Insider Purchases and Abnormal Returns:

Event study in Helsinki Stock Exchange

Department of Accounting and Finance

Bachelor's thesis

Author:

Jere Viheriäkoski

Supervisor(s):

Md Khaled Hossain Rafi

17.4.2024

Turku

Kandidaatintutkielma

Tämän kandidaatintutkielman tarkoituksena on tutkia sisäpiirin ostojen vaikutusta epänormaaleihin tuottoihin Helsingin Pörssissä vuosina 2022–2023. Aikaisemman kirjallisuuden perusteella epänormaalin tuoton suuruuteen vaikuttaa mm. yhtiön koko ja sisäpiiriläisen asema kohdeyhtiössä ja näiden vaikutusta tarkastellaan tässä tutkielmassa muuttujien muodossa. Tutkimuksen tavoitteena on selvittää tekevätkö sisäpiiriläiset ostoillaan epänormaaleja tuottoja ja miten em. muuttujat vaikuttavat tuottojen määräytymiseen.

Tutkielma koostuu kirjallisuuskatsauksesta ja empiirisestä tutkimuksesta. Kirjallisuuskatsauksessa käydään läpi finanssialan teorioita, jotka ovat aiheen ymmärtämisen kannalta tärkeä tuntea, sen lisäksi aikaisempien tutkimusten tuloksia analysoidaan, jonka pohjalta tutkielman hypoteesit muodostuvat. Kirjallisuuskatsaukseen sisältyy teoriaa ja tutkimuksia päämies-agentti-ongelmasta, signalointiteoriasta, markkinoiden tehokkuudesta ja tarkemmin sisäpiirin kaupankäynnistä.

Empiirinen osa tutkimuksesta koostuu tapahtumatutkimuksesta ja regressioanalyysistä. Tutkimuksessa havaittiin, että toimitusjohtajan ostot tuottivat positiivista kumulatiivista keskimääräistä epänormaalia tuottoa (CAAR) eniten suurissa yhtiöissä. Pienten yhtiöiden keskimääräiset epänormaalit tuotot (AAR) olivat korkeammat, mutta suurten yhtiöiden keskimääräiset tuotot pysyivät negatiivisina. Keskisuurilla yhtiöillä muuttujien vaikutus oli käytännössä olematon. Regressioanalyysi osoitti, että epänormaaliin tuottoon vaikuttivat eri tekijät eri yrityskokoluokissa, ja toimitusjohtajan ostot vaikuttivat tuottoihin eniten suurissa yhtiöissä ja aikaisempi kurssikehitys pienissä yhtiöissä. Nämä tulokset olivat kuitenkin myös tilastollisesti merkityksettömiä. Tutkimus hylkää hypoteesit, joiden mukaan sisäpiirikauppa, positio, yrityksen koko ja aiemmat kurssimuutokset vaikuttavat epänormaaleihin tuottoihin.

Key words: sisäpiirikauppa, epänormaalit tuotot, tapahtumatutkimus

Bachelor's thesis

The purpose of this thesis is to examine the impact of insider purchases on abnormal returns in the Helsinki Stock Exchange in the period 2022-2023. Based on previous literature, the size of the abnormal return is affected by the size of the company and the insider's position in the target company. The aim of the study is to investigate whether insiders make abnormal returns on their purchases and how these variables affect the determination of returns.

The thesis consists of a literature review and an empirical study. The literature review will review the financial theories that are important for understanding the topic, and will analyse the results of previous studies, which will form the basis for the hypotheses of this study. The literature review includes theory and studies on the principal-agent issues, signalling theory, market efficiency and, more specifically, insider trading.

The empirical part of the study consists of an event study and regression analysis. The study found that CEO purchases generated highest positive cumulative average abnormal returns (CAAR) in large companies. Small companies had higher average abnormal returns (AAR) and large companies maintained negative average returns. For medium-sized companies, the effect of the variables was practically non-existent. The regression analysis showed that abnormal returns were affected by different factors across firm sizes, with CEO purchases affecting returns for large firms and past stock price performance for small firms. However, these results were statistically insignificant. The study rejects the hypotheses that insider trading, position, firm size and past stock price movements affect abnormal returns.

Key words: insiders, abnormal returns, event study

TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

1 Introduction

1.1 Background and motivation of the study

Rational investor will buy a security if one expects to get a positive return on the investment and, in addition, a rational investor will invest in the security that gives the highest possible risk-adjusted return among the alternatives. In theory, an individual who is more informed than an ordinary investor, i.e. an insider, expects the security to be undervalued at the time of the transaction and the buyer believes it will provide the best risk-adjusted return at the time (Sharpe, 1964). This thesis examines whether insider purhases affects market performance.

Previous studies suggest a link between abnormal returns and insider trading, although there is some variation in the results. A study conducted in 1986 in the US market concluded that insider trading yields abnormal returns (Seyhun, 1986). However, Eckbo and Smith (1998) study rejects the hypothesis that insider trading generates abnormal returns in the Norwegian Stock Exchange. This shift in findings over time underscores the evolving nature of insider trading dynamics and highlights the importance of continuous examination and reassessment of factors influencing abnormal returns in financial markets. There is very little studies on this topic from the Finnish stock market, leaving a research gap for this thesis. Where insider trading regulations and market dynamics may differ from other global exchanges, this study seeks to examine efficacy of insider purchases as a predictive tool for abnormal returns in the Finnish market.

1.2 Purpose of the study

The purpose of this thesis is to investigate the impact of insider purchases on the abnormal returns on the Helsinki Stock Exchange. Event study was conducted on insider purchases for the period 1.1.2022–31.12.2023 and overall, 139 purchases were selected for the study. The abnormal returns were measured with Average Abnormal Returns (AAR) and Cumulative Average Abnormal Returns (CAAR) from the event window and the values obtained were tested for statistical significance. Regression analysis was also performed on the subject, using the Ordinary Least Square (OLS) method to examine the impact of the variables on abnormal returns and the statistical significance of these variables were also tested. The variables used in the regression model were 1) stock's performance prior of the event and 2) the acquirer's position in the company in question. The main challenge

in this thesis was the limited amount and structure of available data, especially after excluding routine transactions. However, the focus remained on analyzing the impact of the most interesting purchases included in the sample on abnormal returns.

