid size firms generate larger abnormal returns compared to larger ones. In contrast, disposals show the largest effect among the larger companies.

1.3 Outline

The rest of the paper is structured in the following way: Section 2 includes a literature review over the efficient market hypothesis, the signalling theory, and abnormal returns in correlation with insider trades, as well as the hypothesis development. Section 3 includes a description of the methodology used and section 4 contains a presentation of the empirical data collection. Section 5 outlines the results derived from the analysis. Section 6 presents a discussion of the results and section 7 provides conclusions, contributions, limitations and suggestions for future research. Section 8 provides references.

2. Literature Review and Hypothesis

This section provides a theoretical background for our study. The efficient market hypothesis is first described, followed by description of information asymmetry and signalling theory. Previous research on insider trading and abnormal returns is subsequently presented, concluding with the hypothesis development based on previous empirical findings and literature.

2.1 Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) is a theory in financial economics that suggests that asset prices reflect all available information. According to this hypothesis, it is impossible to consistently outperform the market because stock prices already incorporate and adjust to all relevant information, making it difficult for investors to gain an edge through analysis or trading strategies. According to Fama (1970), there are three forms of market efficiency: weak, semi-strong and strong form. The weak form stipulates that the stock price at any given point in time reflects the historical price and return of the share. The semi-strong form states that share prices fully reflect all publicly available information, while the strong form maintains that a stock's price reflects all information, both public and private. In a weak form there is a possibility to outperform the market by using information and conducting fundamental analysis. In a semi-strong form, one should not be able to outperform the market by analysis, however, as insiders possess information not publicly available they are in theory able to generate abnormal returns by using that information. Consequently, utilising insider information to generate abnormal returns should not be possible in the strong form, as all information is already reflected in the share price.

2.2 Information Asymmetry and Signalling Theory

Information asymmetry arises when one party has access to more information than another (Akerlof, 1970). In financial markets, information asymmetry occurs when one party possesses more or superior information than another, potentially influencing investment decisions and outcomes. Stiglitz (2000) emphasises the significance of information asymmetry in two key areas: quality and intent. Regarding quality, asymmetry arises when one party lacks awareness of the other's characteristics, while in matters of intent, it becomes crucial when one party is concerned about the behavioural intentions or actions of the other.

A common problem occurring from information asymmetry is adverse selection. The fundamental idea of adverse selection is when a buyer and seller have different information. One of the parties may participate in trades that are most beneficial for them at the other party's expense (Akerlof, 1970). This may cause the other party to worry and withdraw from the trade, thus, diminishing the market trade volume. A primary solution, suggested by Akerlof (1970), to the adverse selection, and thus the information asymmetry problem is signalling.

The theory of signalling was first introduced by Michael Spence in 1973, where he studied the concept within job markets with the aim of reducing the knowledge gap between organisations and potential employees. He discusses situations involving information asymmetry, exploring how different parties can signal their intentions to effectively reduce the asymmetry. For example, Spence's theory suggests that education and credentials serve as signals in the labour market. By investing time and resources in obtaining degrees or certifications, individuals demonstrate their commitment and capability to potential employers. The effectiveness of a signal lies in its costliness. Signals that are easy to fake or acquire without genuine ability hold little value. However, signals that require significant investment or effort can credibly convey information about the sender's abilities.

According to Connelly et al. (2011) the concept of signalling involves three key participants: the signaller, the signal, and the receiver. The signaller is an insider with access to exclusive, potentially impactful information about a person, product, or organisation. This information, which can be either positive or negative, equips the insider with unique insights into the subject's quality or behaviour. The signal itself is the information transmitted by the signaller to outsiders, typically emphasising positive attributes to highlight favourable organisational traits. The receiver, on the other hand, is an outsider seeking information they do not possess, which affects their decisions and actions regarding the organisation. Effective signalling requires that both the signaller and the receiver benefit from the exchange, where the former gains from the actions prompted by the signal, and the latter benefits from making informed decisions based on the signal. In the context of insider trading, signalling could be seen as a way for an insider to signal to outside investors about future company performance.

In line with information asymmetry and signalling theories, information asymmetry could affect the decision of an investor whether to invest in a firm or not, and the firm can try to influence the decision through signalling. The study by Seyhun (1986) examines whether insiders can make abnormal profits from trading their company's stocks and whether outsiders can also profit by imitating insiders. It analyses around 60,000 insider transactions from 1975 to 1981. The findings suggest that insider trades could indeed lead to abnormal profits and that the insiders' ability to predict stock price movements does impact the cost of trading for other investors. This relates to signalling theory in suggesting that insider trading reflects information not yet available to the market, thus impacting market efficiency.

2.3 Insider Trading and Abnormal Returns

During the past few decades, academics have dedicated significant attention to studying insider transactions, how they influence share prices and if insiders outperform the market.

Beyond purely investigating the abnormal returns produced by insiders, researchers incorporate other factors such as market capitalisation and transaction type into the analysis (e.g. Jeng et al., 2003). One such aspect is the insider's position within the firm (e.g. Seyhun, 1986; Lin and Howe, 1990; Dardas and Güttler, 2011). Seyhun (1986) concludes that an insider's position in the firm influences the abnormal returns. Insiders presumed to have deeper insights into the overall operations of the firm, such as chairpersons of boards of directors or officer-directors, prove to be more adept at forecasting future abnormal stock price fluctuations compared to officers or individual shareholders. This is in line with the Information Hierarchy Hypothesis (IHH) that states that insiders who are closer to the operations of the firm have access to better information which makes their trades more informative. This hypothesis has been both supported and contested. Lin and Howe (1990) found support for the hypothesis, arguing that top executives, officers, and directors engage in trading based on more valuable information in contrast to large shareholders. Dardas and Güttler (2011) find no evidence for the IHH when examining several European countries, with Sweden and France being an exception where the market reaction was stronger for insiders in high positions. Conversely, Jeng et al. (2003) identify that neither the insider's position within the firm or the size of the firm significantly affected the abnormal returns. Similarly, Fidrmuc et al. (2006), find no support for the IHH. They offer the explanation that

CEOs, since they possess more information, face heightened scrutiny leading them to hesitate in utilising their informational advantage, consequently lowering informational value.

2.3.1 Influence of Transaction Type on Short-term Abnormal Returns

Previous studies indicate a distinction in informational content between insider sales and purchases (see Lakonishok and Lee, 2001; Fidrmuc et al., 2013; Kallunki et al., 2009). Lakonishok and Lee (2001) argue that only insider purchases contain useful information for future stock performance, since the primary objective for buying a stock is to generate returns. Fidrmuc et al. (2013) investigate abnormal returns using more than 240,000 insider trades in 15 European countries and the USA. In line with Lakonishok and Lee (2001), they argue that the informational value of insider sales is generally lower compared to purchases. This is because the motivation for divesting a stock often encompasses insiders' diversification and liquidity requirements, which are not primarily tied to informational factors. Kallunki et al. (2009) further supports this view. They examine why corporate insiders trade in the context of the Swedish market and conclude that the primary factors influencing insiders' decisions to sell are portfolio rebalancing objectives, tax implications, and behavioural biases, making disposals less informative than acquisitions.

2.3.2 Influence of Transaction Size on Short-term Abnormal Returns

Jeng et al. (2003) incorporate the factor of transaction size to analyse abnormal returns. Intuitively, larger transactions should have a stronger impact on any reaction, aligning with Akerlof's (1970) signalling theory. Using this theory, larger transactions carry more signalling value, indicating a stronger corporate belief (purchases) or disbelief (sales). However, Jeng et al. (2003) contend that larger sales transactions may have motives beyond mere returns, such as risk reduction or personal consumption. Similarly, they argue that large-volume purchases may be driven by motives like corporate control or non-monetary benefits rather than pure returns. Nonetheless, Jeng et al. (2003) find that large-and medium volume trades yield economically large and statistically significant returns, whereas low-volume purchase trades exhibit considerably lower returns. Conversely, the analysis of the sales portfolio yields insignificant results. Similarly to this, Dardas and Güttler (2011) find that large transactions trigger larger announcement effects than smaller transactions. They find that transactions amounting to more than 0.1% of the market value of equity of a firm yields the highest abnormal returns, which is consistent with research by Fidrmuc et al. (2006).

