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### **Insider trading by Swedish CEOs**

*Do CEO- and firm characteristics affect the extent of abnormal returns generated by CEO insider trading?*

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## **Abstract**

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**Five key words:** CEO insider trading, CEO- and firm characteristics, Efficient market hypothesis, Information asymmetry, Signaling

**Purpose:** The purpose of this study is to investigate whether certain CEO- and firm characteristics have an impact on the extent of abnormal return on Swedish firms at the event of a CEO insider trade. Furthermore, the study aims to examine whether there is a difference depending on firm size and sector.

**Methodology:** An event study has been performed based on the market model where the presence of abnormal return has been calculated from a three-day event window followed by a confirming t-test. OLS-regression models were implemented to identify the effect of the explanatory variables. The regressions were furthermore grouped by size and controlled for sector.

**Theoretical perspectives:** The theoretical perspectives are derived from the Efficient Market Hypothesis, Information Asymmetry and Signaling. These three theories are applicable when assessing abnormal return at the event of new information reaching the market.

**Empirical foundation:** The complete data sample consists of 236 firms and 1,764 individual insider trades within Large Cap, Mid Cap and Small Cap firms on Nasdaq OMX Stockholm. The retrieved data is based on the ten-year period from 2012 to 2021.

**Conclusions:** The study provides evidence of abnormal return at the event of insider trading, which is larger for smaller firms. Furthermore, the study proposes that CEO- and firm characteristics do affect the extent of abnormal returns. The direction and extent of the abnormal return depends on the explanatory variable in question and firm size.

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## **1. Introduction**

*The first chapter will cover the background of the study, followed by a problematization and a discussion regarding the lack of previous empirical work as well as the purpose and research question. Finally, the contributions to existing research will be presented.*

### **1.1 Background**

It should come as no surprise that the chief executive officers seem to pick the perfect time to buy or sell the firm's stock since they have the most superior informational advantage. Despite their informational access, investors are not left in the dark entirely. Investors have access to multiple data sources and news outlets that will inform them of recent insider trading that could serve as a signal of insiders' perception of firm value and future outlook. Investors react to the insider trading signal with a price adjustment, depending on the informational value of the signal and the market efficiency. This price adjustment can potentially allow for abnormal returns. The word "insider trading" is often perceived as an illegal act which refers to a transaction made based on information that is not yet public. However, insider trading is only illegal under certain conditions and time frames. From here on after, insider trading refers to the legal act of a CEOs transaction of a firm's stock.

CEOs informational advantages over outsiders is further emphasized by regulation imposed by Finansinspektionen on insider trading (Finansinspektionen, 2022). The regulation consists of restriction of trading periods and requires insiders to report their transaction within three days after the transaction. Due to the regulation, insider trading in Sweden should be of interest to outside investors. Furthermore, if a CEO believes that the company's future value will decrease, he or she is unlikely to buy a large number of shares. The CEO of the Sweden-based firm Desenio stated the following in a recent interview in light of an insider trade "*There are several reasons to sell a stock, but only one reason to buy a stock*". This emphasizes the informational value of CEOs and how their insider trades may function as a signaling mechanism to the market.

In recent years, numerous new investors have entered the market with less experience and knowledge, compared to professional investors, who seek understandable information to support investment decisions. While advanced fundamental analysis might not be suitable for new investors, CEO activity and information should be of interest for all investors since there

is a general understanding that a CEO has a large impact on a firm's operations and future performance and their investment decision therefore serves as a signal.

Fama (1970) presented the efficient market hypothesis which argues that one cannot beat the market by using available information. However, several studies have presented evidence of abnormal return based on the event of an insider transaction and that it is possible for outsiders to generate abnormal returns by mimicking insiders (Seyhun, 1988; Posylnaya et al., 2019). The studies therefore contradict the strong form of the efficient market hypothesis and instead refers to the semi-strong form which implies that market prices are being adjusted instantaneously at the event of new information of an insider trade.

## **1.2 Problem discussion**

Previous studies related to insider trading tend to focus on abnormal return and the possibility of insiders and outsiders generating abnormal return. In these studies, control variables are often used to explain some differences in terms of abnormal return. A common control variable is firm size and was used by for instance Seyhun (1986) and Lakonishok & Lee (2001) where they concluded that the abnormal return is larger for small-sized firms compared to large firms due to less efficient pricing in small firms. Furthermore, Fidrmuc et al. (2006) found that transaction size matter and that larger transactions yield larger abnormal returns.

However, few, if any, empirical studies have used a comprehensive sample of explanatory- and control variables to identify underlying factors that affect the extent of abnormal return. Therefore, the existing evidence that focuses on abnormal return from the event of an insider transaction produces an empirical gap in explaining potential underlying characteristics that could potentially affect the extent of the abnormal return. Therefore, researching the abnormal return with an emphasis on underlying characteristics both complements and draws upon the current research within insider trading and the abnormal return achieved as a result of it.

Previous studies of abnormal return by insider trading have in common that they have been performed on other international markets, mainly the US. The availability of studies on the Swedish market is rather limited but nonetheless just as applicable due to the high level of integration of the Swedish market and the world economy, it is therefore of interest to perform

the study on the Swedish market to validate previous research and explore potential underlying explanations of the abnormal return.

### **1.3 Purpose and research question**

When a CEO performs an insider transaction, it sends a signal to the market about the CEO's perception of the firm's current value and future outlook. This signal has been shown to lead to abnormal returns which incentivizes to study the subject.

This study aims to investigate if certain CEO- and firm characteristics have an impact on the extent of abnormal return for Swedish firms and to control for differences based on firm size and sector. The discovery of which characteristics produce the largest market reaction at the time of an insider trade, could help investors to focus their attention on firms that might reward them with abnormal returns. The study is executed by calculating the abnormal return centered at the event of a CEO transaction and then performing regression models to identify how and if CEO- and firm characteristics affect the abnormal return. The main research question of the study is as follows:

*Do CEO- and firm characteristics affect the extent of abnormal returns generated by CEO insider trading?*

To be able to answer the question, data of insider transactions, stock prices and related ratios has been downloaded from Finansinspektionen, Nasdaq OMX Nordic and Refinitiv Eikon ranging from the year 2012 to 2021. The dataset consists of all CEO transactions that have been made on Small Cap, Mid Cap and Large Cap and consists of 236 firms, after exclusions were made. An event study has been used along with regression models to be able to answer the research question stated. The CEO characteristics that are being investigated are tenure, gender, transaction size, stock ownership and transaction type. Furthermore, firm specific operational and valuation characteristics are taken into consideration with the variable's debt to equity, cash, capex, profit margin, return on equity, price to book, price to sales, price to earnings and lastly peg multiple.



## **1.4 Contribution**

Although various studies have identified the existence of abnormal return at the event of a CEO insider trade and related control variables for interpretation of differences this study takes on an explorative view of a wide range of characteristics that could fill the gap of explaining underlying determinants to the market reactions. Therefore, this study could prove to be of value in understanding the efficient market hypothesis and the correction in market prices based on CEO- and firm characteristics, specifically at the event of a CEO insider trade. Furthermore, the study could serve as a guidance in investment decisions for market participants.

## **1.5 Outline**

The outline of the study is as follows; Chapter 2 *Theoretical frame of reference* presents the theoretical foundation that is relevant for insider trading and the possibility for generating abnormal return. Chapter 3 *Literature review* covers previous literature regarding insider trading, abnormal return and the variables used in this study. Furthermore, the two hypotheses for the study are expressed in Chapter 4 *Hypothesis development*. Chapter 5 *Methodology* presents the methodology of the event study, statistical tests and models used. The dataset and summary statistics are presented in Chapter 6 *Data and sample description*. Lastly, the results and analysis from the regression models are presented in Chapter 7 *Results and analysis*, followed by the study's conclusion in Chapter 8 *Conclusion* which aims to answer the research question.

## **2. Theoretical frame of reference**

*The following section will describe the theoretical foundation of the study. It includes Fama's Efficient market hypothesis, Information asymmetry, and finally Signaling theory.*

### **2.1 Efficient market hypothesis**

Fama (1970) developed the theory of efficient markets, which states that all market prices are reflected by all available information and that information cannot be used to beat the market. The theory can be tested empirically by categorizing it into three forms: weak, semi-strong, and strong.

In the weak form, securities prices are based on historical prices and information. Consequently, investors cannot beat the market or generate abnormal returns by studying historical data. Malkiel (1973) assumed that prices would follow a random walk in this form, and that price adjustments would be random. Fundamental analysis is not a viable approach to finding undervalued stocks in this form.