1.3   Outline of the study

Chapter 2 of this thesis contains the literature review where the hypothesis of this study is largely based. Chapter 3 describes in more detail the dataset and the methodology used in the event study and the regression analysis. In chapter 4 the results are summarized and analyzed and lastly chapter 5 concludes the findings of this thesis.

2 Literature review

2.1 Principal-agent issues

The principal-agent problem is a conflict of priorities between the owner of a security and the agent to whom control of the security has been delegated by the principal. The risk that the agent will act in a manner contrary to the principal's interests can be defined as agency costs. The principal-agent problem can arise from a variety of relationships, but in this thesis the relation between stakeholders (principal) and corporate officers (agent) will be addressed.

To better understand the relationship between the principal and the agent, we need to review the theory of comparative advantage based on the teachings of David Ricardo (1817). Comparative advantage is the ability of an alliance or individual to produce a particular good or service at a lower opportunity cost than its peers (Ricardo, 1817). In the context of this thesis, comparative advantage is reflected in the fact that the principal has limited amount of time and expertise, therefore the principal empowers the agent to manage the business. The agent has more time at his disposal because he works for the company, and also has more detailed information about the company as the typical shareholder so the agent has a comparative advantage to perform the task.

There are two main problems that can occur in these relationships. The first one occurs when the goals of the principal and agent conflict, and it is difficult or expensive to monitor and verify what the agent is doing. The second issue arises when the principal and agent have differing risk preferences, leading to potential conflicts in their preferred actions. While the principal may prioritize cautious approaches to minimize risk, the agent might favor riskier actions for personal gain (Eisenhardt, 1989). Han and Suk (1998), found that increases in insider ownership, the stock returns increased but not in linear fashion. These results indicate that as insider ownership grows, their interests become more aligned with those of external shareholders, thereby mitigating agency problems. However, excessive ownership may lead to the consolidation of managers' positions and differentiation of objectives with shareholders. Managers with large shareholdings can sell its holdings or trade on insider information and thereby receive "artificial remuneration" which have an impact on the incentive to perform the task as the principal expects (Han & Suk, 1998).

2.2   The signaling theory

Spence's article, "Job Market Signaling" (1973), serves as a foundational text for the signaling theory. In this article, Spence proposes that individuals invest in education and training not only to acquire specific job skills but also to signal their qualities and capabilities to potential employers. While the educational qualifications may not always directly align with the requirements of a particular job, they serve as a credible signal of the applicant's intellectual ability, work ethic, and potential for success in the workplace. According to Spence, the job market operates under uncertainty, where employers face challenges in accurately assessing the abilities and characteristics of candidates. By investing time and resources in obtaining education or training, individuals demonstrate their willingness to commit to a goal and their ability to succeed in challenging environments, this reduces information asymmetry in the hiring process. Through Spence's signaling model, the hiring decision focuses not only matching specific skills to job requirements but also about evaluating the broader attributes and potential of candidates, in this case, the signal sent by educational success of the candidate reinforces the employer's beliefs. Investing in a company inherently involves uncertainty, which makes signaling theory applicable in the investment market. Investors lack complete assurance about a company's future trajectory, and their perceptions are influenced by the information provided by the companies.

Dividends are commonly perceived as a signal of a company's success, with an increase in dividends often indicating improved performance. Strong dividends typically suggest reliable cash flow and a stable, well-established business, leading the market to value such companies with higher multiples up to a certain point. However, according to Modigliani and Miller (1963), a company's dividend policy theoretically has no effect on the valuation of its stock. In practice, changes in dividend policy should not alter the stock price. Modigliani and Miller's argument is rooted in the concept of investor preferences and the notion that investors can essentially create their own dividends. They suggest that if investors receive dividends, they consider unnecessary, they can effectively mimic dividend payouts for themselves by selling a portion of their holdings or reinvesting the excess dividends. Consequently, according to their theory, investors should not be willing to pay a premium for a company's dividend policy since they can replicate the desired dividend stream on their own. In addition, Modigliani and Miller propose that the market values a company based on its underlying fundamentals rather than its dividend policy.

While dividends may serve as a signal of a company's financial health and management's confidence in its prospects, their impact on stock valuation, according to this theory, is indirect or negligible. Research indicates that Modigliani and Miller's theory often doesn't align with real-world market behavior. Stocks frequently respond to changes in dividend policy, as noted by Irwin and Puckett (1964). In fast-growing companies, dividend payouts may not be viewed favorably, as investors prefer to see these firms reinvesting excess capital into high-return projects. Conversely, in established companies, higher dividends can lead to increases in share prices. The market typically expects growing companies to allocate surplus funds towards value-adding projects, provided these projects offer returns surpassing the dividend yield investors would otherwise receive. Conversely, high dividend payments might signal a lack of attractive investment opportunities, prompting the company to distribute capital to shareholders instead (Irwin & Puckett, 1964).

Insider trading could also serve as a signal to the market. When company insiders buy or sell shares of their own company, it indicates their confidence or lack thereof in the company's future performance. Since insiders possess intimate knowledge about the company, their actions are often interpreted as a reliable indicator of its prospects. Positive insider trading activity reinforces investors' perceptions of a well-managed and potentially high-performing company. Dividend policy, along with insider trading activity, can significantly influence investor perceptions and stock prices, reflecting broader market expectations regarding a company's growth prospects and financial position.

2.3 Efficient Markets Hypothesis

Efficient Market Hypothesis (EMH) started to gain more attention in the 1950s and is still strongly present in modern financial theory. The efficient-market hypothesis was first developed by Professor Eugene Fama which made him considered the founding father of the theory. According to a study the EMH was supported by under half of the research on market efficiency (Sewell, 2011), making it a controversial theory in finance.

There are differing opinions in academic world as whether the stock market follows a so-called random walk, i.e. whether market returns cannot be predicted from historical price data and whether returns are determined purely by randomness. Steiger (1964) proves that the stock market does not follow a random walk, while Godfrey (1964) in his paper

of the same year concludes that a random walk is the only consistent price determination mechanism in the market. In the following year Fama (1965) mentions market efficiency for the first time in his article and Fama empirically tests a random walk model with two assumptions, 1) successive price changes are independent of each other, and 2) price changes conform to a probability distribution. According to Fama, the data from the study support the hypothesis that price movements in the market follow a random walk making the market efficient (Fama, 1965).