2.3.3 Influence of Company Size on Short-term Abnormal Returns

Seyhun (1986) utilise the market model to compute normal returns and integrate a size factor to categorise firms according to their market capitalisation. His results indicate a negative correlation between firm size and abnormal returns, suggesting that insider trades yield larger abnormal returns in smaller firms compared to larger ones. This is supported by Lakonishok and Lee (2001), who claim that the small-cap segment often is regarded as less efficient. With a smaller firm, it becomes increasingly feasible for a single manager to possess a substantial amount of relevant information. Jeng et al. (2003) find that small-firm purchase portfolios consistently yield significant abnormal returns, while sale portfolios do not. However, the difference in abnormal returns between small and large firms diminishes when size is controlled for. Moreover, given that smaller firms obtain less scrutiny from equity analysts compared to larger companies, insiders within smaller firms are more likely to maintain an informational edge over other market participants. This is in line with Frankel and Li (2004), which argue that increased analyst following is associated with reduced information asymmetry between managers and investors, thus lowering the predictive power of insider trades.

2.3.4 Regulatory Impact and Market Efficiency

Over the past few decades, Europe has significantly tightened its regulatory framework around insider trading. Starting with a directive from the European Union in 1989, adopted into national legislation by member states during the 1990s, these regulations have continually evolved (European Union. Council, 1989). The initial directive was replaced by the Market Abuse Directive (MAD) in 2003, which sought to harmonise market regulations throughout the European Union (European Parliament and Council, 2003). More recently, the introduction of the Market Abuse Regulation (MAR) in July 2016 added even stricter controls (European Commission, 2016). This raises questions about the current efficacy of insider trading as a market signal and the ability of insiders to secure abnormal profits under these stringent conditions.

In Sweden, Finansinspektionen is tasked with overseeing financial markets, including the supervision of insider trading (Finansinspektionen, 2023). Being a member of the European Union, Sweden is directly subject to the EU's MAR. This regulation mandates that insiders in listed companies, particularly those holding significant managerial roles such as CEOs with

access to sensitive information, must personally report their trading activities (Finansinspektionen, 2016).

According to research by Kim et al. (2016), the progression towards stricter regulations is expected to improve the information quality of insider trades. Their study, which analysed insider trading regulations across 44 countries and 24,000 companies, indicates that tighter regulation not only increases the informativeness of insider trades but also enhances overall market efficiency.

2.4 Hypothesis Development

The research question relates to whether there are abnormal returns in the short term when insiders trade stocks. Specifically, we want to investigate if abnormal returns are generated by CEOs on the Nasdaq First North Growth Market. The analysis is made on the immediate market reaction on the publication day as well as the share price development for 1, 3 and 7 days before and after the publication of the transaction.

Because of the more relaxed regulated environment, First North is typically tailored for smaller and growing companies, often characterised by higher volatility. This creates an environment where CEO insider trades may have a more pronounced impact on stock prices, potentially leading to significant short-term abnormal returns. Investigating insider trading patterns specifically within this context can offer new insights and contribute to a deeper understanding of the dynamics of insider trading. Previous research, such as Jaffe (1974), Finnerty (1976) and Fidrmuc et al. (2013), conclude that insiders do earn abnormal returns. Consistent with these findings, this paper expects to find evidence of short-term abnormal returns following insider transactions in the Nasdaq First North Growth Market.

The different types of transaction communicate different signals to the market, generally generating different market reactions. Intuitively, an insider's purchase should signal confidence and thus generate a positive market reaction, while the opposite should hold for a disposal. Given this, separating buy and sales transactions in our study is natural, since their market reaction can be assumed to offset each other. Prior studies have highlighted the difference in informational content between acquisitions and disposals with acquisitions being more informative (see Lakonishok and Lee, 2001; Fidrmuc et al., 2013; Kallunki et al.,

2009). Hence, we expect that acquisitions will generate larger abnormal returns compared to disposals. Therefore, our first hypothesis is as follow:

H1: Abnormal returns do not vary significantly between transaction types.

H1a: Abnormal returns vary significantly between transaction types.

Jeng et al. (2003) incorporated the factor of transaction size to analyse the returns generated. Intuitively, larger transactions should have a larger impact on any reaction, aligning with Akerlof's (1970) signalling theory. Dardas and Güttler (2011) conclude that transactions exceeding 0.1% of a firm's market capitalisation generate the largest abnormal returns, aligning with the same idea formulated by Fidrmuc et al. (2006). Using this theory, larger transactions carry more signalling value and should generate the largest market reaction. Therefore, our second hypothesis is as follow:

H2: Abnormal returns do not vary significantly between different transaction sizes.

H2a: Abnormal returns vary significantly between different transaction sizes.

Seyhun (1986) argues that insider trading is most informative in small companies compared with larger counterparts. This also aligns with Lakonishok and Lee (2001), who claim that the small-cap segment often is regarded as less efficient. They use market capitalisation to determine the size of firms, dividing them into categories based on their market value of equity. Based on these findings, we expect that the impact of insider trading will be more prominent in smaller companies, where inefficiencies in market information potentially increase the effects of such trades. Based on this, our third hypothesis examines the relation of firm size and abnormal return:

H3: Abnormal returns do not vary significantly between different market values of equity of the firms.

H3a: Abnormal returns vary significantly between different market values of equity of the firms.

3. Methodology

This paper examines the research question and hypotheses about insider trades on the Nasdaq First North Growth Market and their short-term effects on share prices. The methodology involves a market model event study as described by MacKinlay (1997) and is an appropriate method to use to assess a specific event's impact on the valuation of a security. The method is based on the efficient market hypothesis and indicates that the effects of an event will be reflected directly in the stock's price.

An event study compares stock returns from two time periods: the event window and the estimation window. The event window represents the period surrounding the event day, while the estimation window refers to a timeframe before the event day that serves as a basis for comparison with the event window. The estimation window is used to predict the stock's normal return, enabling the calculation of the expected normal return for the event window as if the event had not occurred. The difference between the expected normal return and the actual return constitutes the abnormal return. Thus, a positive abnormal return indicates that the actual return exceeds the expected normal return.

The event of interest is a CEO's acquisition or disposal of his or her company's own stock. We define the event's date based on the publication date of a CEO transaction, as opposed to the transaction's actual date. This rationale stems from our focus on the market's response to the transactions, therefore making it interesting when the information becomes publicly accessible. In cases where the publication occurs on a non-trading day, we consider the subsequent trading day as the event date.

3.1 Event Window

The event windows are set to $[-7; 7]$, $[-3; 3]$, $[-1; 1]$ and $[0; 1]$. The purpose of using extended event windows is to account for pre- and post-event returns that may arise due to for example leakages between the transaction and publication date. We decided to keep the maximum event window at seven days since longer event periods make it harder to draw statistical inferences from the results due to the fact that there might be other reasons for movements in share prices that are difficult to control for.

3.2 Estimation Window

An estimation window of 120 days is set, starting 128 days before the event and ending 8 days before the event. This aligns with the recommendation of MacKinlay (1997) that the estimation window and the event window should not overlap. MacKinlay's use of a 120-day estimation window has been adopted in our study as well.

3.3 Market Model

MacKinlay (1997) presents two models for normal returns: the constant mean return model and the market model. The constant mean model simply adopts the mean return of a specified period as the normal return. In contrast, the market model involves regressing a security's historical return to a market index to account for variations in the market portfolio. By utilising the market model, it is anticipated that the fluctuations in abnormal returns will decrease. Therefore, we decided to use this framework in our study.