The semi-strong form means that prices are influenced by historical data and corporate events, for example quarterly and annual reports. Thus, new information should be reflected in prices immediately. Professional investors could react faster to new information in the semi-strong form and a stock's price would correct faster than it would in the weaker form of efficiency (Fama, 1970).

The strong form means that prices are determined by all current and future information, both private and public. This implies that no matter what information investors possess, they cannot beat the market (Fama, 1970).

## **2.2 Information asymmetry**

The information asymmetry theory, developed by Akerlof (1970), describes the situation of buyers and sellers of a car based on product quality. As opposed to buyers, sellers have an informational advantage. The situation is often referred to as moral hazard and adverse selection, where the former means hidden actions and the latter hidden information. It is the purpose of this study to demonstrate that individuals have access to different amounts of information. It is also suggested by Landes and Néron (2018) that market efficiency is reduced when there is a high level of information asymmetry between market participants, indicating that it is possible to generate abnormal returns when there is information asymmetry.

## **2.3 Signaling**

In Spence (1973), signaling is viewed from an employer's point of view, where an employer must hire an employee. Given that there is asymmetry of information and uncertainty regarding the value of a potential employee, recruiting is a large investment for a firm. Signaling theory assumes that one individual has an informational advantage over another and is therefore applicable for insider trading. As a result of insider trading, the market can act accordingly and decide to buy or sell the firm's stock based on the signal. As Conelly et al. (2011) indicate, if

the receivers of a signal, investors, interpret it the same way, their actions are likely to be the same, which indicates that stock price reactions are determined by whether investors interpret the information as positive or negative based on the firm's valuation.

### **3. Literature review**

Insider trading is a well-researched area with several studies indicating evidence of stock price adjustments and thus abnormal return. Jaffe (1974) conducted a study that concluded insiders could generate abnormal returns through their transactions, which led to the research area of abnormal returns generated by insiders. Despite this, outsiders were unable to mimic insider transactions to generate abnormal returns at this stage. Numerous studies have been conducted since this study was published. According to Seyhun (1988), insiders can produce abnormal returns because of their informational advantage, similar to Jaffe's study. Aside from this, he concluded that CEOs generate significantly higher abnormal returns compared to other insiders and outsiders can generate abnormal returns by mimicking CEO transactions. Based on their informational advantage regarding the firm's daily operations and future outlook, Lin and Howe (1990) affirm that CEOs' transactions are more informative than those of other insiders.

According to Lakonishok and Lee (2001), insider trading produces abnormal returns that are greater for smaller firms than for larger ones. This is mainly due to the fact that smaller firms are less transparent and informative and therefore do not offer efficient prices which creates advantageous opportunities for investors. Furthermore, Piotroski and Roulstone (2005) confirm that insider transactions can generate abnormal returns because of a large information asymmetry and can be seen as a signal for stronger future earnings for the firm. Posylnaya et al. (2019) confirmed earlier research which found that smaller firms have greater information asymmetry and thus insider transactions in smaller firms lead to higher returns.

Based on empirical research concluding that insider trading can produce abnormal returns, it is of interest to investigate how different characteristics influence the extent of abnormal returns. Previous research has identified how both CEO- and firm characteristics affect stock prices. These studies have tried to explain stock returns explicitly from these characteristics. It could therefore be argued that the same characteristics are drivers in differences of abnormal returns generated by insider transactions.

Regarding CEO characteristics, research has focused on questions that relate to tenure, gender, and stock ownership to explain differences in stock returns. For instance, Clayton et al (2005) studied the relationship between CEO tenure and stock price volatility. In their study, CEO turnovers were found to result in higher levels of stock price volatility. Moreover, Pan et al (2015) found that volatility in stock returns tended to be higher at the time of CEO turnover but decreased as CEO tenure increased. They suggested that the price movements were influenced by rational investors updating their assessment of the CEO's abilities whenever any new firm-related information is published, which tends to happen more frequently with newly appointed CEOs. When tenure increases and the CEO becomes more seasoned within the firm, price volatility decreases. This is because investors gain more confidence in his or her abilities and do not have to make as large of adjustments to new firm-related information.

Furthermore, Braegelmann and Ujah (2020) studied the differences in abnormal return by CEO announcements based on gender of the CEO. They found that the market reacts more positively to male CEO announcements and that the abnormal return is larger compared to announcements by female CEO announcements. However, the market reactions vary over time due to increasing numbers of female CEOs over the years. The market reactions also vary depending on firm size, suggesting differences in information asymmetry between large and small firms. A contradicting study has been made, however, by Marcelo et al. (2016) where they conclude that female CEOs generate marginally higher abnormal returns than male CEOs. Thus, there are conflicting findings regarding gender and the abnormal return generated by holding the stock.

Another CEO characteristic was studied by Lilienfeld-Toal and Ruenzi (2014) who examined the stock market returns of firms with high CEO stock ownership. Their findings show that firms with high CEO and managerial ownership deliver higher stock returns than their counterpart of low managerial ownership. Furthermore, they found owner-CEOs to be value increasing by avoiding empire building and running their firms more efficiently. Lin and Howe (1990) argue that CEOs might have a better understanding and recognize when the firm is undervalued, and thereby benefit from private information. They propose that CEOs communicate good project quality by performing insider transactions themselves. Furthermore, their study suggests that a buy transaction can be interpreted as a positive and stronger signal compared to a sell transaction.

The importance of CEO characteristics in connection to insider trading is further emphasized by Morris and Boubacar (2014) who examined the market reaction for Canadian firms at the time of insider transactions. Their findings suggest that the strongest market reactions stem from CEOs and other senior officers' transactions, with no difference regarding buy or sell. They also found that transaction size matters if it is a purchase transaction. However, Chen, Martin and Wang (2013) investigated the difference in informational value of purchase and sale transactions. Their findings suggest that sell transactions, due to regulation and potential risk of litigation, contain less private information about firms compared to purchase transactions. Therefore, sale transactions have less informational value and are less likely to have an impact.

As previously established, CEO characteristics have an impact on stock return and performance. These returns might also be explained through firm specific characteristics such as, risk, cash holdings, capital expenditure, profitability and lastly valuation.

Previous studies by for example Basu (1983) concluded that beta might be inadequate as a measurement of risk and that we need to take market imperfections into account, such as transaction costs. Bhandari (1988) argues that debt to equity ratio serves as a natural proxy for the risk of common equity in a firm. He therefore proposes to use the ratio as an additional variable to explain expected stock returns.

The interest of the firm characteristic cash holdings and the effect on stock prices has grown through the years. Palazzo (2012) claims that systematically riskier firms with higher expected returns should hold greater amounts of cash to avoid needing expensive external financing in case their future cash flows run low. Similar reasoning of a positive relationship can be found in Simutin (2010) who argues that high cash holding firms have riskier growth options. Since these firms have lower assets in place and thereby a riskier asset base, they have higher expected returns. Finally, the recent study by Ang et al (2019) concluded a positive relationship between cash holdings and stock returns on the NYSE.

In contrast to holding cash, some firms choose to invest rather than hold cash which can be captured by capital expenditures (CAPEX). Cordis and Kirby (2016) found that firms with high levels of capital expenditures in relation to their total assets or similar, have lower stock returns than their counterparts with lower levels of capital investments. Titman et al (2009) found the

same relationship as previous studies. Their observations suggest that investors tend to underreact when firms devote themselves to empire building, due to the implications it brings. Furthermore, their findings assert that firms with high levels of capital expenditures are more likely to have managers that undertake projects that do not provide shareholder value, but rather projects for personal reasons and empire building.

Two common profitability measures are profit margin and return on equity and are often ratios that are relatable to shareholders specifically. A high profit margin can, according to Houmes et al (2018), show how efficiently and effectively a firm is operating and suppressing existing costs. Their study concluded that with a time horizon of up to three years, profit margin and stock returns exhibit a negative correlation. Increasing profit margins might be difficult to sustain which limits the metrics potential in foreseeing stock returns. Furthermore, they state that profit margin remains an important objective of fundamental analysis and analysis of how profit margin shapes the temporally stock returns therefore remain relevant in a value creation aspect.