EMH is based on the impact of information on security pricing. According to the theory, the market is efficient when the price of a security "fully reflects" the information available, i.e. disclosure of information to the entire market would not affect the price of a security. In an inefficient market, excess returns could be made until the price of the security reflects the available information, while in an efficient market it is hardly possible to beat the market when all available information is already reflected in the prices. According to Fama, there are three levels of market efficiency: 1) weak-form, 2) semi-strong-form and 3) strong-form (Fama, 1970). Weak form of efficiency means that the security price considers available market information, such as the historical performance of the share price. Investors cannot beat the market with technical analysis, which attempts to predict the price of a stock from its historical data. In semi-strong form of efficiency, all public information is considered when pricing a security, i.e. including earnings reports and stock splits. According to the theory, investors cannot achieve abnormal returns through fundamental nor technical analysis because the price reacts effectively to new information. Strong form of efficiency is created by a situation where all public and private information, including insider information, is priced, and therefore making it impossible for investors to make abnormal returns in theory. Insider information is an example of a monopolistic access to information (Fama, 1970).

Ball (1978) found that earnings announcements consistently led to excess returns, supporting the hypothesis of market efficiency. On the other hand, Grossman and Stiglitz's study (1980) fundamentally challenged the notion of efficiency in the markets. Demonstrated that, perfect informational efficiency is impossible to achieve, because acquiring and processing information involves costs. If market prices perfectly reflected all available information, there would be no incentive for investors to expend resources on gathering and analyzing that information. This concept forms the basis of their model of market equilibrium, which suggests that there must be some incentive for information

gathering to maintain market efficiency. In 1985, De Bondt and Thaler published a paper that unveiled a market anomaly: stock prices tend to overreact. Prior "losers" tend to outperform prior "winners" consistently in the long-term and researchers found that losing stocks earned about 25 % more than the winners thirty-six months after the portfolio formation. This is because investors tend to overreact to good news regarding the company's future earnings which increases the expectations and the stock price. The overreaction will be corrected over time with new information, but the process could be long. The arcticle suggests that investors' reactions to news are not always rational and can be influenced by psychological biases and study implies a violation of weak-form market efficiency (De Bondt & Thaler 1985). An article (King et al., 1988) found that insider purchases and sales both produced abnormal returns in the US and in the UK. Purchases yielded significantly larger abnormal returns, which may be due to the representation of small firms in the sample, also known as "small firm effect". The research data would argue that the market is weak because stock prices reacted slowly to insider transactions and investors had time to make large profits before the price correction (King et al., 1988).

According to Malkiel (2003) the markets are more efficient and less predictable than recent studies suggested. However, this does not remove the psychological factors from the market and the market cannot be fully efficient, because the information-gathering incentive is lost otherwise quoting Grossman and Stiglitz (1980). Malkiel believes that the development of information technology will create situations for exploiting inefficiencies in the future, but he does not believe that the market's belief in market efficiency will disappear completely, as the market will quickly correct inefficiencies, which is what he refers to in his last sentence in the text: "If any $100 bills are lying around the stock exchanges of the world, they will not be there for long." Schwert (2003), argues that upon the publication of different anomalies, practitioners often adopt strategies suggested by academic papers and consequently, these anomalies tend to weaken or disappear over time. In essence, Schwert's findings suggest that the dissemination of research results leads to a more efficient market. Schwert noticed that after published studies highlighting size effect and value effect the anomalies in question no longer produced excess returns. Jain and Jain (2013) studied data from the Indian stock market (BSE SENSEX) for the period 1993–2013 with the aim of determining whether stock prices follow random fluctuations and whether the market fulfils the criteria for the

weak-form of market efficiency. The conclusion of the study was that price formation in the stock market follows a random walk and it satisfies the weak efficiency requirement as no one in the stock market could make excess returns by doing technical analysis and predicting prices from historical data. On the contrary data from 1991–2012 in the Pakistan stock market (KSE-100) suggested that the Pakistan market is inefficient at a weak-form, i.e. stock prices do not reflect all historical information and investors can outperform the market with technical analysis (Naz et al., 2014).

Studies on market efficiency in established markets are relatively old, so it is misleading to draw conclusions from these studies alone. When examining the efficiency of modern markets, the increase in information, market participants and trading volume should be considered, also the reduction in transaction costs and the establishment of regulation will influence the modern market environment. Studies on market efficiency are controversial, with much of the research focusing on whether the market is inefficient or efficient at the weak-form. In theory, the market can be outperformed at weak-form when using insider information, and established exchanges such as the Helsinki Stock Exchange are generally assumed to operate at weak-form of market efficiency (Malkamäki & Martikainen, 1990) and therefore trading on insider information should generate excess returns, forming the following hypothesis:

H1: Trading on insider information will result abnormal returns.

2.4 Insider Trading

Insider trading involves buying or selling a publicly traded company's stock based on non-public, material information, and it stands at the crossroads of finance, ethics, and law. It embodies a tension between the pursuit of profit and the maintenance of fair and transparent markets. Material information refers to any data or facts that could significantly influence an investor's decision to buy or sell a security. This includes information about a company's financial performance, operational status, management changes, pending litigation, or any other factor that might affect the stock price (U.S. Securities and Exchange Commission). Non-public information is data that hasn't been made available to the public through official channels such as press releases, financial reports, or regulatory filings. This type of information is known only to a select group of individuals within a company or organization. Corporate officers, board members, major shareholders, and any employees or external individuals with access to non-public

information about a company are generally considered insiders. Insider trading grants individuals an unjust advantage over other investors by enabling them to profit from non-public information. The concept of insider trading is not new and the first insider tradings dates to the 17th century when Dutch East India Company issued public shares and the company's insiders exploited information asymmetry to their own advantage (Koudijs, 2015). Insider trading began to be regulated in the 20th century when legislators introduced laws to reduce the exploitation of insider information and regulatory authorities face a difficult task of regulating insider trading without doing so at the expense of market efficiency (Carlton & Fischel, 2016).

