Master's thesis

NTNU
Norwegian University of Science and Technology

Andreas Rosendal Jakobsen and Mats Woldmo Hagen

Post-Earnings Announcement Drift: Evidence from the Norwegian Market

Master's thesis in Financial Economics
Supervisor: Jacopo Magnani
June 2024

NTNU
Norwegian University of Science and Technology

Andreas Rosendal Jakobsen and Mats Woldmo Hagen

Post-Earnings Announcement Drift: Evidence from the Norwegian Market

Master's thesis in Financial Economics
Supervisor: Jacopo Magnani
June 2024

Norwegian University of Science and Technology

Preface

This thesis marks the end of our two-year Master's program in Financial Economics at NTNU. The journey has been challenging, yet immensely rewarding, offering us invaluable experiences and insights. We extend our heartfelt gratitude to our supervisor, Jacopo Magnani, for his unwavering support and guidance throughout our research. His ability to answer all our problems and guide us through this journey has been extremely helpful. We are also deeply thankful to Torberg Falch for his assistance with econometric issues. Lastly, we would like to acknowledge and thank our fellow students, who have worked alongside us this spring. Your ability to share helpful remarks and great conversations has created an exceptional working environment.

Abstract

The purpose of this study is to analyse the post-earnings announcement drift in the Norwegian market. The well-known anomaly has been documented in markets across the world. The anomaly occurs because share prices fail to adjust immediately after new information comes at the release of quarterly reports. This is a deviation from standard economic theory. Over a period of seven years, we have found evidence that suggests the post-earnings announcement drift appears in the Norwegian market. Our results also suggest that firm publicity prior to announcement, and percentage share ownership by strategic entities is inversely related to the drift. Our results do not suggest that firm size has any implications on the post-earnings announcement drift. The findings are consistent with expectations and previous research apart from the fact that we were not able to find any significant effect from firm size.

Sammendrag

Formålet med dette studiet har vært å analysere Post-earnings annoucement drift i det norske markedet. Den kjente anomaly er vell dokumentert i markeder over hele verden. Anomalien oppstår fordi aksjekursen justerer ikke kursen umiddelbart etter ny informasjon som kommer ved utgivelse av kartalsrapporten. Dette er kjent som er avvik fra økonomisk teori. Over en period på syv år finner har vi funnet bevis som tilsier at det finnes en drift etter publisering av kvartalsrapporter. Resultatene i vårt studie tyder også på at selskapets publisitet før annonsering og prosentandel strategiske eiere har en effekt på driften. Vi har dermed ikke funnet at selskapsstørrelse har noe innvirking på driften. Våre funn er konsisente med forventningen og tidligere forsking, bortsett fra funnene på selskapsstørelse.

Contents

1 Introduction

The economic and financial markets are a complex universe assembled by a multitude of participants being affected by several factors. Ranging from individuals to massive corporations and government agencies, in other terms everyone takes part in the economic markets. Since every individual is a part of the economic market, this means that a multitude of factors affect the market. Due to the complexity, it is nearly impossible to perfectly understand all the mechanisms in the financial and economic markets. Still, we are seeing thorough research that makes us able to understand the main aspects of the economic and financial world.

To understand economic and financial theory that is based on assumptions we make to simplify the complex nature of economics. The efficient market hypothesis (EMH) is a central theory in economics that states asset prices are being reflected by all publicly available information (Jones and Netter, n.d.). An important note from the hypothesis is that markets should be frictionless. in other words, there should be no transaction costs (Fama, 1991). This assumption does not hold in practice. Another important assumption is that all investors behave rationally. This assumption has met heavy criticism for not reflecting the nature of human behaviour. Kahneman and Tversky (1979) published the prospect theory where they criticize the expected utility theory as a descriptive model of decision-making under risk and developed an alternative model (Kahneman and Tversky, 1979). The paper represents the beginning of the field we call behavioural economics.

Behavioural economics is the study of how psychological factors influence the decision-making and rationality of individuals (Lin, 2012). Under the field of behavioural economics, we find the subfield of behavioural finance. In this field, researchers are trying to find out how irrational behaviour can be the source of market anomalies that cannot be explained by standard economic theory. In today's market, we witness several documented anomalies where researchers and professionals are having difficulties explaining these anomalies. A well-known anomaly is the post-earnings announcement drift, which we will further discuss in the context of the Norwegian market.

In the modern world with digital news providers, social media, forums and in general unlimited access to information. We can see the importance of studying human behaviour in relation to financial markets. A good example is the short squeeze of GameStop which happened in January 2021. Users from Reddit and specifically the subreddit r/WallStreetBets, believed that the stock was undervalued and saw that a lot of large institutions were short selling the stock. By coming together, they triggered a steep price increase and forced a short squeeze where large institutions needed to cover their losses. This event showed how much power social media and online communities have on the financial markets, and how this arguably irrational behaviour can have a significant impact. We are seeking to investigate how the behaviour of humans can create financial anomalies, that are caused by participants behaving differently from what standard economic theory assumes. We will investigate the presence of the post-earnings announcement drift in the Norwegian market and create hypotheses around firm publicity in digital news providers, strategic entities' ownership and firm size to see how these variables are affecting the drift.

1.1 Motivation

As mentioned in the previous section, we are going to research the post-earnings announcement drift and the presence of the anomaly in the Norwegian market. The motivation for researching the chosen topic comes from a five-year academic career of learning economic and financial theory. We want to connect our knowledge into practice and enhance a deeper understanding of the drivers behind the anomaly. Through our studies, we have acquired a thorough understanding of the fundamentals in economic modeling and assumptions about the models that are not always applicable in real life. In behavioural finance, there is some uncertainty connected to human behaviour that is difficult to incorporate when predicting stock prices. We find this uncertainty very intriguing, and the reason why we would like to study a topic under behavioural finance, especially the post-earnings announcement drift in our domestic market. In this thesis, we hope to answer the questions about the presence of the PEAD in the Norwegian market, if firms' publicity has a negative influence on the drift, if firms with a high percentage of strategic ownership are getting affected by news coverage on the drift and if firm size is inversely related to the drift. We hope the thesis will help us acquire a deeper understanding of the drift and the mechanisms behind it.

1.2 Disposition

In the thesis, we will first provide relevant literature that looks at theories behind the PEAD and the research on social media and newspapers related to post-earnings announcement drift. Then we will elaborate on the data collection process and provide relevant models for our research on PEAD on the Norwegian stock exchange. We will also develop hypotheses about the expected outcome of our models, and the reasoning behind them. In addition, we will provide descriptive statistics about our variables and discuss why we have chosen to include them in our model. Furthermore, we will look at the results of our model and discuss the results in relation to our stated hypotheses and how our results reflect those. There will also be provided robustness checks to authenticate our results. In this part there will also be a discussion about possible shortcomings in our chosen models, that may affect the validity. We will continue by discussing some limitations in our study and open up for further research connected to post-earnings announcement drift on the Norwegian stock exchange. In the end, we will provide a conclusion of our findings in the thesis.