The market model is specified as:

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

Where:

- R_{it} : Return of security i in time period t .
- α_i : Alpha coefficient for stock i .
- β_i : Beta coefficient for stock i .
- R_{mt} : Return of a market portfolio in time period t ,
- ε_{it} : A residual defined as the mean disturbance term for firm i in time period t , with variance $\sigma_{\varepsilon i}^2$. The expected mean disturbance is zero.

The alpha (α) and beta (β) of the market model are estimated using an ordinary least squares (OLS) regression by relating the return of each stock subject to an insider transaction with the return of the market index over the estimation window.

3.4 AR, AAR and CAR

The market model of normal returns allows us to compute our estimated abnormal returns by simply comparing the actual return with the expected normal return:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

Where:

- AR_{it} : The abnormal return for firm i in time period t .
- R_{it} : The realised return for firm i in time period t .
- α_i : Alpha coefficient for stock i .
- β_i : Beta coefficient for stock i .
- R_{mt} : Market return at time t .

The individual securities abnormal returns can be aggregated into Average Abnormal Return (AAR), using AR_{it} for each event period. Given N events, the sample aggregated abnormal returns for period t is:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t}$$

To test the significance of the abnormal returns, we aggregated into cumulative abnormal returns (CARs) across each event window. The CAR is defined as the sum of the abnormal returns for each security i across our event windows and is calculated as follows:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t}$$

The cumulative average abnormal return (CAAR) is calculated by taking the average CAR for each respective observation over the defined event window.

$$CAAR(t_1, t_2) = \frac{1}{N} \sum_{i=1}^N CAR_{t_1, t_2}$$

We formulate our hypothesis as:

$$H_0: CAAR = 0; H_1: CAAR \neq 0;$$

The hypothesis is that CEO trades impact returns, i.e., a cumulative average abnormal return not zero. In line with the consensus in financial literature, the test is statistically significant if we are able to reject the null hypothesis at a 5% significance level.

3.5 Limitations of Study

MacKinlay (1997) identifies three significant challenges in short-term event studies: the selection of sampling intervals, determining the certainty of event dates, and ensuring the quality of the results. However, he notes that the last point is rarely problematic. He first points out that the effectiveness of statistical tests diminishes as the length of the event window increases. In this study, the event window extends to ± 7 days, which might compromise the reliability of our test results and the validity of any conclusions drawn from these extended periods. The rationale for expanding the event window to include days prior to the actual event is to address the second point, the potential for premature information leaks, which cannot be entirely dismissed. MacKinlay highlights the difficulty of accurately determining event days, which can skew results. However, this study is supported by legal requirements that guarantee precise date reporting. Despite these challenges, the paper suggests that the methodological limitations are likely to have a minimal effect, given the shortness of the event windows and the accurate definition of event dates. Thus, following MacKinlay's analysis, the study is expected to yield reliable test statistics.

4. Data Collection and Compilation

4.1 Share Prices, Market Indices and Market Capitalisation

Share price data is collected from the database Capital IQ and includes all Swedish firms that traded on Nasdaq First North Growth Market during the time interval January 1st 2019 - December 31st 2023. Regarding limitations, the dataset is limited to only include Swedish firms traded on First North, with the rationale that they all report their insider trades in the same database. As for indices, the First North All-Share Index is used as reference to calculate the abnormal returns. This index includes all the listed companies traded on Nasdaq First North Growth Market. Data for the index is downloaded from Capital IQ for the time

period corresponding to the share price data. Additionally, the market capitalisation of each firm at the time of the event is obtained from Capital IQ.

4.2 Insider Transactions

The insider transaction data is obtained from Finansinspektionen's PDMR transactions register. The database is used to obtain all insider transactions in the Stockholm Stock Exchange between January 1st 2019 and December 31st 2023. Our initial dataset comprised approximately 2,100 CEO transactions spanning over five years on the Nasdaq First North Growth Market. Details provided in transaction data include transaction nature, value, ISIN code for the security, transaction and publication dates, among others. Given the nature of the data obtained from Finansinspektionen, several stages of filtration are applied. Naturally we only include transactions made by CEOs on behalf of their own account or legal entity. Secondly, we only include acquisitions and disposal with shares as an instrument. Thirdly, we only include current transactions and exclude any observations published more than seven days after the transaction date. As outlined by MacKinlay (1997), when multiple transactions occur for the same entity on a single day, we cluster all sell transactions together and all buy transactions together, respectively. Lastly, we exclude all events without available stock data during the entire estimation window. From the total sample of transactions our final dataset comprises 704 transactions, as described in the Data filtration funnel below.

Table 1: Data Filtration Funnel

Description	# of obs
Total number of insider CEO transactions reported 2019 - 2023	2,126
Less transactions not made by the CEOs on behalf of their own account or legal entity	1,772
Less transactions other than acquisitions or disposals	1,715
Less transactions in other instruments than shares	1,643
Less non-current transactions	1,611
Less transactions published more than seven days after the transaction date	1,521
Less filtration for same day clustering of transactions	829
Less transactions without available data within the entire estimation window	704

4.3 Limitations to Data Set

One limitation of our dataset is the insufficient historical data on stock prices for recently listed companies, which, given our 120-day estimation window, naturally led to their exclusion from the analysis. Another limitation is the composition of our sample, where acquisitions make up about 92 percent of all transactions, leaving a small number of insider disposals for analysis. Such a limited dataset can skew results, as the performance of a few disposals or the unique conditions of certain companies might disproportionately impact the overall findings. However, in light of prior research on various transaction types and their association with abnormal returns, we recognise the importance of incorporating disposals in the analysis to detect potential differences between transaction types. Consequently, while our results offer initial insights into the dynamics of insider disposals, they should be interpreted with caution.

4.4 Variable Construction

As highlighted in the literature review and hypothesis development, the impact of CEO insider trading on abnormal returns can vary significantly depending on different factors, e.g. the size and type of transactions. To effectively address our sub-research questions, and by extension our main research questions, we split the sample data into different variables. Table 2 shows the distribution of variables in our study. Transaction sizes are categorised into three tiers: large, mid, and small. Large transactions include those exceeding SEK 200,000, mid-sized transactions are above SEK 50,000, and small transactions encompass all below SEK 50,000. Noteworthy, disposals typically involve larger transactions, which lead to a somewhat skewed split with the majority of events categorised as large transactions. To account for the proportionality of transactions, we also assess transaction size relative to the market capitalization of the company. Transactions are divided into three tiers: large transactions represent those accounting for more than 0.1% of the total market value of equity at the time of the transaction, mid-sized transactions exceed 0.02%, and small transactions fall below 0.02%. This classification aligns with the findings of Dardas and Güttler (2011), who observed the highest cumulative abnormal returns (CAAR) for transactions exceeding 0.1% of the firm's market capitalisation. Lastly, we classify the market value of equity into tiers: small, for companies with a market capitalization below SEK 200 million; medium, for those between SEK 200 million and SEK 800 million; and large, for companies exceeding SEK 800 million. Market capitalisation is measured at the time of the event.