In this thesis it is assumed that there are two types of insiders in the market, routine insiders, and opportunistic insiders. Routine insider could have some of the characteristics of an opportunistic trader and vice versa. A basic characteristic of a routine insider is its predictability, i.e. the insider spreads his or her purchases over similar periods of time from one year to the next, for example a month after the release of earning reports, it is also a way to show that one is not trading on insider information. Routine trading is often linked to the same time as the remuneration to the company officers and it is a common action in the market and is considered often uninformative from the firm's future perspective. Trading by opportunistic insiders is considered informative, unsystematic, and its higher in "predictive power" about the company's future. Calculating abnormal returns, attention is paid to opportunistic behaviour as routine trades are generally not linked to higher abnormal returns in the market (Cohen et al., 2012).

Research of insider trading covers purchases and sales made by insiders, but there is considerable evidence in the research literature (e.g. Jeng, 2003; Betzer & Theissen, 2009; Bonaimé & Ryngaert, 2013) that insider sales are less informative than purchases and that the explanatory power of sales are smaller compared to purchases when examining abnormal returns. Even strong sale signals, i.e. situations where three or more insiders are selling at the same time, were found to be statistically insignificant (Lakonishok & Lee, 2001). Therefore, this study focuses only on insider purchases, so that the data consists of transactions with as much explanatory power as possible. Studies on information asymmetry within insiders have been much debated, i.e. whether the market values the trades of some specific insiders more than others in terms of informativeness. Core insiders are generally defined as persons who have access to more confidential financial information that is relevant to the pricing of a security, core insiders are generally defined

as the CEO, Chairman of the Board of Directors, CFO and other high rank executives. Study conducted in 1986 at the US market concluded that core insiders earn higher abnormal returns than their non-core insider counterparts (Seyhun, 1986), but a study of the US market twenty years later found that position had no correlation with higher abnormal returns (Jeng et al., 2003). Same conclusion was reached by Betzer and Theissen (2009) in their study of the German market where they found that the identity of the transactor had no statistically significant effect on the abnormal returns. CFO trades were considered more informative compared to CEO trades, in a 2014 study CFO trading portfolio performed better than the CEO trading portfolio and the proposed theory for this was that CFOs are more likely to exploit their information advantage and CEOs simply curb their own aggressiveness in trading because they are more closely monitored by the market (Knewtson & Nofsinger, 2014). Previous research suggests that not all insiders are created equal, and CEOs being in the top of information distribution making them high-informed insiders. Past research suggests that trades made by CEOs yield higher returns compared to other insiders, leading to the following hypothesis:

H2: CEO transactions result larger abnormal returns compared to others.

When investigating insider trading, the relationship between firm size and abnormal returns is multifaceted. Research suggests that smaller firms tend to exhibit higher abnormal returns compared to larger firms. Lakoniskoh and Lee (2001) found that in smaller firms insider trading was seen as a greater indicator for future stock returns and with purchases generating the highest returns and dispositions the lowest returns compared to other size segments. The same study also found that strong buy (where 3 or more buy at the same time) signals generate higher abnormal returns in all segments except in larger firms (Lakoniskoh & Lee, 2001). This phenomenon could be attributed to various factors such as lower liquidity, less analyst coverage, and greater inefficiencies in smaller markets. However, Jeng et al. (2003) came to the opposite conclusion in their study, finding that small firms and low-volume transactions do not generate abnormal returns. Conversely, larger firms may have more stringent internal controls and greater scrutiny from the market, making it harder for insiders to execute profitable trades without attracting attention. However, exceptions exist, as certain large firms may still generate significant abnormal returns due to the the occurrence of unique events or unusually high transaction volumes (Bettis et al., 1997). Based on previous studies, the following hypothesis is formulated:

H3: Small-Cap transactions yield higher abnormal returns compared to other segments.

One can see from previous studies that the relationship between abnormal returns and insider trading is not unambiguous and there is much disagreement among studies and when comparing studies they may give opposite results. Results are influenced by the time period of the study, the market and also the measurement methods used nevertheless, the hypotheses have sought to build on an overview of previous studies.

3 Methodology

3.1 Data

The data used in this thesis is from LSEG Workspace and the data in the study is between the period of 1.1.2022 to 31.12.2023. Time period is short because the LSEG Workspace data was very limited on the subject, to obtain a comprehensive sample of companies from different size segments, the last 2 years of data had to be taken. Large-cap companies had slightly longer time horizons regarding the data, but small-cap and mid-cap companies were limited to few years. Criteria for the data: 1) the company must be listed in Nasdaq Helsinki 2) the company must have trading history at least 205 days before the event 3) only direct purchases are considered 4) the purchase does not involve remuneration, options or any other activity associated with routine transactions 5) the price of the transaction must be over EUR 10 000.

The dataset used in this study consists of total 139 insider acquisitions. The data is specified by the company size and the role of the acquirer. The Nasdaq Nordic's method has been used to determine the size of the company: market capitalisation of less than EUR 150 million is considered *Small-Cap,* market capitalisation between value of EUR 150 million and EUR 1 billion is called *Mid-Cap* and companies with market capitalisation over EUR 1 billion are *Large-Cap* companies (Nasdaq, 2012). The dataset is detailed in Table 1 showing the number of transactions by detail.

Table 1. Overview of the dataset.

	Role of the acquirer	
Company size	CEO	Other
Small-Cap	14	23
Mid-Cap	20	21
Large-Cap	9	52

3.2 Event study

To investigate the transaction informativeness between CEO and other positions and between different company sizes, on event study is conducted. Event study measures if an economic event has an independent effect on the stock returns in each period and in

this thesis the effect of insider purchases to stock prices is analyzed. First, event study requires to define the event of interest (purchase) and the time period where the impact of the event is being examined and that time period is called *event window*. According to previous studies on the subject, there is no established practice on how long the event window should be and window lengths have ranged from a few days to tens of days. In this thesis a seven-day event window (-5, +1) is used to note the immediate effect of the acquisition.