Return on equity (ROE) is another firm specific characteristic that serves as a popular key metric among investors, since it connects the income statement through the net profit and loss, and the balance sheet through the shareholders' equity. It is also the end result of the structured financial ratio analysis model known as Du Pont analysis, making it popular in the financial community (Stowe et al., 2002). However, it could be a deceiving measure of corporate performance, earning can be manipulated through changes in a company's accounting policy for example, according to (Dhaliwal et al., 2011). Furthermore, it increases with leverage as long as the returns earned on borrowed funds exceed the cost of these funds. A leverage above a certain level could translate into increased systematic risk or beta. Maniul Ahsan (2012) presented evidence from the US markets NYSE and NASDAQ during the period 1970-2006, that portfolios based on ROE can generate abnormal returns. Even though investors put emphasis on ROE, a higher ROE does not guarantee higher returns. The study displayed the opposite relationship where portfolios based on negative ROE produced the highest return, volatility, and systematic risk. He thereby presents that higher ROE stocks do not produce higher returns.

Lastly, another firm characteristic that matters for investment purposes is valuation which can be calculated through different ratios such as price to book, price to sales, price to earnings and

price to earnings divided by growth. Dickgiesser and Kaserer (2008) evaluated the information content of insider transactions on the German stock market and its relation to the firm specific metric price to book value (P/B). Their findings show that insider transactions of low P/B value firms experienced larger price volatility, compared to their counterpart of high P/B value firms. Fama and French (1992) supported the existence of a negative relation between P/B and security performance. They postulate that the P/B ratio captures a certain degree of potential relative financial distress. Firms that the market deem to have poor prospects are signaled by low stock prices and low ratios of P/B. Like the more recent study by Dickgiesser and Kaserer (2008), they found that low P/B ratio firms have a higher expected stock return than firms with strong prospects, due to the former being penalized with higher costs of capital. Furthermore, they clarify that P/B might capture the unraveling of irrational markets that have new opinions of the prospect of the firms. Nonetheless, Fama and French (1992) emphasize that the ratio provides a simple and powerful measure of stock returns for their observed period 1963-1990.

The price to sale ratio (P/S) was popularized by Fisher (1984) who argued that the ratio is an indicator of stock's popularity. Stocks with high P/S ratios are not likely to gain long-term above average returns since they are popular among investors and have a high stock price in relation to their sales. On the contrary, stocks with low P/S are expected to provide long-term above average rates of return, since improvements in the firm's performance will increase its popularity among investors exponentially compared to high P/S stocks.

Ball (1978) describes the price to earnings ratio (P/E) as an overall metric that takes risk factors in expected returns into account. If the current earnings are a sufficient proxy for future expected earnings, then high-risk stocks with high expected returns will have high prices relative to their earnings. The P/E metric should thus be related to expected returns, whatever the omitted source of risk. However, the P/E ratio does not serve as a proxy for the earnings forecast and expected returns when the current earnings are negative, according to Ball (1978). Basu (1983) describes the same relationship and confirms that stocks of low P/E firms earn, on average, higher returns than the stocks of high P/E firms on a risk-adjusted basis. Building upon these previous findings, Fama and French (1992) found that firms with negative earnings have higher average returns and that low P/E firms often also had low P/B ratios.

A further extension of the P/E metric is the PEG ratio, which is derived by dividing the P/E ratio with the short-term earnings growth rate. The ratio has become a popular metric that

combines prices, earnings forecasts and earnings growth and is implicitly used for comparing expected rates of return, according to Easton (2004). Based on his data from the S&P 500 index between the years 1981 and 1999, Easton (2004) found high correlations between PEG ratio and stock returns. A low PEG ratio exhibited higher returns on average than their counterpart of high PEG ratio firms.

#### **4. Hypothesis development**

The section of empirical research formulates a base of important variables and their potential impact on stock prices. Two main hypotheses have been formulated below that aim to answer the paper's main question. Each hypothesis is further divided with several variables that will be examined through regression models. Due to the explorative nature of the study, two broad hypotheses facilitate the interpretation of the study's results and contribution. Hypothesis one examines CEO characteristics and includes the following variables: *tenure, gender, CEO ownership, transaction size in relation to market cap* and lastly *transaction type*. The second hypothesis below examines firm characteristics and relates to different aspects of cash holding, capital expenditure, debt, profitability measures as well as valuation multiples. The hypothesis includes the following variables: *debt to equity ratio, cash holding, capex, profit margin, roe, price to book ratio, price to sales ratio, price to earnings ratio* and *peg*.

*H1: CEO characteristics have an impact on the extent of abnormal returns generated by CEO insider trading.*

*H2: Firm characteristics have an impact on the extent of abnormal returns generated by CEO insider trading.*

In the results section, each hypothesis may include some variables that are statistically significant based on the regression models and others that are not. At these occurrences, the hypothesis will be accepted, and each variable will be further emphasized and explained. The hypothesis will therefore only be rejected if all variables within the category are insignificant.



## **5. Methodology**

*An event study will be performed to investigate if CEO insider transactions on the Swedish market are informative and can generate abnormal returns. The event study will be followed by regressions in order to investigate whether CEO- and firm characteristics affect the extent of abnormal return. The study will test for differences in time-period as well as for firm size in terms of OMX Stockholm Small Cap, Mid Cap and Large Cap. The following section consists of a description of the event study that has been conducted to calculate abnormal return. Furthermore, we present the dependent variable followed by explanatory variables and control variables. The last section of methodology presents the regression models as well as relevant statistical tests for the study.*

### **5.1 Event study**

The event study is a useful tool for measuring the impact of new information on a company's stock price. In an efficient market, the price adjustment of stock prices should occur instantly and can be tracked by an event window (MacKinlay, 1997). An abnormal return is calculated by comparing stock prices to an index benchmark. Using an event window is suitable since the insider transactions are done sporadically in terms of timeframe and by different CEOs. The study is restricted to firms in Sweden listed on Nasdaq OMX Stockholm, including Small Cap, Mid Cap and Large Cap. Firms are categorized in these lists based on market capitalization. Small Cap include firms below 150 million Euro, Mid Cap include firms between 150 million and 1 billion Euro, and finally Large Cap firms include firms above 1 billion Euro.

The objective of this study is to investigate if CEO- and firm characteristics impact the extent on the abnormal return. To be able to investigate this, the abnormal return must be calculated which identifies if the announcement of CEO insider trading has informational value. If the announcement contains valuable information to market participants, there should be a correlation between the information and the change in market value of the firm.

#### *5.1.1 Defining the event*

An event covered in this study refers to a buy or sell transaction by the CEO of a company listed on the OMX Stockholm. Rather than the transaction date, investors and other market participants are interested in the publication date since that is when information is made

available. An event study allows us to find out if there have been any significant changes in market pricing at the time of publication and if the extent of these changes is affected by CEO- and firm characteristics.

### *5.1.2 Defining the event window*

The event windows should not overlap in order to achieve reliable results. The overlap problem is solved by using a short event window centered around the announcement of an insider trade. Furthermore, using a short event window means that the risk of including other unrelated economic events minimizes that could affect the stock prices, thus the results of this study. Since leakage of information is possible, it is often useful to include at least a day before the announcement date in the event window (McWilliams et al, 1999).

The study includes an event window with three days, one day before the announcement day and one day after. Using a few days like this allows for better interpretation of the results in line with market efficiency. The event window allows us to concentrate on the effects that the insider transaction has on stock price corrections. As stated previously, if the market is efficient then stock prices would adjust instantaneously which gives incentives to use a short event window centered around the publication date.

### *5.1.3 Defining the estimation window*

The estimation window defines the time frame that the normal returns are calculated from, and the most common method is to use a period prior to the event window, as opposed to after the event window. Furthermore, the event window is not included in the estimation window since it could influence the normal performance significantly and thus would not be representative. This study uses an estimation window of 120 days prior to the event day which is expected to be a measure of a stocks normal return. Using a longer period, such as 120 days, minimizes the risk that uncommon events affect the return and is thus not what is normal for the stock (McKinlay, 1997).

### *5.1.4 Actual return*

The actual return is calculated in order to calculate normal and abnormal return. The formula is as follows:

$$R_{i,t} = \frac{P_{i,t1}}{P_{i,t0}} - 1$$

### 5.1.5 Normal and abnormal returns

Since the study aims to investigate if CEO and firm characteristics impact the extent of abnormal return of a CEO trade, it is of importance to determine if abnormal returns exist. Firstly, the actual return compared to the normal return, meaning the expected return if no CEO transaction was to take place must be calculated. The effect of a CEO transaction can be measured as the abnormal return generated by the event. Furthermore, the abnormal return can be simplified as the difference between the actual return and the expected return (Fama, 1998). There are several ways to calculate abnormal returns and the most common way is the market model (Brown & Warner, 1980). The market model has been used in this study to estimate normal returns which is a preferred method when using an event window (McKinlay, 1997). Normal return,  $R_{i,t}$ , is defined as expected return of a stock without taking the event into consideration and is expressed by the following formula:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t}$$

According to the market model, the abnormal return is equal to the intercept of the estimation window, the slope of the estimation window, the return on the market index and finally the residual. By rearranging the equation, the model is simplified to the following abnormal return equation. The above allows us to calculate the abnormal return for the event windows. The abnormal return is calculated by subtracting the expected normal return from the actual return:

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

## 5.2 Variable definition

### 5.2.1 Dependent variable

Abnormal return is the dependent variable of this study and has been calculated for every transaction and thus event window. Abnormal return allows us to capture price correction at the announcement of a CEO insider trade and if it deviates from the normal return.

