Norwegian School of Economics
Bergen, Fall 2023

When the Rules Change the Game

A Case Study Analysis of Market Reactions to the Implementation of EU's Market Abuse Regulation on the Oslo Stock Exchange

Jesper Farem & Elenius Hansen-Tangen Buvarp

Supervisor: Professor Liam Brunt

Master Thesis, Economics and Business Administration

Major: Financial Economics

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

This paper investigates the short-term abnormal return among primary insiders at the Oslo Stock Exchange following the implementation of the EU Market Abuse Regulation framework. The regulatory changes involve stricter regulation governing market manipulation, false disclosure of inside information, and reporting standards, intending to ensure the financial market's attractiveness in Norway. This study expands on previous literature and provides contributing evidence on how regulatory changes affect the short-term market reaction.

Initially, evidence shows that the abnormal return among primary insiders declines significantly from 4.23% to 2.70% after the government announces the future introduction of the new framework, before declining to 1.04% after the implementation. A decline in short-term market reaction implies fewer opportunities to exploit material non-public information. Further, we observe that the results obtained in our report contradict that the size of the transaction solely drives the abnormal return, as it stipulates that "Medium-sized" transactions lead to greater short-term market reactions. Evidence supports that the ability of primary insiders to achieve abnormal returns is influenced by their position; mainly among "Board Members" and "Executives". We also find that purchase transaction leads to a positive abnormal return in the short term. Conversely, sales transactions often lead to negative market reactions, as other market participants struggle to differentiate between the anticipation of negative updates regarding the firm's performance and actions taken by primary insiders for diversification or liquidity purposes. Lastly, we discuss policy implications, such as alternative investment strategies among primary insiders and the urge to circumvent the regulatory changes, as possible implications to the new EU MAR framework.

Keywords: Primary Insider, Insider Trade, Abnormal Return, Market Abuse Regulation

Acknowledgements

This thesis concludes the final part of our master's degree in financial economics at the Norwegian School of Economics. The process has been an enriching experience and improved our professional abilities.

We want to express our sincere appreciation to our supervisor, Liam Brunt, for his guidance and continuous support throughout the process. His constructive and invaluable feedback has significantly enhanced the quality of this thesis.

Norwegian School of Economics
Bergen, December 2023

Jesper Farem

Elenius Hansen-Tangen Buvarp

Table of Content

List of Figures

List of Tables

1. Introduction

Insider trading is often referred to as the action of buying or selling securities based on material non-public information (Finanstilsynet, 2022). Transactions conducted by primary insiders pose significant ethical, legal, and economic challenges because they might provide insiders with unfair opportunities to obtain abnormal returns.[1] Primary insiders typically have access to sensitive information prior to other market participants; as a result, their trading behaviour can offer valuable insights into the valuation of a firm and thereby cause reactions in the stock price. Previous literature has consistently presented evidence that primary insiders' transactions provide information that impacts the market, with the magnitude of these responses escalating in situations where there is a greater disparity in information (Seyhun, 1986).

The financial market in Norway was governed by the Securities Trading Act until the switch to the EU Market Abuse Regulation (MAR) No. 596/2014 on March 1, 2021. According to Finanstilsynet, the aim was to improve market integrity and ensure the protection of investors, thereby increasing the attractiveness of the Oslo Stock Exchange (XOSL) as a place to list and trade equities. Even though the EU MAR framework has similarities to the Securities Trading Act, it imposes several changes regarding market manipulation, false disclosure of inside information, and reporting standards (Finanstilsynet, 2022). Persons Discharging Managerial Responsibilities (PDMR), also referred to as "primary insiders", and closely related parties, should report their trades to Finanstilsynet within three trading days following their transactions. Additionally, they need to complete a form notifying the number of shares traded, the average share price, their position in – or relation to – the company, whether the trade was conducted at a public trading floor, and the day of the transaction (Lovdata, 2023).

Our initial idea was to see whether stock prices reacted differently to the revelation of insider trades after the new law was implemented. However, the Norwegian government announced the intention to implement the EU MAR framework on November 27, 2020, approximately three months before the actual implementation. We were concerned that the mere announcement of the regulatory changes may have caused insiders to change their behaviour to conform to the new law. In such a case, comparing the stock price impacts of insider trades for the three months before and after the law took effect would underestimate the law's impact

[1] Abnormal return is when a security outperforms its market index or benchmark.

because insider behaviour, and market reaction to it, would already have changed before we started the analysis period. Therefore, we decided to collect data additionally for the period *before* the announcement. This enables us to determine whether the announcement, or the actual implementation of the EU MAR, had the most substantial impact on market reactions to insider transactions and, hence, the abnormal returns enjoyed by primary insiders.

This thesis complements the previous literature along several dimensions. Initially, we believe it would provide valuable information about the current market response to insider trading at the Oslo Stock Exchange. To the best of our knowledge, no other research has delved into the impact a change in regulatory environment will have on abnormal returns at the Oslo Stock Exchange, nor at other Scandinavian stock markets. Additionally, there are only limited studies discussing the short-term market reaction to transactions conducted by primary insiders at XOSL. Lastly, our dataset provides information about the insider's position, the type of transaction, and the significant regulatory change governing the Norwegian stock market. The granularity of our data and analysis therefore provides additional insight into how abnormal returns are a function of the insider's position and type of transaction, and how this evolved in response to specific regulatory changes. This is potentially policy-relevant, as future policy changes should depend on the effectiveness of previous policy choices.

Our analysis mainly follows the event study methodology outlined by MacKinlay (1997). First, we investigate whether primary insiders obtain abnormal returns after the implementation of EU MAR, before comparing it to the periods before and after the announcement of the scheduled implementation of the regulatory changes. To ensure the robustness of our results, we compare our findings to a study by Eckbo and Ødegaard (2019) that examines insider trading returns for men and women on the XOSL for an earlier, but recent period. We then delve into the short-term market reaction to the type of transaction and the position of the primary insider.

1.1. Research Question

To summarise, we will use the best-practice approach given in the finance literature to address our research question:

"How did the announcement and implementation of the EU's Market Abuse Regulation affect the abnormal returns of primary insiders on the Oslo Stock Exchange?"

The rest of the thesis is structured as follows. Section 2 lays out the theoretical framework for conducting the research and the previous literature covering similar topics. Section 3 explains the hypotheses developed for this research. Section 4 gives a brief description of the data applied. Section 5 introduces the methodology applied to implement an event study analysis of insider trades and weaknesses related to the chosen methodology. Section 6 presents the analysis and results found in our report. Section 7 presents the conclusion to our thesis and answers our research question. Section 8 discusses possible limitations of the current study and suggests possible avenues for further research. There are numerous appendices that describe in detail some crucial topics, such as how the data were collected, as well as offering alternative and additional results. We have undertaken several robustness checks and made our analysis as complete as possible; but much of the detail has been relegated to the appendices so as not to distract from the main thrust of our line of research.

2. Theoretical Framework & Literature Review

This section provides a conceptual framework to frame the findings in this thesis. We begin by clarifying the concept of insider trading - discussing both the previous Norwegian regulatory landscape and the nuances of the EU Market Abuse Regulation (MAR) framework, which became effective in Norway on March 1, 2021. Then, we outline theories and empirical studies incorporating lawful insider trading and disparities in information access. A discussion of market efficiency and the dynamics of information asymmetry set the premises for assessing empirical research on insider trading profits, the market's response to insider transactions, and the broader implications of the primary insider's role in the firm.

2.1. Insider Trading and the Regulatory Framework Governing the Oslo Stock Exchange

Insider trading has been analysed in finance and economics for decades. It typically includes the transaction of public financial assets by company insiders or closely related parties - such as executive management, the board of directors, or shareholders with substantial holdings. Insider trading is often categorised into two types: legal and illegal. The critical distinction depends on whether the trade is based on information that is publicly disclosed and available for all market participants or on material, non-public information (Finanstilsynet, 2022). This paper focuses exclusively on legal insider trades conducted by individuals categorised as primary insiders under the EU MAR regulation.[2] Individuals covered under the EU MAR framework often possess information that, when made public, could offer valuable insight into the firm's intrinsic value. Therefore, within legal constraints, primary insiders might execute trades on publicly disclosed information, potentially ahead of market reactions to new data.

Prior to March 1, 2021, the regulation of the Norwegian financial market was governed by the Norwegian Securities Trading Act. With the introduction of the EU Regulation No. 596/2014 on market abuse, significant changes took place, aiming to strengthen market integrity and investor protection (Finanstilsynet, 2022). These objectives align with the long-established goal of enhancing the attractiveness of security markets. The transition to EU MAR brought about key modifications in several areas: it redefined insider information, imposed tighter disclosure requirements, created more comprehensive insider lists, mandated stricter reporting of insider transactions, created harsher penalties and sanctions, and reinforced whistleblower protection (Finanstilsynet, 2021). These changes represent a substantial shift in Norway towards greater regulatory alignment with European Union standards and reflect the commitment to higher transparency and fairness in the marketplace.

Under EU MAR, all companies are obligated to diligently record and report the shareholdings of primary insiders, and related parties who own shares, into a designated system called NewsWeb. The previous legislation states that transactions should be published as promptly as possible and no later than prior to the opening of the Oslo Stock Exchange on the subsequent business day. By contrast, EU MAR stipulates insiders to notify trades exceeding a total value

[2] The category of primary insiders for reporting obligations included members of the firm's administrative, management and supervisory bodies, senior executives with decision-making power, dependent children, spouses, relatives who have lived under the same roof for at least a year, and legal entities managed by primary insiders (EUR-Lex, 2014).

of EUR 5,000 within three business days following the transaction date; in that sense, EU MAR is less transparent than the previous regulation. Perhaps the most notable change introduced by EU MAR is the establishment of procedures for "red periods", thus putting trading restrictions on primary insiders in the period 30 days before the publication of the firm's required and interim financial reports.

The regulatory framework governing insider trading continues to provoke debate, lying at the intersection of ethics, market efficiency and legal enforcement. Proponents of insider trading suggest that it acts as an incentive for managers, synchronising their interests with those of shareholders, potentially reducing the need for shareholders to engage in costly supervision (Easterbrook, 1985). They further argue that insider trades lead to more efficient markets, as they ensure that stock prices more accurately reflect the true value of the firm (Manne, 1966). This contradicts the findings of Wang and Steinberg (2010). They argued that insider trading erodes investor confidence in the credibility of securities markets because it gives insiders the opportunity to exploit superior information at the expense of other market participants. The argument is further extended by conferring an unfair advantage on a subset of market participants. Insider trading may therefore deter uninformed investors from participating and/or entering the market, potentially decreasing market liquidity and, as a result, increasing capital costs for issuers (Bainbridge, 2014).

A nuanced view of insider trading recognises the complexity and importance of a regulatory framework that seeks to balance such concerns. Empirical evidence suggests that robust insider trading laws encourage a more effective stock market, with the effectiveness of the laws being dependent on the quality of the enforcement (Beny, 2005). While some consider insider trading to be contributing positively to market efficiency, its potential to undermine market integrity cannot be overlooked. Thus, a regulatory balance that reduces the damaging impacts while maintaining the benefits for market functionality is essential.

2.2. Efficient Market Hypothesis

The efficient market hypothesis (EMH) is a central pillar in the field of finance that seeks to explain the behaviour of security prices. According to Fama (1970), the EMH assumes that financial markets are efficient in processing information, meaning that all information is promptly incorporated into the asset price and that all information is equally available to all market participants. The theory builds on the hypothesis that all investment strategies will result

in the same return, as it is impossible to obtain consistent positive alpha.[3] Fama (1970) defined three forms of the EMH based on the same basic theory: the Weak Form, the Semi-Strong Form, and the Strong Form.

The weak form of the EMH suggests that all information, except new information that is not yet available to the public, is reflected in the security's stock price. Therefore, previous prices are not relevant for future stock price movements and hence stock prices often follow a random walk (Malkiel, 1973).[4] Thus, in the weak form, it is suggested that it is possible to obtain higher returns than the market by incorporating new information that could influence the stock price. The semi-strong form follows the assumption that all publicly available information is incorporated in the price, and it is therefore not possible to obtain a higher return than the market by using either technical or fundamental analysis. Studies on the semi-strong form examine whether it is possible to obtain abnormal returns by trading on events such as earnings announcements and financial results. Lastly, the strong form affirms that all information, both public and private, is entirely reflected in stock prices. The strong form suggests that even insiders with material non-public information cannot find consistent alphas.

According to the strong form of EMH, all information is incorporated into stock prices, indicating that no group of investors, including primary insiders, should be able to obtain consistent abnormal returns. Thus, if insider transactions were to yield abnormal returns or lead to unusual trading volumes, then such findings would challenge the principle of efficient capital markets in their strong form. Consequently, this thesis will concentrate exclusively on testing the strong form of market efficiency and its implications for insider transactions on the Oslo Stock Exchange.

2.3. Asymmetric Information

Information asymmetry is highly relevant when analysing returns and volume on transactions conducted by primary insiders. Asymmetric information refers to a situation where one party possesses more or superior information than those they are dealing with in a transaction. Hence, we can draw the interconnections between the topics of asymmetric information and insider trading within the framework of EMH. Assuming that the strong form of EMH does not hold,

[3] Alpha is used as a term to describe an asset's possibility to outperform the market or its "edge". It originates from the Capital Asset Pricing Model (CAPM), the standard workhorse model in securities pricing.
[4] The random walk theory argues that stock prices are random, meaning that previous stock price movements cannot be used to predict future behaviour.

corporate insiders possess information related to the inner workings of the firm, while external market participants possess only publicly disclosed information. This disparity potentially offers primary insiders the opportunity to profit from non-public information.

Bhattacharya & Daouk (2022) researched the effect that insider trading laws had on market conditions, finding that they led to reduced information asymmetry and thus significantly reduced the cost of equity in a country. This thesis intends to investigate whether corporate insiders lose the ability to obtain abnormal returns following the implementation of the EU MAR framework, which would imply that insiders have fewer possibilities to trade on material, non-public information. Kyle (1985) delves into the impact that information asymmetry imposes on market dynamics. He found evidence that insider trading can affect stock prices and liquidity in the market. His findings are supported by evidence showing that insider trades convey information to the market, which is not immediately incorporated into stock prices, indicating the presence of information asymmetry (Cohen et al., 2012).

2.4. Profitability of Insider Trades

Many articles cover the topic of the profitability of insider trades, with varying results. Seyhun (1986) discovered, in an analysis of around 60,000 insider trades conducted at the NYSE, significant abnormal returns among primary insiders; the magnitude is related to the size of the transaction and the role that the insider plays in the firm. Additionally, his results of an increase in abnormal returns with the net number of insiders are supported by findings from Jaffe (1974). Both articles suggest that primary insiders, who act on the superior information available to them, can predict future stock price changes. This evidence supports the findings that the use and action of superior information among corporate insiders are leading to profits, which contradicts the strong form of EMH (Finnerty, 1976).

Further studies show that the market reaction to insider trades is positive in the short term, which could indicate that investors interpret insider purchases as a sign of future profitability (Karpoff & Lee, 1991). Nevertheless, there may be differences between purchase- and sales transactions. Franzen et al. (2014) investigated the market reaction to the sale of restricted stock by insiders. They found that sales often lead to negative abnormal returns, especially in the short term, indicating that the market is estimating poorer financial results in the near future. Contradictory findings from Marin & Oliver (2008) showcase how the absence of insider sales transactions could indicate that the corporate insiders are expecting a future downturn in the

firm's stock price. Several studies, such as Lakonishok & Lee (2001), Ke et al. (2003), and Huddart & Ke (2007) among others, conclude that insider selling is not always a negative signal about the firm's future expectations, but often seems to be linked to the diversification of the corporate insiders' portfolios and personal liquidity reasons.