After the event window has been selected, the *estimation window* must be defined. Typically, the estimation window is used to estimate model parameters and the estimation window typically ends where the event window begins to avoid influencing the normal performance parameter estimates. In this thesis a 205-day estimation window is selected. Timeline of this study is presented in Figure 1.
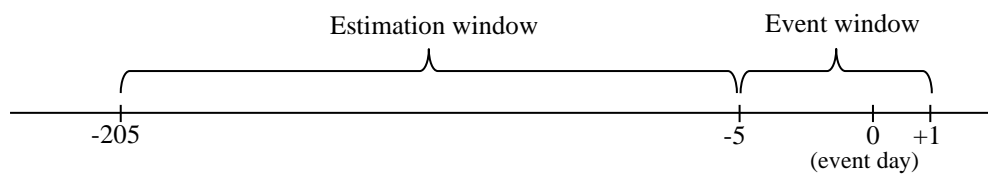
Figure 1. Timeline of the event study.

The impact of the event on the share price is examined using abnormal returns within the event window. MacKinlay (1997) defines the abnormal return as follows: "The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window". There are many ways of calculating the normal return and the next section explains how the normal return in this thesis is constructed.

3.2.1 Normal Returns

MacKinlay (1997) divides the models for determining the normal return into two categories: statistical and economic. Statistical model approach is based on statistical assumptions about the asset returns and excludes economic events and investor behaviour when estimating returns. Economic models includes both statistical and economic assumptions and Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) are common methodologies when estimating stock returns when using economic models. When using CAPM the expected

return of a given security is determined by its covariance with the market portfolio, although CAPM has restrictions which are avoidable at a little cost when using the market model. APT is a multifactor model which can be useful when chosen properly, but studies have shown that additional factors have relatively little explaining power when compared to market factors (MacKinlay, 1997).

Constant Return Mean Model and Market Model are the most common choices when calculating normal returns using statistical models. Constant Mean Return Model is a simple model, but it often yields similar results when compared to more sophisticated models (Brown & Warner, 1980; 1985), however the model assumes that returns will be constant through time which creates inaccuracies during times when market volatility is higher than usual i.e. during COVID-19. In this thesis Market Model is used when calculating normal returns, it's a linear model which assumes a joint normality of asset returns (MacKinlay, 1997). For any security i, the market model is:

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

$$\text{var}(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}$$

$$E(\varepsilon_{it} = 0),$$

where R_{it} is the t period return for the asset i, and R_{mt} is the t period return for the market portfolio. β_i is the coefficient of the stock in relation to the market portfolio. α_i is the constant and ε_{it} is the zero mean disturbance term of the model (MacKinlay, 1997). Market portfolio will be OMXHCAPGI, because event study is conducted in Finnish stock market and the index is a broad sample of the stock market, the weight of a single stock in the index is limited to 10% so the dominance of individual stocks is taken out. Returns of securities and market portfolio are converted into logarithmic returns as follows:

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

where P is the price of an asset.

3.2.2 Abnormal Returns

The Abnormal Return is the return of a given asset minus the normal return inside the event window. Formula for the abnormal return:

$$AR_{it} = R_{it} - E[R_{it}|x],$$

where AR_{it} is the abnormal return for an asset i at time t, R_{it} represents the return of the asset i at time t and $E[R_{it}|x]$ is the normal return for the asset i at time t (MacKinlay, 1997). Using OLS linear regression to obtain estimates for the parameters equation can be shown as follows:

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt}\right)$$

Average abnormal returns in period t are calculated as follows:

$$AAR_t = \frac{1}{n}\sum_{t=1}^{n} AR_{it}$$

where n is the number of observations. Abnormal returns for specific time frame are possible to measure with Cumulative Abnormal Returns (CAR):

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

where $CAR_i(t_1, t_2)$ is the cumulative abnormal returns of asset from period t_1 to t_2. Formula for the Cumulative Average Abnormal Returns is:

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

3.3 Regression analysis

This thesis uses three different regression models to analyse abnormal returns and the control variables remain the same between these regressions. The regression models are as follows:

$$CAR_{(0,1)}^{SMALL} = \beta_0 + DPOS + \beta_{SMALL}$$

$$CAR_{(0,1)}^{MID} = \beta_0 + DPOS + \beta_{MID}$$

$$CAR_{(0,1)}^{LARGE} = \beta_0 + DPOS + \beta_{LARGE}$$

where $CAR_{(0,1)}^{i}$ is the Cumulative Abnormal Return from period 0 (event day) to +1. β_0 is the intercept term, $DPOS$ is a dummy variable indicating position of the acquirer and β_i represents Cumulative Abnormal Returns -5 to -1 days prior the event in the given market-cap segment. Ordinary Least Squares (OLS) method is used to estimate the parameters of the model. The data was tested for heteroskedasticity because OLS method assumes homoskedasticity among the used data. Heteroskedasticity refers to a situation where the variance of the residuals varies between data points, i.e. the variance is not constant over the observations causing inefficiencies when conducting OLS estimation. The White test was performed to examine heteroskedasticity concluding that all three regression models were homoskedastic, meeting the standards for OLS estimation.

Table 2. Variables used in OLS regression.

$CAR_{(0,1)}^{i}$	Dependent variable. Cumulative abnormal returns over two-day period (0, +1) in market cap segment i.
$DPOS$	Explanatory dummy variable. CEO equals 1 and other positions equal 0 (directors, board members, other officers)
β_i	Explanatory variable. Cumulative abnormal returns over five-day period (-5, -1) in market cap segment i. Proxy for undervaluation.

3.3.1 Multicollinearity

Multicollinearity refers to a situation where there is correlation between explanatory variables that make it difficult to model the effect of individual variables on the dependent variable. In this thesis, multicollinearity is examined with the correlation matrix and values over 0.6 imply multicollinearity between variables. Correlation matrix is provided in Tables 3, 4, 5 where one can find that there is no multicollinearity between explanatory variables in any of the models.

Table 3. Small-Cap correlation matrix.

	$CAR^{SMALL}_{(0,1)}$	$DPOS$	β_{SMALL}
$CAR^{SMALL}_{(0,1)}$	1.000		
$DPOS$	-0.182	1.000	
β_{SMALL}	0.122	0.188	1.000

Table 4. Mid-Cap correlation matrix.