### *5.2.2 Explanatory variables*

Different explanatory variables have been used to identify if certain CEO- and firm characteristics have an influence on the abnormal return. The explanatory variables are divided into CEO characteristics and firm characteristics to be able to answer the study's two main hypotheses. CEO characteristics consist of the following: tenure, gender, stock ownership, transaction size and transaction type. Tenure refers to the number of years that the CEO has had his or her position as CEO and does not take previous roles within the firm into consideration. A newly appointed CEO within the year is appointed a tenure of zero. Gender is divided as male and female between the CEOs. Stock ownership is defined as the CEO's personal stake in the company at the time of the transaction. Insider transaction size measures the transaction size as a ratio of the firms' market capitalization at the time of the transaction. Transaction type refers to a buy or a sell transaction made by a CEO.

The firm characteristics consist of the following variables: debt to equity ratio, cash (%), capex (%), profit margin, return on equity, price to book value, price to sales, price to earnings and price to earnings divided by growth. Debt to equity aims to measure if the amount of debt matters to the price reactions of a CEO insider trade. Cash refers to the ratio of cash to total assets and capex refers to the ratio of capital expenditures divided by operating cash flow. Profit margin and return on equity are profitability measures while the remaining variables are valuation multiples, and both could be important values for an investor when deciding whether to invest in a firm or not.

### *5.2.3 Control variables*

Some of the variables above are defined as control variables and aims to identify potential differences of the explanatory variables effect on abnormal return. The first control variable consists of gender where every CEO in the dataset is expressed as female or male. The second is transaction type, meaning if it is a buy or a sell transaction. The control variables are dummy variables where of gender, females are coded as 1 and males as 0. Buy transactions are coded as 1 and sell tell transactions as 0. The third control variable is list dummy and refers to firm size in terms of Large, Mid and Small Cap where they are coded as 1, 2 and 3 respectively. The last control variable is sector, where the firms have been grouped into 10 different sectors.

## 5.3 Model description

### 5.3.1 Model 1

$$\text{Abnormal return (AR)} = \beta_0 + \beta_1 \text{Tenure} + \beta_2 \text{Gender} + \beta_3 \text{Log CEO Ownership} + \beta_4 \text{Log Transaction size} + \beta_5 \text{Transaction type} + \beta_6 \text{D/E ratio} + \beta_7 \text{Log Cash} + \beta_8 \text{Capex} + \beta_9 \text{Profit Margin} + \beta_{10} \text{ROE} + \beta_{11} \text{P/B} + \beta_{12} \text{P/S} + \beta_{13} \text{P/E} + \beta_{14} \text{PEG} + \epsilon$$

### 5.3.2 Model 2

$$\text{Abnormal return (AR)} = \beta_0 + \beta_1 \text{Tenure} + \beta_2 \text{Gender} + \beta_3 \text{Log CEO Ownership} + \beta_4 \text{Log Transaction size} + \beta_5 \text{Transaction type} + \beta_6 \text{D/E ratio} + \beta_7 \text{Log Cash} + \beta_8 \text{Capex} + \beta_9 \text{Profit Margin} + \beta_{10} \text{ROE} + \beta_{11} \text{P/B} + \beta_{12} \text{P/S} + \beta_{13} \text{P/E} + \beta_{14} \text{PEG} + \beta_{15} \text{List Dummy} + \epsilon$$

### 5.3.3 Model 3

$$\text{Abnormal return (AR)} = \beta_0 + \beta_1 \text{Tenure} + \beta_2 \text{Gender} + \beta_3 \text{Log CEO Ownership} + \beta_4 \text{Log Transaction size} + \beta_5 \text{Transaction type} + \beta_6 \text{D/E ratio} + \beta_7 \text{Log Cash} + \beta_8 \text{Capex} + \beta_9 \text{Profit Margin} + \beta_{10} \text{ROE} + \beta_{11} \text{P/B} + \beta_{12} \text{P/S} + \beta_{13} \text{P/E} + \beta_{14} \text{PEG} + \beta_{15} \text{List Dummy} + \beta_{16} \text{Sector Dummy} + \epsilon$$

## 5.4 Statistical tests

### 5.4.1 Heteroskedasticity

Heteroskedasticity arises when the variance of the error term is not constant. A common approach to visually check for heteroskedasticity is to plot the residuals in a scatter plot and look for any signs of unequal scatter. Although, since the previously mentioned approach is based on visuals rather than significant results, it has to be complemented with a White's test (Dougherty, 2016).

If the white's test detects heteroskedasticity Stata allows the implementation of *Robust* which adjusts the standard errors to correct heteroskedasticity and finally produce accurate p-values. Incorrect standard errors can severely affect the regression due to it producing false p-values (Varbeek, 2017).

#### 5.4.2 Multicollinearity

Multicollinearity arises when two or more explanatory variables display strong correlations with each other. It is hence important to ensure that additional explanatory variables do not suffer from multicollinearity, since it may undermine the statistical significance of the independent variable. Statistically it can create a wider confidence interval and less reliable results (Danthine & Donaldson, 2014). According to Westerlund (2005), a correlation below -0.8 or above 0.8 will display multicollinearity. Since these highly correlated variables probably explain the same thing, one solution would be to drop one of them.

## 6. Data and sample description

*The following sections present the data sample used for the statistical tests as well as summary statistics for the study's dependent and explanatory variables. Results of a white's test will be presented to identify if there is a need to adjust for heteroskedasticity. Lastly, the section contains a correlation matrix to test for multicollinearity as well as a test of normal distribution.*

### 6.1 Sample description

The data sample was downloaded for the ten-year period between 2012-01-01 to 2021-12-31 and ultimately consists of 1,764 observations and 236 firms. Insider transaction has been extracted from Finansinspektionen's insider-register website. Stock prices and returns are based on companies listed on OMX Stockholm Small Cap, Mid Cap and Large Cap Index and have been collected from Nasdaq OMX Nordic. The benchmark prices of OMXSPI have also been downloaded from Nasdaq. Using OMXSPI as a benchmark allows us to compare the stocks return to the overall Swedish stock market since the index includes all stocks of Small, Mid and Large Cap.

Some firms of the total dataset have been excluded due to inexistent transactions made by CEOs within the examined period. Data from CEO transactions of de-listed firms have also been excluded, due to limitations of downloading stock prices. Since the study aims to investigate the transactions done by CEOs only, all transactions done by any other role is excluded from the dataset. Every person that has access to insider information within a firm is obligated to report their transactions that exceed 5,000 euro and then ends up at the insider

register at Finansinspektionen. Due to the limit of 5,000 euro this study only examines transactions above that amount. Furthermore, every related person to a CEO is obligated to report transactions but they are excluded from this study since they are not expected to have the same informational advantage as the CEO itself. Regarding transaction types, only buy and sell stock transactions are included which means that all other instruments such as stock option plans and warrants are excluded. The transactions that are examined are expected to have informational value which is best reflected in buy and sell transactions since they are expected to have economic motives behind the transactions, compared to stock option plans which could be compulsory.

For some firms and CEOs, there have been several independent transactions that were ultimately published the same day and thus sends a signal of the total amount. Therefore, for these occurrences, the individual transactions have been merged into one transaction with a weighted average price since volume and price could differ slightly between the transactions.

The already mentioned data serves the purpose of defining event windows for each CEO transaction and calculating the abnormal return. For the explanatory variables, these have been downloaded from Refinitiv Eikon to excel for further sorting before extracting the data to Stata for statistical testing.

## 6.2 Summary statistics and correlation

### 6.2.1 Abnormal return

Before conducting the study of identifying how CEO- and firm characteristics affect the extent of abnormal return, we conducted t-tests to see whether there exists an abnormal return for our Swedish based dataset. The t-tests serve to test the variable abnormal return to see if it is statistically larger than zero. A first test is done on the entire dataset of observation and then also divided by Large Cap, Mid Cap and Small Cap.