Corporate insider portfolios seem to obtain abnormal returns ranging from 3 to 30 per cent, compared to the market (Lin & Howe, 1990; Seyhun, 1998; Jeng et al., 2003; Pratt & DeVere, 1970). Such research has been conducted on foreign stock exchanges and the available information on the Oslo Stock Exchange is limited. Hvide & Nielsen (2021) showed that Norwegian corporate insiders, sitting just below the top management, are earning more than one per cent per month. These types of trades are covered to a greater degree by the new EU MAR regulation framework, and it would therefore be interesting to see if, and how, this impacts our results. Eckbo & Ødegaard (2019) argued in their paper that there would likely be an insider market in Norway since it is such a small community, but they didn't find any evidence of differential results compared to other countries.

2.5. Short-Term Market Reactions Following Insider Trades

Previous studies examining the effects of insider trading mainly focus on the long-term effects, and not on the immediate consequences following an inside trade. These studies often examine whether insiders can obtain excess returns by trading on sensitive information not available to the public. By investigating the long-term impact following insider trades, past literature has found evidence suggesting the abnormal returns obtained by insiders endure those observed following the disclosure of company news. Further, their findings indicate that the trades themselves are contributing to the observed excess returns obtained by insiders (Givoly & Palmon, 1985). Past literature provides a good overview of the obtained abnormal returns of insiders but does not adequately explain the short-term market reactions. The reason for limited research on this topic may be explained by the lack of regulation covering the topic of mandatory reporting for insider trading in the past. Insider trading and reporting requirements have recently become significantly tighter, where mandatory and immediate reporting of inside trades enables us to analyse the short-term impacts of insider trades.

A study conducted by Aktas et al. (2008) examined short-term market reactions to insider trading. They find a positive cumulative average abnormal return for insider trades but,

although statistically significant, the economic response to these trades is modest. With a 5-day event window [0, 4] their results are 0.417% for purchases and 0.225% for sales. An interesting observation presented in this study is that larger transactions appear to have a greater impact on the stock price. However, a study examining short-term effects on the LSE found that insider trades made by company directors have a significant positive abnormal return (Fidrmuc et al., 2006). They observed a favourable abnormal return of 1.65% for all purchase transactions. Further, they found contrasting results for sales transactions, where the abnormal return was statistically negative at -0.49%. This study confirms the trend of larger trades having a greater impact on market reaction. Givoly and Palmon (1985) found results in their study suggesting that the abnormal returns are higher in the short term. They find that inside trades that are not followed by disclosure of company news, have an abnormal return of 3.01% with a holding period of the first 19 days, compared to 1.38% in the following 40 days. This indicates that the market initially reacts strongly to inside trades, but the impact appears to decrease over a longer time period.

Purchases by insiders have a significant positive abnormal return. But what about sales transactions? Some studies find positive abnormal returns, while others find negative. Again, we find that transaction size has a large impact on how the market reacts to insider trades. It is important to specify that these studies are conducted on larger stock exchanges and are not necessarily transferable to the Oslo Stock Exchange.

2.6. Position Held by the Primary Insider

There are few studies that examine the market reaction to insider trading, specifically considering the insider's roles within the firm. Seyhun (1986) argues that insiders with a better understanding of the firm's operation are trading on more valuable information. This implies that insiders in higher positions within a firm, which are usually linked to increased access to sensitive and valuable information, have a greater influence on the stock price. Therefore, trades made by the top executives are expected to generate greater abnormal returns compared to other insiders.

A study conducted by Jeng et al. (1999) investigates the differences in obtained returns based on the insiders' position within the firm. The study segregates the insiders into three groups: top executives, officers, and directors. This study utilises three different models where they observe similar trends across all three. They find only insignificant differences for sales

transactions. However, for purchases, they find that officers and directors obtain statistically significant abnormal returns. On the other hand, top executives have no significant abnormal returns across either of the models. Similar results were found by Fidrmuc et al. (2006), who actively investigated the difference in abnormal returns based on managerial responsibilities within a firm. They find that there are statistical differences between abnormal returns for purchases made by CEOs and former directors at the 5% level. Further, they find significant differences between "Other Directors" and "Former Directors" at the 10% level. However, the market reacted most strongly to trades from insiders in the group "Chairmen", but they unexpectedly observed that the market response to trades conducted by CEOs was the weakest among the groups. This contradicts the hierarchy hypothesis, which stipulates those trades made by directors with more knowledge of the day-to-day operation, trade on more valuable information. The study further uncovered significant differences in sales between current and former directors, at the 10% significance level. Furthermore, the market does not appear to react significantly differently to sales, based on the insider's position.

There are contradictory results from previous research regarding how the primary insider's role within a firm affects the market reaction. However, it is reasonable to assume that the more sensitive information an insider has available due to his position, the stronger the market will react to his trades. Previous studies examine only a small group of company insiders. It would be interesting to compare managers' and directors' impact with other insider positions to potentially gain a greater insight into the true impact of the insiders´ role on market reaction.

3. Hypotheses

The implications of Chapter 2 are that primary insiders often possess information that allows them to predict future stock price changes ahead of other market participants. The literature examines both the short- and long-term effects of insider trading. Evidence suggests that corporate insiders tend to achieve abnormal returns in the extended period following their transactions. However, previous literature also states a divergence in results when examining the short-term reaction. Specifically, the impact of sales- and purchase transactions appear to display significant distinctions in the short term.[5] Given abnormal returns among primary insiders, it is natural to assume that the announcement of their trades has a strong influence on

[5] Previous literature investigating long-term market reactions are also considering the various impacts of purchase- and sales transactions, but the results indicates that there is larger discrepancies between purchase and sales transactions in the short-term.

stock price movements. This should, according to the EMH, result in short-term market reactions. Limited research has been conducted on the Oslo Stock Exchange, and it will therefore be interesting to see whether primary insiders in Norway are able to obtain abnormal returns or if other results occur. Thus, we would like to test the following hypothesis:

Hypothesis I: *Primary insiders are obtaining abnormal returns on the Oslo Stock Exchange.*

A well-regulated framework could have a substantial impact on the effectiveness of the stock market. As the main purpose of this thesis is to see whether the EU MAR framework impacted the abnormal return among primary insiders, it will be interesting to compare the results before and after the announcement of the implementation of the regulatory changes. Prior to the implementation of the EU MAR framework, the regulatory landscape in Norway was less stringent. Stricter reporting and transparency requirements can impact primary insiders' potential to gain abnormal returns, and it will therefore be vital to examine the effect of the announcement and implementation of the new regulations. "Red periods" is a vital aspect of the new regulation, stipulating that primary insiders are restricted from trading 30 days prior to interim- and financial reports. Additionally, a recent study found that the primary insiders below the top management, in companies listed on the Oslo Stock Exchange, are obtaining abnormal returns far greater than the remaining groups. This is more strictly regulated under the new framework, and we have therefore developed our second hypothesis:

Hypothesis II: *Primary insiders obtain lower abnormal returns on the Oslo Stock Exchange following the implementation of the new EU Market Abuse Regulation.*

We believe that it will be interesting to examine if the size of the transactions affects the short-term market reaction. It is reasonable to assume that the size of the transaction will affect other market participants' perception of the trade, regardless of whether it is a sale or a purchase. Previous literature supports this assumption and provides evidence of higher abnormal returns for larger transactions. Therefore, we would like to investigate if this holds on XOSL:

Hypothesis III: *Large transactions are leading to stronger short-term market reactions at the Oslo Stock Exchange.*

The literature suggests that insiders, who have gained a better understanding of a firm's operation, could have a greater effect on the stock price. Such studies from Seyhun (1986) and Fidrmuc et al. (2006), indicate that the "Board Members" and "Executive Managers" have the largest impact on the market reaction. It is therefore intriguing to investigate if the market reaction is affected by the role of the primary insider and if this outcome is affected by the regulatory changes. We have divided the different roles in our study into the following categories: "Board Member", "Executives"[6], "Directors & VP"[7], "Other"[8], and "Related Parties"[9]. The following hypothesis aims to test for this:

Hypothesis IV: *The position held by the primary insider affects the short-term market reaction to insider trades conducted at the Oslo Stock Exchange.*

The last topic of interest is to investigate differences between the short-term reaction to sales- and purchase transactions. As the assumption is that primary insiders are expecting improvement in future performance when purchasing stocks, while sales might indicate poorer results, it could be vital to see if there is a noteworthy difference between them. Additionally, information obtained from investigating the differences between sales- and purchase transactions could provide substantial information to understand the results received when examining the abnormal return. To better understand what drives the abnormal return in a positive or negative direction, we would like to test the following:

Hypothesis V: *Abnormal returns from trades made by primary insiders at the Oslo Stock Exchange are greater for purchase transactions.*

4. Data Description

The subsequent chapter will describe our data collection procedure and the method of gathering and filtering the data. We explain the assumptions made, the filters we applied during the data cleaning process, and the methodology used to obtain our final datasets. Initially, we will present our process of obtaining the insider trading data before we investigate the stock price

[6] All primary insiders with "Chief" in their title, i.e., CEO, CFO, CMO, and so on.
[7] All primary insiders with "Director" or "Vice President" in their title, i.e., Marketing Director, Vice President of EMEA, or similar.
[8] All primary insiders not covered by the other categories, such as Manager, Legal Counsel, Strategic Advisor, or similar.
[9] Related parties refer to all trades conducted by people closely associated or related to a primary insider in the firm.

data. Finally, we summarise our process and explain our decisions, before presenting a statistical overview of the collected data.

4.1 Primary Insider Data

The insider trades conducted in our time period were manually retrieved from NewsWeb, a platform publishing all reported trades made by primary insiders on the Oslo Stock Exchange. NewsWeb presents the data as string text and includes details of each insider trade executed on the exchange.[10] To ensure accuracy, we methodically extracted all trade information manually by hand over our three distinct time periods. Each of the mandatory trading reports contained the transaction- and announcement date. Further, they include the specific stock that was traded, share price, volume traded, currency, position held by the insider, whether the trade was a sale or a purchase, and the primary insider's holding post transaction.[11]

We started by gathering all trades done in a 6-month period before the announcement of the scheduled implementation of EU MAR, from May 27, 2020, to November 27, 2020. Then, we collected all reported trades done between the announcement and implementation day, from November 28, 2020, to February 28, 2021. Lastly, we extracted all insider trades conducted after the implementation of EU MAR, from March 1, 2021, to June 1, 2023. The reason for limiting the last period to June 1 is attributed to a minor change in the EU MAR regulation, effective from that date.[12] Hence, we wanted to exclude potential effects from this change to skew our results.

To ensure the consistency of our analysis, we have only included trades that were conducted on the Oslo Stock Exchange and that were made in Norwegian kroner (NOK). The exclusion of trades not conducted in NOK or at XOSL is limited to three observations and the choice will not affect the results. In addition, by setting this limit, we address implications related to exchange rates and currency conversions. This adjustment aligns with the new EU MAR regulation, which mandates reporting for trades exceeding EUR 5,000 (Finanstilsynet, 2022).

[10] See appendix section D.1 and D.2 for visual presentation on trades reported at NewsWeb.
[11] Appendix section D.3 presents the template for reporting of inside trades.
[12] The regulatory changes to EU MAR after June 1, 2023, include: a minor change in the issuer's publication deadline for inside trades, and a new exemption from market probing regime on certain placement of bond loans (Sæhle et al., 2023).

Our analysis focused exclusively on insider trades carried out within companies that are currently active issuers, which might create a survivor bias, but will ensure that the companies included in our analysis follow the same requirements.[13] The raw observations for all the periods were 1,720 insider trades. We excluded trades valued lower than NOK 75,000, based on the assumption that small trades have little to no impact on the stock price.[14] Nevertheless, we believe this limit will remove mainly insignificant trades, whilst still leaving a sufficient number of observations for our analysis.

When examining our data, we observed four trades with extreme values. It is important to be aware of these extreme observations and the possibility of them disrupting our results. The previous literature argues that outliers can lead to less accurate regression fitting. Nevertheless, if they are to be removed, we could end up not considering important information regarding the effect of the event (Sorokina, et.al., 2013). There are multiple options to handle or adjust for extreme values. In our case, we have chosen to compare the results with and without the largest outliers, where we observed similar trends and have therefore retained the outliers in our final analysis.[15]

To further guarantee a more balanced dataset, we have excluded all reported trades that were made through a program or at a discount. This includes employee share purchase programs, private placements, IPOs, mandatory offerings due to takeover bids, and executive remuneration. Our goal is to identify the effects the implementation of EU MAR has on the abnormal returns on inside trades. Therefore, it is important that all trades included in our analysis are conducted under the same conditions.

4.2 Historical Stock Price Data

Individual stock price data were collected for all stocks traded by primary insiders within our timeframe. The data were collected from Yahoo Finance and Refinitiv Eikon. For all stocks

[13] The survivor bias refers to a situation where the researchers have ignored or excluded some observations that didn't pass a certain "selection process". In this instance, it refers to the situation of only including trades in companies that are currently active issuers at XOSL.
[14] Appendix B.1 shows that CAARs below NOK 75,000 are not statistically or economically significant. The table illustrates that the CAARs are ranging from -1.01% to 1.15%.
[15] In appendix section A.1, a table is presented to illustrate the results for the adjusted CAAR. These results have been adjusted for extreme values, where our largest outliers are removed.

traded, we gathered the closing price adjusted for dividends and stock splits, as well as the volume traded for each day during the time period. To be able to calculate the turnover, we have further collected the number of outstanding shares and market capitalisation for trades conducted after the implementation of EU MAR.

MacKinlay (1997) argues that the utilisation of the market model allows for a reduction in the variance of the abnormal returns, thereby increasing the ability to detect event-specific effects. Further, he explains the need for a broad-based stock index. The index enables us to calculate the abnormal return of insider trades. The market index serves as a benchmark for "normal" or "expected return", which is compared to the return of insider trades. As we examine abnormal returns of primary insiders on the Oslo Stock Exchange, our choice of index was the Oslo Børs All Share Index (OSEAX), which includes every share traded on the Oslo Stock Exchange. OSEAX is adjusted for dividend and capital events. The calculations of abnormal returns were done for all three time periods, where we used the averages of prior returns on the OSEAX as the benchmark.

With the intention of adjusting our stock price data to exclude non-trading days on the Oslo Stock Exchange, we adjusted the reporting delays to only count active trading days, which prevents an inaccurate higher mean.[16] This implies that information can leak over the weekend, but is still included in our analysis, to reflect on the fact that more information may have leaked from the close on Friday to the opening on Monday. Additionally, to categorise the companies into industry sectors, we have used the same classifications as Euronext (Euronext, 2023). Due to a lack of observations in some of the sectors, which might lead to insufficient results, we merged some of the industries. Table 1 illustrates our adjustment to the industry sectors included in our analysis.

[16] Oslo Stock Exchange is not open to trading on the weekends. This is adjusted for by not taking Saturdays and Sundays into account when calculating delays for reporting of trades, only active trading days count.

Table 1: Industry Specifications

Table 1 provides the consolidated industries derived from the Oslo Stock Exchange industry categorisation. We have merged the 11 industry categorisation to six broader industries.