Table 2: Variable Construction

Variable	Description	# of obs
Acquisitions	Buy transactions	647
Disposals	Sell transactions	57
Value of transaction > SEK 200,000; acquisitions/ disposals	Transaction in “large” tier	150/ 40
Value of transaction > SEK 50,000; acquisitions/ disposals	Transaction in “mid” tier	262/ 7
Value of transaction < SEK 50,000; acquisitions/ disposals	Transaction in “small” tier	235/ 10
Value of transaction > 0.1% of market cap; acquisitions/ disposals	Transaction in “large” tier	110/ 29
Value of transaction > 0.02 of market cap; acquisitions/ disposals	Transaction in “mid” tier	272/ 17
Value of transaction < 0.02% of market cap; acquisitions/ disposals	Transaction in “small” tier	265/ 11
Market capitalisation > SEKm 800; acquisitions/ disposals	Transactions in “large” market cap	138/ 19
Market capitalisation > SEKm 200; acquisitions/ disposals	Transactions in “mid” market cap	258/ 24
Market capitalisation < SEKm 200; acquisitions/ disposals	Transactions in “small” market cap	251/ 14

4.5 Final Data Sample

After conducting the filtration steps as outlined in table 1, we end up with a total of 704 transactions in our data sample. In table 3 the transactions are presented divided into years and the transaction types acquisitions and disposals. As shown, there is a clear preponderance of acquisitions versus disposals with approximately 92 percent of the final data sample consisting of acquisitions. Furthermore, the split between years is relatively even, with 2019 having the lowest number of transactions and 2022 containing the largest amount of transactions.

Table 3: Number of transactions by year

	2019	2020	2021	2022	2023	Total
Acquisitions	78	100	123	195	151	647
Disposals	11	11	15	12	8	57
Total transactions	89	111	138	207	159	704

5. Results

In this section, we present the results of our analyses. The section contains descriptive statistics of our findings, as well as the result of our statistical analysis.

5.1 Descriptive Statistics

Table 4 shows a descriptive analysis over all transactions used in the statistical analysis, divided into our event windows. We observe the largest outliers in the $[-7; 7]$ event window, with acquisitions naturally having the largest positive outliers and disposals the largest negative outliers. Furthermore, we observe that the standard deviation decreases with the shorter event windows. As expected the results are volatile, which is natural given the nature of companies listed on the Nasdaq First North Growth Market.

Table 4: Descriptive analysis of abnormal returns for all transactions

Panel A: Acquisitions				
Event Windows	[0; 1]	[-1; 1]	[-3; 3]	[-7; 7]
Observations	647	647	647	647
Minimum	-39.48%	-40.09%	-45.01%	-77.24%
Mean	1.42%	0.85%	0.96%	0.38%
Median	0.89%	0.47%	0.47%	0.77%
Maximum	69.80%	76.79%	76.16%	297.17%
Standard Deviation	8.50%	10.37%	13.29%	22.26%

Panel B: Disposals				
Event Windows	[0; 1]	[-1; 1]	[-3; 3]	[-7; 7]
Observations	57	57	57	57
Minimum	-16.48%	-18.78%	-38.84%	-112.59%
Mean	-1.29%	-1.27%	-1.94%	-6.91%
Median	-0.87%	-1.27%	-1.94%	-6.51%
Maximum	34.94%	34.85%	34.86%	41.64%
Standard Deviation	7.06%	11.50%	11.50%	20.26%

5.2 Statistical Analysis

In this section, we present the results of the statistical analysis conducted on our data sample, following the methodology outlined in section 3.

5.2.1 Abnormal returns by transaction type

Table 5 summarises the Average Abnormal Returns (AAR) for the 7-day event window. For the acquisitions we observed negative abnormal returns prior to the event day, with the -7 day being an exception. The event day itself shows significant positive abnormal returns of 1.04%. Contrary to expectations, we observe that the days leading up to the event yield more significant outcomes in comparison to those that follow. As anticipated, the positive trend in AARs persists following the event day, however, these results are not significant. For disposals, we observe significant results on the event day, as well as on days 4, 5 and 6. The event day AAR is -0.88%, and the significant days following the event day are as expected negative.

Table 5: Summary of AAR, t-value and p-value for all transactions

	Acquisitions			Disposals		
Day	AAR	t-value	p-value	AAR	t-value	p-value
-7	0.14%	0.313	0.755	-0.06%	-0.157	0.875
-6	-0.58%	-3.021	0.003	-0.47%	-0.754	0.454
-5	-0.25%	-1.502	0.134	-0.14%	-0.351	0.727
-4	-0.66%	-3.220	0.001	-2.69%	-1.101	0.276
-3	-0.08%	-0.433	0.665	0.06%	0.095	0.924
-2	-0.08%	-0.347	0.729	-0.15%	-0.207	0.836
-1	-0.57%	-2.420	0.016	0.02%	0.041	0.967
0	1.04%	3.717	0.000	-0.88%	-2.207	0.031
1	0.38%	1.731	0.084	-0.41%	-0.500	0.619
2	0.10%	0.576	0.565	0.06%	0.124	0.902
3	0.16%	0.984	0.325	-0.40%	-0.949	0.347
4	0.14%	0.703	0.482	-0.82%	-2.056	0.044
5	0.21%	0.929	0.353	-1.08%	-2.232	0.030
6	0.12%	0.655	0.513	-1.10%	-2.788	0.007
7	0.31%	1.672	0.095	-0.84%	-1.623	0.110

Table 6 shows the CAAR for all transactions divided into acquisitions and disposals. The result of our t-tests conducted on the overall dataset indicate evidence that insider transactions within the Nasdaq First North Growth Market yield significant abnormal returns during certain event windows. For the acquisitions, we observe a CAAR of 1.42% on the [0;

1] event window with a p-value indicating strong significance. For the [-1; 1] event window, we observed a CAAR of 0.85% and successfully rejected the null hypothesis at a 5% significance level. In contrast, the [-3; 3] event window showed a CAAR of 0.96%, however, despite a low p-value, we could not reject the null hypothesis at the same significance level. Regarding the disposals, we only observe significant results for the event window [-7; 7] of -6.91%. Given these results, we can in line with expectations reject the null hypothesis on a 5% significance level for acquisitions on the [0;1] and [-1;1] event windows.

Table 6: Cumulative abnormal returns for all transactions

	CAAR	t-value	p-value
Acquisitions N= 647			
[0; 1]	1.42%***	4.250	0.000
[-1; 1]	0.85%**	2.093	0.037
[-3; 3]	0.96%*	1.831	0.068
[-7; 7]	0.38%	0.434	0.664
Disposals N= 57			
[0; 1]	-1.29%	-1.380	0.173
[-1; 1]	-1.28%	-1.224	0.226
[-3; 3]	-1.71%	-1.124	0.266
[-7; 7]	-6.91%**	-2.576	0.013

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2.2 Abnormal returns by transaction size

Our second hypothesis examines the differences in abnormal returns generated by different transaction sizes. Firstly, we examine this by looking at transactions in absolute value.

Table 7 shows AAR for the [-7; 7] event window. For acquisitions, shown in panel A, the most substantial effects on AAR across all transaction sizes typically occur on the event day, except for small transactions, which show the largest significant effect on day 2. Notably, large and mid-sized transactions exhibit higher abnormal returns, with the largest transactions showing the greatest effect.

Analysing the data across different transaction sizes reveals varied market reactions to disposals, shown in panel B. For large transactions, the most significant impact is seen on the event day, where the Average Abnormal Return (AAR) is notably negative at -1.19% with a p-value of 0.014, indicating a strong market reaction to large disposals. Additionally, day 4

also registers a significant negative AAR of -0.95%, with a p-value of 0.049. In contrast, mid-sized transactions exhibit a significant negative reaction only on day -5, with an AAR of -1.30% and a p-value of 0.031. Small transactions, while showing volatility, only mark a significant positive outcome on day 7, with an AAR of -2.65% and a p-value of 0.003.