**Table 1:** One sample t-tests of Abnormal return

<b>T-test, Ha: mean &gt; 0</b>	<b>P-Value</b>	<b>Abnormal Return</b>
All observations	0.0208	Yes
Large Cap	0.9806	No
Mid Cap	0.0423	Yes
Small Cap	0.0004	Yes

Table 1 presents the p-value that the mean of abnormal return is larger than zero and the results indicate that there is an abnormal return on the 95 percent level based on all observations. Furthermore, only Mid Cap and Small Cap is statistically significant on the 95 and 99 percent level respectively. Large Cap is therefore not significant in abnormal returns in total, but since abnormal return still exists on some observations, the data will be used for the regression models. The fact that medium and smaller firms produce larger abnormal returns is in line with earlier research (Lakonishok & Lee, 2001; Piotroski & Roulstone, 2005; Posylnaya et al., 2019). These t-tests, along with earlier research regarding abnormal return, incentives to study which underlying CEO- and firm characteristics affect the extent of abnormal return at the event of publication of an insider trade on the Swedish market.

### 6.2.2 Summary statistics

The tables below present summary statistics for the dependent variable and explanatory variables used in the study's regression models and present tables of Large, Mid and Small Cap in this particular order. Some variables have been winsorized at the 1 percent and 99 percent level to reduce the effect of extreme outliers. Table 2 presents data from firms listed on Large Cap and the dependent variable, abnormal return, presents discrepancies between the minimum and maximum values suggesting that some transactions produce large abnormal returns from the announcement of a CEOs insider trading. The mean suggests that the abnormal return is slightly negative with -0.3 percent which is in line with the t-test of Large Cap.

**Table 2: Summary Statistics of Large Cap**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>
Abnormal Return (%)	663	-0.300	3.500	-0.100	-16.900	17.600
Tenure	663	5.678	6.353	3.000	0.000	26.000
CEO Ownership (%)	493	0.700	2.700	0.000	0.000	24.200
Transaction size / MCAP (%)	663	0.001	0.004	0.000	0.000	0.042
D/E <sup>1</sup>	663	1.646	1.266	1.370	0.056	8.159
Cash (%)	654	8.780	8.154	6.562	0.100	82.000
Capex (%) <sup>1</sup>	663	68.520	116.774	40.081	-122.500	591.040
Profit Margin (%) <sup>1</sup>	663	23.866	34.693	8.404	-79.457	93.500
ROE (%) <sup>1</sup>	663	14.658	12.582	15.700	-93.200	43.180
P/B <sup>1</sup>	663	2.921	2.217	2.300	0.509	13.300
P/S <sup>1</sup>	663	4.110	4.987	1.839	0.253	43.873
P/E <sup>1</sup>	663	20.908	20.535	15.700	-57.329	124.136
PEG <sup>1</sup>	620	0.116	3.006	0.147	-13.200	23.685

<sup>1</sup> Winsorized on the 1st and 99th percentile



The CEO characteristics that are being studied are tenure, stock ownership and transaction size in relation to market capitalization. Tenure of CEOs consists of values between newly appointed CEOs, which represent the number zero, and 26 years. The mean represents that it is more common for CEOs to have their position for approximately six years. CEO stock ownership varies between 0 percent to 24.2 percent with the mean of 0.7 percent. Transaction size in relation to market capitalization has a mean of 0.1 percent and varies between the interval of 0 to 4.2 percent.

The remaining explanatory variables in the table consist of firm characteristics. D/E ratio for Large Cap firms tend to be around 1.6 and cash ratio around 8.8 according to the mean. The remaining variables and their values are further explained in comparison with Mid Cap and Small Cap below.

**Table 3: Summary Statistics of Mid Cap**

Variable	N	Mean	SD	Median	Min	Max
Abnormal Return (%)	619	0.3	4.6	0.2	-18.9	20.900
Tenure	619	6.659	7.167	4.500	0.000	43.000
CEO Ownership (%)	532	5.100	16.400	0.200	0.000	69.900
Transaction size / MCAP (%)	619	0.001	0.004	0.000	0.000	0.042
D/E <sup>1</sup>	619	1.207	0.994	0.982	0.056	8.159
Cash (%)	618	17.383	21.627	7.850	0.000	95.546
Capex (%) <sup>1</sup>	617	111.689	182.648	44.600	-122.500	591.040
Profit Margin (%) <sup>1</sup>	616	-4.476	74.075	5.701	-224.381	93.500
ROE (%) <sup>1</sup>	619	0.992	32.333	10.939	-113.882	43.180
P/B <sup>1</sup>	619	3.051	2.585	2.180	0.509	13.300
P/S <sup>1</sup>	616	10.997	41.375	1.632	0.000	314.840
P/E <sup>1</sup>	619	11.693	25.156	11.740	-70.595	124.136
PEG <sup>1</sup>	470	0.900	3.979	0.300	-13.200	23.685

<sup>1</sup> Winsorized on the 1st and 99th percentile

Table 3 above presents summary statistics of Mid Cap. The average CEO of a Mid Cap firm has had their position for approximately six and a half years according to the mean, which is slightly longer than their counterpart at Large Cap firms. CEO ownership in Mid Cap firms display greater variance which can be observed through the increase in standard deviations. The largest CEO ownership of the whole data set can be found at a Mid Cap firm, with an ownership of almost 70 percent of the firm. The average CEO of a Mid Cap firm owns approximately 5.1 percent of the firm. Transaction size in relation to market capitalization is similar to that of firms in Large Cap presented previously.

Regarding firm characteristics we can see that both cash and capex tends to be slightly higher for Mid Cap firms compared to Large Cap. On the other hand, the profitability measures and leverage are lower for Mid Cap firms compared to larger firms listed on Large Cap. Lastly, the valuation multiples are higher for medium sized firms compared to larger firms, except for P/E with a value of 11.7 compared to 20.9 of Large Cap firms. However, this could be a result of more firms with negative earnings in Mid Cap and therefore negative P/E values that decreases the mean.

**Table 4: Summary Statistics of Small Cap**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Median</b>	<b>Min</b>	<b>Max</b>
Abnormal Return (%)	482	0.700	4.800	0.000	-19.300	22.800
Tenure	482	6.388	6.473	4.500	0.000	38.000
CEO Ownership (%)	393	4.700	8.500	0.700	0.000	37.300
Transaction size / MCAP (%)	482	0.003	0.007	0.000	0.000	0.042
D/E <sup>1</sup>	482	1.237	1.170	0.879	0.056	8.159
Cash (%)	482	19.993	21.150	13.100	0.000	98.540
Capex (%) <sup>1</sup>	469	76.755	155.494	33.263	-122.500	591.040
Profit Margin (%) <sup>1</sup>	474	-27.892	77.117	2.113	-224.381	67.253
ROE (%) <sup>1</sup>	482	-0.644	28.376	5.889	-113.882	43.180
P/B <sup>1</sup>	481	2.925	3.007	1.804	0.509	13.300
P/S <sup>1</sup>	473	11.467	44.974	0.700	0.098	314.840
P/E <sup>1</sup>	481	7.959	30.966	10.117	-70.595	124.136
PEG <sup>1</sup>	290	-0.076	3.210	0.040	-13.200	23.685

<sup>1</sup> Winsorized on the 1st and 99th percentile

Table 4 above presents Small Cap where tenure for CEOs is on average similar to Mid Cap but slightly longer than Large Cap, with a lower standard deviation. Small Cap CEOs have slightly lower ownership in their firms compared to Mid Cap CEOs, at 4.7 percent but higher than the mean of Large Cap of 0.7 percent. Transaction size in relation to market capitalization is slightly higher than in both Mid and Large Cap firms which is expected due lower total market capitalization. For Small cap firms, the average transaction is 0.3 percent of the firm's market cap compared to 0.1 percent for Large Cap and Mid Cap.

In terms of firm characteristics, leverage is similar to Mid Cap which is lower than Large Cap. The profitability measures are lower than Large- and Mid-Cap firms. The earnings multiples, price to earnings is the lowest among Small Cap firms. Although the extreme values of negative 70.6 could have a large impact. Furthermore, the peg ratio displays a negative ratio, suggesting negative growth or earnings.