Finance	**Industrial**	**Consumer**	**Energy**	**Healthcare**	**Technology**
Finance	Industrial	Consumer Discretionary	Energy	Healthcare	Technology
Real Estate	Basic Materials	Consumer Staples	Utilities		Telecommunication

4.3 Descriptive Data

Table 2 presents a descriptive overview of data on insider trades made on the Oslo Stock Exchange from March 1, 2021, to June 1, 2023. The table displays the characteristics of the transactions divided into purchases and sales. We can evidently state that the quantity of purchases far outweighs the quantity of sales. Lakonishok & Lee (2001) argue that insiders may sell their shareholdings when in need of diversification or liquidity, and this can explain the large results discrepancy between the transaction types. From the table, we observe that the transaction size clearly differs from sales to purchases. Both the median and mean values of transaction size are higher for sales transactions. Trades are usually reported within one trading day. However, there are instances where there are reporting delays of up to 280 days. It appears that insider sales are conducted in companies with a larger market cap. When manually collecting the data, we noticed that sales transaction often was triggered by people leaving the firm, as they sold most or all of their holdings. This may explain the size differences in transaction value between sales and purchases.

Table 2: Descriptive Statistics

Table 2 provides a summary of the descriptive statistics for Market Capitalisation (in mNOK), Daily Traded Volume ('000s), Daily Turnover, Transaction Value, and Notification Delay (number of days from the trade took place to the notification was published in NewsWeb) for both purchase and sales transactions on XOSL.

	Mean	Median	SD	Min	Max
XOSL Purchase (*N = 1,005*)					
mCap	9,693	1,959	27,483	2.676	385,940
VOL	1,691	470.878	6,229	0.000	107,924
Transaction Value	4,034	487.909	16,424	75	301,786
Delay	0.833	0.000	11.428	0.000	280
Turnover	0.00362	0.00028	0.27694	0.000	0.67531
XOSL Sale (*N=177*)					
mCap	19,675	2,555	52,229	162.279	342,327
VOL	1,703	426.277	3,025	0.000	22,578
Transaction Value	19,797	1,856	55,273	75.239	363,978
Delay	1.073	0.000	7.099	0.000	87
Turnover	0.01015	0.00075	0.02997	0.000	0.20315

Figure 1 presents descriptive data for both purchases and sales conducted in the period between March 1, 2021, to June 1, 2023. It showcases the distribution based on the transaction date, transaction size, role of the insider, and industry in which the trades are made. The chart indicates no systematic pattern of the month in which the trades took place. However, we observed low inside trading activity in January and a larger number of purchases conducted in May. This is partly explained by our timeframe, where the month of May happens to occur three times instead of two. When analysing the distribution of transaction size, we have contrasting patterns for sales and purchases. Purchases appear to be conducted at a higher frequency in "small" and "medium" trades, while sales transactions consist of mostly "large" transactions. There seems to be a fairly even distribution of sales transactions across the different industries. The industrial sector has considerably more purchases than any other industry. There are also significantly fewer purchases within the healthcare sector. The remaining four industries have a similar number of purchases. The chart illustrates that insider trades are driven by the transactions of board members. This group is responsible for more than half of all observed trades. There also appears to be a notable number of trades made by executives, while the number of transactions conducted by "related parties" and "others" is small.[17] When excluding trades valued below NOK 75,000, we omit a lot of trades conducted by insiders outside the two most prominent groups.

[17] When running a Chi-squared test to see whether the monthly observation is significantly different from the monthly observations for the entire dataset, we find that "Transaction by Month", "Transaction by Size", and "Transaction by Industry" are statistically significant at a 1% level.

Figure 1: Distribution of Transactions

The figure provides an overview of all transactions registered on XOSL throughout the period of 01.03.2021 – 01.06.2023. The data is sorted on the time of the transaction, the size, industry, and the role of the primary insider. The size of the transaction is sorted on the following criteria's: small transaction volume falls within the range of NOK 75,000 – NOK 300,000. Medium transaction falls within the range of NOK 300,000 – NOK 1,500,000 and large transactions are above NOK 1,500,000. The sector categorisation is further explained in Table 1.

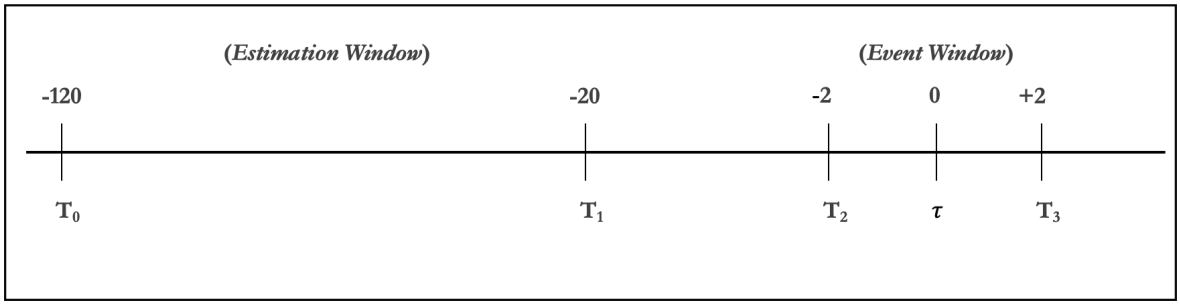
5. Methodology

This chapter explains the methodology employed to investigate abnormal returns and market reactions to insider transactions conducted at the Oslo Stock Exchange, and if the primary insider's abnormal return is affected by the implementation of the EU MAR framework. In the first section, we present the event study methodology used in our analysis, defining the chosen events, event windows, and estimation windows. Note that the selection criteria, also covered in Mackinlay's paper, are explained in section 4. Then, we will expound on the approach used to measure abnormal returns. In the second section, we present the methods used to test for robustness and we elaborate on how we have ensured a reduced covariance. In the last section, we discuss the weaknesses of our chosen methodology.

5.1. Event Study Methodology

The methodology chosen for this thesis, primarily derived from the framework outlined by Mackinlay (1997), has been employed to examine hypotheses I-V. Financial theory suggests that all available information about a company is reflected in the firm's stock price. Following this premise, it is possible to examine the short-term market reaction to changes in regulatory framework, mergers and acquisitions, earning announcements, or similar events (Mackinlay, 1997). This thesis focuses on investigating the stock price behaviour around the announcement of trades conducted by primary insiders on the Oslo Stock Exchange and examine the market reaction to the implementation of the EU MAR framework, by comparing the stock performance before and after both the announcement and the actual implementation of this regulatory change. The three general assumptions outlined by Brown & Warner (1980) state that: i) the return of the stock, within the event window, correctly reflects the financial impact of the event; ii) there is an unscheduled event whose impact is not incorporated into the price of the security; and iii) the event is not impacted by other events occurring at the same time. Figure 2 illustrates the timeline for our event study:

Figure 2: Timeline for Our Event Study



where,

$T_0 - T_1$ denotes the estimation window spanning 100 trading days.

$T_1 - T_2$ denotes the interval between the conclusion of the estimation window and the commencement of the event window.

$T_2 - T_3$ accounts for the event window of 5 trading days, where τ denotes the event date.

5.1.1. Defining Events

The initial phase of the event study methodology involves defining the events to be analysed (MacKinlay, 1997). In this thesis, we will investigate all individual trades conducted by primary insiders at the Oslo Stock Exchange. We can conclude that the exogenous premise seems valid, given that the insider trades are not planned events.

5.1.2. Defining Event Windows

As argued by MacKinlay in his paper from 1997, the event window is often expanded to several days around the event date, to capture the price effects of announcements. He argues that it will be valuable to include days before and after the event, as the market could acquire information about the insider trades before the announcement is made publicly known and it could take time for other market participants to interpret the informational content of the trades. This could be either a leakage of information from primary insiders to close associates or a lag in the market reaction. Further research suggests that the length of the event window is crucial when investigating insider trades, as these trades are often reported with a greater lag (Lakonishok & Lee, 2001). It could therefore take several days before the market reacts to the transaction of insider trades. As previously explained, primary insiders were obligated to report their transactions promptly and no later than the opening of the next trading day under the old regulatory regime; but they are obligated to report the trades within three business days under EU MAR. When manually retrieving the data from NewsWeb, we noticed that the trades are

reported with a lag of between 0 and 280 days.[18] Consequently, trades that are reported with a lag exceeding the required three days, are excluded from the analysis. Further, the main event window includes two days prior to the announcement, to capture possible leakages that might have occurred. Thus, the event dates used in this thesis range from -2 to +3 days.

5.1.3. Construction of Estimation Window

The estimation window is used as a tool to anticipate the expected return in the absence of the analysed event. MacKinlay (1997) argues that the most common approach is to use days prior to the event and stipulates that including the event in the estimation window could lead to biases in the results. The inclusion of several observations will contribute to a reduction in variance when calculating the cumulative abnormal return, and we have therefore decided to include 100 days, in the interval [-120, -20], before each event. Even though MacKinlay (1997) suggest that the number of observations should not be too narrow, it should also not be too comprehensive, because this might lead to the chance of including confounding events in the estimation window.

5.1.4. Measuring Abnormal Returns

To investigate whether primary insiders can obtain abnormal returns on the Oslo Stock Exchange, we need to calculate both the daily and the normal returns. We can then subtract the normal from the daily return, to measure the abnormal return.

5.1.4.1. Calculating Returns

We use the percentage change in the closing price for every day in the event window as a measure of the daily returns. The decision to apply the arithmetic return is based on findings from Brown & Warner (1985), stating that it will simplify the aggregation of returns for multiple different stocks. Therefore, we use the following equation:

(1)

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

[18] There are seven trades with delays exceeding the mandatory reporting period, and they are ranging from 7 to 280 days. The size of transactions among the delayed trades are NOK 78,848 – 1,316,130. To the best of our knowledge, nothing particularly happened during this period and the reason for why it happened is therefore unknown. Nevertheless, one of the instances did notify NewsWeb about the delay with the following message: "As a result of a misunderstanding, the notification of the transaction is only issued today. An overview of the transaction is provided below" (NewsWeb, 2022). No one got prosecuted.

where,

R_{it} denotes the return (in percentage) of firm *i* on day *t*, while P_{it} denotes the closing price of firm *i* on day *t*, and P_{it-1} denotes the closing price of firm *i* on day $t-1$.

5.1.4.2. Modelling Normal Returns

MacKinlay (1997) argues in his paper that there are several approaches to modelling the normal return, mainly divided into statistical and economic. We calculate the normal return with the use of the market model. The market model posits a consistent linear relationship, linking the market return and the specific security. As it serves as a statistical single-factor model, it eliminates returns related to the variation in the market, thus reducing abnormal returns and thereby seizing the full effect of the events (MacKinlay, 1997). A paper investigating the effects of various methodologies for event studies found that, if the day of the event is uncertain then, the market model would be the most appropriate approach (Dyckman et.al., 1984). We therefore conclude that, in the instance of primary insider transactions, the market model will provide the most sufficient estimate. Thus, we use the following equation to model the normal returns for firm *i*:

$$E(R_{it}) = \alpha_i + \beta_{it}E(R_{mt}) \tag{2}$$

where,

R_{it} denotes the return for firm *i* at time *t*, while R_{mt} is the return for the market *m* at time *t*.

To estimate the beta (β) and alpha (α) coefficients, we use the least squares method, minimising the sum of squared deviations in the value of the stock of firm *i* and the market index. We are using the Oslo Børs All-Share Index (OSEAX), as it represents all shares traded at XOSL.

5.1.4.3. Measuring Abnormal Returns

Abnormal return serves as a metric for assessing the impact of each event. By simply subtracting the expected return from the normal return, we obtain the abnormal return for the given event. Hence, the following equation is applied:

$$AR_{it} = R_{it} - E(R_{it}) \tag{3}$$

where,

AR_{it} denotes the abnormal return for firm *i* on day *t*, R_{it} denotes the normal return, and $E(R_{it})$ denotes the expected return.

As previously explained, we are investigating the abnormal return over a period that spans several days. To see the full effect of the insider trade, we look at the days preceding and following the announcement, thereby obtaining the Cumulative Abnormal Return (CAR). The CAR is determined by aggregating the returns for firm *i* on date *t* over the event window. Thereby, we have the given equation:

(4)

$$CAR_i[T_3, T_4] = \sum_{t=T_3}^{T_4} AR_{it}$$

Lastly, to see the full effect of the events for each of the given event windows included in our analysis, we have to find the Cumulative Average Abnormal Return (CAAR). CAAR is found by taking the average of all CARs obtained with the same event window (MacKinlay, 1997). Equation 5 demonstrates the method used:

(5)

$$CAAR_i = \frac{1}{N}\sum_{i=1}^{n} CAR_i$$

5.1.4.4. Significance Testing

To test H_0, and the significance of the average market reaction, we use a parametric test (MacKinlay, 1997). The parametric test operates under the assumption that the abnormal return of each event follows a normal distribution, resembling an adjusted t-test.

(6)

$$\theta_1 = \frac{CAAR(T_3, T_4)}{\sqrt{var\big(CAAR(T_3, T_4)\big)}} \sim N(0,1)$$

5.2. Robustness Tests

To ensure the robustness of the results, we implemented three strategies. First, in all analyses estimating the abnormal return among primary insiders, several event windows are applied. By using more than one event window, we can compare the impacts that materialise over varying time horizons. We can thereby detect both immediate and delayed market reactions. As previously explained, it might take time for the market to fully understand and interpret the information after the announcement of the insider trade, but the risk of not capturing such events is reduced with this approach. Additionally, we can reduce model risk by applying several event windows, as one event window might not capture the full effect of the events.

Second, we wanted to ensure that the results obtained in our analysis were statistically and economically significant. The F-test is used to compare the variances of two populations. We have used the F-test to investigate whether the variability of results found before the announcement, after the announcement, and after the implementation, are statistically different from each other. In our case, we can see whether the abnormal return is significantly different between the three periods. This can indicate changes in market behaviour or volatility. Therefore, it would be decisive to determine if the majority of the effect from the EU MAR arose from the announcement or the implementation of the framework.

Third, to ensure that our findings are comparable to other studies covering the same topic at the Oslo Stock Exchange, we adjusted our event window to mimic Eckbo & Ødegaard (2019). Their analysis is mainly focused on looking into the trading performance of male and female insiders. Nevertheless, by taking their findings from both genders and multiplying with the number of observations for males and females separately, before dividing it by the total observation, we were able to compare their results with our findings to check for consistency.

5.3. Weaknesses

It is important to be aware of weaknesses in our choice of methodology and what implications this might entail. In this section, we therefore delve into potential weaknesses of our methodology and any possible biases that we should be aware of.

A longer estimation window would lead to more reliability in our results but could accidentally include confounding (extraneous) events that could skew our results. Thus, we have chosen a

relatively short estimation period (MacKinlay, 1997). Another potential weakness is the time period examined for insider trades. They may have been affected by external factors; this is especially true of the earlier trades in our sample period, which could have been influenced by the aftermath of Covid-19. Transactions made in volatile times may cause extreme returns and could lead to bias in the estimated normal distribution. We spent some time looking at large outliers in order to lay this concern to rest.

In event studies, there is always a concern about clustering. In our case, the assumption of zero covariance between the return of stocks does not hold due to the magnitude of transactions in the event. To a certain degree, you can anticipate that insiders in two completely different companies will trade independently of each other, but you cannot determine the same independence for the cross-section of stock returns over a short period in the event study. Clustering is the lead cause of two problems. First, each event date with positively correlated market model residuals across companies will cause an increased variance. Second, according to Brown & Warner (1980), you would discard the null hypothesis too often if the firm-specific abnormal returns are positively correlated.