2 Literature Review

In this part of the paper will start by introducing the economic theory of the Efficient Market Hypothesis, Capital Asset Pricing Model and Arbitrage Pricing Theory. Furthermore, we will discuss progress made in economic theory, and turn our discussion to behavioural economics and finance that is putting the light on assumptions made in standard economic theory. Then we seek to explain the theory behind our model of choice, and important notes and possible limitations around this. in the end, we want to introduce previous research that has investigated financial anomalies and why they occur. Further, we will discuss articles and literature that investigate the post-earnings announcement drift in different markets.

2.1 Efficient Market Hypothesis

The Efficient market hypothesis (EMH) claims that all available information is fully reflected in (security) prices. A market where prices adjust rapidly to new information and fully reflect the new information is called an "efficient" market(Fama et al., 1969). The

theory is one of the most central theories in finance. The theory has been tested broadly and widely by researchers for different time and a variety of markets such as the New York Stock Exchange (NYSE) and the American stock market. The data has been in line with the theory of EMH, with few exceptions (Jensen, 1978).

We can split the Efficient market hypothesis into ranked forms of market efficiency. Weak form, Semi-strong and Strong form of the hypothesis. They differentiate based on how much information is accounted for in the prices (Fama, 1970).

Weak form takes into account the information set, where just historical prices are available to investors and market participants. The testing of this form has been tested as a random walk model where there would not be any new information from past prices.

Semi-Strong form builds on the weak form, but also incorporates the information set of publicly available information such as announcements of earnings, stock split and dividend payout. In general, the Semi-strong form of the Efficient Market Hypothesis is concerned with the speed of adjustment to new information.

Strong form of the efficient market hypothesis is concerned with whether all available information is fully reflected in prices, in the sense that no investor has higher expected returns than others because of monopolistic access to information. In other words, in a strong efficient market there should be no evidence of inside trading based on information.

The theory is important for the research in the thesis. Since quarterly earnings announcements are a source of information, therefore if markets should be in a strong form, the adjustment to such information should be rapid and be incorporated into prices right after the earnings announcements. The question is if these are abnormal returns to information, and it is evidence against the efficient market hypothesis.

2.2 Capital Asset Pricing Model (CAPM)

The capital asset pricing model is another central model in finance. Developed by Sharpe (1964) and Lintner (1965). The CAPM is looked at as the start of modern asset pricing

theory. Intuitively the model explains the relationship between risk and expected return and has for a long time widely been used in financial applications (Fama and French, 2004).

The theoretical foundation of the CAPM is based on several assumptions, in general we can say that they are simplified assumptions to comprehend the complexity of asset pricing. For example, the return only being dependent on the market risk and the asset's correlation to the market. Simplified assumptions as this one, are one of the main reasons why the empirical evidence is poor from the model(Fama and French, 2004). Different papers have looked into the capital asset pricing model and many studies have found evidence against the theory. Higher E/P stocks generate higher returns than predicted by the CAPM (Basu, 1977). Smaller stocks measured by market capitalization generated on average a higher return than measured by the model (Banz, 1981). Another paper found that the debt/equity ratio is correlated with returns above their respective beta value (Bhandari, 1988). The evidence suggests that the CAPM is way too simplified to correctly estimate the risk-return trade-off in a complex financial market. Our question is how does the evidence against the CAPM affect the possibility for the PEAD anomaly to appear?

The CAPM assumes that the markets are efficient, this means that everyone receives information at the same time and all new information is immediately captured by the share price. If the assumption about an efficient market holds then the PEAD would not occur since all new information available from the quarterly reports would immediately be captured in the price. Ball et al. (1993) suggested a shift in the beta coefficient based on the unexpected earnings and found that the post-earnings announcement drift was no longer significant. However, Bernard and Thomas (1989) expanded on this study and found evidence that unexpected earnings and the beta are correlated but far from being able to explain the magnitude of drift witnessed in the American market.

2.3 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory (APT) is an extended model from the CAPM that includes several factors of risk measurements. The theory and model were formulated by Stephen Ross in 1976. Different from the CAPM which only assumes one factor to capture the

systematic risk, the APT assumes multiple macroeconomic variables to capture the risk. The APT assumes no arbitrage opportunities, if it occurs an arbitrage opportunity will quickly be exploited by investors and disappear (Ross, 1976). In the context of PEAD, it is difficult to say that the presence of this anomaly will create arbitrage opportunities and that this will be highly dependent on trading strategies and risk factors (Fink, 2021). However, if we assume that arbitrage opportunities arise from PEAD these will quickly be exploited and therefore disappear. Empirical evidence suggests that anomalies that are found and analysed in academic literature often seems to disappear. This opens the possibility that arbitrage opportunities from anomalies have occurred but been exploited (Schwert, 2003). The APT also differs from the CAPM in the sense that it does not assume no transaction costs. A previous study introduced the idea that PEAD is caused by transaction costs. The study found that the drift appeared to be constrained by an upper bound close to the individual transaction costs (Bernard and Thomas, 1989). The study did not conclude this as an explanation of the drift, but it remains an interesting remark. Based on the assumptions of the APT and previous studies it seems that in a theoretical world where the APT reflected the reality the post-earnings announcement drift would still have the possibility to appear, and this distinguishes the model from the capital asset pricing model.

2.4 Behavioral Economics

Behavioural economics and behavioural finance are fields that challenge the efficient market hypothesis, Capital asset pricing model and the arbitrage pricing theory, which we can call the backbone of economic theory. These models assume that all investors are rational agents, have the same ability to process information, and looking to maximize returns. The assumptions were not realistic to human behaviour, this started the field of behavioural economics. The field grew interest with Kahneman and Tversky's paper on "Prospect Theory" and the paper highlights how investors are more cautious to potential losses than similar gains and this leads to a decision-making that deviates from rational expectations (Kahneman and Tversky, 1979). Behavioural economic theory suggests that cognitive biases and emotional factors influence the decision-making (Kenton, n.d.). Biases and phenomena's as overconfidence and loss aversion demonstrate the psychological factors of investing that could lead to market anomalies.

How does behavioural finance suggest that the anomaly post-earnings announcement drift can appear? Fama calls the post-earnings announcement drift "the grandaddy of under-reaction events" (Fama, 1998). The reason for this is the investors failing to process all new information following the earnings announcement, thereby creating a drift. In other terms, the anomaly is created, because cause of investors reduced ability to process new information at once. This contradicts the efficient market hypothesis. The field of behavioural economics has started the research on the psychological and behavioural mechanisms behind investment decisions.

2.5 Financial Anomalies

The word "anomaly" can be described as a deviation from natural order or an exceptional condition and comes from a violation of paradigm-induced expectations (Kuhn, 1996). In financial literature, the paradigm-induced expectations are most often referred to as EMH and CAPM assumptions of all agents are stable, rational and have well-defined preferences (Thaler, 1987). Because the standard economic models introduce a set of assumptions about individuals' behaviour the anomalies occur due to these assumptions not holding.

Some well-known anomalies in the financial markets are the January effect which is a seasonal increase in stock return in the first month of the year (Klock, 2014), and the sunshine effect which states that stock returns are positively correlated with sunshine (Hirshleifer and Shumway, 2003). Common between these anomalies is that human behaviour changes around certain events and from this financial anomalies occur. An interesting remark however is that financial anomalies often seems to disappear, reverse or attenuate after being analysed in academic literature (Schwert, 2003). This opens the question for us if the post-earnings announcement drift will disappear in the future.