**Table 5: Summary Statistics of Sector**

<b>Sector</b>	<b>Large Cap</b>	<b>Mid Cap</b>	<b>Small Cap</b>	<b>Total</b>	<b>Percent</b>
Consumer Durables	37	128	42	207	11.73
Energy	4	4	4	12	0.68
Financials	166	104	0	270	15.31
Food & Beverage	16	33	1	50	2.83
Health Care	75	106	72	253	14.34
Industrials	274	128	163	565	32.03
Materials	49	12	9	70	3.97
Technology	25	99	180	304	17.23
Telecom	17	2	4	23	1.30
Utilities	0	3	7	10	0.57
<b>Total observations</b>	<b>663</b>	<b>619</b>	<b>482</b>	<b>1,764</b>	<b>100</b>

Table 5 presents the distribution of sectors divided by Large Cap, Mid Cap and Small Cap. The most common sectors for our observations consist of firms within industrials, technology, financials, health care and consumer durables. When comparing insider trades between lists, the distribution is rather even in terms of number of transactions. Even distribution between the lists allows us to test for differences of firm size. Large Cap consists of firms above 1 billion euro in market cap, and Mid Cap consists of firms between 150 million and 1 billion euro in market cap. Lastly, Small Cap refers to firms with a market cap of less than 150 million euro.

**Table 6: Summary Statistics of Transaction type and Gender**

<b>Transaction Type</b>	<b>Large Cap</b>	<b>Mid Cap</b>	<b>Small Cap</b>	<b>Total</b>	<b>Percent</b>
Sell	137	121	132	390	22.11
Buy	526	498	350	1,374	77.89
<b>Total</b>	<b>663</b>	<b>619</b>	<b>482</b>	<b>1,764</b>	<b>100</b>

  

<b>Gender</b>	<b>Large Cap</b>	<b>Mid Cap</b>	<b>Small Cap</b>	<b>Total</b>	<b>Percent</b>
Male	588	561	457	1,606	91.04
Female	75	58	25	158	8.96
<b>Total</b>	<b>663</b>	<b>619</b>	<b>482</b>	<b>1,764</b>	<b>100</b>

Table 6 shows that buy transactions are more common than sell transactions for CEOs. During the studied ten-year period between 2012 to 2021 buy transactions consist of 77.89 percent of the total observations. The distribution between transactions by gender heavily consists of transactions made by male CEOs. Only 8.96 percent of the transactions are done by females.

### 6.2.3 White's test

White's tests have been performed to identify the level of heteroskedasticity of the regression models. Since the p-value indicates significance on the 99 percent level, the data suffers from heteroskedasticity. To solve for this, the regressions in the study have been made with robust standard errors which improves the reliability in the results.

**Table 7:** *White's test for Heteroskedasticity*

<b>White's test</b>	<b>P-value</b>	<b>Heteroskedasticity</b>
Regression Models	0.000	Yes

*Note: All regression models presented later have been performed with robust standard errors to correct for heteroskedasticity.*

### 6.2.4 Correlation matrix

Table 8 on the following page presents a correlation matrix of the dependent variable and the explanatory variables whose purpose is to see if the variables suffer from multicollinearity. There are no explanatory variables that are highly correlated with the dependent variable, abnormal return. Regarding correlation between the explanatory variables, there does not exist any correlations that are negatively or positively stronger than -0.8 or 0.8. This means that there is no existence of multicollinearity that can disrupt the reliability in the regression models.

**Table 8: Pearson's Correlation Matrix**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Abnormal Return	1.000												
(2) Tenure	-0.013	1.000											
(3) CEO Ownership	0.002	0.483***	1.000										
(4) Transaction size / MCAP	-0.013	0.026	0.034	1.000									
(5) D/E	-0.01	-0.158***	0.044*	-0.008	1.000								
(6) Cash	0.057**	-0.100***	-0.137***	0.077***	-0.337***	1.000							
(7) Capex	-0.033	0.036	0.247***	0.052**	0.083***	-0.256***	1.000						
(8) Profit Margin	-0.027	0.225***	0.221***	-0.040*	0.169***	-0.619***	0.246***	1.000					
(9) ROE	-0.016	0.155***	0.080***	-0.081***	0.167***	-0.454***	0.088***	0.648***	1.000				
(10) P/B	0.03	0.078***	-0.148***	-0.012	0.002	0.343***	-0.173***	-0.084***	0.096***	1.000			
(11) P/S	0.056**	-0.045*	-0.024	-0.005	-0.190***	0.465***	-0.080***	-0.473***	-0.255***	0.124***	1.000		
(12) P/E	-0.013	0.054**	-0.102***	-0.058**	0.074***	-0.226***	0.003	0.219***	0.291***	0.199***	-0.169***	1.000	
(13) PEG	-0.007	0.018	-0.039	0.036	-0.003	0.036	-0.045*	-0.079***	0.049*	0.086***	-0.042	-0.002	1.000

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

### 6.2.5 Test of normality

To test for normality distribution, histograms have been executed for the dependent and explanatory variables. The results indicated that the distribution was skewed for CEO ownership, transaction size and cash. To solve for skewness, the variables have been transformed into logarithm values which makes the variables have more normally in its distribution. Furthermore, the log values allow for elasticities and simplifies the regression models.

## 7. Results and analysis

The following sections will present regression models with abnormal return as dependent variable and the remaining as explanatory and control variables. The results are divided into three subsections where the first presents regression models of Large, Mid and Small Cap combined. The second aims to narrow the results and presents the same inputs as in the first subsection but divides the data into the different lists to be able to identify differences of variables effect on abnormal return based on firm size.

### 7.1 Standard regression models

**Table 9: Regression Model**

Dependent Variable Variables	Model (1)		Model (2)		Model (3)	
	Abnormal Return		Abnormal Return		Abnormal Return	
	Coeff.	Std. Err	Coeff.	Std. Err	Coeff.	Std. Err
Tenure	0.02	(0.02)	0.02	(0.02)	0.02	(0.02)
Gender <sup>1</sup>	0.16	(0.47)	-0.06	(0.47)	-0.06	(0.47)
Log CEO Ownership	-0.02	(0.07)	-0.14*	(0.08)	-0.15*	(0.08)
Log Transaction Size	-0.04	(0.07)	-0.15*	(0.07)	-0.16*	(0.07)
Transaction Type	0.36	(0.36)	0.36	(0.36)	0.34	(0.36)
D/E ratio	0.08	(0.09)	0.09	(0.09)	0.09	(0.09)
Log Cash	0.11	(0.11)	0.10	(0.11)	0.12	(0.11)
Capex	0.002*	(0.00)	0.002*	(0.00)	0.002*	(0.00)
Profit Margin	-0.01**	(0.01)	-0.01**	(0.01)	-0.01**	(0.01)
ROE	-0.02*	(0.02)	-0.02*	(0.02)	-0.02*	(0.02)
P/B	-0.02	(0.05)	-0.02	(0.05)	-0.01	(0.05)
P/S	0.08	(0.06)	0.05	(0.05)	0.04	(0.06)
P/E	0.01	(0.01)	0.00	(0.01)	0.00	(0.01)
PEG	-0.02	(0.04)	-0.02	(0.04)	-0.01	(0.04)
Nasdaq List <sup>1</sup>			0.98***	(0.21)	1.02***	(0.21)
Sector <sup>1</sup>					-0.07	(0.06)
Constant	-0.86	(0.77)	-4.50***	(1.08)	-4.39***	(1.37)

Observations	1,764	1,764	1,764
Control for list	No	Yes	Yes
Control for sector	No	No	Yes
R-squared	1.7	3.7	3.8

*Note: This regression table aims to capture how the variables affect the dependent variable abnormal return. Model (1) is a standard OLS regression, model (2) is similar but controls for Nasdaq list (firm size), in terms of Large, Mid and Small Cap. Model (3) is also an OLS regression but controls for both list and sector.*

<sup>1</sup> Dummy variable

Robust standard errors in parentheses

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

Table 9 above presents three regression models of Large, Mid and Small Cap combined that aim to identify how and if the explanatory variables affect the extent of abnormal return. Due to the existence of heteroskedasticity all regression models consist of robust standard errors which reduces biases from heteroskedasticity. The result of all regressions is rather surprising due to inexistent statistical significance on the majority of explanatory variables. Regression (1) shows that CEO characteristics do not have a significant impact on the extent of abnormal return which is surprising since a larger transaction or a person with a large stock holding has their own personal wealth at stake in the firm and a transaction could therefore signal their belief of future performance. A potential explanation for the insignificance of the CEO variables is that there are other factors that matter such as reputational aspects of the specific individual that made the transaction. It is known that some CEOs get more attention than others and it is, thus, possible that some CEOs could create a market reaction at the event of an insider trade. It can therefore be argued that the studied CEOs and their transactions do not produce signals to the market based on their studied characteristics. Due to insignificant CEO characteristics, hypothesis one is rejected for this specific regression model, and we cannot prove that they affect the extent of abnormal return at the event of a CEO insider trade.