Table 7: Summary of AAR, t-value and p-value for all transactions by transaction size

Panel A: Acquisitions

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	-0.27%	-0.795	0.428	-0.24%	-0.813	0.417	-0.49%	-0.280	0.780
-6	0.02%	0.061	0.952	-0.67%	-2.155	0.032	-0.72%	-1.933	0.054
-5	-0.22%	-0.618	0.538	-0.29%	-1.169	0.244	-0.23%	-0.784	0.434
-4	-0.88%	-2.039	0.043	-0.57%	-1.877	0.062	-0.57%	-1.616	0.107
-3	0.45%	1.157	0.249	-0.45%	-1.510	0.132	0.06%	0.219	0.827
-2	0.26%	0.406	0.685	0.55%	1.444	0.150	-0.82%	-2.299	0.022
-1	-0.55%	-1.072	0.285	-0.67%	-1.695	0.091	-0.48%	-1.410	0.160
0	1.74%	2.158	0.033	1.21%	2.900	0.004	0.40%	1.184	0.238
1	0.26%	0.501	0.617	0.39%	1.274	0.204	0.44%	1.205	0.230
2	-0.62%	-1.986	0.049	0.09%	0.325	0.746	0.58%	2.075	0.039
3	0.21%	0.550	0.583	0.00%	0.011	0.991	0.34%	1.210	0.228
4	-0.37%	-1.303	0.195	0.22%	0.691	0.490	0.39%	1.006	0.315
5	0.52%	1.407	0.162	0.09%	0.311	0.756	0.16%	0.331	0.741
6	0.18%	0.554	0.580	0.07%	0.237	0.813	0.21%	0.604	0.546
7	0.27%	0.764	0.446	0.18%	0.695	0.488	0.46%	1.296	0.196

Panel B: Disposals

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	-0.43%	-0.945	0.351	-1.31%	-2.336	0.058	2.52%	1.449	0.181
-6	-0.41%	-0.474	0.638	-0.56%	-0.513	0.626	-0.51%	-1.077	0.310
-5	0.12%	0.235	0.815	-1.30%	-2.811	0.031	-0.35%	-0.408	0.693
-4	-0.20%	-0.264	0.793	-0.26%	-0.394	0.707	-2.43%	-1.505	0.167
-3	0.23%	0.283	0.778	-1.63%	-1.424	0.204	0.82%	0.636	0.541
-2	-0.36%	-0.357	0.723	0.08%	0.150	0.885	0.40%	0.435	0.674
-1	0.02%	0.060	0.953	-1.10%	-1.594	0.162	0.52%	0.346	0.737
0	-1.19%	-2.587	0.014	-1.64%	-2.005	0.092	0.73%	0.653	0.530
1	-0.96%	-1.648	0.107	-2.98%	-1.258	0.255	3.83%	1.092	0.303
2	-0.36%	-0.633	0.530	0.68%	0.710	0.504	1.63%	1.665	0.130
3	-0.69%	-1.307	0.199	1.46%	1.405	0.210	0.02%	0.021	0.983
4	-0.95%	-2.036	0.049	-1.18%	-1.217	0.269	-0.09%	-0.073	0.943
5	-0.79%	-1.367	0.179	-1.07%	-0.763	0.474	-1.95%	-1.643	0.135
6	-1.17%	-2.532	0.015	-0.62%	-1.662	0.148	0.15%	0.187	0.855
7	-0.89%	0.015	0.190	1.61%	1.320	0.235	-2.65%	-4.05	0.003

Panel A in table 8 shows the CAAR for the buy transactions divided into small, mid and large transactions. We observe the largest CAARs amongst the largest transactions, with the CAAR becoming smaller with the mid and small transactions. The results are only significant during the [0; 1] event window and for large and mid size transactions with the CAAR being 2.00% and 1.60% respectively. This indicates that large acquisitions yield larger short-term abnormal returns compared to mid size transactions. Panel B shows the CAAR for disposals divided into transaction size. We observe that the large transactions are significant on event windows [0; 1], [-1; 1] and [-7; 7], with the CAAR for the event windows being -2.15%, -2.13% and -8.02% respectively. For the mid and small transactions, the CAARs are insignificant across all event windows and we cannot reject the null hypothesis at a 5% level. The result indicates that large sales transactions yield significant negative abnormal returns. One notable difference between large acquisitions and disposals is the difference in the magnitude and significance of effects across event windows. For acquisitions, the [0; 1] event window is significant and the magnitude of abnormal return diminishes as the event window extends. The opposite holds for disposals with an increased effect over longer event windows and significant results for most event windows.

Table 8: Cumulative abnormal returns for all transactions by transaction size

Panel A: Acquisitions			
	CAAR	t-value	p-value
Large N= 150			
[0; 1]	2.00%**	2.237	0.027
[-1; 1]	1.45%	1.430	0.155
[-3; 3]	1.73%	1.410	0.160
[-7; 7]	1.00%	0.579	0.563
Mid N= 262			
[0; 1]	1.60%***	3.409	0.001
[-1; 1]	0.94%	1.524	0.127
[-3; 3]	1.12%	1.340	0.182
[-7; 7]	0.09%	-0.079	0.937
Small N= 235			
[0; 1]	0.84%*	1.696	0.091
[-1; 1]	0.36%	0.586	0.559
[-3; 3]	0.52%	0.648	0.518
[-7; 7]	-0.28%	-0.125	0.900

Panel B: Disposals

	CAAR	t-value	p-value
Large N= 40			
[0; 1]	-2.15%***	-3.406	0.002
[-1; 1]	-2.13%***	-3.137	0.003
[-3; 3]	-3.30%*	-1.986	0.054
[-7; 7]	-8.02%**	-2.265	0.029
Mid N= 7			
[0; 1]	-4.62%	-1.555	0.171
[-1; 1]	-5.72%	-1.338	0.156
[-3; 3]	-5.13%	-1.621	0.229
[-7; 7]	-9.81%*	-2.005	0.062
Small N= 10			
[0; 1]	4.56%	1.173	0.271
[-1; 1]	5.08%	1.182	0.268
[-3; 3]	7.95%*	2.046	0.071
[-7; 7]	2.64%	0.635	0.541

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Apart from looking at transactions in absolute value, we examine the size of transactions in relation to the market capitalisation. Table 9 shows the AAR for the [-7; 7] event window with transaction sizes adjusted for market capitalisation. Panel A shows the effect for acquisitions. Similarly as in table 7, we observe the largest significant effect for large and mid size transactions on the event day. For large transactions, the effect is greater of 2.27% compared to 1.74% in table 7, however, for mid size the effect is smaller of 1.03% compared to 1.21%. For small transactions we surprisingly note the largest significant effect on day -1 of -1.26%, while the event day does not yield significant results.

For disposals, in panel B, we for large transactions note the greatest significant effect on day 1 of -1.68%. Mid size transactions surprisingly yield the largest, and only, significant result of -1.60% on day 6 while small transactions yield no significant results.

Table 9: AAR for acquisitions by market capitalisation adjusted transaction size over a 7-day event window

Panel A: Acquisitions

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	-0.64%	-1.358	0.177	0.80%	0.801	0.424	-1.38%	-1.148	0.252
-6	-0.28%	-0.658	0.512	-0.84%	-2.802	0.005	-0.31%	-0.905	0.366
-5	0.10%	0.231	0.818	-0.31%	-1.162	0.246	-0.34%	-1.390	0.166
-4	-0.80%	-1.552	0.124	-0.45%	-1.403	0.162	-0.77%	-2.526	0.012
-3	0.04%	0.103	0.918	-0.43%	-1.452	0.148	0.28%	1.100	0.272
-2	0.43%	0.723	0.471	0.11%	0.300	0.764	-0.33%	-0.778	0.437
-1	0.24%	0.335	0.738	-0.23%	-0.687	0.493	-1.26%	-3.611	0.000
0	2.27%	2.158	0.033	1.03%	2.681	0.008	0.54%	1.539	0.125
1	0.31%	0.618	0.538	0.47%	1.198	0.232	0.31%	1.126	0.261
2	-0.63%	-1.819	0.072	0.02%	0.086	0.932	0.49%	1.921	0.056
3	-0.02%	-0.044	0.965	0.20%	0.767	0.444	0.22%	0.866	0.388
4	0.28%	0.807	0.421	-0.07%	-0.205	0.838	0.30%	0.918	0.359
5	0.46%	0.802	0.424	0.15%	0.523	0.601	0.18%	0.444	0.657
6	1.30%	2.286	0.024	-0.18%	-0.677	0.499	0.00%	-0.008	0.994
7	0.48%	1.262	0.210	-0.05%	-0.162	0.871	0.59%	2.163	0.031