2.6 Post-Earnings Announcement Drift

Post-earnings announcement drift is an accounting anomaly, and it is described as the tendency for a firm's stock price to drift for some time after the quarterly announcement. The research on post-earnings announcement drift (PEAD) started with the research of Ball and Brown (1968). Where they found out that Cumulative returns maintained a

drift upwards for Positively good news and downwards for bad news for security listed on NYSE in the period 1946-1966. (Bernard and Thomas, 1989). After the paper of Ball and Brown, there have been countless studies afterward who have investigated this puzzling anomaly. The research has been extended to several countries and markets, the effect has been stable across developed and emerging markets. Some countries studies that have confirmed the PEAD: UK (Liu et al., 2003), Spain (Forner et al., 2009), South Africa (Swart and Hoffman, 2013).

Prior studies have looked at potential explanations for PEAD based on markets' failure to adjust the abnormal returns. (Ball et al., 1993; Bartov et al., 2000; Bernard and Thomas, 1989). PEAD could come from investors' ability to adjust their risk perspective. A study has shown that betas for firms with higher(lower) unexpected earnings in the subsequent period had an increase(decrease) in betas. (Ball et al., 1993). Another explanation for PEAD could be a divergence in opinions among investors and this is shown in the trading volume before the announcement. GARFINKEL and SOKOBIN (2006) documented in their study that unexpected trading volume had an impact on the PEAD. In their studies, they have used the average turnover rate in the period from 54 to 5 days ex-ante. Recent studies have different explanations for the delayed response after to earnings announcement is due to underreaction (Dellavigna and Pollet, 2009). However, the later assumption takes into account that the under-reaction comes from the cost of individual investors to understand the information released in the earnings announcements.

Post-earnings announcement drift can be observed in every firm size. In the paper from Foster et al. (1984), they found that smaller firms have larger PEAD. Later studies have confirmed this statement (Bernard and Thomas, 1989). A potential explanation for this observation from the studies is that more analysts are following bigger firms. Once new information comes, analysts try to get small informational advantages, by doing so the analyst forecast becomes superior to a time-series forecast. This results in earnings announcements will be less informative (Getmansky et al., 2004; Bhushan, 1989).

Further studies have looked at the post-earnings announcement drift related to investor sophistication. The measure of firms' investor sophistication has been dealt with using institutional investors' holdings as a proxy for the sophistication of firms' ownership. They are more in relative advantages when it comes to collecting and processing information. Institutional owners could also be categorized as specialists. The findings are that a high (Low) percentage of institutional holdings have a significantly negative(positive) impact on PEAD (Bartov et al., 2000).

The more recent studies have looked at other potential explanations for the drift. The research has focused on social media coverage/news coverage could decrease the information processing and information acquiring cost of earnings announcements. It has shown that companies with a higher social media footprint have a lower price reaction to earnings news (Bhagwat and Burch, 2013). The previous studies have focused on big social media platforms such as X (previously Twitter), Seeking Alpha and Google search trends (Ding et al., 2023; Bartov et al., 2000).

The research on post-earnings announcement drift has looked at different return periods of the drift. Ball and Brown (1968) found that drift was up to six months after the earnings announcement. While Bernard and Thomas (1989) has found that the drift increased up to a period of sixty days. Other more recent papers have found the same results of the drift shown up to sixty trading days or a quarter(Ding et al., 2023, Chae et al., 2020). We decide to incorporate the same approach by using sixty trading days post-announcement.

The mentioned research has gained valuable results and relevant results for our analysis. We have incorporated the methods of others, where we want to include the variables, the mentioned studies have focused on. We have chosen to focus on the same approach from "Social media coverage and post-earnings announcement drift: evidence from seeking alpha" from Ding et al. (2023). The research has looked at the impact of news coverage and mentions in the financial platform Seeking Alpha. The theory raises an important question, could we see the effect in the Norwegian stock exchange and does the Norwegian market differ from the previous research?

3 Methodology

In this section, we will elaborate on our data gathering process. Further, we will discuss relevant theories for the model selection and research design. In the end, we will state our hypotheses.

3.1 Data Collection

For the data collection part, we have used Eikon Refinitiv as our main provider of data. The license for the database access has been provided by the Norwegian University of Science and Technology (NTNU). At the start of the process, we gathered a substantial amount of data for primary quotas listed on the Oslo Stock Exchange. We collected quarterly earnings per share (EPS) median estimates and actual reported. Further in the process, we collected the number of analysts for each firm, market capitalization, share prices, trading volume and strategic entities. The definition from Eikon Refinitiv is "percent of shares held by strategic entities (individuals, corporations, holding companies and government agencies)". Earnings per share, earnings per share median estimates and number of analysts were quarterly frequency. Strategies entities in monthly frequency. Trading volume, market capitalization, and prices were in daily frequency. We gathered the mentioned data above for 62 firms(See Appendix) listed on the exchange, after we filtered data, we excluded 4 firms("AFK.OL", "ODLO.OL", "ODF.OL", "SNI.OL") because insufficient data that did not meet the requirements below to be in the final sample.

- *Needed to have analyst estimates for earnings per share*
- *Possible to separate firms when collecting Atekst data.*
- *Need to be listed on the exchange more than 10 quarters and listed at the time of data collection*

We wanted to look at how the firm publicity affects the post-earnings announcement drift and from this, we decided to find the number of different articles where each firm is mentioned. To specify a variable capturing this effect we used a site called ATekst. This is a portal where academics can gain access to newspaper content and statistics based on the mentioned words. We used the platform to collect weekly data from the biggest financial newspaper in Norway, E24. The paper had an average of 555.645 daily readers

in the fourth quarter of 2023(Medietall, 2024). Along with this site, we also included articles and news posted on the homepage for the Oslo Stock Exchange called "Børsen". The way we did this was to specify keywords, and the site calculates how many articles are published in a weekly frequency that contains these keywords. For each keyword, we specified either the company name or the stock ticker symbol. We then retrieved the exact number of articles published on E24 or Børsen for each company. This was an essential part of the thesis because initially, we planned to use search frequency from Google to get an overview of the publicity surrounding each firm, but we considered some biases that may arise from this. By using Google search frequency we would capture the whole interest in the firm not only for investors' interest but also services that firms provide. Considering that there is a difference between consumers interested in the products and the investor purposes this could have given us skewed results. We therefore, decided to go for publicity in financial news sources since readers of these sources have an interest in the financial performance of the firms.

3.2 Model Theory

3.2.1 Ordinary Least Squares

Ordinary least squares is an estimation method, the method is one of the most common methods for estimating the relationship between dependent and independent variables. The main goal is to estimate the model where it is minimizing the sum of squares, between the observed values and the predicted values. The model comes with a few assumptions that should be in place for the model to be the best linear unbiased estimator (BLUE) (Brooks, 2019).