Regarding firm characteristics, there are three variables that are statistically significant on the 95 percent level, namely capex, profit margin and ROE. Capex has a slightly positive coefficient, meaning that when capex increases by one percent the abnormal return increases by 0.002 percent, which can be interpreted as a low abnormal return. A positive coefficient is contradicting previous research done by Cordis and Kirby (2016) who found that firms with high levels of capex have lower stock returns compared to firms with lower capex. The variable profit margin is in line with Houmes et al (2018) where they state a negative correlation of

profit margins and stock return due to difficulties of sustaining a high profit margin. Our study produces a negative coefficient suggesting that when profit margin increases with one percent, the abnormal return decreases with 0.01 percent. A potential explanation of this negative relationship could be that CEOs insider transactions provide a stronger positive signal about the future as their firms profit margin deteriorate, which in itself might be cause for concern on the market. The third significant firm characteristic ROE also displays a slightly negative coefficient. The result is in line with Mainul (2012) that states that ROE does not produce higher returns. The negative relationship of ROE and abnormal return could be explained with the same logic as profit margin. Therefore, hypothesis two is accepted due to significance of three variables related to firm characteristics.

Regression (2) controls for firm size in terms of Large, Mid and Small Cap and the control variable is highly significant on the 99 percent level and generates significance on two CEO characteristics. However, both CEO variables, ownership, and transaction size, have negative coefficients meaning that when the ownership or transaction size increases the abnormal return decreases, which is opposite of previous empirical findings. Our findings contradict Lilienfeld-Toal and Ruenzi (2014) who brought forward evidence of a positive relationship. They postulate that firms with large CEO and managerial ownership deliver higher abnormal returns. It could therefore be argued that an increase in CEO ownership should produce abnormal return with a positive coefficient. The interpretation of CEO ownership could be that if a CEO already has a large stake in the firm, a transaction might not change the market's current perception of the firm compared to a firm where the CEO for instance buys shares for the first time. Buying shares for the first time could signal that the CEO believes that the future performance will be good from now on. A purchase by a CEO with a large stock holding could be motivated by controlling motives rather than the mere purpose of earning returns as a first buy transaction.

The negative coefficient of transaction size is statistically significant on the 90 percent level. Although, the economical interpretation is rather surprising and unreasonable. As the transaction size increases, the abnormal return decreases by approximately 0.15 percent. A large purchase could be interpreted as a strong signal for positive future performance. Regarding firm characteristics, capex, profit margin and ROE are significant and share the same interpretation as of the first regression. The list dummy that captures firm size is highly significant and provides further incentives to examine independent regressions of Large, Mid and Small Cap to narrow it down and analyze potential differences within firm size. The



significance of firm size is already hypothesized in the t-tests that were presented in the data section where no significance could be found on Large Cap suggesting that abnormal return is achieved for CEO transactions in medium and small companies on the Swedish market. The result from the t-test and the significance in the regression is therefore in line with previous research by Lakonishok and Lee (2001) and Posylnaya et al. (2019) who conclude that abnormal return is larger for smaller firms due to larger information asymmetry and inefficient pricing compared to larger firms.

Regression (3) controls for firm size and sector. The significance and interpretations are similar to the second regression and the sector does not have a significant impact on the abnormal return at the announcement of a CEO insider transaction, when using the combined dataset of Large Cap, Mid Cap and Small Cap.

## 7.2 Regression models grouped by firm size

*Table 10: Regression models grouped by firm size*

Dependent Variable Variables	Large Cap		Mid Cap		Small Cap	
	Abnormal Return Coeff.	Std. Err	Abnormal Return Coeff.	Std. Err	Abnormal Return Coeff.	Std. Err
Tenure	0.1**	(0.04)	-0.04	(0.07)	0.003	(0.06)
Gender <sup>1</sup>	-0.90*	(0.48)	0.61	(1.07)	0.3	(1.24)
Log CEO Ownership	-0.27**	(0.12)	0.12	(0.19)	-0.13	(0.27)
Log Transaction Size	-0.12	(0.13)	-0.36**	(0.17)	-0.14	(0.24)
Transaction Type	0.07	(0.77)	1.51**	(0.68)	-0.51	(0.72)
D/E ratio	0.09	(0.14)	-0.002	(0.17)	0.17	(0.62)
Log Cash	0.01	(0.15)	0.07	(0.25)	0.29	(0.33)
Capex	0.002	(0.002)	-0.001	(0.002)	0.003	(0.003)
Profit Margin	-0.01*	(0.01)	-0.002	(0.01)	0.08*	(0.04)
ROE	-0.002	(0.02)	-0.03***	(0.01)	-0.11	(0.07)
P/B	0.11	(0.10)	-0.16	(0.13)	0.39	(0.31)
P/S	0.05	(0.08)	0.06	(0.08)	-0.33*	(0.21)
P/E	0.02	(0.01)	0.03**	(0.02)	-0.035*	(0.02)
PEG	-0.06	(0.04)	-0.005	(0.06)	-0.035	(0.09)
Sector <sup>1</sup>	-0.29**	(0.12)	-0.002	-0.12	0.03	(0.23)
Constant	-1.80	(1.52)	-3.20	(2.30)	-0.65	(3.37)
Observations	663		619		482	
Control for sector	Yes		Yes		Yes	
R-squared	6.7		8.03		6.14	

*Note: This regression table aims to capture how the variables affect the dependent variable abnormal return based on firm size. The three regression models are grouped by Nasdaq list (firm size), meaning Large Cap, Mid Cap and Small Cap.*

<sup>1</sup> *Dummy variable*

*Robust standard errors in parentheses*

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

When dividing the regression models into firm size by lists we see some differences in the variables that affect the abnormal return. In Large Cap firms, tenure is statistically significant on the 90 percent level with a coefficient of 0.1 meaning that for every extra year as a CEO the abnormal return increases by 0.1 percent. The coefficient is reasonable since an extra year of CEO should result in better knowledge about the firm and its potential in future performance, thus a transaction generates a larger abnormal return. Furthermore, an alternative interpretation of the positive coefficient could be that the information asymmetry gradually increases with tenure due to more experience and knowledge about the firm. Information asymmetry refers to the informational advantage that should increase over the years compared to outside investors. However, a positive coefficient is contradicting to the study made by Clayton et al (2005) where they concluded that price volatility generally declines with tenure due to gained confidence in the CEO over the years and therefore reduced need to adjust for firm-related information compared to a newly appointed CEO which produces a larger stock price volatility. Their study suggests a negative coefficient meaning that abnormal return is reduced for an additional year of CEO tenure. For Mid Cap and Small Cap, we cannot prove that tenure has a significant impact on the extent of abnormal return at the event of a CEO insider trade. A potential reason for the significance of only Large Cap is that larger companies are usually more thoroughly followed by media and analysts which could trigger better knowledge and importance of the CEOs at large firms. This coverage results in smaller degree of information asymmetry.

Gender is also significant on the 99 percent level, meaning that the abnormal return is 0.9 percent higher for male CEOs compared to female CEOs which is in line with previous research done by Braegelmann and Ujah (2020). They found that the market reactions in terms of abnormal return are larger at the event of announcements made by male CEOs compared to female CEOs. However, they state that it varies depending on firm size which is the conclusion for this study as well. As seen in the table above, gender is only significant for Large Cap. In Mid Cap and Small Cap, the variables are not statistically significant, but the coefficients are

positive, indicating that the abnormal return might be larger for announcements by female CEOs. Furthermore, as described in the summary statistics, the data is heavily skewed to male transactions due to limited female CEOs which in turn could affect the results of the variable.

Furthermore, ownership and transaction size are significant on the 95 percent level on Large Cap and Mid Cap respectively with negative coefficients. The results with negative coefficients are similar to that of the standard regression in the previous regression model which means that the interpretation is the same as before. A negative coefficient for ownership contradicts previous research and the negative coefficient of transaction size lacks economic significance since it should rather strengthen the signal than the opposite.

The last CEO characteristics of the regression models refer to transaction type, meaning if a transaction is a buy or a sell transaction. The variable is only significant for Mid Cap firms and means that a buy transaction generates 1.51 percent higher abnormal return than a sell transaction. The result is in line with Lin and Howe (1990) who argue that a buy transaction can be interpreted as a positive and stronger signal compared to a sell transaction. That its only significant for Mid Cap is rather surprising and lacks a valid interpretation based on previous empirical research. The conclusion of CEO characteristics is that hypothesis one is accepted for Large Cap and Mid Cap, but not for Small Cap since no variable is significant for Small Cap firms. The acceptance of hypothesis one infers that CEO characteristics do impact the extent of abnormal return, with variation depending on firm size, more precisely the variables tenure, gender, ownership, transaction size and transaction type.