Panel B: Disposals

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	-1.18%	-2.547	0.017	0.60%	0.895	0.384	2.07%	1.261	0.236
-6	-1.28%	-1.468	0.153	1.27%	0.929	0.367	-0.88%	-1.514	0.161
-5	0.25%	0.420	0.680	-0.68%	-1.333	0.201	-0.34%	-0.371	0.718
-4	-1.37%	-2.059	0.049	1.91%	1.478	0.159	-2.47%	-1.701	0.120
-3	-0.45%	-0.452	0.655	0.60%	0.607	0.552	0.79%	0.676	0.515
-2	-0.83%	-0.633	0.532	0.31%	0.336	0.741	0.81%	1.124	0.287
-1	-0.25%	-0.680	0.502	-0.06%	-0.085	0.933	0.61%	0.440	0.670
0	-1.18%	-2.303	0.029	-1.44%	-1.982	0.065	0.63%	0.623	0.547
1	-1.68%	-2.063	0.048	-0.98%	-1.149	0.267	4.03%	1.267	0.233
2	0.10%	0.153	0.879	-0.62%	-0.771	0.452	1.31%	1.400	0.192
3	-0.80%	-1.173	0.251	0.13%	0.226	0.824	0.35%	0.416	0.686
4	-1.44%	-2.460	0.020	-0.76%	1.269	0.223	0.69%	0.701	0.499
5	-0.97%	-1.290	0.207	-0.60%	-0.794	0.439	-1.83%	-1.810	0.100
6	-0.99%	-1.824	0.079	-1.60%	-3.463	0.003	0.58%	0.694	0.503
7	-1.26%	-1.464	0.154	0.22%	0.297	0.770	-1.65%	-1.869	0.091

Table 10 shows the CAAR for all transactions in proportion to market capitalisation. The CAAR for large acquisitions are significant on the $[0; 1]$ and $[-1; 1]$ event windows, as compared to only being significant on the $[0; 1]$ event window for large transactions in

absolute value. The CAAR is also higher across all event windows when adjusting for the market capitalisation. The mid size transactions yield a lower CAAR of 1.50% on event window [0; 1] , compared to 1.60% when looking in absolute numbers. However, the [-1; 1] event window yields significant CAAR of 1.27%. The small size transactions stay insignificant for all event windows. The large disposals remain significant across all event windows. We observe larger abnormal returns when adjusting for market capitalisation for all event windows for the large transactions. Surprisingly, the small size disposals yield a positive CAAR of 8.54% with the [-3; 3] event window remaining the only significant result. Similarly as when examining size in absolute terms, the pattern of greater results over longer time periods holds in with this division. The largest CAAR of -13.32% is observed on the [-7; 7] event window. Given these results, we can in line with expectations reject the null hypothesis on a 5% significance level for both acquisitions and disposals.

Table 10: Cumulative abnormal returns for all transactions by market capitalisation adjusted transaction size

Panel A: Acquisitions

	CAAR	t-value	p-value
Large N= 110			
[0; 1]	2.58%***	2.655	0.009
[-1; 1]	2.81%**	2.469	0.015
[-3; 3]	2.64%*	1.835	0.069
[-7; 7]	3.54%*	1.944	0.054
Mid N= 272			
[0; 1]	1.50%***	2.781	0.006
[-1; 1]	1.27%**	1.982	0.048
[-3; 3]	1.17%	1.497	0.136
[-7; 7]	0.22%	0.131	0.896
Small N= 265			
[0; 1]	0.85%*	1.929	0.055
[-1; 1]	-0.41%	-0.716	0.475
[-3; 3]	0.26%	0.316	0.752
[-7; 7]	-1.47%	-0.946	0.345

Panel B: Disposals

	CAAR	t-value	p-value
Large N= 29			
[0; 1]	-2.86%***	-3.380	0.002
[-1; 1]	-3.11%***	-3.261	0.001
[-3; 3]	-5.08%**	-2.391	0.024
[-7; 7]	-13.32%***	-3.276	0.003
Mid N= 17			
[0; 1]	-2.42%*	-2.046	0.058
[-1; 1]	-2.48%*	-1.845	0.084
[-3; 3]	-2.06%	-1.084	0.295
[-7; 7]	-1.69%	-0.406	0.690
Small N= 11			
[0; 1]	4.67%	1.328	0.214
[-1; 1]	5.27%	1.360	0.204
[-3; 3]	8.54%**	2.513	0.031
[-7; 7]	4.72%	1.230	0.247

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2.3 Abnormal returns by market value of equity

Our third hypothesis examines if the market capitalisation of a firm has an impact on the abnormal returns generated from an insider transaction. Table 11 shows the AAR for acquisitions by the size of market capitalisation. For acquisitions, in panel A, we observe no significant effects for the large transactions, with day -4 being an exception. For the mid and small transactions we observe the largest effect on the event day of 1.23% and 1.20% respectively. For disposals, in panel B, we observe no significant results on a 5% significance level.

Table 11: AAR for acquisitions by size of market capitalisation over a 7-day event window**Panel A: Acquisitions**

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	-0.36%	-1.050	0.296	0.19%	0.644	0.520	-0.88%	-0.533	0.595
-6	-0.43%	0.999	0.320	-0.33%	-1.173	0.242	-0.77%	-2.145	0.032
-5	-0.43%	-1.270	0.206	-0.35%	-1.429	0.154	-0.06%	-0.197	0.844
-4	-1.06%	-2.966	0.004	-0.19%	-0.576	0.565	-0.88%	-2.557	0.011
-3	0.31%	0.812	0.418	0.00%	0.014	0.989	-0.32%	-1.175	0.241
-2	0.79%	1.165	0.246	-0.52%	-1.730	0.085	0.06%	0.141	0.888
-1	-0.50%	-1.047	0.297	-0.87%	-2.283	0.023	-0.31%	-0.820	0.413
0	0.38%	0.842	0.401	1.23%	3.182	0.001	1.20%	2.184	0.030
1	0.32%	0.626	0.533	0.51%	1.812	0.071	0.28%	0.703	0.483
2	0.05%	0.137	0.891	-0.01%	-0.037	0.970	0.25%	0.890	0.374
3	-0.15%	-0.389	0.698	0.16%	0.556	0.578	0.36%	1.590	0.113
4	-0.33%	-0.732	0.465	0.17%	0.621	0.535	0.38%	1.077	0.282
5	-0.15%	-0.460	0.646	0.18%	0.665	0.507	0.45%	0.932	0.352
6	0.15%	0.429	0.669	-0.21%	-0.900	0.369	0.51%	1.359	0.175
7	0.76%	1.957	0.052	0.02%	0.066	0.948	0.35%	1.002	0.317

Panel B: Disposals

	Large			Mid			Small		
Day	AAR	t-value	p-value	AAR	t-value	p-value	AAR	t-value	p-value
-7	0.44%	0.703	0.491	0.28%	0.324	0.749	-1.15%	-1.399	0.185
-6	-0.44%	-0.271	0.789	-0.59%	-0.850	0.404	-0.19%	-0.367	0.720
-5	0.13%	0.172	0.865	-0.61%	-1.016	0.320	0.30%	0.580	0.572
-4	0.07%	0.061	0.952	-0.59%	-0.600	0.554	-1.52%	-1.315	0.211
-3	-0.87%	-0.723	0.479	0.24%	0.240	0.812	1.18%	1.357	0.198
-2	-0.83%	-0.953	0.353	-0.57%	-0.912	0.371	1.41%	0.556	0.588
-1	0.35%	0.451	0.658	-0.09%	-0.159	0.875	-0.43%	-0.704	0.494
0	-0.93%	-1.116	0.279	-0.91%	-1.850	0.077	-0.87%	-1.029	0.322
1	-1.72%	-1.673	0.112	-0.31%	-0.445	0.660	1.37%	0.490	0.632
2	0.13%	0.122	0.904	0.85%	1.733	0.096	-1.15%	-1.555	0.144
3	-0.90%	-0.893	0.384	0.08%	0.146	0.885	-0.13%	-0.249	0.807
4	-1.43%	-1.703	0.106	0.11%	0.206	0.839	-1.60%	-2.266	0.041
5	-0.58%	-1.015	0.324	-0.94%	-1.718	0.099	-1.78%	-1.133	0.278
6	-1.42%	-2.021	0.058	-0.25%	-0.555	0.584	-1.18%	-1.518	0.153
7	-1.14%	-0.899	0.381	-0.46%	-0.935	0.360	-1.30%	-1.304	0.215

Table 12 shows the CAAR for the transactions divided by size of market capitalisation. As shown in panel A, the effect is larger for acquisitions in mid and small size companies compared to larger counterparts. The effect is only significant on the [0; 1] event window for mid and small transactions, with the mid transactions yielding the largest CAAR of 1.74%.