- **Linearity:** *The relationship between the dependent variable and independent variables is linear.*
- **Independence:** *The observations are independent from each other.*
- **Homoscedasticity:** *The variance of the error term is constant across all levels of the independent variable.*

- **Normality:** *The error terms are normally distributed.*
- **No perfect multicollinearity:** *There is no perfect correlation between the independent variables.*

3.2.2 Panel data and Fixed Effects

Panel data is referred to as the pooling of cross-sectional data, where the data is formed with observations over time and for several entities(companies). For modeling the data in the simplest way a Pooled Ordinary Least Squares (OLS), is a way where you treat the data as one cross-sectional data and assume that there is no difference between the units or time (Brooks, 2019).

Pooled Ordinary Least Squares:

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it} \tag{1}$$

In most cases it is not interesting how to look at the data as one. The interesting part is to look at how the data differs within each unit. Most of the time doing a regression analysis you would like to consider the different characteristics of entities. To look at the characteristics of the entities, we introduce fixed effects where we include the differences between time and entities in the equation. Fixed entity effects (α_i) are a method to control all time-invariant characteristics of the entities. The method allows us to control heterogeneity in entities and each entity to have their own intercept (Brooks, 2019).

Ordinary least Squares with fixed entity effects:

$$Y_{it} = \alpha_i + \beta X_{it} + \mu_{it} \tag{2}$$

Fixed time effects (λ_t) is being used to control for unobserved variables that vary over time but are constant for all entities across all time periods. This is often when analysing data that could be influenced by economic circles, policy changes and pandemics like the Covid-19 Pandemic.

Ordinary least squares with time-fixed effects :

$$Y_{it} = \alpha + \lambda_t + \beta X_{it} + \mu_{it} \tag{3}$$

When combining both entity and time-fixed effect we get a model that accounts for both the entity-specific (α_i) and time-specific (λ_t) factors that vary over entities and time. By including both effects we account for unobserved heterogeneity in both dimensions.

Ordinary least squares with fixed time and entity:

$$Y_{it} = \alpha_i + \lambda_t + \beta X_{it} + \mu_{it} \tag{4}$$

3.2.3 Standard Errors

Standard panel-data analysis assumes that all observations have identical slope coefficients, with any unobserved heterogeneity among individuals being attributed to individual-specific effects that do not vary over time (Christodoulou and Vasilis, 2017). The assumption is rarely justified since we have multiple observations across one group, and the probability that some of the data generating process is not accounted for and shared across the groups observations, which makes them correlated and therefore wrongly estimated standard errors (Huntington-Klein, n.d). A possible solution for this issue is to cluster the standard errors at the same level as the fixed effect. This way it is possible to obtain fully robust standard errors. This is done by grouping together each cross-sectional unit as a cluster of observations over time, this allows for arbitrary correlation, serial correlation and changing variances for each cluster. The goal of this is to mitigate the heteroscedasticity in the model. Heteroscedasticity refers to a condition where the variability of errors

is not equal across different levels of an independent variable or different groups in the data (Wooldridge, 2016).

3.3 Research Design

With our panel data, we had to organize the data in a manner where we were able to do our analysis. For calculating the dependent variable (CAR), we had to do data manipulation where we started by calculating the daily log return for each firm (i). After we had the daily return, we divided the firms into five portfolios (P) based on the market capitalization. The portfolios are recalculated at the end of each quarter, based on the end-quarter market capitalization. The recalculation of portfolios is done because firms are in different life cycles and could change during our period. After calculating the returns for both portfolios and the individual firms, we determined the abnormal return for each firm. This was done by subtracting the return from the portfolio previous year from the firm's current year. For the method to be done, we collected data for the period from 2015 to 2023. To ensure accuracy, we subtracted the return of the same day the prior year or the closest date before the exact if the exact date was a holiday or weekend. This method ensures that non-trading days are accounted for. The cumulative abnormal returns ((CAR) were calculated one day before the quarterly earnings announcement to sixty days after. The time interval for the research is during the period Q1 2016 until Q3 2023(the latest available data point). We have implemented the same calculation method for the cumulative abnormal return (CAR) as the research from Ding, Shi and Zhou on "Social media coverage and post-earnings announcement drift: evidence from seeking alpha". Below we have stated the equations for calculating the abnormal return and cumulative abnormal return.

$$AbnormalReturn_{it} = lnReturn_{it} - lnReturn_{P,t-365} \tag{5}$$

$$CAR_{-1:60} = \sum_{t=-1}^{60} AbnormalReturn_i t \tag{6}$$

Furthermore, we calculated the variable standardized unexpected earnings (SUE). The calculation method is by taking the earnings per share (EPS) from the quarterly report subtracted by the analyst's median estimate before the announcement for the same quarter. For standardizing we divided the difference by the closing price on the same day as the announcement.

$$SUE_{it} = \frac{EPS_{it} - EPS_{Est}}{P_{it}} \tag{7}$$

For the variable capturing the media publicity, we wanted to see the effect of publicity before the earnings announcement. This variable is calculated as the total number of articles published in the interval four weeks prior to the earnings announcement for each firm.

The other variables we include in the model is ownership by strategic entities (($STRAT$) which is the percentage of ownership held by strategic entities at the time of the earnings announcement. The definition from Eikon Refinitiv is the percentage of shares held by strategic entities (individuals, corporations, holding companies and government agencies). In the definition "Individuals" refers to key employees of the firm. Market capitalization ((CAP) is the market capitalization at the opening of announcement day and the variable is scaled down by a million of NOK. ($PRICE$) is the Closing share price one month before the announcement. Trading volume($TOTVOL$) is the total trading volume one month prior to the announcement and the variable is scaled down by a hundred thousand.

We have included the variables to control for variation in investors' attention. We have included these because firms have different attributes when it comes to size and media attention.

Table 1: Variable Definition

Variables	Definition
CAR	Cumulative abnormal return 1-day preannouncement and 60 days post announcement
CAR_7	Cumulative abnormal return 1-day preannouncement and 7 days post announcement
CAR_14	Cumulative abnormal return 1-day preannouncement and 14 days post announcement
CAR_30	Cumulative abnormal return 1-day preannouncement and 30 days post announcement
SUE	Standardized unexpected earnings
NA	Number of company specific articles published in a 4-week period prior to announcement
STRAT	Percentage ownership of strategic entities
PRICE	Closing share price one month prior to announcement
CAP	Market capitalization at the time of announcement, scaled down with 1 million
TOTVOL	Total trading volume the month prior to announcement, scaled down with 100 thousand

Notes: The table shows the variables used in our analysis, and a brief explanation of all of them

The effect of scaling CAP and $TOTVOL$ to smaller numbers is that we must study the effect as a change in million for CAP and 100 thousand for $TOTVOL$. This will be important for later when we are going to interpret the results. After defining all variables of interest, we can now start by looking at the regression models we are going to use.

Finally, our main model for the analysis will be:

$$\begin{aligned} CAR_{[-1:60]} = \beta_0 &+ \beta_1 SUE_{it} + \beta_2 NA_{it} + \beta_3 SUE_{it} \cdot NA_{it} \\ &+ \beta_4 PRICE_{it} + \beta_5 SUE_{it} \cdot PRICE_{it} + \beta_6 STRAT_{it} \\ &+ \beta_7 SUE_{it} \cdot STRAT_{it} + \beta_8 CAP_{it} + \beta_9 SUE_{it} \cdot CAP_{it} \\ &+ \beta_{10} TOTVOL_{it} + \beta_{11} SUE_{it} \cdot TOTVOL_{it} + \epsilon \end{aligned} \tag{8}$$

In our main model, we are testing for the cumulative abnormal return in the time interval from one day before the announcement until sixty days after. The reason for having the interval period one day before the announcement is that we want to include the effect

of the announcement. We are following the same interval window as research on seeking alpha mentioned in the theory part (Rong Ding and Zhou, 2023). In addition, we are including time and entity fixed effects to control for differences within quarters and firms and clustered standard errors for quarters and firms.