In terms of firm characteristics, the results display some differences compared to previous regression models, as well as between firms of different sizes. Debt to equity ratio and cash ratio does not have a significant impact on the extent of abnormal return which concludes that it is not a determinant factor for the market regarding investment decisions at the announcement of a CEO insider trade. When grouping by firm size, capex appears to be insignificant as well compared to the previous regression models. Profit margins are significant for firms in Large Cap and Small Cap on the 90 percent level. Large Cap presents the same negative coefficient as the first regression models but Small Cap, however, presents a positive coefficient which is contrary to the literature by Houmes et al. (2018) where they state a negative correlation between profit margin and stock returns. The results of Small Cap indicate that when profit margin increases with one percent, the abnormal return increases with 0.08 percent. It is

reasonable that a positive profit margin is attractive for investors of firms in Small Cap since, generally, there are many firms in Small Cap with low or even negative earnings. Therefore, increasing profit margin seems to be an important factor for small firms compared to medium-sized and large firms.

ROE is only significant for Mid Cap firms, on the 99 percent level. The coefficient is negative, so the interpretation is similar to the one made from the first regression models in table 9 and is also in line with previous empirical research.

Regarding the valuation multiples, P/E is statistically significant for Mid Cap and Small Cap. The coefficient is positive for Mid Cap meaning that when as firms valuation increases, the abnormal return increases as well. Another interpretation however is that firms that are highly valued usually get much attention by media and analysts which mean that an insider transaction at that point could lead to a wide awareness and signal that the firm is actually not overvalued. The result is contrary to Small Cap since the P/E coefficient on Small Cap is negative meaning that higher valued firms do not earn higher abnormal returns.

The multiple P/S however is only significant on Small Cap which is interesting due to the fact that Small Cap includes many firms that have negative earnings compared to Large Cap and Mid Cap. That means that earnings and thus P/E might not be representative or be of informational value and P/S could become a good substitute for investment analysis purposes. Furthermore, the coefficient is negative, suggesting that when the multiple goes up the abnormal return is lower. The remaining valuation multiples, P/B and PEG are not significant on any list. Lastly sector indicates to only be significant for the extent of abnormal return on firms listed on Large Cap as shown in the regression above.

In conclusion regarding firm characteristics, hypothesis two is accepted for Large, Mid, and Small Cap since at least one significant variable exists for each list. The variables that show significance for abnormal return are profit margin, ROE, P/S and P/E. Meaning that firm characteristics do affect the extent of abnormal return at the event of an insider transaction.

### **7.3 Regression models grouped by time periods**

During the working process of the study, regressions were grouped of the ten-year period into three different time periods of 3 years and 4 months each. This was performed to identify any significant changes between time periods in terms of significant variables and how they potentially affected the abnormal return. It is reasonable to assume that the market has changed its approach and interest in certain CEO- and firm characteristics which would present itself in the regression models. However, when performing the regression models', unreliable results were presented due to limited data for the period from 2012 to 2015. Due to limited data and unreliable results, the regression models are excluded from the study.

## **8. Conclusion**

The aspiration of this study was to provide new insights on whether certain CEO- and firm characteristics have a significant impact on the extent of the abnormal returns generated by CEO insider transactions on the Swedish market between the years of 2012 and 2021.

Three t-tests were performed of total observations and grouped by Large, Mid, and Small Cap to identify whether abnormal return exists at the event of an insider trade by a CEO. The results indicate that all observations, Small Cap and Mid Cap firms earn abnormal return during the examined event window. Large Cap however does not indicate any significance regarding abnormal return suggesting that smaller firms contain more information asymmetry and not as efficient in its pricing as large firms. The presence of abnormal return is in line with previous research and provides incentives to research underlying CEO- and firm characteristics effect on abnormal return on the Swedish stock market.

The first three regression models of the result section aimed to identify overall results of Large, Mid and Small Cap combined. The results indicated low significance of the CEO characteristics and more significance of firm characteristics. However, since there are large differences in size between the dataset the results are more informative and easier to interpret when grouping for firm size, which is further emphasized below. Sector does not appear to have any significant differences in how the variables affect the abnormal return, based on the total combined data.

Both CEO- and firm characteristics indicate statistical significance on the abnormal return generated by CEO insider transactions. For Large Cap firms, tenure, gender, and CEO ownership displayed significant results. The CEOs of these large firms increased their abnormal return generated by their insider transactions as their tenure increased. With regards to gender, male CEOs indicated a larger positive abnormal return. The ownership among these CEOs also affected the extent of abnormal returns in a surprising way. The abnormal return produced by their insider transactions declined as their ownership stake increased. For Mid Cap listed firms, the transaction size and transaction type affected the abnormal return in terms of CEO characteristics. The findings suggest that as transaction size increases, the abnormal return decreases. Furthermore, the transaction type infer that a buy transaction provides larger abnormal returns which is in line with previous research in that they possess larger informational value. The examined CEO characteristic variables displayed no significance for Small Cap listed firms which are the firms that according to previous empirical studies should provide the largest abnormal returns.

Profit margin is the only statistically significant firm specific variable for Large Cap firms. The coefficient implies that an increase in profit margin results in a decrease of abnormal returns and is in line with previous empirical findings. Sector also affects the extent of the abnormal returns among Large Cap firms. Both profitability- and valuation measures display a statistical significance for Mid Cap firms. ROE is highly significant with a negative coefficient which is also in line with previous empirical work. The valuation metric P/E also displays significance which diverts from previous studies with its positive coefficient. This would indicate that CEOs of highly valued firms gain larger abnormal returns. Firm specific characteristics that are significant for Small Cap firms include profit margin, P/S and P/E. Profit margin is significant with a positive coefficient compared to the negative of Large Cap firms. The P/S and P/E valuation variables are accompanied by negative coefficients, which infer that CEO insider transactions in high valuation firms gain less abnormal returns. Surprisingly, the P/S metric is only significant for Small Cap firms.

The first hypothesis examined whether CEO characteristics impact the extent of abnormal returns generated by their insider trading. The study indicates that CEO characteristics, such as tenure, gender, ownership, transaction size and transaction type do affect the extent of the abnormal returns generated and is therefore accepted. The impact of these characteristics does however vary depending on firm size. Some characteristics have shown larger significance on

larger firms, while others have shown larger significance on smaller firms. The acceptance of the first hypothesis infer that the information provided through CEOs insider transactions is interpreted by the market differently depending on firm size.

The second hypothesis examined whether firm characteristics impact the extent of abnormal returns generated by their insider trading. The study indicates that firm characteristics, such as profit margin, ROE, P/S, P/E, and sector affect the extent of the abnormal returns generated and are therefore also accepted. Similar to the variables of the first hypothesis, different firm characteristics impact the extent of abnormal returns depending on the size of the firm. For large firms, profit margin and sector are of main concern. While transactions in smaller firms display greater informational value when these take place in firms of low valuations of P/S and P/E.

As a result of these findings, we propose that CEO- and firm characteristics do affect the extent of abnormal returns generated by CEO insider trading on the Swedish market. The extent of the abnormal return and the direction is largely dependent on which characteristic is being examined and firm size.

The study has provided new insights and confirmed previous research regarding insider trading. Previous papers have suggested the possibility of generating abnormal returns at the event of insider trading. These have mainly investigated the US market while studies on the Swedish market have been limited. Our study suggests the possibility of generating similar returns on the Swedish market in the event of insider trading. These findings infer that the Swedish market is efficient and reacts to new information that the CEO conveys through their transactions. The study has also provided a new foundation of potential explanations and understanding to which CEO- and firm characteristics affects the extent of the abnormal return, which has previously been lacking in the academic literature.

Due to time constraints and informational limitations, the study has not provided new insights on if other CEO characteristics such as age, education, internal recruitment affect the ability of CEOs to generate abnormal returns. In terms of firm specific characteristics, the study is lacking environmental, social and governance metrics due to lack of uniformity in the studied firms reporting of these metrics. Furthermore, using more years could have allowed for grouping the regression in time periods to identify if there are any differences over time.

For future research a recommendation would be to take these previously mentioned personal aspects of CEOs into consideration when testing for their effect. It could also be of value to investigate if environmental, social and governance reporting affect the informational value of CEOs insider transactions. Finally, by taking more c-suite positions into consideration and examining their insider transactions could provide further and more precise information as to who and what generates the most significant returns and market reactions from their transactions.



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