	$CAR^{MID}_{(0,1)}$	$DPOS$	β_{MID}
$CAR^{MID}_{(0,1)}$	1.000		
$DPOS$	-0.093	1.000	
β_{MID}	-0.013	0.230	1.000

Table 5. Large-Cap correlation matrix.

	$CAR^{LARGE}_{(0,1)}$	$DPOS$	β_{LARGE}
$CAR^{LARGE}_{(0,1)}$	1.000		
$DPOS$	0.210	1.000	
β_{LARGE}	-0.102	0.067	1.000

4 Results

4.1 Event study

Average Abnormal Returns (AAR) from days -5 to +5 are presented in Table 6. Z-scores tend to rise slighty after event day but remain statistically insignificant in all confidence levels. All z-scores were under 1 and above -1 which means that the AAR was less than one standard deviation above or below the mean making it insignificant. Figure 2 provides a graphical description of the average abnormal returns.

Table 6. Daily Average Abnormal Returns and z-scores.

| Day	AAR%			z-score		
	Small-Cap	Mid-Cap	Large-Cap	Small-Cap	Mid-Cap	Large-Cap
-5	-0.242 %	0.247 %	0.361 %	-0.125	0.076	0.176
-4	0.484 %	-0.086 %	0.049 %	0.133	-0.070	-0.015
-3	-0.189 %	-0.222 %	-0.091 %	-0.076	-0.140	-0.080
-2	0.003 %	-0.890 %	0.316 %	-0.019	-0.451	0.133
-1	0.089 %	-0.370 %	-0.186 %	0.003	-0.170	-0.076
0 (event day)	0.399 %	-0.179 %	-0.327 %	0.092	-0.084	-0.119
+1	0.467 %	0.981 %	-0.181 %	0.118	0.431	-0.114
+2	-0.320 %	0.502 %	0.391 %	-0.188	0.241	0.155
+3	0.251 %	0.426 %	-0.150 %	0.098	0.189	-0.136
+4	-0.053 %	0.095 %	0.206 %	-0.055	0.027	0.087
+5	-0.204 %	-0.033 %	0.361 %	-0.122	-0.038	0.177
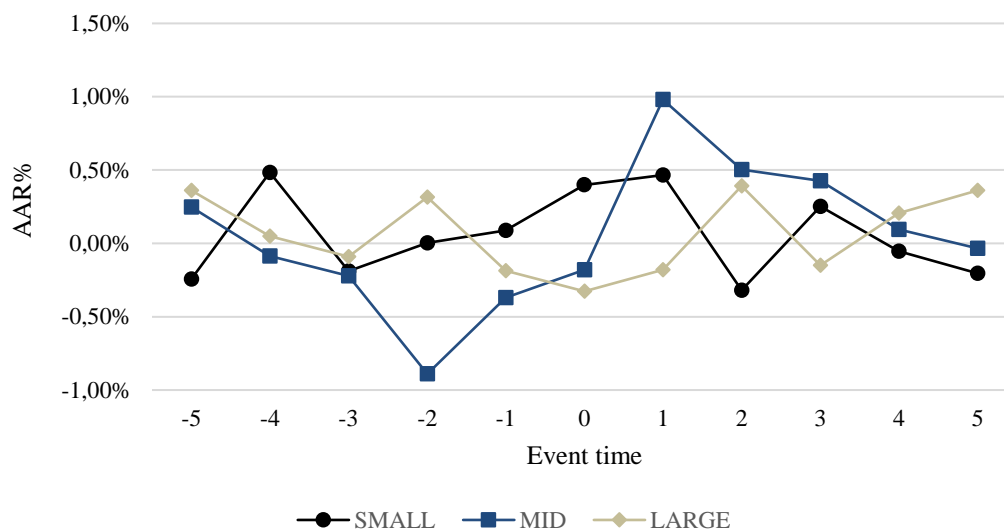
Figure 2. Daily Average Abnormal Returns.

Cumulative Average Abnormal Returns (CAAR) from the event window (-5, +1) is presented in Table 7. CAAR tend to be higher for CEO purchases compared to other positions, although looking at the CEO's average abnormal returns separately from other positions in the transaction window, the returns were also insignificant (Appendix 1).

Table 7. CAAR % from the event window.

Company Size	CAAR % (-5, +1)	
	CEO	Other
Small-Cap	3.014 %	-0.207 %
Mid-Cap	0.430 %	-1.424 %
Large-Cap	3.288 %	-0.643 %

The market portfolio used in this study (OMXHCAPGI) and the Helsinki Stock Exchange in general has been stagnant during the period under review which poses challenges for the examination of the relationship between abnormal returns and market events. In a stagnant market abnormal returns may exhibit reduced effect or fail to exhibit substantial deviation from zero if the whole market acts "lethargic".

Figure 3. OMXHCAPGI from 1.1.2022 to 31.12.2023.

4.2   Regression analysis

The summary of the three regressions can be seen in Table 8 with estimated coefficients, t-statistics in parentheses, R-Squared and R-Squared Adjusted. One can see that Small-Cap regression explains 5.8 % of the changes in Cumulative Abnormal Returns right after the event, the corresponding figures were 0.9 % for the Mid-Cap regression and 5.7 % for the Large-Cap. Previous days' returns had the largest impact on Cumulative Abnormal Returns in the small-caps, which may indicate that the lower trading volume of small companies allows for trend-like movements in the stock prices. CEO purchases had a negative effect on Cumulative Abnormal Returns in Small-Cap and Mid-Cap, but a positive effect in Large-Cap companies. CEO purchases were relatively the lowest in the Large-Cap segment, which may affect the regression model, however CEOs in larger companies can make larger acquisitions compared to its peers and CEOs have a high brand value in big companies. However, none of the variables had a statistically significant effect on the immediate Cumulative Abnormal Returns of a security.

Table 8. Regression results

	$CAR^i_{(-5,-1)}$	Position of the acquirer	Intercept	R^2	$R^2 \; Adjusted$
$CAR^{SMALL}_{(0,1)}$	0.056	-0.018	0.016	0.058	0.003
	(0.956)	(-1.253)	(1.777)		
$CAR^{MID}_{(0,1)}$	0.005	-0.006	0.011	0.009	-0.044
	(0.050)	(-0.570)	(1.546)		
$CAR^{LARGE}_{(0,1)}$	-0.009	0.022	-0.009	0.057	0.025
	(-0.916)	(1.699)	(-1.778)		

4.3   Hypotheses evaluation

The hypotheses of the study were summarised as follows:

H1: Trading on insider information will result abnormal returns.