In addition to the main model, we also wanted to check for potential biases arising from events that potentially could give extreme outliers in the estimation of the model. We created a model using quarter dummies, instead of using the time-fixed effects. This captures the extreme outliers in the quarters. The thought behind extending the model by using quarter dummies is that during our sample period, there have been two major macroeconomic events. The first that could potentially affect the estimation is the Covid-19 pandemic The second is Russia- Ukraine which also affected the financial markets in the whole of Europe. The model is similar to the main model but uses a set of control variables to control for each quarter. The time interval for our data includes a total of 31 quarters. In the model we have only included 30-time dummies, when using dummies we need to have a reference point. In the model, we have set Q1 2016 as the reference in this model. We expect including dummies in the model to have a statistically significant effect on our model. We are looking at this model before using time-fixed effects. Below is the stated model including the time dummies:

$$\begin{aligned} CAR_{[-1:60]} = \beta_0 &+ \beta_1 SUE_i + \beta_2 NA_i + \beta_3 SUE_i \cdot NA_i \\ &+ \beta_4 PRICE_i + \beta_5 SUE_i \cdot PRICE_i + \beta_6 STRAT_i \\ &+ \beta_7 SUE_i \cdot STRAT_i + \beta_8 CAP_i + \beta_9 SUE_i \cdot CAP_i \\ &+ \beta_{10} TOTVOL_i + \beta_{11} SUE_i \cdot TOTVOL_i \\ &+ \sum_{t=2}^{31} \alpha_t \text{Quarter}_t + \epsilon \end{aligned} \tag{9}$$

We also wanted to look at whether the effect is statistically significant for a shorter time interval than sixty trading days. Is there possibly an effect for the Norwegian market, that we can witness an effect on shorter time intervals? This is why we have also included in the research cumulative abnormal return (CAR) for the interval periods of seven-,

fourteen- and thirty days post-announcement. By including different interval periods, we are looking to further advance the development of the cumulative abnormal return and the interaction with the independent variables. In this method, we could look at if the effect increases(decreases) with a longer(shorter) time horizon.

$$\begin{aligned} CAR_{[-1:7]} = \beta_0 &+ \beta_1 SUE_{it} + \beta_2 NA_{it} + \beta_3 SUE_{it} \cdot NA_{it} \\ &+ \beta_4 PRICE_{it} + \beta_5 SUE_{it} \cdot PRICE_{it} + \beta_6 STRAT_{it} \\ &+ \beta_7 SUE_{it} \cdot STRAT_{it} + \beta_8 CAP_{it} + \beta_9 SUE_{it} \cdot CAP_{it} \\ &+ \beta_{10} TOTVOL_{it} + \beta_{11} SUE_{it} \cdot TOTVOL_{it} + \epsilon \end{aligned} \tag{10}$$

$$\begin{aligned} CAR_{[-1:14]} = \beta_0 &+ \beta_1 SUE_{it} + \beta_2 NA_{it} + \beta_3 SUE_{it} \cdot NA_{it} \\ &+ \beta_4 PRICE_{it} + \beta_5 SUE_{it} \cdot PRICE_{it} + \beta_6 STRAT_{it} \\ &+ \beta_7 SUE_{it} \cdot STRAT_{it} + \beta_8 CAP_{it} + \beta_9 SUE_{it} \cdot CAP_{it} \\ &+ \beta_{10} TOTVOL_{it} + \beta_{11} SUE_{it} \cdot TOTVOL_{it} + \epsilon \end{aligned} \tag{11}$$

$$\begin{aligned} CAR_{[-1:30]} = \beta_0 &+ \beta_1 SUE_{it} + \beta_2 NA_{it} + \beta_3 SUE_{it} \cdot NA_{it} \\ &+ \beta_4 PRICE_{it} + \beta_5 SUE_{it} \cdot PRICE_{it} + \beta_6 STRAT_{it} \\ &+ \beta_7 SUE_{it} \cdot STRAT_{it} + \beta_8 CAP_{it} + \beta_9 SUE_{it} \cdot CAP_{it} \\ &+ \beta_{10} TOTVOL_{it} + \beta_{11} SUE_{it} \cdot TOTVOL_{it} + \epsilon \end{aligned} \tag{12}$$

After we have looked at the models of interest, it would be interesting to look at the descriptive statistics of the variables. This will help us identify important measures such as mean, median, maximum value, minimum value, and number of observations. The statistics are a great way to get an overview of the dataset to see the propositions in the dataset.

Table 2: Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Min	Max
CAR	1,509	-0.01	0.25	-2.40	1.57
CAR_7	1,509	-0.00	0.11	-1.19	0.57
CAR_14	1,509	-0.01	0.15	-2.30	0.98
CAR_30	1,509	-0.01	0.22	-1.50	1.12
SUE	1,509	0.02	0.70	-23.12	6.74
NA	1,509	11.07	22.00	0.00	123.00
STRAT	1,509	40.26	21.16	0.00	109.96
PRICE	1,509	166.49	569.25	2.47	8,677.17
CAP	1,509	49,528.73	113,203.09	599.73	1,198,263.66
TOTVOL	1,509	298.19	620.32	2.02	11,329.69

The table shows descriptive statistics of all our variables. The statistics include observation count, mean, standard deviation, minimum value and maximum value.

From the descriptive statistics, we get a clear overview of all the variables and the variation within the variables. In the table, the mean of cumulative abnormal return is -0.0092 and the mean of SUE is -0.0198. This can potentially suggest that for the average firm in the sample, the earnings per share is lower than the analysts' median estimate. We can also notice the minimum and maximum values for SUE is quite big and that can imply in some instances that analysts have heavily misjudged some firms' earnings, thereby creating some extreme values. The average number of articles published 4 weeks before the announcement is 11.07. The mean share price one month prior to the announcement is 166.49, mean percentage of strategic investors is 40.26%. the mean market capitalization is 49,529 million and the mean total trading volume in the month leading up to the announcement is 298,190.

It is also important to know how the variables interact with each other, and a measure of correlation between the variables will help us observe this. Looking at the correlation matrix is a straightforward way to identify potential issues with Multicollinearity.