A noteworthy weakness to be aware of, is that our results are based on adjusted closing prices, where the stock prices are only obtained at a 24-hour interval, which is represented by the last sold stock for each given day. This is mentioned by MacKinlay (1997), and known as the nonsynchronous trading affect, and can introduce biases into the market model. On the other hand, MacKinlay (1997) further argues that this assumption does not hold for actively traded stocks and should therefore not be an issue in our case.

Our study is based on manually registered and gathered data, which can incorporate human errors, both from the people reporting the trades and when we manually extract the information. Even though this method is frequently used, it is a method that is vulnerable to mistakes, which can decrease the precision of our data. Depict the fact that the extraction of data is done carefully, it is difficult to ensure the quality of all the data due to the quantity of observations. However, intending to strengthen our obtained dataset, we have rechecked a random sample of 5% of our collected trades and investigated if there were any errors during the extraction. The collection error found during this process was zero, which implies a reliable dataset that contains few errors. Although this method highlights the accuracy of the extracted data, it does not validate the reports themselves, where errors could have occurred by people submitting the

reports. Additionally, some reports go unreported which causes unwanted omitted observations, and further weakens our data.

6. Analysis

This section presents the results of our event study. We answer the hypotheses chronologically, each with its own section. First, we analyse the CAAR for primary insider trades conducted in the period after the implementation of the new regulatory framework, to estimate the short-term market reaction. Second, we investigate the difference in abnormal returns before the announcement and after the implementation, to determine whether the regulatory changes of the EU MAR framework had an impact on primary insiders' abnormal returns. Third, we examine whether the transaction size impacts the short-term market reaction. Fourth, we investigate the position of the insider and the type of transaction, to see if the market reacts differently to different insider trades. Lastly, we investigate possible policy implications that follow the implementation of the regulatory changes.

6.1. Short-Term Market Reactions to Insider Trades After EU MAR

Table 3 provides an overview of abnormal returns obtained by primary insiders on the Oslo Stock Exchange in the period from March 1, 2021, to June 1, 2023. The sample includes only trades above NOK 75,000 conducted as a public transaction on XOSL. Panel A provides an overview of the entire sample and classifies the trades as "Small", "Medium", and "Large". "Small" transactions include all trades below the total value of NOK 300,000, "Medium" transactions include trades in the interval NOK 300,000 to 1,500,000, and "Large" transactions refers to those exceeding NOK 1,500,000.

The findings reveal the market's response to insider trading in various event windows. Each transaction size category demonstrates statistically significant abnormal returns post-event, suggesting that insider trades, regardless of size, are perceived positively by the market. Other market participants appear to perceive these trades as an indication of the primary insiders' confidence in the firm's prospects and future performance. The abnormal returns are all positive, ranging from 0.33% for small transactions in the period [-2, 0] to the highest abnormal return in [-1, 2] for medium transactions of 1.74%. Hypothesis I, stating that transactions by primary insiders generate abnormal returns on the Oslo Stock Exchange, is strongly supported

by these results. Upon closer examination, the table illustrates an observable pattern of diminishing CAARs as the event includes days before the announcement. This is particularly evident for large transactions, where CAARs decrease from 0.78% in the [0, 0] window to 0.19% in the [-2, 0] window. Nevertheless, such observations are not found for the medium transaction, where the abnormal return remains unchanged from the window [0, 0] to [-2, 0]. When looking at the opposite direction, we can see that in all cases, both for the entire data set and for the various transaction sizes, the abnormal return increases when including the following trading day of the announcement. Such an observation could indicate that the market is using some time to assimilate the information conveyed by insider trades. This could be due to the fact that insiders often report their transactions at the end of the day, which could cause a delay in market reaction.

Note the consistently high abnormal return for medium-sized transactions across all event windows. This might suggest an optimal balance between the perceived credibility of the insider's actions and the trade's informational content, which could lead to a sustained market adjustment. Smaller transactions don't seem to affect the stock price to the same extent as medium- and large transactions. However, in the event window [0, 1], we can observe a significant economic and statistical market response at the 1% level. Overall, the results underscore the market's sensitivity to insider transactions and affirm the need for a critical investigation of the trading activities of primary insiders and the regulatory framework.

Lastly, from Table 3 we can see from the main event window of [-2, 2] that the overall abnormal return for the entire dataset is significant at a 1% level. Even though the abnormal return is greater in other event windows, the results are still substantial, as primary insiders are obtaining 1.04% more than the market. Small transactions are positive and of economic impact, but not significant at any level. However, both medium and large transactions do show a substantial positive abnormal return that is significant at a 1% and 5% level. Based on these findings, our first hypothesis, that primary insiders obtain abnormal returns, appears to be valid and we cannot reject our hypothesis.

Table 3: Cumulative Average Abnormal Return

Table 3 presents the Cumulative Average Abnormal Return for all insider transactions surrounding the event date, categorised based on the transaction size. The sample comprises all trades registered in NewsWeb from 01.03.2021 to 01.06.2023 with a transaction value exceeding NOK 75,000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model is employed to calculate β using an estimation window of [-120, -20]. To minimise covariance, insider trades occurring on the same day within the same firm are excluded from the analysis. Panel A reports all transactions conducted before the implementation of EU MAR on 01.03.2021.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Implementation								
All	0.79%***	1.34%***	1.25%***	1.22%***	1.20%***	0.54%**	1.08%***	1.04%***
(N = 997)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Small	0.53%**	1.15%***	0.95%**	0.65%*	0.71%*	0.33%	0.72%**	0.59%
(N = 346)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Medium	1.09%***	1.57%***	1.69%***	1.74%***	1.66%***	1.09%**	1.57%***	1.62%***
(N = 331)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Large	0.78%***	1.31%***	1.13%***	1.31%***	1.25%***	0.19%	0.95%*	0.90%**
(N = 320)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6.2. Abnormal Returns Before and After the Implementation of EU MAR

The previous table provided a strong basis to pursue a more in-depth analysis of the impact of the EU MAR framework. We were solely looking at the short-term market reaction to insider transaction after the implementation of regulatory changes. Nevertheless, to ensure that the implementation had an effect, we must look at how the results resemble findings from before and after the announcement of the EU MAR framework. Panel A provides us with information about short-term market reactions before the Norwegian government announced that it would implement the EU MAR framework. Panel B reports the findings for the period between the announcement and the implementation on March 1, 2021. Lastly, Panel C reports the abnormal return after the implementation took place and before new changes occurred on June 1, 2023.

Panel A provides data that shows substantial positive CAARs across all sizes of transactions. This reveals that the market reacted favourably to insider trading activity in this period. The significant CAARs, particularly in the event window [-1, 1] and extending to [-2, 2], suggest that insider purchase and sales activity are interpreted by the market as informative signals and possibly predictive for future stock performance. We can observe abnormal returns ranging

from 2.25% in the [0, 0] window to 4.96% in the [-2, 2] window for the entire dataset. This is particularly interesting, as this deviates from what is found in Table 3, stating that the market reaction seems to stem from the time after the announcement. In the instance of the event window [-1, 1] we are suddenly seeing an impactful increase in abnormal return when including a day prior to the event. The medium-sized transaction group displays an indisputably higher CAAR than the remaining groups, which drives up the overall abnormal return. When examining the reason behind the extreme deviation, we observed those three instances of insider trades led to abnormal returns above 100%. An adjusted version and explanation of the three cases are further visualised and described in Appendix A.1. Nevertheless, as argued in the data section, we will not exclude these extreme values in our analysis, as it might lead us to not consider important information regarding the effect of these specific events.

Panel B provides an overview of the period following the announcement and shows a noticeable decrease in CAARs for all transactions. This suggests a reduced market reaction to insider trades, which could be due to an increase in uncertainty of market participants adjusting their behaviour in anticipation of the new regulatory environment. What's interesting to see, is that the second highest CAAR is now observed in our main event window [-2, 2] for both the entire data set and small transactions. Additionally, we can observe similar trends to before the announcement, where the abnormal return shows a sufficient increase in abnormal return when including days prior to the event date. This could imply that insiders are sharing their knowledge with close associates or related parties before the announcement of the insider trade, and that they are exploiting this information before it is available to the remaining market participants. Smaller transactions are now leading to greater market reaction with the highest abnormal return of 4.83% and are significant at the 10% level. An interesting finding, similar to panel A, is that an instance of abnormal return of above 100% occurred.[19]

After the implementation of EU MAR, displayed in Panel C, CAARs across all transaction sizes appear to be more stable. All of them are showing significant positive returns in every event window, except for small- and large transactions in the [-2, 0] window. Such stability could indicate that the market has adjusted to the new regulatory framework and that insider trading

[19] The adjusted and descriptive table can be found in Appendix A.1.

is still considered a credible signal, but with more caution. Notably, the CAARs for medium and large transactions are lower than in the pre-announcement phase but remain significant, indicating that – while the market continues to react to insider trades – the magnitude of the response has been moderate. This could reflect the increased transparency and international coherency of the regulation under EU MAR. It is interesting to notice that the abnormal returns are at the lowest in the [-2, 0] window for all transactions. This could imply that people are not in possession of information about the insider trades before it is made public known.

By comparing Panel A, B and C, it is evident that the announcement and subsequent implementation of the EU MAR framework have had a differentiated impact on the abnormal returns linked to insider trades. Before the announcement, the market reaction to insider trade was more pronounced, especially for medium-sized transactions. This could possibly be due to less stringent regulations. The post-announcement period reflects a period of adjustment, with lower and more varied CAARs. Following the implementation of EU MAR, the market response seems to be revised. The abnormal return is still significant at both the 1% and 5% levels but is moderated. This suggests that, while the market has adapted to the new regulatory landscape, insider trades continue to provide valuable information that is reflected in stock prices. Another reason could be that primary insiders are more careful about trading on non-public information because sanctions have increased, while the scope of notification has become stricter. Lastly, it is worth mentioning that “red periods” have been implemented, reducing the opportunities to trade on financial and interim reports. This will be further discussed in another section. The findings discussed in this section provide strong evidence for Hypothesis II, as the regulatory changes seem to affect the short-term market reaction. Nevertheless, there seems to be little evidence that large transactions lead to greater short-term reactions. In most cases, medium transactions outperform the remaining groups. This contradicts Hypothesis III, in which large transactions are posited to lead to greater abnormal returns.

Table 4: CAAR Before and After EU MAR Framework

Table 4 presents CAARs for all insider transactions surrounding the event date, categorised based on the transaction size. The sample comprises all insider trades registered in NewsWeb from 27.05.2020 to 01.06.2023 and with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, where the market model is employed to compute β with an estimation window [-120, -20]. To minimise covariance, insider transactions occurring on the same day within the same firm are excluded from the analysis. Panel A reports all transactions before the announcement of EU MAR, Panel B reports all transactions after the announcement and before the implementation, and Panel C reports all transactions after the implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement								
All	2.25%**	2.62%***	4.45%***	4.55%***	4.68%***	4.48%***	4.86%**	4.96%***
(N = 210)	(0.009)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Small	2.49%	3.28%*	3.84%**	4.14%**	4.25%**	2.98%	3.77%*	4.07%**
(N = 81)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Medium	2.29%***	2.23%***	7.16%**	7.03%***	7.48%***	8.41%***	8.34%***	8.22%***
(N = 76)	(0.007)	(0.008)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
Large	1.83%	2.20%	1.53%	1.65%	1.33%	1.16%	1.53%	1.64%
(N = 53)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Panel B: After Announcement (Pre-Implementation)								
All	0.72%**	1.88%**	2.59%***	2.04%**	1.78%**	2.09%***	3.25%***	2.70%**
(N = 117)	(0.004)	(0.008)	(0.009)	(0.009)	(0.009)	(0.006)	(0.01)	(0.01)
Small	0.49%	2.59%	4.01%*	3.77%*	3.50%*	2.74%**	4.83%*	4.59%*
(N = 45)	(0.007)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Medium	1.49%**	1.72%**	1.91%**	0.78%	0.77%	1.98%***	2.21%***	1.08%
(N = 42)	(0.007)	(0.007)	(0.009)	(0.01)	(0.01)	(0.006)	(0.009)	(0.009)
Large	-0.03%	1.05%*	1.42%	1.19%	0.62%	1.28%	2.36%**	2.14%
(N = 30)	(0.005)	(0.006)	(0.01)	(0.01)	(0.01)	(0.009)	(0.01)	(0.01)
Panel C: Implementation								
All	0.79%***	1.34%***	1.25%***	1.22%***	1.20%***	0.54%**	1.08%***	1.04%***
(N = 997)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Small	0.53%**	1.15%***	0.95%**	0.65%*	0.71%*	0.33%	0.72%**	0.59%
(N = 346)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Medium	1.09%***	1.57%***	1.69%***	1.74%***	1.66%***	1.09%**	1.57%***	1.62%***
(N = 331)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Large	0.78%***	1.31%***	1.13%***	1.31%***	1.25%***	0.19%	0.95%*	0.94%**
(N = 320)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In line with EU MAR, we focus here on trades larger than NOK 75,000. However, one might suppose that smaller insider trades also contain relevant information that should be revealed to the market through mandatory disclosure. Indeed, the size of a trade is not necessarily a guide to the importance of the information that it contains; rather, it may just be a guide to the funds

available to the individual making the trade. For example, an office administrator might have important inside information but only NOK 70,000 available to invest. To examine the issue in detail, we repeated our analysis for trades smaller than NOK 75,000. The results are reported in Appendix B.1. The results are consistent with what we find for larger trades, which stipulates that they make a positive CAAR, on average, and this does halve after the EU MAR is announced, and it halves again after EU MAR is implemented. The returns are somewhat smaller than we find for larger trades and, importantly, they are statistically insignificant. However, we have a relatively small sample size that accounts for merely 25 trades in the first two periods, so the lack of statistical significance is not surprising. Our results suggest that reducing the reporting threshold in EU MAR might be a sensible strategy. This would enable the collection of further information to address this matter with a larger sample size in the future.

6.2.1. F-Test of Two Sample for Variances

Our goal is to find out if the introduction of the EU MAR affected abnormal returns captured by primary insiders. However, comparing the period before and after the implementation of the EU MAR is too simplistic because the mere announcement that the EU MAR would become law might have prompted people to change their behaviour. So, a cleaner comparison is between the pre-announcement period and the post-implementation period. However, it is also interesting to examine whether there was indeed a significant announcement effect, and how large it was compared to the actual implementation of the framework. We use an F-test to assess the significance of the changes (from the *status quo ex ante* to the announced change, to the implementation).

Panel A in Table 5 illustrates the F-statistics for the abnormal return obtained before the announcement vs. after the announcement (but pre-implementation). All F-statistics are statistically significant at the 1% level within all event windows. This suggests that there is a significant difference in abnormal returns before and after the government announced their plan to implement the EU MAR framework. Panel B compared the period before the MAR announcement with the period after its implementation. The F-statistics remain significant at the 1% level within all event windows. The degrees of freedom in this case indicate a substantial sample size. Lastly, we can see in Panel C, the comparison of the period after the announcement with the period after the implementation. We can see that there are some mixed results within

two event windows, namely [0, 0] and [-2, 0]. Both these windows do not show any significant difference at the 5% level. However, all the other event windows are significant at a 1% or 5% level. Overall, the typical conclusion of "Yes" for almost all event windows signals robust and consistent differences in abnormal returns between each of the three periods.