H2: CEO transactions result larger abnormal returns compared to others.

H3: Small-Cap yield higher abnormal returns compared to other segments.

After interpreting the results, *H1* is rejected because insider trading did not generate abnormal returns with a sufficient level of significance, i.e. trading with insider information will not result abnormal returns. *H2* is also rejected because although CAARs were higher for purchases made by the CEO, they were not statistically significant to draw conclusions about the informativeness of trades made by the CEO. The last hypothesis *H3* is also rejected for statistical insignificance, i.e. the size of the company is not proven to have an impact on the magnitude of abnormal returns.

5 Conclusions

This study examined that whether insider purchases resulted abnormal returns in the Helsinki Stock Exchange. Study focused on the impact of the insider's position within the company and the size of the firm on the level of abnormal returns. Firm size was defined as small-cap, mid-cap and large-cap segments and position was declared between CEO and other positions. Abnormal returns in the days (-5, -1) prior the event were also included as an explanatory variable to account for possible undervaluation of a security.

Previous studies have found that insider purchases generate abnormal returns, there are differences in the size of abnormal returns between insider positions and smaller companies tend to yield higher abnormal returns. Abnormal returns were calculated using an event study, and regression analysis was used for further review. Results suggests that CEO purchases generated positive CAAR (-5, +1) of 0.430% to 3.288% depending on the firm size being the highest in large-cap companies, purchases made my other positions failed to generate positive CAAR. Average Abnormal Returns in period (0, +1) were between -0.508% to 0.866%, small-cap generating the highest AAR and large-cap remained at negative AAR. However, all the abnormal returns were statistically insignificant. Regression analysis revealed that abnormal returns were driven mostly by CAR (-5, -1) in small-cap companies and large-cap companies abnormal returns were driven by CEO purchases. In the mid-cap segment, these variables were practically irrelevant. As in the event study, the results of the regression analysis were all statistically insignificant. Research results in this thesis provide a clear answer, position, firm size and past price movements and insider trading in general do not generate abnormal returns, rejecting all hypotheses.

For future studies, the organisation and quantity of data is important as studies have shown that insider trades are not all equally informative so they cannot be treated as one large dataset to avoid bias. Routine transactions should be weeded out and the scope of data should be extended. Future researchers should closely examine the impact of insider position by breaking it down into more specific categories. Additionally, categorizing transaction sizes is important to determine when the market starts considering a transaction as informative.

References

Aboody, D. – Lev, B. (2000) Information Asymmetry, R&D, and Insider Gains. The Journal of finance, Vol. 55 (6), 2747–2766.

Alldredge, D. – Cicero, D. (2015) Attentive insider trading. Journal of financial economics, Vol.115 (1), 84–101.

Ball, R. (1978) Anomalies in relationships between securities' yields and yield-surrogates. Journal of financial economics, Vol. 6 (2), 103–126.

Bettis, C. – Vickrey, D. – Vickrey, D.W. (1997) Mimickers of Corporate Insiders Who Make Large-Volume Trades. Financial analysts journal, Vol. 53 (5), 57–66.

Betzer, A. – Theissen, E. (2009) Insider Trading and Corporate Governance: The Case of Germany. European financial management: the journal of the European Financial Management Association, Vol. 15 (2), 402–429.

Bonaimé, A. – Ryngaert, M. (2013) Insider trading and share repurchases: Do insiders and firms trade in the same direction? Journal of corporate finance, Vol.22 (1), 35–53.

Brown, S. – Warner, J. (1980) Measuring security price performance. Journal of financial economics, Vol. 8 (3), 205–258.

Brown, S. – Warner, J. (1985) Using daily stock returns: The case of event studies. Journal of financial economics, Vol. 14 (1), 3–31.

Campbell, C. – Cowan, A. – Salotti, V. (2010) Multi-country event-study methods. Journal of banking & finance, Vol. 34 (12), 3078–3090.

Carlton, D. – Fischel, D. (2004) The Regulation of Insider Trading. Economic Analysis of the Law, 201–211.

Cohen, L. – Malloy, C. – Pomorski, L. (2012) Decoding Inside Information. The Journal of finance, Vol. 67 (3), 1009–1043.

De Bondt, W. – Thaler, R. (1985) Does the stock market overreact? The Journal of Finance, Vol. 40 (3), 793–805.

Eckbo, B. – Smith, D. (1998) The Conditional Performance of Insider Trades. The Journal of finance, Vol. 53 (2), 467–498.

Eisenhardt, K. (1989) Agency Theory: An Assessment and Review. The Academy of Management Review, Vol. 14 (1), 57–74.

Fama, E. (1965) Random Walks in Stock Market Prices. *Financial analysts journal,* Vol. 21 (5), 55–59.

Fama, E. (1970) Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance, Vol. 25 (2), 383–417.

Finanssivalvonta, Sisäpiiriluettelot < https://www.finanssivalvonta.fi/finanssisektorin-toimijalle/paaomamarkkinat/liikkeeseenlaskijat-ja-sijoittajat/sisapiiriasiat/sisapiiriluettelot/ >, retrieved 13.3.2024.

Godfrey, M. – Granger, C. – Morgenstern, O. (1964) The random walk hypothesis of stock market behavior. Kyklos, Vol. 17 (1), 1–30.

Grossman, S. – Hart, O. (1983) An Analysis of the Principal-Agent Problem. Econometrica, Vol. 51 (1), 7–45.

Grossman, S. – Stiglitz, J. (1980) On the impossibility of informationally efficient markets. The American Economic Review, Vol. 70 (3), 393–408.

Han, K. – Suk, D. (1998) The effect of ownership structure on firm performance: Additional evidence. Review of financial economics, Vol. 7 (2), 143–155.

Irwin, F. – Puckett, M. (1964) Dividends and Stock Prices. The American Economic Review, Vol. 54 (5), 656–82.