	CAR	SUE	NA	STRAT	PRICE	CAP	TOTVOL
CAR	1.0000						
SUE	-0.0256	1.0000					
NA	0.0153	-0.0323	1.0000				
STRAT	0.0041	0.0142	0.1595	1.0000			
PRICE	-0.0529	0.0085	0.1024	-0.0338	1.0000		
CAP	-0.0028	0.0130	0.3185	0.1014	0.0252	1.0000	
TOTVOL	0.0433	-0.0330	0.0697	-0.0224	-0.0861	0.1239	1.0000

Table 3: This table shows the correlation relationship between our variables

Table 3 includes the correlation matrix for the variables. In the table, we can witness some surprising results from our dataset. Firstly, the correlation between CAR and SUE is negative and this deviates from previous theories that have found a positive relationship between the variables (Rong Ding and Zhou, 2023). The PEAD is an anomaly that occurs as a cause of an underreaction among investors not incorporating all new information into the price immediately. Considering a larger earnings surprise will result in new information revealing a discrepancy from the analyst's estimate, this should be incorporated into the price during the period until the next earnings announcement resulting in a larger CAR. Another note from the correlation matrix is the correlation of CAP and NA 31.85%. This gives us a clue that the companies with bigger market capitalization often have more articles written about the firm than smaller ones. This can potentially be explained by these firms being more known to the readers of the paper and the paper gets more clicks by writing about bigger firms.

3.4 Hypotheses

In this part we want to elaborate on our hypotheses for the analysis. These will be the variables we expect to see a significant effect on CAR, and we will base our results and discussion part around these hypotheses. When discussing our hypotheses in the results part we will use a significance level of 5% to determine significant variables.

Hypothesis 1: Standardized Unexpected Earnings (SUE)

The variable standardized unexpected earnings explains the earnings surprise that follows the earnings announcement, this is standardized across companies by dividing with the share price at the time of earnings announcement. If the analysts' expectations of the firm's earnings are further from the actual it is expected that the cumulative abnormal return is higher. We therefore expect a significant positive relation between unexpected earnings and cumulative abnormal return. Our null hypothesis is that the effect is 0, below you can see an overview of the hypothesis regarding this variable.

$$H_0 : \beta_1 = 0$$

$$H_A : \beta_1 > 0$$

Hypothesis 2: Number of Articles (SUE^*NA)

Firms that receive more attention before the earnings announcement will generally have more articles published connected to the firm. We assume that more published articles about a company will decrease the processing cost of the information on the announcement day. When investors have acquired the information beforehand, we expect that investors adjust their expectations on the earnings announcement and reduce the post-earnings announcement drift. Therefore, we expect a negative relation between the number of articles published before the earnings announcement and the effect that unexpected earnings have on the cumulative abnormal return. In other terms, an increase in articles (NA) will cause a decrease in SUE and this will negatively affect the PEAD. To verify our hypothesis. Below is the null hypothesis and the alternative hypothesis.

$$H_0 : \beta_3 = 0$$

$$H_A : \beta_3 < 0$$

Hypothesis 3: Ownership by Strategic Entities (SUE*$STRAT$)

The hypothesis is created by the assumption that ownership by strategic entities is that they will have information far exceeding the average retail investors. Since the institutional owners have more information, we don't expect these investors to contribute to the drift. Based on this we expect a higher percentage of strategic entity ownership to affect the post-earnings announcement drift negatively. To test for this, we look at the interaction term between SUE and $STRAT$. Below are the stated null hypothesis and the alternative hypothesis.

$$H_0 : \beta_7 = 0$$

$$H_A : \beta_7 < 0$$

Hypothesis 4: Market Capitalization (SUE*CAP)

We expect a company with a high market capitalization to be more familiar among investors, and that this leads to investors being more informed about larger firms. We therefore expect to witness a negative effect from market capitalization on the post-earnings announcement drift. We test this by looking at the interaction term between SUE and CAP. Below are the stated null hypothesis and the alternative hypothesis.

$$H_0 : \beta_9 = 0$$

$$H_A : \beta_9 < 0$$

4 Results and Discussion

In this section, we will present and describe the results of our analysis. We will verify the significance of the results in relation to our hypotheses. We will see if the results can help us reject the hypotheses or conclude that we do not have enough evidence to reject them. Earlier we introduced the theory for panel data analysis, and we will discuss if our data meet the assumptions required for the analysis. At the end we will discuss potential limitations in our study and open for further research surrounding this topic.

Table 4: Not including time fixed effects or clustered standard errors

Variables	CAR
SUE	0.8862*
	(0.4868)
NA	0.0005
	(0.0003)
CAP	-0.0000
	(0.0000)
STRAT	-0.0000
	(0.0004)
PRICE	0.0000***
	(0.0000)
TOTVOL	0.0000***
	(0.0000)
SUE*NA	-0.0087*
	(0.0051)
SUE*STRAT	-0.0238**
	(0.0111)
SUE*CAP	0.0000
	(0.0000)
SUE*TOTVOL	0.0001
	(0.0001)
SUE*PRICE	-0.0002
	(0.0001)
Constant	-0.0362**
	(0.0181)
Observations	1,509
R-squared	0.024
Fixed Effects(Firm)	Yes
Fixed Effects(Time)	No

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

Table 4 shows results including firm fixed effects. The results show a significant positive effect for SUE on CAR at 10%. The interaction term SUE^*NA is significantly negative at 10%. The interaction term SUE^*STRAT is significantly negative at 5%. We observe a significant effect at 1% for the variables $PRICE$ and $TOTVOL$. However, the coefficient for both is close to zero and does not show any major effect on CAR. Generally, in financial analyses we want the variables of interest to be significant at a 5% significance rate. Based on the results the only variable of interest that we see this effect for is the interaction term SUE^*STRAT.

In the dataset, we noticed extreme outliers for CAR and SUE. By looking at the time period in our dataset we see that is affected by the Covid-19 pandemic are included in the sample. Also we calculated CAR by distributing firms into portfolios based on the size, the prior year as the benchmark return. The years around Covid-19 may be influenced by the time period, that could potentially have an effect on the results. To make sure we do not have any time-related biases affecting our results, we decided to introduce time-fixed effects to make our results more robust. Another robustness measure we introduced was to cluster both time and firms. We did this measure to ensure that heteroscedasticity does not make our results biased. Heteroscedasticity refers to a situation where the variance of the error term is not constant across observations (London Global University). Considering we are dealing with panel data, where we have observations for each firm over time. We cluster the standard errors to account for heteroscedasticity across the clusters.

Table 5: Fixed time and entity

Variables	CAR
SUE	0.8862**
	(0.422)
NA	0.0003
	(0.0003)
CAP	-0.0000
	(0.0000)
STRAT	0.0003
	(0.0003)
PRICE	0.0000***
	(0.0000)
TOTVOL	0.0000***
	(0.0000)
SUE*NA	-0.0069**
	(0.0031)
SUE*STRAT	-0.0239**
	(0.0117)
SUE*CAP	0.0000
	(0.0000)
SUE*TOTVOL	0.0000
	(0.0000)
SUE*PRICE	0.0000
	(0.0000)
Constant	-0.048***
	(0.0147)
Observations	1,509
R-squared	0.0257
Fixed Effects(Firm)	Yes
Fixed Effects(Time)	Yes

Robust standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Table 5 shows the results of the analysis when including firm and time-fixed effects. in addition to fixed effects, we have clustered standard errors on firm and time levels. This is done to account for differences in standard errors within firms and over time. Looking at the results a 1 unit increase in SUE is expected to increase CAR with 0.86 units. This effect is significant at a 5% significance rate. We are not interested in looking at the direct effect of the other variables on CAR, but rather the interaction with SUE to find out if these variables have implications on the effect unexpected earnings have on CAR.