Table 5: F-Test Two Sample for Variances

Table 5 presents F-test results to compare two variances for all insider transactions around the event date, categorised based on the period before the announcement, after the announcement (Pre-implementation), and after the implementation. The sample comprises all insider trades registered in NewsWeb from 27.05.2020 to 01.06.2023 with a transaction value exceeding NOK 75,000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. Panel A reports the f-statistic comparing the result before the announcement vs. after the announcement (pre-implementation), while Panel B reports the F-statistic comparing the results before the announcement vs. after implementation. Panel C reports the F-statistic comparing the results after the announcement (pre-implementation) vs. after implementation.

	F-Test							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement Vs. After Announcement (Pre-Implementation)								
F-Statistics	8.2488***	2.6145***	3.7547***	3.7044***	4.046***	9.0328***	3.0334***	3.0879***
Degrees of Freedom	(209, 116)							
Conclusion[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Before Announcement Vs. After Implementation								
F-Statistics	6.3934***	4.4033***	7.1054***	6.1377***	5.3451***	7.6427***	6.8561***	5.9456***
Degrees of Freedom	(209, 996)							
Conclusion	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: After Announcement (Pre-Implementation) Vs. After Implementation								
F-Statistics	0.77507*	1.6842***	1.8924***	1.6569***	1.3233**	0.84611	2.2602***	1.9254***
Degrees of Freedom	(116, 996)							
Conclusion	No	Yes	Yes	Yes	Yes	No	Yes	Yes

The numerator (before) and denominator (after) are given in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1. The conclusion is marked as "Yes" if the F-statistic is significant at a 5% level, while "No" otherwise.

6.2.2. Abnormal Return in "Red Periods"

Another important aspect to consider is the so-called "red periods". Under the new regulations, primary insiders are restricted from trading in the firm's stock 30 days before financial and interim reports. As there was no regulation covering this topic before the announcement, it would be particularly interesting to see how these trades performed in the time before the

implementation. We have therefore compared all trades conducted in "red periods" before and after the government announced the implementation of EU MAR.

We can see that primary insiders were obtaining positive abnormal returns in all event windows *ex-ante*, although only the results in event windows [-2, 1] and [-2, 2] were statistically significant. Comparing Panels A (*ex-ante*) and B (*ex-post*) further shows that insider trades were leading to greater short-term market reaction in every event window, except [-1, 1] and [-1, 2]. Our main event window [-2, 2] shows the highest average abnormal return, at 3.86% (*ex-ante*) and 2.49% (*ex-post*), thus revealing a decrease of 1.37%. This is an economically and statistically significant change and could be a result of a more cautious market.[20]

The data indicates that insider trades conducted during, what is now called, "red periods", have consistently resulted in positive abnormal returns. This applies for both before and after the announcement of the EU MAR framework. We can assume that these results may suggest that insiders have been able to anticipate the impact of forthcoming financial reports and thereby adjust their investment strategies accordingly. The post-announcement period shows a slight decrease in abnormal returns, which may reflect the market adjusting to the announcement of the new regulatory environment. Additionally, we can assume that further statistically significant CAARs in the post-announcement period could suggest that the announcement might have influenced insider trading behaviours or the market perception of these trades.

[20] Appendix F.1 provides an F-Test of Two-Variances for "red periods" between the period before the announcement vs. after announcement (pre-implementation) and shows statistically significant change at the 1% level in our main event window [-2, 2].

Table 6: CAAR Red Periods

Table 6 presents CAARs for all insider transactions surrounding the event date, if the date is conducted in a "red period".[1] The sample includes all insider trades registered in NewsWeb from 27.05.2020 to 26.02.2021 with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model has been employed to compute β using an estimation window of [-120, -20]. To minimise the covariance, insider trades occurring on the same day within the same firm are excluded from the analysis. Panel A reports transactions conducted before the announcement, while Panel B reports transactions conducted after the announcement but before the implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement								
All	0.61%	1.21%	1.46%	2.02%	2.22%	2.69%	3.29%*	3.86%**
(N = 52)	(0.007)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Panel B: After Announcement (Pre-Implementation)								
All	0.55%	1.06%	2.30%**	2.27%*	2.02%	2.00%*	2.52%**	2.49%**
(N = 39)	(0.005)	(0.007)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1. Red-Periods are periods where primary insiders are restricted from trading in their own firm, being the period 30 days prior to the publication of required annual and interim accounts.

We performed an additional "Heaping" analysis on trades conducted around the "red periods" after the implementation, trying to detect if any unusual trading pattern occurs and if similar abnormal returns to the "red periods" are discovered. Such results could provide us with information about the effect of the regulatory implementation of restricted trading periods. The results present evidence of more frequent trading activity on the day of the publication of the financial report and the following day.[21] This could indicate that primary insiders have tried to adapt their investment strategies to obtain similar abnormal returns as proven under "red periods". By treating the two pre-implementation periods as a placebo, we estimate that 85.5% of insider trades in the "red period" were shifted to the three days immediately after it ended, whilst 14.5% simply never happened. So, most of the information was still revealed to the market by insiders under EU MAR, but only at a time that was "fair" and at which all market participants could react immediately to the news.

[21] Appendix G.1. presents findings of the analysis investigation transactions conducted around "red periods" after the implementation of EU MAR.

6.2.3. Comparison to Eckbo & Ødegaard's Study

The findings of Eckbo and Ødegaard can be used as an additional external check on the validity and credibility of our findings. To enable a direct comparison, we altered our event windows to match their study (Eckbo & Ødegaard, 2019).[22] We will start by explaining how they conducted their study, before summarising their findings and comparing them to ours.

A board gender-member law being implemented in Norway caused a significant increase in female representation on corporate boards. In a two-year period from January 2006 to December 2007, there was an increase from 15% female representation to a legally mandated minimum of 40% (SSB, 2007). Eckbo and Ødegaard set out to examine whether this expansion of the female director network caused an increased information content and the relative performance of trades conducted by female primary insiders. They chose to utilise an event-study analysis to detect changes in the information content of primary insider trades. Further, to identify the abnormal trading performance of insiders they applied a modern test of holding-based performance.

They find positive information effects of the expansion of the female director network, especially in the short run. There is a statistically significant increase in CAAR for women, from 0.26% and 0.69% before the mandatory quota (1997-2007) to 1.55% ([-1,1]) and 1.47% ([-1,5]) after the quota (2008-2016). Males also have a positive average abnormal return for the two short-term event windows.[23]

By multiplying their findings for the entire period between 1997 and 2016, with the number of observations for both genders separately, to then dividing it by the total number of observations, we have comparable results. In Table 6, we have displayed our results next to those of Eckbo and Ødegaard. Our study consists of 997 observations, compared to their 1 656 774, because they have a much longer sample period. However, as the table highlights, our results are virtually identical to theirs for the short-term event windows. This indicates that we have found the true values of abnormal returns for primary insiders despite our relatively small sample size.

[22] Note that there have been different choices of methodology, where Eckbo & Ødegaard utilise the CAPM-method to extract their abnormal returns.
[23] According to the results of Eckbo & Ødegaard, male insiders obtained abnormal return of 0.014 in both short-term periods between 1997-2007, while it remained almost unchanged between 2008-2016 (0.014 and 0.013).

Table 7: Comparison to Findings from Eckbo & Ødegaard

Table 7 presents CAARs for all insider transactions surrounding the event date, compared to findings from Eckbo & Ødegaard in the period from 1997-2016. The sample comprises all insider trades registered in NewsWeb from 01.03.2021 to 01.06.2023 with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-1, 1] and [-1, 5] to have a comparable analysis with similar event windows. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model has been employed to compute β with an estimation window [-120, -20]. To minimise covariance, transactions occurring on the same day within the same firm are excluded from the analysis. Panel A reports all transactions after the implementation of EU MAR, while Panel B reports all transactions found in Eckbo & Ødegaard's paper.

	CAAR			
	[-1, 1]	[-1, 5]	[-1, 25]	[-1, 50]
Panel A: Implementation				
All	1.25%***	1.22%***	1.08%*	2.21%*
(N = 997)	(0.002)	(0.003)	(0.005)	(0.009)
Panel B: Findings from Eckbo & Ødegaard (1997-2016)				
All	1.32%***	1.32%***	0.46%	-0.43%
(N = 1,656,774)	(0.001)	(0.0008)	(0.0004)	(0.0003)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6.3. Impact of Primary Insider Positions on Short-Term Market Reaction

In Table 7, we examine the different CAARs categorised by the insider's position in the firm. Panel A displays the CAAR pre-announcement, Panel B post-announcement, and Panel C post-implementation. Here we present evidence that speaks to our hypothesis IV. The table presents the total CAAR for both purchases and sales combined for each of the five positions.[24]

Panel A illustrates a statistically significant CAAR at the 1% level for both Board Members and Directors & VPs during our main event window [-2, 2]. Notably, we observe multiple significant abnormal returns for both positions across the different event windows presented. Executives do not obtain a statistically significant abnormal return during our main event window, which contradicts what might be expected due to their access to sensitive information. However, we observe that Executives have significant CAAR across other event windows. Related Parties and "Others" do not obtain a consistent statistically significant CAAR across the various event windows.

[24] Appendix E.1. provides an overview of all positions included in our analysis.

As illustrated in Panel B, Board Members have significantly decreased their CAAR after the announcement, where we observe a decrease from 7.14% to 2.14% in our main event window. The decline could be explained, to some extent, by the extreme instances of abnormal returns above 100%.[25] Further, the table showcases that Executives obtain a statistically significant CAAR at the 10% level after the announcement. Directors & VPs maintain a statistically significant CAAR at the 1% level and remain fairly unchanged. We interestingly observe Related Parties having a statistically significant CAAR at the 5% level, where their cumulative abnormal returns have increased from 0.15% to 4.99%. For "Others", we observe a drastic fall in CAAR, as it decreased from 4.24% to -2.13%.

In Panel C, we observe that both Executives and Board Members have a statistically significant CAAR at the 1% level during the main event window. These observations are consistent throughout all the various event windows, where both groups have multiple observations of significance at the 1% level. Further, none of the other positions acquires significant abnormal returns in our main event window, which does not change when examining other windows.

[25] As can be seen from Appendix A1, the trades that results in an abnormal return above 100% all stem from transactions made by "Board Members".

Table 8: CAAR from Insider Trades Categorised by Position

Table 8 presents CAARs for all insider trades surrounding the event date, categorised based on the position held by the primary insider. The sample comprises all reported insider trades registered in NewsWeb from 27.05.2020 to 01.06.2023 with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as majority of transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model has been employed to compute β with an estimation window [-120, -20]. To minimise covariance, insider transaction occurring on the same day within the same firm are excluded from the analysis. Panel A reports transactions before the announcement, while Panel B reports transactions after the announcement. Panel C reports transactions after implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before the Announcement								
Board Member	3.36%*	3.86%**	6.29%**	6.50%**	6.63%**	6.44%**	6.94%**	7.14%***
(N = 81)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Executives	1.77%	1.67%	2.65%**	2.77%**	2.99%**	3.12%*	3.02%	3.14%
(N = 45)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Directors & VP	0.76%	1.56%	2.57%*	3.96%***	4.00%**	2.45%**	3.25%**	4.64%***
(N = 34)	(0.006)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Related Parties	0.36%	1.55%	1.06%	0.80%	1.49%	-0.78%	0.41%	0.15%
(N = 12)	(0.008)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Other	2.39%	2.43%	5.44%*	4.24%	4.16%	5.43%	5.46%	4.27%
(N = 38)	(0.03)	(0.02)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
Panel B: After Announcement (Pre-Implementation)								
Board Member	0.90%	3.07%*	2.98%	1.49%	1.09%	1.46%	3.63%	2.14%
(N = 48)	(0.005)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Executives	0.06%	0.98%	2.15%	2.52%	2.87%*	2.52%	2.62%	3.00%*
(N = 26)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Director & VP	0.92%	1.54%	3.14%*	3.09%*	2.50%	3.61%**	4.23%***	4.18%***
(N = 24)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Related Parties	2.48%	3.60%*	3.87%*	4.25%*	3.90%	3.49%**	4.61%**	4.99%**
(N = 10)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
Other	-0.84%	-0.70%	-1.60%	-2.13%	-2.27%	-1.74%	-1.60%	-2.12%
(N = 8)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
Panel C: Implementation								
Board Member	0.80%***	1.51%***	1.43%***	1.36%***	1.17%***	0.52%	1.22%***	1.10%***
(N = 554)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Executives	1.09%***	1.39%***	1.54%***	1.74%***	2.09%***	0.98%*	1.28%***	1.41%***
(N = 284)	(0.003)	(0.003)	(0.004)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
Director & VP	0.23%	0.69%	0.02%*	-0.35%	-0.52%	-0.34%	0.13%	0.21%
(N = 117)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)
Related Parties	1.86%**	2.07%**	1.04%*	0.33%	0.55%	1.29%	1.50%	0.79%
(N = 16)	(0.009)	(0.008)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Other	-0.57%	-0.51%	0.11%	0.24%	0.23%	-0.27%	-0.22%	-0.09%
(N = 26)	(0.005)	(0.005)	(0.007)	(0.008)	(0.01)	(0.008)	(0.008)	(0.008)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When investigating our results, it is noteworthy that we observe significant changes across the different periods for each of the insider positions. When examining our main event window, a clear pattern emerges where the CAAR observed for each of the positions decreases from Panel A to Panel B, and drastically further in Panel C. Additionally, it appears that market reactions to which position the insider holds, differ in all three time periods, although this could be a small sample problem affecting statistical significance. Executives are only marginally affected by the announcement. In contrast, Executives exhibit statistically significant CAARs at the 1% level after the implementation. Trades conducted by Directors & VPs appear to be unaffected by the announcement, but major changes occur after the implementation itself, where they experience a significant decrease in CAAR. This is consistent with findings from Hvide & Nielsen (2021), stating that executives below top management were obtaining far greater abnormal returns than other groups. Directors & VPs are further regulated under the new regime, and it is therefore rational to believe that it will affect their opportunities to obtain abnormal returns.

When examining Related Parties, their trades appear to be affected positively by the announcement, where we observe a significant increase in returns. In our exploration of to whom the Related Parties are related, our results reveal that – post-announcement – Related Parties are not linked to "Others", but exclusively to Board Members, Executives, and Directors & VPs.[26] Among all the trades conducted before and after the announcement, the percentage of trades made by Related Parties is significantly higher post-announcement. This may indicate that Board Members, and more well-informed insiders, get their Related Parties to conduct trades on their behalf, which could explain the increase in CAAR. We can assume that the increase in the volume of trades conducted by related parties to Board Members and Executives occurs as a result of trying to exploit the opportunity by taking advantage of the lack of regulation before EU MAR was implemented. However, this does not appear to be the case after the implementation, where trades conducted by Related Parties decrease. Consequently, our empirical findings reveal that the new regulatory framework imposes stricter restrictions covering Related Parties' transactions and are thereby limiting Board Members and Executives

[26] Appendix C.1 provides a visualisation of whom the "Related Parties" transactions belongs to.

from exploiting such methods for trading on their behalf. “Others”, have statistically insignificant returns in all three periods, but a relatively large discrepancy in obtained returns. This might be caused by the low number of observations, where a single observation can have a significant impact on the mean.

Based on our findings, we can argue that the hierarchy theory seems to hold, at least to some extent, where both Executives and Board Members obtain statistically significant CAAR after the implementation. However, you would expect Directors & VPs to obtain similar results, which they obtained prior to the implementation because they often have similar access to privileged information and decision-making power within the firm. Our results suggest that Board Members were the group most affected by both the announcement and the implementation of EU MAR. Interestingly, we observed that both Board Members and Executives were affected by the announcement, which appears to not be the case for Directors & VPs. On the other hand, the implementation itself appears to have a more dominant effect on Directors & VPs compared to any other position. Overall, our findings show evidence of significant behaviour changes to both the announcement and the implementation of EU MAR. We observe significant differences in the short-term market reactions based on which position the insider holds in their firm. This confirms our hypothesis IV, where the position held by the primary insider affects the short-term market reaction.