Jain, K. – Jain, P. (2013) Empirical study of the weak form of EMH on Indian stock market. International Journal of Management and Social Sciences Research, Vol. 2 (11), 52-59.

Jeng, L. – Metrick, A. – Zeckhauser, R. (2003) Estimating the return insider trading: A performance-evaluation perspective. Review of Economics and Statistics, 453-471.

Jiang, X. – Zaman, M. (2010) Aggregate insider trading: Contrarian beliefs or superior information? Journal of Banking and Finance, Vol. 34, 1225–1236.

King, M. – Roell, A. – Kay, J. – Wyplosz, C. (1988) Insider Trading. Economic Policy, Vol. 3 (6), 163–93.

Knewtson, S. – Nofsinger, R. (2014) Why are CFO insider trades more informative? Managerial Finance, Vol. 40 (2), 157–175.

Koudijs, P. (2015) Those Who Know Most: Insider Trading in Eighteenth-Century Amsterdam. Journal of Political Economy, Vol. 123 (6), 1356–1409.

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

Lin, J.-C. – Howe, J. (1990) Insider Trading in the OTC Market. The Journal of finance, Vol. 45 (4), 1273–1284.

MacKinlay, A. (1997) Event Studies in Economics and Finance. Journal of Economic Literature, Vol. 35 (1), 13–39.

Malkamäki, M. – Martikainen, T. (1990) Rahoitusmarkkinat. Gummerus Kirjapaino Oy, Helsinki, Suomi.

Malkiel, B. (2003) The efficient market hypothesis and its critics. The Journal of Economic Perspectives, Vol. 17 (1), 59–82.

Modigliani, F. – Miller, M. (1958) The Cost of Capital, Corporate Finance, and the Theory of Investment. American Economic Review, Vol. 48, 261–97.

Modigliani, F. – Miller, M. (1963) Corporate Income Taxes and the Cost of Capital: A Correction. American Economic Review, Vol. 53, 433–43.

Naz, S. – Razaque, S.– Khuwaja, H. – Bhutto, N. (2014) Validity of EMH; A Case Study of KSE-100 Index. Sukkur IBA Journal of Management and Business, Vol. 1(1), 112-126.

Nordic All-Share, List, Tradable and Sector Indexes Version 1.2 <https://indexes.nasdaqomx.com/docs/Methodology_OMXNORDIC.pdf >, retrieved 10.4.2024.

Ricardo, D. (2015) On the principles of political economy and taxation. Cambridge: Cambridge University Press.

Rossi, M. – Gunardi, A. (2018) Efficient market hypothesis and stock market anomalies: Empirical evidence in four european countries. Journal of Applied Business Research, Vol. 34 (1), 183–192.

Schwert, G. (2003) Anomalies and market efficiency.

Sewell, M. (2011) History of the efficient market hypothesis. Vol. 11 (4), 4.

Sewell, M. (2012). The Efficient Market Hypothesis: Empirical Evidence. International Journal of Statistics and Probability, Vol 1, 164.

Seyhun, H. (1986) Insiders' profits, costs of trading and market efficiency. Journal of Finance Economics, Vol. 16, 189–212.

Sharpe, W. (1964) Capital-asset prices - A theory of market equilibrium under conditions of risk. The Journal of finance, Vol. 19 (3), 425–442.

Spence, M. (1973) Job Market Signaling. The Quarterly journal of economics, Vol. 87 (3), 355–374.

Steiger, W. (1964) A Test of Nonrandomness in Stock Price Changes. Vol. 12, 303–312.

U.S. Securities and Exchange Commission, Insider Trading. <
https://www.investor.gov/introduction-investing/investing-
basics/glossary/insider-trading >, retrieved 13.3.2024.

Wang, W. – Shin, Y. – Francis B. (2012) Are CFOs' Trades More Informative Than
CEOs' Trades? The Journal of Financial and Quantitative Analysis, Vol. 47 (4),
743–762.

Yen, G. – Lee, C. (2008) Efficient Market Hypothesis (EMH): Past, Present and Future.
Review of Pacific Basin Financial Markets & Policies, Vol. 11(2), 305–329.

Appendices

Average Abnormal Returns and z-scores in parentheses

	Small-Cap		Mid-Cap		Large-Cap	
Day	CEO	Other	CEO	Other	CEO	Other
-5	0.006	-0.008	0.001	0.004	0.005	0.003
	(0.180)	(-0.320)	(-0.009)	(0.132)	(0.120)	(0.181)
-4	-0.003	0.010	0.004	-0.005	0,001	0.000
	(-0.126)	(0.403)	(0.194)	(-0.245)	(-0.143)	(0.018)
-3	-0.004	-0.0003	-0.004	-9.9E-05	0.000	-0.002
	(-0.230)	(-0.007)	(-0.309)	(0.013)	(-0.189)	(-0.060)
-2	0.003	-0.002	-0.009	-0.008	0.010	0.002
	(0.065)	(-0.053)	(-0.470)	(-0.411)	(0.297)	(0.097)
-1	0.027	-0.017	0.008	-0.013	0.002	-0.002
	(0.173)	(-0.578)	(0.282)	(-0.595)	(-0.086)	(-0.074)
0	0.001	0.006	-0.006	0.002	0.020	-0.007
	(-0.017)	(0.148)	(-0.217)	(0.159)	(0.830)	(-0.221)
+1	-0.001	0.009	0.011	0.008	-0.007	-0.000
	(-0.090)	(0.240)	(0.517)	(0.359)	(-0.540)	(-0.040)
+2	-0.003	-0.003	0.004	0.005	-0.007	0.006
	(-0.207)	(-0.150)	(0.181)	(0.274)	(-0.495)	(0.284)
+3	0.004	0.002	0.002	0.005	0.004	-0.002
	(0.101)	(0.097)	(0.091)	(0.248)	(0.024)	(-0.173)
+4	-0.010	0.006	-0.002	0.004	0.007	0.001
	(-0.561)	(0.344)	(-0.170)	(0.196)	(0.174)	(0.069)
+5	-1,5E-05	-0.003	0.005	-0.005	0.006	0.003
	(-0.05078)	(-0.267)	(-0.068)	(-0.218)	(0.102)	(0.189)