From the results we can observe a significant negative effect from the interaction terms SUE*NA and SUE*$STRAT$. The coefficient is significant at 5% for both variables. We are not able to see any significant effect from any of the other interaction terms, so the results do not seem to suggest that market capitalization, share price or trading volume have any impact on the effect from unexpected earnings on post-earnings announcement drift. Comparing the results when including time fixed effects and clustered firm and time to the model without, we seem to increase the significance in SUE and SUE*NA. This is consistent with our expectations that there is not a constant relationship between the quarters and CAR. The inclusion of time-fixed effects helps the model focus more on the relationship between the dependent and the independent variables, and exclude time trends.

From Table 5 we witness the interaction term SUE*NA which gives us the coefficient -0.0069. These results states that more articles published in the 4 weeks before the earnings announcement will decrease the effect that SUE has on CAR. Intuitively this suggests that higher firm publicity prior to earnings announcement will inform investors more which will limit the degree of underreaction at earnings announcement and the period after. The results are significant at 5%.

Another important result is the interaction term between SUE and $STRAT$ which gives us a coefficient of -0.0239. The result is significant at a 5% significance level. This suggests that a higher percentage of strategic entities ownership will decrease the effect that SUE has on CAR. Since we assume that strategic entities on average are more informed than the average retail investor this aligns with our expectations. We would not expect entities such as hedge funds or government entities to underreact with new information at earnings announcement, and therefore a higher ownership of those entities should reduce the effect that an earnings surprise has on CAR.

To investigate the direct effects of the quarters more thoroughly we also decided to include a model that replaces the time-fixed effects with quarter dummies. With this change we can directly see the effects of each quarter and determine which quarters that have a significant effect on CAR. We expect that the quarters affected by Covid-19 will experience

a significant effect, but it is also possible that we observe other quarters with similar effects. Table 6 below shows our regression results when introducing time dummies, and for simpler reading we have decided to only show the quarters that experience a significant coefficient at either 1, 5 or 10%.

Table 6: Including time dummies

Variables	CAR
SUE	0.8631**
	(0.4201)
NA	0.0003
	(0.0003)
CAP	-0.0000
	(0.0000)
STRAT	0.0003
	(0.0003)
PRICE	0.0001***
	(0.0000)
TOTVOL	0.0001*
	(0.0000)
SUE*NA	-0.0069**
	(0.0035)
SUE*STRAT	-0.0239**
	(0.0111)
SUE*CAP	0.0000
	(0.0000)
Q_3	0.1153*
	(0.0574)
Q_11	-0.0782*
	(0.0451)
Q_16	-0.1326*
	(0.0627)
Q_17	-0.1276*
	(0.0767)
Q_20	0.2429***
	(0.0603)
Q_23	-0.1482**
	(0.0493)
Q_24	-0.1068*
	(0.0543)
Constant	0.0025
	(0.0069)
Observations	1,509
R-squared	0.1331
Fixed Effects(Firm)	Yes
Fixed Effects(Time)	No

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

Including time dummies is a similar approach to time-fixed effects, and we expect the coefficient for the variables to be very similar to the model including time-fixed effects. We decided to exclude the interaction terms not connected to our hypotheses from the display. We included them when running the model, but removed them since they do not hold any interest in this section. From Table 6 we see the results and indeed we observe that the coefficients and their respective significance are similar. SUE, SUE*NA and SUE*$STRAT$ are still significant at 5% where SUE shows a positive coefficient and the interaction terms are negative.

We have included quarters that show a significant effect on a 10% significance level. When we investigate the quarters which have a significant effect on CAR, we especially notice quarters 16, 17, 20, 23, and 24. These quarters are either directly at Covid or the year following the pandemic. What we see by including these quarters is that there is not a constant relationship between CAR and time. This means that by not including time-fixed effects our results are biased due to time-specific effects being interpreted in the variables. Since most of the quarters that show a significant effect are linked to the Covid years, we also conclude that the Covid years do have an impact on our analysis but we can remove this bias by including time-fixed effects. This works because fixed effects in our model mitigate the bias caused by Covid-19 by accounting for unobserved variables that impact all firms uniformly, thus isolating the specific influence of firm-level variations. Quarter 3 and 11 is also showing significant coefficients, but it is difficult to exactly point to why this is. A possible reason could be due to macroeconomic shocks affecting the stock market and therefore giving large earnings surprises that are far from the analysts' estimates. With this section we conclude that the inclusion of time fixed effects is a necessity for the analysis.

4.1 Discussion around the Hypothesis

Previously we stated some hypotheses that reflect our expectations about the variable and their effects on CAR. After studying the results with and without time-fixed effects, we decide to focus on the results including fixed effects. Excluding time-fixed effects from our

model, despite the clear significance of time variations, can lead to biased estimates by failing to account for time-specific shocks that affect all firms. This omission could distort the true relationship between the variables of interest. The main variable of interest in our model is SUE. If we cannot determine a significant positive effect from this variable. We do not have sufficient evidence to conclude that the PEAD can be observed in the Norwegian market, based on our data.

To test the significance of our variables to either accept or reject the hypotheses we will perform a check of the p-value to determine if the variable is significant at a 5% significance level. The p-value is defined as a number that indicates how likely we are to obtain a value that is at least equal to or more than the actual observation if the null hypothesis is correct (Beers, n.d.). In our case, we are seeking evidence to reject our null hypothesis, so a smaller p-value would mean stronger evidence to reject it. The p-value is determined from the t-statistics and the corresponding t-distribution.

Hypothesis 1: We are looking at whether standardized unexpected earnings have a significant effect on CAR. As mentioned earlier we are expecting a positive effect due to a larger earnings surprise contributing to a higher accumulated CAR during the period post-announcement. From Table 5 we see that the coefficient to the corresponding variable SUE is 0.8631 which is positive. To test if the result is significant, we will check the t-statistics and corresponding p-values. We observed a t-statistics of 2.0544 and this corresponds to a p-value of 0.0401. This is less than our significance level of 0.05, and because of this we reject our null hypothesis and find that our analysis supports the claim that standardized unexpected earnings have a significant positive effect on CAR. This supports the claim that the post-earnings announcement drift can be observed in the Norwegian market. We believe this happens because the investors react to the news slowly, causing the return to drift in the direction of the news in the period post-announcement. Therefore the tendency for investors to underreact following earnings announcements seems to also hold in Norway.

Hypothesis 2: This hypothesis questions the effect that the media publicity surrounding a firm in the period before the earnings announcement has on the degree of the post-earnings announcement drift. We are expecting evidence to support the claim that more publicity will inform investors more and thereby reduce the effect that the earnings surprise has on the drift. To investigate this we are checking the interaction term between standarized unexpected return(SUE) and the number of articles(NA). We observed a t-statistic of -1.998 which corresponds to a p-value of 0.0457. This is less than our significance level of 0.05 and we therefore reject our null hypothesis that the number of articles published has no impact on the standarized unexpected earnings have on the drift. We find evidence to support the claim that the number of articles published prior to the earnings announcement negatively affects the effect that SUE has on CAR. This aligns with both our expectations and previous research. Intuitively we believe that more publicity prior to the announcement will inform investors directly about the firm performance, but also influence investors in conducting more research and reading the quarterly report.