6.4. Transaction Size and Short-Term Market Reaction

Lastly, we examine the short-term market reaction to sales and purchase transactions. It is reasonable to believe that primary insiders, who are expecting improvement in future performance, will purchase shares as they believe that improvement will imply a rise in the stock price. If the EMH holds then outsiders observing this signal will react by buying shares and the future improvement will be incorporated into the share price immediately, thus generating a CAR. However, we would like to examine if the market reacts conversely in times of sales transactions. This can provide us with a better understanding of the drivers behind positive and negative market reactions. Lastly, it could provide us with further knowledge regarding the results obtained in the previous sections.

Panel A reports all trades conducted before the government announced the regulatory changes. It is evident that the abnormal return for purchase and sales transactions is positive for all event windows, except [0, 0] and [-1, 0] for sales transactions. Nevertheless, we can see that purchase transactions are clearly the dominating factor, with a 5.73% abnormal return in our main event window [-2, 2]. This could suggest that the market responds firmly to purchase transactions in anticipation of positive news. All purchase transactions are statistically significant at a 1% or 5% level. By contrast, sales transactions show positive abnormal returns for almost all event windows but are not statistically significant at any level.

Table 9: CAAR Before and After EU MAR Framework (Purchase & Sales)

Table 9 presents CAARs for all insider transactions surrounding the event date, categorised based on whether the trade was a sale- or purchase transaction. The sample comprises all insider trades registered in NewsWeb from 27.05.2020 to 01.06.2023 with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model has been employed to compute β with an estimation window [-120, -20]. To minimise covariance, insider transactions occurring on the same day within the same firm are excluded from the analysis. Panel A reports all transactions before the announcement of EU MAR, Panel B reports all transactions after the announcement and before the implementation, and Panel C reports all transactions after the implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement								
All	2.25%**	2.62%***	4.45%***	4.55%***	4.68%***	4.48%***	4.85%**	4.96%***
(N = 210)	(0.009)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Purchase	3.00%**	3.66%***	4.94%***	5.25%***	5.26%***	4.75%***	5.42%***	5.73%***
(N = 163)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sale	-0.35%	-0.98%	2.75%	2.12%	2.65%	3.54%	2.91%	2.28%
(N = 47)	(0.009)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Panel B: After Announcement (Pre-Implementation)								
All	0.72%**	1.88%**	2.59%***	2.04.%**	1.78%**	2.09%***	3.25%***	2.70%**
(N = 117)	(0.004)	(0.008)	(0.009)	(0.009)	(0.009)	(0.006)	(0.01)	(0.01)
Purchase	1.06%**	1.68%***	2.14%***	1.67%**	1.27%	1.82%***	2.47%***	1.98%**
(N = 98)	(0.005)	(0.005)	(0.007)	(0.008)	(0.008)	(0.006)	(0.007)	(0.008)
Sale	-1.01%**	2.93%	4.93%	3.97%	4.41%	3.49%	7.30%	6.44%
(N = 19)	(0.004)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)
Panel C: Implementation								
All	0.79%***	1.34%***	1.25%***	1.22%***	1.20%***	0.57%**	1.08%***	1.04%***
(N = 997)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Purchase	0.95%***	1.73%***	1.64%***	1.62%***	1.61%***	0.70%**	1.41%***	1.43%***
(N = 837)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Sale	-0.03%	-0.68%**	-0.74%*	-0.85%*	-0.91%*	-0.09%	-0.84%*	-0.99%*
(N = 160)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

After the announcement, but pre-implementation, purchase transactions still maintain a strong positive CAAR. This is particularly the case for event windows [-1, 1] and [-2, 1], with abnormal returns of 2.14% and 2.47%, respectively. These findings could indicate continued confidence in the informative contribution of insider purchases. The discrepancy in abnormal returns for sales transactions is even larger after the announcement, ranging from -1.01% to 7.30%. As previously discussed, both periods before and after the announcement included

extreme cases of abnormal returns above 100%. This affects the results in this study, where purchase transactions before the announcement and sales transactions after the announcement both include extreme values. Nevertheless, we can still observe negative abnormal returns in the event window [0, 0] at -1.01%. This is consistent with findings in panel A, whilst being significant at a 5% level.

Panel C provides an overview of all transactions conducted by primary insiders after the implementation. Both purchase and sales transactions demonstrate a decrease in abnormal returns. Purchases continue to show a positive abnormal return, albeit at a reduced rate, ranging from 0.70% to 1.73%. Interestingly, the abnormal return seems to be higher around the event date, which was not the case for the two previous periods. This could indicate that the market is reacting even faster to purchase transactions after the implementation of the EU MAR framework.

Results from the analysis suggest that prior to the EU MAR implementation, the market reacted positively to insider purchase transactions. This could be a result of other market participants perceiving these as informed trades anticipating positive future growth for the firm. A comparison to after the announcement and implementation indicates that primary insiders are still obtaining sufficient abnormal returns, yet lower in terms of economic value. On the other hand, sales transactions initially show an increase after the announcement, which could be because of the extreme returns from one of the trades, before turning negative for all the event windows after the implementation. An interesting observation is that the market reacts negatively to the event window [0, 0] for all periods. This could indicate that as soon as information reaches the market, it is interpreted as a negative signal about future performance. However, previous literature prompts that insider sales are often related to diversification and liquidity reasons, which could indicate that the market is misinterpreting the informational value of the trades, leading to a negative short-term reaction. Further, we observed from our data collection procedure that most sales transactions show that primary insiders often sell their entire holding as a consequence of resigning their position. The findings from Panel A and Panel C supports our hypothesis that insider purchase transactions are leading to greater

abnormal return than sales, in all event windows. Nevertheless, this is not the case for Panel B, as the extreme values are forcing the total abnormal return up.

6.5. Policy Implications

The initial purpose of the EU MAR was to establish a uniform and stronger framework that preserves market integrity for all the member states (EUR-Lex, 2023). The legislation aims to align with the evolving market dynamics, addressing issues related to market abuse in financial markets.[27] Therefore, we can infer that the initial purpose of EU MAR aligns with the rationale for its implementation in Norway. But if insider trades become less prevalent and less profitable then is it a success, or rather a loss of information to the market?

Our results clearly show that the implementation of the EU MAR had a significant impact on the abnormal returns among primary insiders. The regulations are designed to enhance market integrity and prevent abuses, including measures such as restrictions on insider trading. This includes the “red periods” that restrict trading windows for insiders. One potential consequence of these stringent regulations is that primary insiders may become cautious and, in some cases, reluctant to invest in their own firm’s stock. The perceived legal and regulatory risks associated with insider trading could lead primary insiders to explore alternative investment opportunities, such as diversifying their portfolios with financial instruments outside the firm. Further, it could also affect the market’s perception of the firm and its stock performance. As discussed previously, insider purchase transactions have historically been interpreted as a positive signal about the firm’s future performance. If the new legislation puts constraints on primary insiders’ ability to trade in their own firms, then it could lead to a shift in how the market interprets the confidence level of insiders, potentially affecting stock valuation. Easterbrook (1985) also adds an important element to this discussion, stating that insider trading acts as an incentive for managers to synchronise their interests with those of shareholders, which could reduce the need for costly supervision and thereby provide the firm with additional funds to explore investment growth opportunities.

We present evidence that insider trades move out of the "red periods", to the days immediately following the "red periods" under EU MAR; there is also a significant reduction in abnormal

[27] Market abuse prevents the complete transparency essential for trading in modern integrated financial markets. The regulations prohibit three forms of abuse: market manipulation, insider dealing, and unlawful disclosure of inside information (EUR-Lex, 06.01.2023).

return. This implies that insider trades reveal less information to the market - or, at least, delayed information - after the implementation of EU MAR.[28] It would therefore be interesting to study stock price behaviour and see whether it is systematically different during "red periods"; if so, then this would imply that the market was interpreting these insider trades as valuable and informative.

A further result of our study is that board members experience lower abnormal returns, while related parties show an increase. This shift could involve board members exploring alternative means to execute trades, potentially through collaboration with close associates or other third parties, in order to maintain the informational advantage. Attempts to navigate around regulatory constraints carries important policy implications. This trend also underscores the dynamic nature of market participants adapting to regulatory shifts. A proactive approach to regulatory adjustments may involve periodic reviews and updates to ensure that the regulations effectively fulfil their intended purposes and are resilient to attempts to circumvent them. This is in line with evidence provided by Beny (2005), stating that robust insider trading laws encourage a more effective stock market, with the effectiveness of the laws being dependent on the quality of the enforcement.

There are nuanced implications that extend beyond the immediate objectives of EU MAR. A reduction in abnormal returns obtained by primary insiders, while aligning with the desired outcome of preventing potential market abuse, prompts reflection on the broader impact on market efficiency. The restrictions on insider trading may inadvertently limit the flow of information that can come with such trades, raising questions about the balance between market fairness and the efficiency of price discovery. Nevertheless, we can say that the EU MAR has met its objectives since the reduction in both abnormal returns and the disparities between returns obtained within the firm are economically significant.

[28] Appendix G.2. provides evidence of no abnormal returns for trades conducted immediately after the "red periods".

7. Conclusion

The Norwegian government announced on November 27, 2020, that the EU Market Abuse Regulation would be implemented on March 1, 2021, – thereby changing the regulatory regime of the Oslo Stock Exchange. Considering the abnormal returns accruing to the trades of primary insiders, we have investigated the impact of both the announcement of the regulatory change and its implementation. We employ an event study methodology to examine the short-term effects following the announcement of insider trades and assess the change in perception among other market participants since the implementation of the new regulatory framework.

We present evidence that primary insiders obtain statistically- and economically significant abnormal returns following the implementation of the new legislation and that the abnormal return is strongly driven by "Medium-sized" transactions. Comparing the findings to before- and after the announcement, we found interesting results showing that the abnormal return halves following the announcement, and halves once again following the implementation. This indicates that the regulatory changes covering the topics of market manipulation, false disclosure of insider information, and reporting standards, had a substantial and statistically significant impact on the abnormal returns obtained by primary insiders at the XOSL.

The most prominent change introduced by EU MAR – preventing insiders from trading in their own stock 30 days prior to financial- and interim reports, also referred to as "red periods" – eliminated significant abnormal returns that had been enjoyed by insiders before the implementation. Results obtained in our analysis imply that insider trades reveal less information to the market, or at least postpone the information, following the implemented regulatory change. Restricted trading windows and a consequence of more stringent regulations is that primary insiders become more cautious and, in some cases, reluctant to invest in their own firm's stock. The restrictions of insider trading may therefore inadvertently limit the flow of information that comes with such trades, raising questions about the balance between market fairness and the efficiency of price discovery.

"Board Members" and "Directors & VP" outperformed other primary insiders in the periods before- and after the announcement. However, after the implementation of the EU MAR framework, we see that "Board Members" and "Executives" are outperforming the remaining positions, which supports the hierarchy theory. Nevertheless, in the period between the

announcement and its implementation, we see a significant increase in abnormal returns for "Related Parties" and an equally significant reduction in abnormal returns among "Board Members". The divergent movements in abnormal returns could be explained by the exploitation of closely related parties and family members that conduct the trades on their behalf and thereby circumvent the regulations. A proactive approach to regulatory adjustment should be considered and may involve periodic reviews and updates to ensure that the regulations effectively fulfil their intended purposes and are resilient to attempts to circumvent them.

Further, an investigation of the short-term market reaction to purchase- and sales transactions, respectively, shows that purchases are often perceived as a positive signal about a company's future performance and thereby result in an increased stock price movement. On the other hand, the market seems to react negatively to sales transactions, with negative abnormal returns in the shortest event window interval in all three periods. However, it has been argued that insider sales are often linked to diversification and liquidity reasons. Additionally, we observed from our data collection procedure that primary insiders resigning from their current position usually sold their entire holdings, which could limit the perceived informational content and therefore affect the short-term market reaction following these transactions. This indicates that sales transactions do not necessarily indicate negative firm development but could rather be seen as a misinterpreted market reaction.

Our research is based on new evidence compiled around a case study analysis of the exogenous introduction of a new regulatory framework spurred by a desire to conform to the EU norm. Our evidence both confirms and supplements the previous literature examining the short-term market reaction to insider trades. In conclusion, we show convincingly that the announcement and implementation of the EU MAR significantly reduced the abnormal returns obtained by primary insiders at XOSL. In that sense, insider trading has become less informative to other market participants, thereby generating smaller and fewer short-term price adjustments, creating a more attractive and equitable marketplace.

8. Limitations and Further Research

8.1. Limitations

This section provides an overview of factors that could limit the credibility of our results. We highlight important aspects that address the potential weaknesses related to the data collection process, the methodology applied, and the criteria used in our analysis.

We have defined “small”, “medium”, and “large” transactions based on our own judgment. There is no clear choice on how to classify transactions based on size. It is possible that the results could be slightly different if different cut-offs were set. However, the results are rather consistent across the groups, so we do not believe that any serious damage has been done.

Lastly, our study is based on manually registered data, where primary insiders are required to disclose their transactions to NewsWeb. During the data collection procedure, we observed several instances where the issuer published adjusted forms following the reported transactions, replacing errors in the initial notification of mandatory trades.[29] Nevertheless, we do not know if this is handled in every single situation, and it is therefore difficult to ensure the validity of all published forms. Additionally, some reports go unreported which causes unwanted omitted observations, and further limits our data.

8.2. Further Research

It would be interesting to conduct similar event study analyses for other European countries – where the EU MAR was also implemented – and compare them to our findings. This would increase the reliability of the results and check their robustness of. Of course, individual markets behave differently from one another, and the variation could be interesting in itself – do Italians exhibit the same behaviour as Norwegians or French? It would provide additional information on the general effectiveness of the EU MAR framework. If similarities in market reactions are discovered, then it more strongly suggests a universal effect that can be attributed to the regulation. Lastly, it will complement the findings with comparative analyses that can extricate the real impact of the EU MAR from other market-specific factors.

[29] Adjusted forms include adjustments such as transaction price, transaction volume, insider holding post transaction, position of the insider, and so on. An example of an adjusted form could be found in Appendix D.4.

Our analysis is solely focused on short-term abnormal returns. It could be valuable to examine the Cumulative Average Abnormal Volume (CAAV) around the event dates. Such an approach isolates the trading conducted by the primary insiders and subtracts their transaction from the overall volume that day, with the intention to see explicitly and directly how the market reacts to insider trades (Chae, 2005). This could provide complementary information to the findings obtained here and thereby strengthen the evidence of the effect of the regulatory changes. Changes in abnormal volume can also allow the detection of unusual trading patterns around the time of the event. This is especially useful when looking at the various event windows running from [0, 0] to [-2, 2], as it can give in-depth information about the response time of other market participants. A fast and significant adjustment of trading volumes in response to new information supports the notion that the market is efficiently processing and incorporating the implications of EU MAR. If consistent patterns of abnormalities across both return and trading volume are discovered, the overall argument regarding the regulatory impact on the Oslo Stock Exchange will become stronger.