The effect on larger companies is small and not significant. Panel B shows disposals divided into the size of market capitalisation. In contrast to the acquisitions, we observe the largest and only significant effect on large transactions during the [0; 1] event window. Given these results, we can partly reject the null hypothesis. The result for acquisitions is in line with expectations of smaller companies generating more significant results, while disposals contests our expectations and shows more significant results for large companies.

Table 12: Cumulative abnormal returns for all transactions by market capitalisation

Panel A: Acquisitions

	CAAR	t-value	p-value
Large N= 138			
[0; 1]	0.70%	0.935	0.352
[-1; 1]	0.20%	0.219	0.827
[-3; 3]	1.19%	1.027	0.306
[-7; 7]	-0.65%	-0.407	0.684
Mid N= 258			
[0; 1]	1.74%***	3.744	0.000
[-1; 1]	0.88%	1.539	0.125
[-3; 3]	0.51%	0.651	0.516
[-7; 7]	-0.02%	-0.013	0.989
Small N= 251			
[0; 1]	1.48%**	2.521	0.012
[-1; 1]	1.17%	1.627	0.105
[-3; 3]	1.52%*	1.678	0.094
[-7; 7]	0.62%	0.290	0.772

Panel B: Disposals

	CAAR	t-value	p-value
Large N= 19			
[0; 1]	-2.66%**	-2.231	0.039
[-1; 1]	-2.31%*	-1.750	0.097
[-3; 3]	-4.78%*	-1.804	0.088
[-7; 7]	-9.15%	-1.349	0.194
Mid N= 24			
[0; 1]	-1.22%	-1.499	0.147
[-1; 1]	-1.31%	-1.212	0.238
[-3; 3]	-0.70%	-0.418	0.680
[-7; 7]	-3.77%	-1.390	0.178
Small N= 14			
[0; 1]	0.50%	0.155	0.879
[-1; 1]	0.07%	0.020	0.985
[-3; 3]	1.37%	0.331	0.746
[-7; 7]	-7.06%*	-1.804	0.095

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6. Discussion

Our analysis of three hypotheses addresses our primary research question and demonstrates that CEO insider transactions generate abnormal returns in a short-term perspective. These findings are consistent with previous research such as those by Jaffe (1974), Finnerty (1976) and Fidrmuc et al. (2013). This validation is achieved through a structured investigation of various sub-questions, improving our understanding of the underlying factors. Overall, our results meet our initial expectations and provide new insights into the impact of insider trading activities within the Nasdaq First North Growth Market.

The findings from our first hypothesis show that acquisitions reveal significant results during the $[0; 1]$ and $[-1; 1]$ event windows, while disposals only generate significant results during the $[-7; 7]$ event window. Previous research (see Lakonishok and Lee, 2001; Fidrmuc et al., 2013; Kallunki et al., 2009) concludes that acquisitions tend to be more informative than disposals. Although this holds true for our shorter event windows, the observed results from disposals show the largest significant abnormal return of -6.91% during the $[-7; 7]$ event window. Throughout our study, we consistently observe that the longest event windows for disposals generate the most significant abnormal returns. This effect could indicate a delayed market reaction to disposals, potentially due to the time required for investors to fully assess the implications of these transactions. Alternatively, the model may have failed to account for certain factors, such as other market events in the longer event window causing noise in the share price performance. Nevertheless, during the shorter event windows, we observe a significant effect for acquisitions and not for disposals. This could be attributed to the diverse reasons for divesting stock, as discussed by, for example, Lakonishok and Lee (2001) and Kallunki et al. (2009). Given that the primary motivation behind acquiring shares is profit generation, the market perceives these transactions as a stronger signal, thus generating the largest effect on share price movements.

The findings from our second hypothesis indicate that there are differences in the observed abnormal returns across various transaction sizes for both acquisitions and disposals. The results demonstrate that larger transaction sizes are associated with statistically significant abnormal returns. For example, on the $[0; 1]$ event window, large acquisitions yield a notable CAAR of 2.00% and large disposals a CAAR of -2.15%, confirming our expectations that larger transactions communicate stronger market signals. This finding

emphasises the market's perception of large transactions as more informative. These results support previous literature, including Jeng et al. (2003), which demonstrate that trades of large and medium volumes yield economically significant returns, in contrast to the considerably lower returns observed in low-volume purchase trades. The impact is more evident when adjusting for transaction size relative to market capitalisation. The magnitude of abnormal returns is greater for large and mid-sized transactions during both the $[0; 1]$ and $[-1; 1]$ event windows for acquisitions. Similarly, for disposals, the effect for large adjusted transactions becomes larger and more significant. This analysis emphasises the role of proportional transaction size in signalling value, thus highlighting the importance of scale and proportionality in evaluating insider trading activities. This observation is in line with findings from Dardas and Güttler (2011), who noted that larger transactions lead to more distinct announcement effects than their smaller counterparts. They argue that transactions exceeding 0.1% of a firm's market capitalisation generate larger abnormal returns, a perspective that aligns with our findings and is supported by Fidrmuc et al. (2006). The relation between transaction size and market impact aligns with the principles of signalling theory, as articulated by Akerlof (1970). The theory suggests that larger transactions convey greater signalling value, indicating a stronger conviction about the firm's prospects, thereby attracting greater attention and reaction from the market. Our study reinforces this theory, providing empirical evidence that larger transaction sizes are perceived as more substantive signals, thus influencing market behaviour more significantly than smaller transactions.

Our third hypothesis examines insider transactions in relation to company size based on the market value of equity. Our results show that acquisitions in small and mid size companies generate larger abnormal returns during the $[0; 1]$ event window, however, the longer event windows do not yield significant results. The observed effect for the large companies is notably smaller and not significant. This is consistent with Seyhun (1986) that observed a negative correlation between firm size and abnormal return. Prior research states several reasons for smaller companies generating larger abnormal returns. According to Lakonishok and Lee (2001), one such factor is the increased feasibility for a single manager in smaller companies to possess a substantial amount of relevant information. Additionally, Frankel and Li (2004) contend that increased analyst following is linked to reduced information asymmetry, thereby diminishing the predictive power of insider trades. Given the typically lower analyst coverage of smaller companies, this implies that trades within these firms convey more informative signals. In contrast to previous research, disposals only generate

significant results amongst the larger companies during the $[0; 1]$ event window. One possible reason for this could be the notable effect we have observed for large transaction sizes, as mentioned earlier. If larger transactions are more prevalent in larger companies, the influence of these sizable transactions on abnormal returns might outweigh the effect of firm size alone. Thus, this factor could help explain the differences in results compared to previous research.