It would also be interesting to use a larger sample size before the announcement when comparing the results to the time after the announcement and implementation, respectively. More observations could limit the impact of the extreme values observed in Panel A. We also think that it would be valuable to look at a longer time period after the new regulation was implemented on June 1, 2023. If the impact of insider trades falls further, then it could imply that the full effect of the EU MAR framework is not captured in our analysis. Lastly, it would be interesting to know if there was a systematic difference between the excluded insider trades arising from share purchase programs, private placements, IPOs, mandatory offerings due to takeover bids, and executive remuneration. These also contain information, but it is not obvious how other market participants value them.

Bibliography

References

Aktas, N. , de Bodt, E. & Van Oppens, H. (2008). *Legal Insider Trading and Market Efficiency*. Journal of Banking and Finance, Vol. 32 (1), 1379-1392

Bainbridge, S. M. (2014). *Insider Trading: An Overview.* Corporate Practice Commentator, 56 (1), 1-22.

Beny, L. N. (2005). *Do Insider Trading Laws Matter? Some Preliminary Comparative Evidence.* American Law and Economics Review, 7 (1), 144-183.

Bhattacharya, U., & Daouk, H. (2002). *The world price of insider trading.* The Journal of Finance, 57 (1), 75-108.

Brown, S. J & Warner, J. B (1980). *Measuring Security Price Performance.* Journal of Financial Economics, 8 (3), 205-258.

Brown, S. J & Warner, J. B (1985). *Using Daily Stock Returns – The Case of Event Studies.* The Journal of Financial Economics, 14 (1) 3-31.

Chae, J. (2005) *Trading Volume, Information Asymmetry, and Timing Information*. Journal of Finance, 60, 413-442

Cohen, L., Malloy, C., & Pomorski, L. (2012). *Decoding Inside Information.* The Journal of Finance, 67 (3), 1009-1043.

Dyckman, T., Philbrick, D., & Stephan, J. (1984). *A Comparison of Event Study Methodologies Using Daily Stock Returns: A Simulation Approach.* Journal of Accounting Research, 22, 1-30.

Easterbrook, F. H. (1985). *Insider Trading as an Agency Problem.* In Principles of Corporate Governance: Analysis and Recommendations (pp. 1-22). American Law Institute.

Eckbo, B. E. & Ødegaard, B. A. (2019). *Board Gender Balancing and Insider Trading Performance.* European Corporate Governance Institute – Finance Working Paper No. 783/2021.

Fidrmuc, J.P., Goergen, M. & Renneboog, L. (2006). *Insider Trading, News Releases, and Ownership Concentration.* The Journal of Finance, 61 (6), 2931–2973.

Finnerty, J. E. (1976). *Insiders and market efficiency.* The Journal of Finance, 31 (4), 1141–1148.

Franzen, L., Li, X., Urcan, O., & Vargus, M. E. (2014). *The Short-Term Market Reaction to Insider Sales of Restricted Stocks.* The Journal of Financial Research, 37 (1), 99-118.

Givoly, D. & Palmon, D. (1985). *Insider Trading and the Exploitation of Inside Information: Some Empirical Evidence.* The Journal of Business, 59 (1), 69-87.

Huddart, S., Ke, B. (2010). *Information Asymmetry and Cross-Sectional Variation in Insider Trading.* Contemporary Accounting Research, 24 (1), 195-232.

Hvide, H., and Nielsen, K, M. (2021) *Flying below the radar: Insider trading by executives below the top.* Available at SSRN: https://ssrn.com/abstract=3957199

Jeng, L. A., Metrick, A. & Zeckhouser, R. (1999). *The Profits to Insider Trading: A Performance-evaluation Perspective.* National Bureau of Economic Research, NBER Working Paper No. 6913.

Karpoff, J. M., & Lee, D. J. (1991). *The Information Content of Insider Trades.* Journal of Financial and Quantitative Analysis, 26 (4), 465-477.

Ke, B., Huddart, S., & Petroni, K. (2003). *What insiders know about future earnings and how they use it: Evidence from Insider Trades.* The Journal of Accounting and Economics 35 (3), 315-346.

Kyle, A. S. (1985). *Continuous Auctions and Insider Trading*. Econometrica, 53 (6), 1315-1335.

Lakonishok, J., & Lee, I. (2001). *Are Insiders' Trades Informative?* The Review of Financial Studies, 14 (1), 79-111.

MacKinlay, C. A. (1997). *Event Studies in Economics and Finance.* The Journal of Economic Literature, 35 (1), 13-29.

Malkiel, B. G. (1973). *A random walk down Wall Street: The time-tested strategy for successful investing.* W. W. Norton & Company.

Manne, H. G. (1966). *Insider Trading and the Stock Market.* New York, NY: The Free Press, 13, 274.

Marin, J. M., & Oliver, P. O. (2008). *The Dog that Did Not Bark: Insider Trading and Crashes*. The Journal of Corporate Finance, 63 (5), 2429-2476.

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

Seyhun, H. N. (1998). *Investment Intelligence from Insider Trading.* The MIT Press

Sorokina, N., Booth, D. E., & Thornton, J. H. Jr. (2013) *Robust Methods in Event Studies: Empirical Evidence and Theoretical Implications.* Journal of Data Science, 11 (3), 575-606.

Wang, W. K. S., & Steinberg, M. I. (2010). *Insider Trading* (3rd ed.). Oxford University Press.

Websites

Altinn (n.d.) *Template for Notification of Transactions by Persons Discharging Managerial Responsibilities (PDMR) and Persons Closely Associated with them (KRT-1500).* Retrieved 19.10.2023 from:

https://info.altinn.no/en/forms-overview/financial-supervisory-authority-of-norway/template-for-notification-of-transactions-by-persons-discharging-managerial-responsibilities-pdmr-and-persons-closely-associated-with-them-krt-1500/

Euronext. (n.d.) *OSLO Sectorial Indices* [PDF File]. Retrieved 15.10.2023 from:

https://live.euronext.com/sites/default/files/documentation/index-factsheets/OSLO%20Sectorial%20Indices.pdf

EUR-Lex (2023, January 1.) *Preventing Market Abuse in Financial Markets*, *2023*. Retrieved 07.12.2023 from:

https://eur-lex.europa.eu/EN/legal-content/summary/preventing-market-abuse-in-financial-markets.html

EUR-Lex (2014, June 12.) *Regulation (EU) No 596/2014 of the European Parliament.* Last consolidated January 1, 2021. Retrieved 07.12.2023 from:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0596

Finanstilsynet. (2022, November 12). *Forbud mot innsidehandel og tilskyndelse til innsidehandel*. Retrieved 06.11.2023 from:

https://www.finanstilsynet.no/tilsyn/markedsatferd/forbud-mot-innsidehandel-og-tilskyndelse-til-innsidehandel

Finanstilsynet. (2023, June 01). *Meldeplikt for personer med ledelsesansvar (primærinnsidere) og deres nærstående.* Retrieved 17.11.2023 from:

https://www.finanstilsynet.no/tilsyn/markedsatferd/meldeplikt-for-personer-med-ledelsesansvar/

Lovdata. (2023, June 01) *Acts on Securities Trading (Securities Trading Act)*. Retrieved 28.11.2023 from:

https://lovdata.no/dokument/NLE/lov/2007-06-29-75/*#*

NewsWeb (2022, November 24) *TOMRA: Mandatory Notification of Trade*. Retrieved 01.12.2023 from:

https://newsweb.oslobors.no/message/576674

Statistisk sentralbyrå (2007, July 13.) *Styre og leiing av aksjeselskap, 2007.* Retrieved 25.11.23 from:

https://www.ssb.no/virksomheter-foretak-og-regnskap/statistikker/styre/arkiv/2007-07-13

Sæhle, P. A., Evje, K. S., & Fjeldstad, C. P. (2023, May 15). *Endringer i markedsmisbruksforordningen 1. juni 2023*. Wiersholm. Retrieved 15.11.2023 from:

https://www.wr.no/aktuelt/endringer-i-markedsmisbruksforordningen-1-juni-2023

Appendices

A.1: Adjusted CAAR

Careful inspection of the data reveals that extreme values for medium-sized transactions in Panel A, and for low-sized transactions in Panel B, are driving up abnormal returns. In a few specific cases, we found abnormal returns over 100%. We can see that the abnormal return for medium transactions in Panel A moves from 8.34% to 4.32% in the event window [-2, 1] if we exclude the extreme observations. Additionally, from Panel C we see that the abnormal return moves from 4.83% to 2.21% in the same event window. The extreme values are also affecting findings in Table 7 - CAAR from Insider Trades Categorised by Position - where "Board Members" in our main event window [-2, 2] obtain an abnormal return of 7.14%. To obtain a better understanding of the underlying forces behind these changes, we investigate specific events causing the extreme values.

Case 1 and 2 - Abnormal return of 119% & 107%:

The Case 1 trade was conducted on 28.05.2020, the day before the firm announced the acquisition of seven other companies. The transaction had a value of approximately NOK 320 million. The Case 2 transaction was conducted two days prior to the announcement, yet still on the same company news. Following the acquisition of the seven companies, the abnormal return for the primary insiders was 119% and 107%.

Case 3 - Abnormal return of 102%:

The third case is also within the same firm but was conducted later on that year. A new acquisition of two companies, with a total value of approximately NOK 110 million, was announced the next day. Following the acquisition of the two companies, the abnormal return for the primary insider was 102%.

Case 4 - Abnormal return of 115%:

The fourth case is a sales transaction and for the time period after the announcement. A trade from a primary insider was conducted the day before the announced the acquisition of two other companies, with a total value of approximately NOK 500 million. Following the acquisition of the two companies, the abnormal return for the primary insider was 115%.

Table 10: CAAR Before and After EU MAR Framework (Adjusted)

Table 10 presents CAARs for all insider transactions surrounding the event date, categorised based on the size of the transaction. The sample comprises all trades registered in NewsWeb from 27.05.2020 to 01.06.2023 with a transaction value exceeding NOK 75.000, which are conducted on XOSL, adjusted for four extreme cases of CAR above 100%. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the average percentage change in the closing price, while the market model has been employed to compute β with an estimation window [-120, -20]. To minimise covariance, insider transactions occurring on the same day within the same firm are excluded from the analysis. Panel A reports all transactions before the announcement of EU MAR, Panel B reports all transactions after the announcement (Pre-Implementation), and Panel C reports all transactions after the implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement								
All	1.49%**	1.73%***	2.28%***	2.53%***	2.69%***	2.45%**	2.68%***	2.93%***
(N = 207)	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)	(0.007)	(0.009)	(0.009)
Small	0.84%*	1.46%**	2.02%**	2.23%**	2.57%***	1.33%	1.95%*	2.15%**
(N = 80)	(0.004)	(0.006)	(0.009)	(0.008)	(0.009)	(0.008)	(0.01)	(0.01)
Medium	1.97%**	1.69%**	3.11%***	3.49%***	3.80%***	4.60%***	4.32%***	4.70%***
(N = 74)	(0.007)	(0.007)	(0.008)	(0.009)	(0.001)	(0.01)	(0.02)	(0.02)
Large	1.83%	2.20%	1.53%	1.65%	1.33%	1.16%	1.53%	1.64%
(N = 53)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Panel B: After Announcement (Pre-Implementation)								
All	0.74%*	1.24%***	1.81%***	1.37.%**	1.18%*	1.75%***	2.25%***	1.82%***
(N = 116)	(0.004)	(0.004)	(0.006)	(0.007)	(0.007)	(0.005)	(0.006)	(0.007)
Small	0.54%	0.92%	1.98%*	2.08%	1.95%*	1.85%**	2.23%*	2.14%*
(N = 44)	(0.008)	(0.009)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Medium	1.49%**	1.72%**	1.91%**	0.78%	0.77%	1.98%	2.21%**	1.08%
(N = 42)	(0.007)	(0.007)	(0.009)	(0.01)	(0.01)	(0.007)	(0.009)	(0.009)
Large	-0.03%	1.05%*	1.42%	1.19%	0.62%	1.28%	2.36%**	2.32%
(N = 30)	(0.005)	(0.006)	(0.01)	(0.01)	(0.01)	(0.009)	(0.01)	(0.01)
Panel C: Implementation								
All	0.79%***	1.34%***	1.25%***	1.22%***	1.20%***	0.54%**	1.08%***	1.04%***
(N = 997)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Small	0.53%**	1.15%***	0.95%**	0.65%*	0.71%*	0.33%	0.72%**	0.59%
(N = 346)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Medium	1.09%***	1.57%***	1.69%***	1.74%***	1.66%***	1.09%**	1.57%***	1.62%***
(N = 331)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Large	0.78%***	1.31%***	1.13%***	1.31%***	1.25%***	0.19%	0.95%*	0.90%**
(N = 320)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B.1: CAAR for Transactions Below NOK 75,000

Table 11: CAAR from Trades Below NOK 75,000

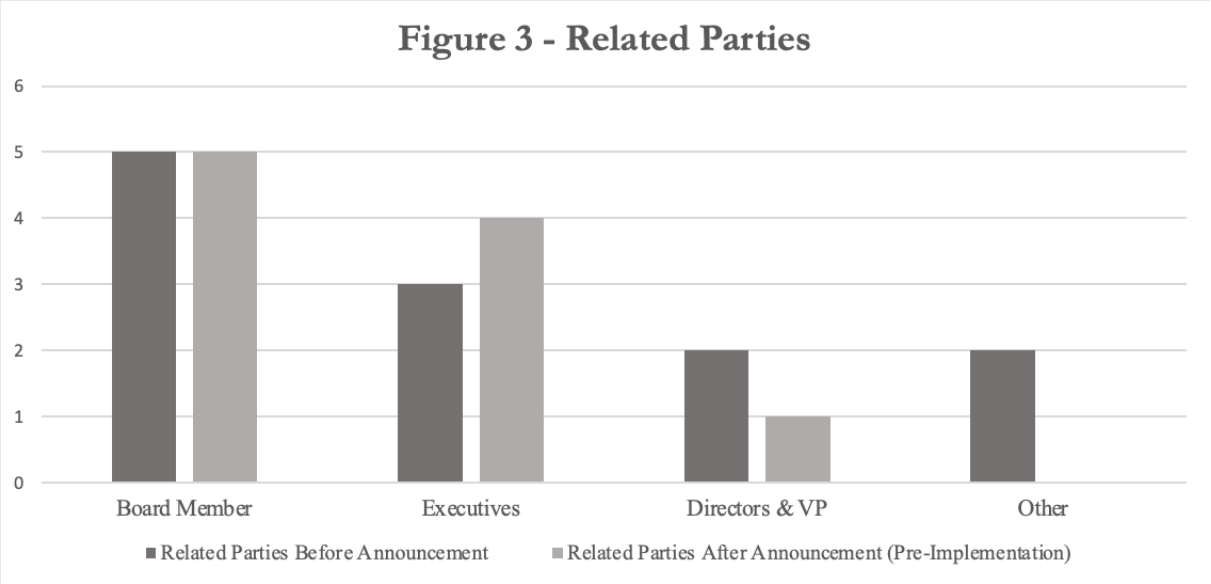
Table 11 presents CAARs for all insider transactions surrounding the event date, categorised based on the three periods analysed in our report. The sample comprises all insider trades registered in NewsWeb from 28.05.2020 to 01.06.202 with a transaction value below NOK 75.000 and that are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. CAARs are computed as the percentage change in the closing price, while the market model has been employed to compute β with an estimation window [-120, -20]. To minimise covariance, insider transactions occurring on the same day within the same firm are excluded from the analysis. Panel A reports transactions before the announcement, while Panel B reports transactions after the announcement (pre-implementation). Panel C reports transactions after implementation.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before the Announcement								
All	0.02%	0.43%	0.58%	0.04%	-0.19%	-1.03%	-0.62%	1.15%
(N = 30)	(0.007)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Panel B: After Announcement (Pre-Implementation)								
All	0.15%	0.50%	0.64%	0.16%	0.91%	0.76%	1.11%	0.64%
(N = 22)	(0.006)	(0.008)	(0.007)	(0.006)	(0.009)	(0.007)	(0.008)	(0.008)
Panel C: Implementation								
All	0.18%	0.51%	0.61%	0.21%	0.01%	0.35%	0.67%	0.28%
(N = 121)	(0.004)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)