7. Conclusion

This paper investigates whether CEO transactions on the Nasdaq First North Growth Market generate abnormal returns. This was done by analysing the stocks of firms with CEO transactions on First North from 2019 to 2023, addressing several sub-questions to synthesise the findings and answer our primary research question. Our study contributes to the literature on insider trades by focusing on CEO transactions on First North, a market characterised by less regulations and increased volatility. Additionally, our examination of various factors, including transaction type and size, and market capitalisation, offers a more nuanced analysis. The results from our three hypotheses show that insider transactions do generate abnormal returns in the short-term. Thus, there is evidence supporting our main research question that CEO transactions lead to short-term abnormal returns. Firstly we investigate if the type of transaction has an impact on abnormal returns. We find that acquisitions generate larger and more statistically significant results on the abnormal returns during the shorter event windows, however, the largest effect is found amongst disposals. Secondly, we investigate if there is a difference between abnormal returns in different transaction sizes, both in absolute value and in relation to the market capitalisation of the company. Our results indicate that there is a larger effect amongst larger transactions, especially prominent for transactions amounting for more than 0.1% of the market capitalisation. This emphasises the significance of transaction size as a signal of firm value and highlights the role of scale and proportionality in assessing the impact of insider trading activities. Lastly, we examine if the size of market value of equity impacts abnormal returns. We see indications that the effect is larger for acquisitions in smaller companies compared to larger ones. The analysis of disposals yields opposite results with larger companies generating more significant and larger results compared to smaller ones.

We acknowledge that our study has limitations, particularly concerning insider disposals due to the small sample size. Such a limited dataset can skew results, as the performance of a few

disposals or the unique conditions of certain companies might disproportionately impact the overall findings. Consequently, while our results offer initial insights into the dynamics of insider disposals, they should be interpreted with caution.

Based on the limited sample size of disposals, one interesting angle for future research is to further investigate the effect of disposals on short-term stock movements. Given that our findings diverged somewhat from prior literature, it would be valuable to explore whether this discrepancy persists in a larger dataset or if it stems partially from outliers within our dataset. Additionally, given our observation that the effect increases with larger intervals, examining longer event windows when analysing disposals could provide deeper insights into their impact on stock performance. This could help clarify the timing and duration of the market's response to disposals. Furthermore, our study has established that abnormal returns arise from CEO insider trading on the Nasdaq First North Growth Market. Building on this foundation, future research could conduct a comparative analysis across different market lists within Sweden. By examining how insider trading effects vary between more and less regulated markets, valuable insights into the influence of regulatory environments on insider behaviour and market outcomes could be provided. For instance, a comparative study could focus on contrasting the less regulated Nasdaq First North Growth Market with the more regulated Nasdaq Nordic Large Cap.

8. References

8.1 Literature References

- Akerlof, G.A. (1970). The market for “lemons”: Quality uncertainty and the market Mechanism. *Quarterly Journal of Economics*, 84: 488-500.
- Connelly, B., Certo, S., Ireland, R., Reutzel, C. (2011). Signaling Theory: A Review and Assessment. *Journal of Management* 37.1: 39–67.
- Dardas, K., Güttler, A. (2011). Are directors’ dealings informative? Evidence from European stock markets. *Financial Markets and Portfolio Management*, 25(2): 111-148.
- Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of finance* (New York) 25.2: 383-.
- Fidrmuc, J.P., Goergen, M., Renneboog, L. (2006). Insider trading, news releases, and ownership concentration. *The Journal of Finance*, 61(6): 2931-2973.
- Fidrmuc, J.P., Korczak, A., Korczak, P. (2013). Why does shareholder protection matter for abnormal returns after reported insider purchases and sales?. *Journal of Banking & Finance*, 37(6): 1915-1935.
- Finnerty, J. (1976). Insiders and Market Efficiency. *The Journal of Finance* 31: 1141-1148.
- Frankel, R., Li, X. (2004). Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders. *Journal of accounting and economics*, 37(2): 229-259.
- Jaffe, J.F. (1974). Special information and insider trading. *The Journal of Business*, 47(3): 410-428.
- Jeng, L.A., Metrick, A. & Zeckhauser, R. (2003). Estimating the Returns to Insider Trading:

A Performance-Evaluation Perspective. *The review of economics and statistics*, 85(3): 453-471.

Kallunki, J. P., Nilsson H., Hellström. J. (2009). Why Do Insiders Trade? Evidence Based On Unique Data on Swedish Insiders. *Journal of Accounting and Economics* 48: 37-53.

Kim, D., Ng, L., Wang, Q., Wang, X, (2019). Insider Trading, Informativeness, and Price Efficiency Around the World. *Asia-Pacific journal of financial studies* 48.6: 727-776.

Lakonishok, J., Lee, I. (2001). Are insider trades informative? *Review of Financial Studies* 14: 79-111.

Lin, J C., Howe, J. (1990). Insider Trading in the OTC Market, *the Journal of Finance* 45.4: 1273-1284.

MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature* 35: 13-39.

Seyhun, H. N. (1986). Insiders' Profits, Costs of Trading, and Market Efficiency. *Journal of Financial Economics*, 16(2): 189-212.

Spence, M. (1973). Job Market Signaling. *The Quarterly journal of economics* 87.3 (1973): 355-374.

Stiglitz, J. E. (2000). The Contributions of the Economics of Information to Twentieth Century Economics. *Quarterly Journal of Economics*, 115: 1441-1478.

8.2 Digital Sources

Corporate Finance Institute. (n.d.). What is a Multilateral Trading Facility (MTF)?
[https://corporatefinanceinstitute.com/resources/career-map/sell-side/capital-markets/multilateral-trading-facility-mtf/#:~:text=What%20is%20a%20Multilateral%20Trading,York%20Stock%20Exchange%20\(NYSE\)](https://corporatefinanceinstitute.com/resources/career-map/sell-side/capital-markets/multilateral-trading-facility-mtf/#:~:text=What%20is%20a%20Multilateral%20Trading,York%20Stock%20Exchange%20(NYSE)) [Accessed: 2024-04-02]

European Commission. (2016). Commission Implementing Regulation (EU) 2016/347 of 10 March 2016 laying down implementing technical standards with regard to the precise format of insider lists and for updating insider lists in accordance with Regulation (EU) No 596/2014 of the European Parliament and of the Council. Official Journal of the European Union, L 65: 49-56. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R0347> [Accessed: 2024-03-28]

European Parliament and Council. (2003). Directive 2003/6/EC of the European Parliament and of the Council of 28 January 2003 on insider dealing and market manipulation (market abuse). Official Journal of the European Union, L 96: 16-25. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003L0006> [Accessed: 2024-03-28]

European Union. Council. (1989). Council Directive 89/592/EEC of 13 November 1989 coordinating regulations on insider dealing. Official Journal of the European Communities, L 334: 30-32. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31989L0592> [Accessed: 2024-03-28]

Finansinspektionen. (2023). PDMR Transactions. <https://www.fi.se/en/markets/investors/pdmr-transactions/> [Accessed: 2024-03-15]

Finansinspektionen. (2016). New rules for insider reporting and insider lists. <https://www.fi.se/en/published/news/2016/new-rules-for-insider-reporting-and-insider-lists/> [Accessed: 2024-03-15]

Nasdaq. (n.d.). Nasdaq First North Growth Market. <https://www.nasdaq.com/solutions/listings/markets/nordic/first-north> [Accessed: 2024-03-15]

Nasdaq. (n.d.). First North MTF. <https://www.nasdaq.com/market-regulation/nordic/first-north-mtf-rules#:~:text=First%20North%20is%20a%20Multilateral,exchanges%20in%20the%20European%20Union> [Accessed: 2024-04-02]

Olsson, Mikael. (2023). "Insynsköp en vanskelig köpsignal när rapportfloden ebbar ut".
Dagens Industri.

<https://www.di.se/analys/insynskop-en-vansklig-kopsignal-nar-rapportfloden-ebbar-ut/>

[Accessed: 2024-03-25]