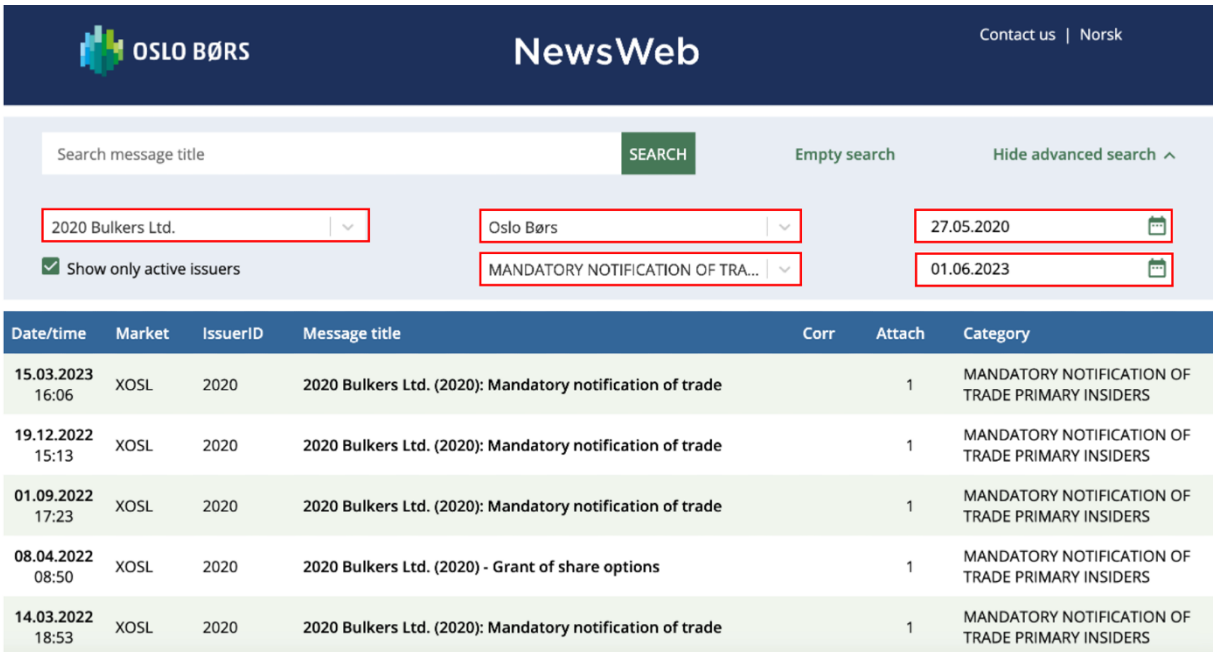
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C.1: Overview of Related Parties

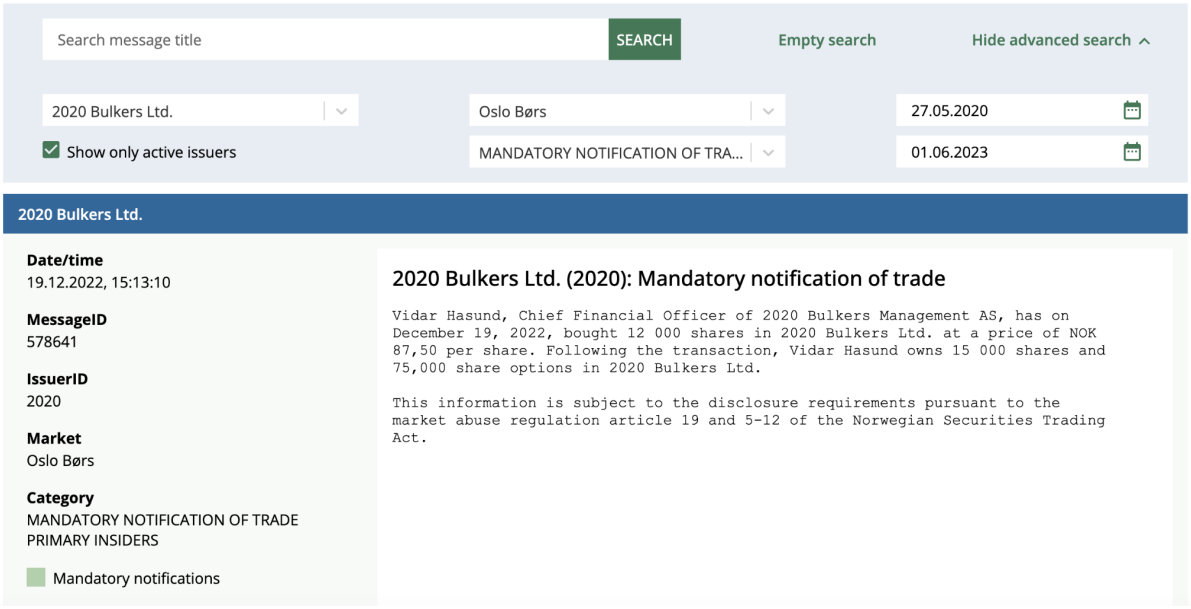
The following section provides a visualisation of whom the related parties belong to before and after the announcement of the EU MAR regulation.



D.1: NewsWeb



D.2: Mandatory Notification of Trade



D.3: Notification Template for Primary Insiders and Close Associates

The following template is mandatory for all primary insiders and their close associates. Persons Discharging Managerial Responsibilities (PDMR) and their close associates are obligated to report their trade to the issuer or the emission allowance market participant, and the relevant regulatory body (in the case of Norwegian trades, this is the Financial Supervisory Authority of Norway) about all of their transactions (Finanstilsynet, 2023).

KRT-1500 Skjema for melding om transaksjoner utført av personer med ledelsesansvar («primærinnsidere») og deres nærstående

FINANSTILSYNET
THE FINANCIAL SUPERVISORY AUTHORITY OF NORWAY

Beskrivelse av det finansielle instrumentet/type finansielt instrument

Instrument	Aksje
ISIN-kode	BMG9156K1018

Navn på og/eller beskrivelse av det finansielle instrumentet

Transaksjonstype

Transaksjonstype	Kjøp

Aksjeopsjonsprogram

Transaksjonen er knyttet til utøvelse av et aksjeopsjonsprogram ○ Ja ◉ Nei

Valuta for transaksjonen

Valuta	NOK

Priser og volum

Pris per enhet	87,5
Volum	12 000

Aggregert informasjon

Gjennomsnittlig pris per enhet	87,50000
Aggregert volum	12 000
Total sum	1 050 000,000000

Dato for transaksjonen

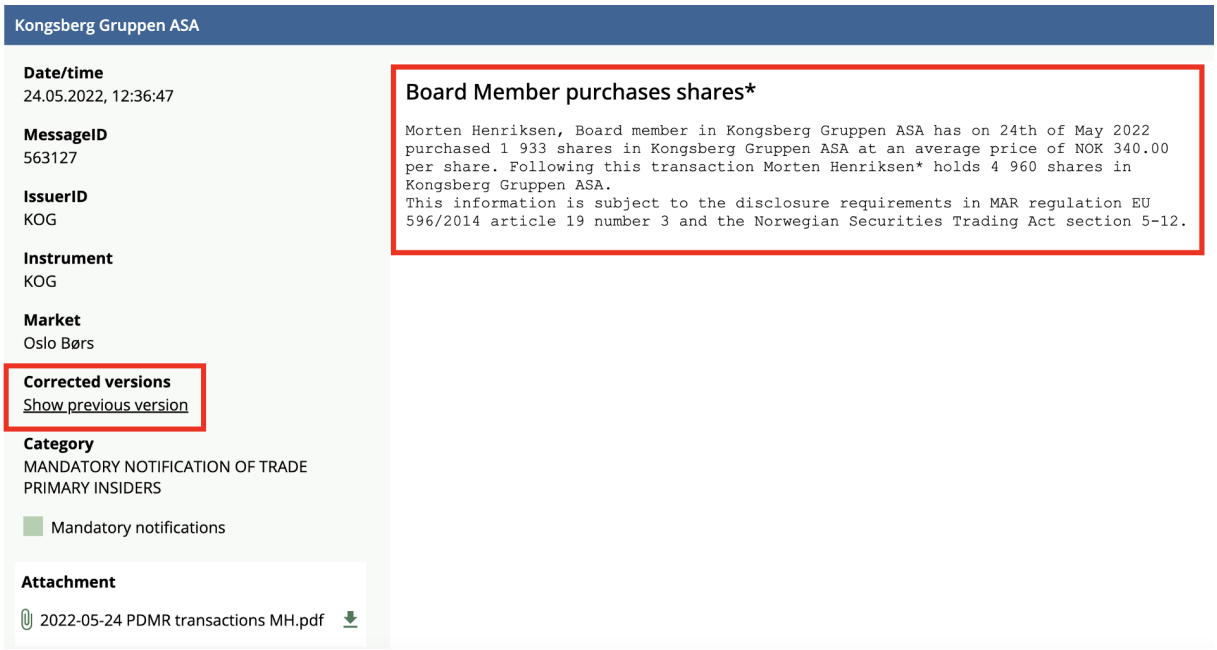
Dato	19.12.2022

Handelsplass for transaksjonen

Handelsplass	XOSL - Oslo Børs

Kommentar

D.4: Correcting the Mandatory Notification Form Reported to NewsWeb



E.1: Primary Insider's Positions

Figure 4: Position Categorisation

Figure 4 presents the merged positions based on the notifications of insider's trades reported to NewsWeb. We have merged the reported positions to five more narrow classifications.

"Board Member"	"Executives"	"Directors & VP"	"Other"	"Related Parties"
Chairman	CEO	Director	Group Legal Counsel	Close Associate to Board Member
Vice Chair	CFO	Head of Research	Group Portfolio Manager	Close Associate to Accountant
Executive Chairman	COO	Vice President	Observer of the Board	Related party to General Counsel
Board Member	CMO	Head of Commercial	CEO France	Related party to Board Member
Vice Chairman	CCO	Strategy	CEO Fjordkraft	Related Party to Observer of the Board
	COP	Head of Manufacturing	CEO (Interim)	Related party to CEO
	CDO	Head of IR	Property Manager	Related party to CFO
	Chief of Staff	President EMEA	Asset Manager	Related Party to Director
	CIO	President Americas	Risk Manager	
	Executive Management	President EMEA	Country Manager	
	CAO	Head of Investments	Sales manager	
	CPO	Director HMS	Regional Manager	
	CTO	Director Corporate Markets	Department manager	
	CSO	Head of Communication	CEO (ass. Firm)	
	CRO	Director Costumer	Ass. W. Primary insider	
	CBC		Former Employee	
	CPMO		Major Owner Company	
			CEO in subsidiary	
			Strategic Advisor	

F.1: F-Test "Red Periods"

Table 12: F-Test Two Sample for Variances ("Red Periods")

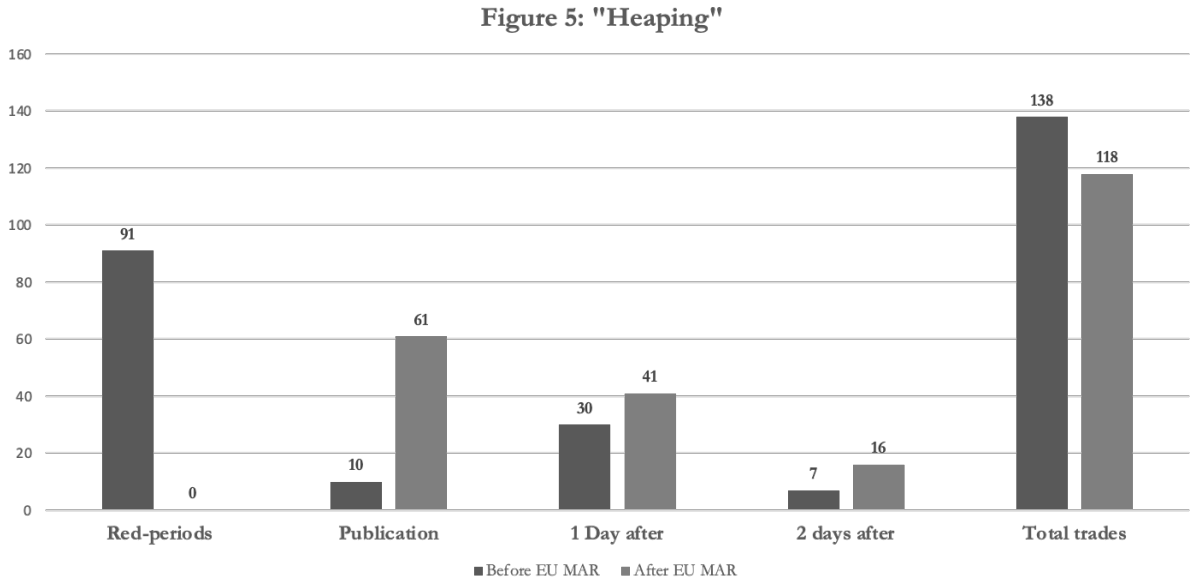
Table 12 presents F-test results to compare two variances for all insider transactions conducted in "Red Periods" surrounding the event date. The sample comprises all insider trades registered in NewsWeb if they are conducted in "Red-Periods" from 27.05.2020 to 01.03.2021 and with a transaction exceeding NOK 75.000. The sample is only considering trades conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. To minimise covariance, trades occurring on the same day within the same firm are excluded from the analysis. Panel A reports the F-statistic comparing the result before the announcement vs. after the announcement (pre-implementation).

	F-Test							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Before Announcement Vs. After Announcement (Pre-Implementation)								
F-Statistics	0.953	1.828**	1.279	1.567	1.649	3.415***	3.048***	3.191***
Degrees of Freedom	(51, 38)							
Conclusion[1]	No	Yes	No	No	No	Yes	Yes	Yes

The numerator (before) and denominator (after) are given in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1. The conclusion is marked as "Yes" if the F-statistic is significant at a 5% level, while "No" otherwise.

G.1: Trades Conducted Before- and After "Red Periods"



G.2: CAARs for Trades Conducted Immediately After the "Red Periods"

Table 13: CAAR for Trades Conducted Immediately After "Red Periods"

Table 13 presents CAARs for all insider transactions surrounding "Red Periods", if the trade is conducted on the publication day itself or within two days after. The sample comprises all reported insider trades registered in NewsWeb from 27.05.2020 to 28.02.2021 with a transaction value exceeding NOK 75.000, which are conducted on XOSL. The main event window in the analysis is [-2, 2] as the majority of insider transactions are disclosed with a two-day lag. Additional event windows are considered for robustness purposes. Panel A reports transactions that are conducted on the publication day of financial- or interim reports or within the following two days.

	CAAR							
	[0, 0]	[0, 1]	[-1, 1]	[-1, 2]	[-1, 3]	[-2, 0]	[-2, 1]	[-2, 2]
Panel A: Implementation								
All	0.39%	0.74%	0.65%	0.91%	1.13%*	0.12%	0.45%	0.61%
(N = 118)	(0.005)	(0.006)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$