Hypothesis 3: The hypothesis is questioning the impact ownership from strategic entities has on the relationship between SUE and CAR. Our expectations state that strategic entities ownership should impact CAR negatively, and we will check this by testing the interaction term SUE*$STRAT$. The coefficient capturing the effect of this interaction term is -0.0239, which is acting according to our expectations. To confirm the significance of the variable we check the t-statistics and p-value. We observed a t-statistics of -2.1453 which corresponds to a p-value of 0.0321 which is less than our significance level of 0.05. Because of this, we reject our null hypothesis that strategic entities ownership has no effect on CAR. We find evidence that strategic entities ownership significantly negatively affects the effect that SUE has on CAR. This aligns with our expectations that firm who has a high degree strategic entities ownership do not underreact to news at the same level as retail investors, and therefore an increase in the ownership of strategic entities will decrease the imapact from SUE has post-earnings announcement drift.

Hypothesis 4: The hypothesis is questioning the impact market capitalization has on the relationship between SUE and CAR. We expect the size of the company to negatively affect this relationship because we assume that investors are more informed about

larger companies. To check this we will analyse the results we obtain from the interaction term SUE^*CAP. The coefficient shows an effect that is positive, but very close to zero. We observe a t-statistics of 0.0345 which corresponds to a p-value of 0.9725. We therefore accept the null hypothesis with a clear margin and find no evidence to support the claim that the size of the company has any effect on the degree of effect that SUE has on CAR. This is a surprising result and does not align with either our expectations or previous studies. As mentioned in the theory section Foster et al. (1984) and Bernard and Thomas (1989) found that size is inversely related to PEAD, but we were unable to find evidence supporting this in the Norwegian market.

4.2 Development of Cumulative Abnormal Return

To look deeper into how CAR develops over time we have also specified models that considered smaller time horizons post announcement. We have specified models for 7-, 14- and 30-days post announcement and we want to see the changes in results when looking at this.

Table 7: Comparison between CAR with different time horizons

Variables	CAR 7	CAR 14	CAR 30	CAR
SUE	0.6351	0.5415*	0.7307**	0.8631**
	(0.4674)	(0.2990)	(0.2930)	(0.4220)
NA	-0.0001	-0.0000	-0.0000	0.0003
	(0.0001)	(0.0001)	(0.0002)	(0.0003)
CAP	0.0000	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
STRAT	-0.0000	-0.0000	0.0002	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0003)
PRICE	-0.0000	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
TOTVOL	-0.0000	0.0000	0.0000**	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
SUE*NA	-0.0050	-0.0036	-0.0081*	-0.0069**
	(0.0039)	(0.0025)	(0.0041)	(0.0031)
SUE*STRAT	-0.0104	-0.0110	-0.0153*	-0.0239**
	(0.0099)	(0.0070)	(0.0075)	(0.0117)
SUE*CAP	-0.0000	-0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Constant	0.0025	-0.0103	-0.0399***	-0.0480***
	(0.0069)	(0.0084)	(0.0121)	(0.0147)
Observations	1,509	1,509	1,509	1,509
R-squared	0.0101	0.0054	0.0204	0.0257
Fixed Effects(Firm)	Yes	Yes	Yes	Yes
Fixed Effects(Time)	Yes	Yes	Yes	Yes

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

From Table 7 we investigate closer the changes in results when accounting for smaller time horizons. Earlier studies have investigated the PEAD for up to 60 trading days post announcement (Fink, 2021). Still, we are interested to find if there are changes in the coefficients for the shorter time horizons. CAR_7 reflects a period of 7 trading days after the earnings announcement. For the shortest time period, we can not see any statistically significant variables. These results imply that we do not observe the drift for a so short period of 7 trading days.

More interestingly are the results from CAR_14 and CAR_30, where we investigate the drift for 14 and 30 trading days post-announcement. The results are more similar to the full 60 days, and we are noticing significant effects for our variables of interest(SUE). A

point to this is that the coefficient estimates increase with the time period. For 14 SUE is significant at a 10% percentage level, and for 30 trading days the variable is significant at a 5% level. This is an important result since it strengthens the argument for using 60 trading days when researching post-earnings announcement drift. We are specifically interpreting the key variables stated in our hypotheses. The interaction term between Unexpected earnings and the number of articles is becoming significant at first at 30 trading at 10% level. The interaction term between Unexpected Earnings and Strategic Entities is also becoming significant at 10% for the same timeframe after the announcement. For the last model with 60 trading days(CAR), we can see that the variables of interest are significant at 5%.

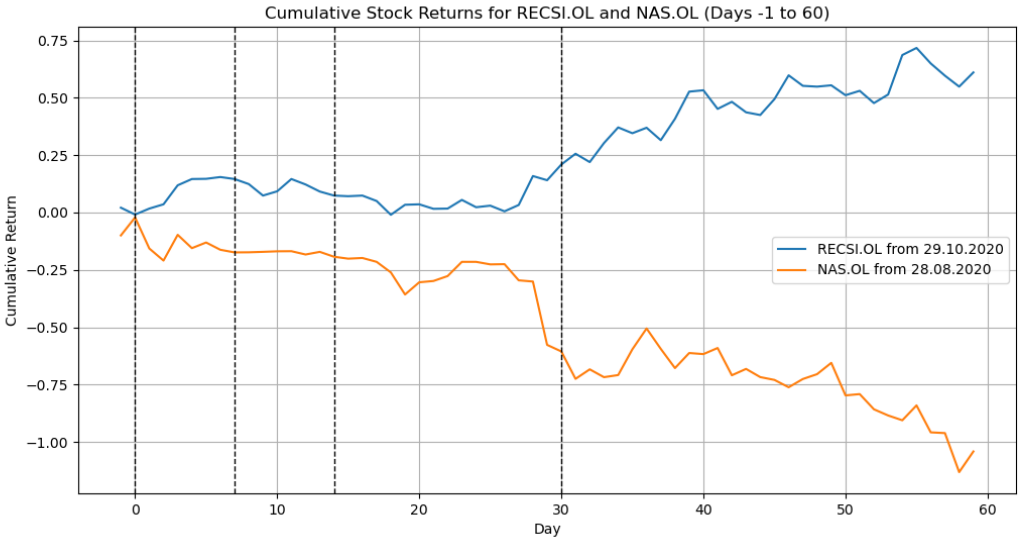


Figure 1: Cumulative returns for the companies RECSI.OL and NAS.OL for one quarter

Figure 1 shows the cumulative return for the companies REC Silicon and Norwegian Air Shuttle for one quarter each. The dotted lines from the left show the announcement date, seven days post announcement, 14 days post and 30 days post. We have included the graph to first show a clear example of the post-earnings announcement drift. Additionally, this graph visualy shows the results from Table 7 where we witness a more significant effect in a longer timeline. We especially notice after day thirty that the effect strengthens up to just short of sixty days. In Table 7 we notice after fourteen days we find a significant effect which does not exactly reflect in the graph, but it remains interesting that we find

concrete evidence from our data that we observe a clearer effect after thirty days.

The results from this section suggest that the argument of using sixty trading days when investigating the post-earnings announcement drift also holds in the Norwegian market. Our results align with previous research that has also witnessed a larger significance up to sixty trading days post-announcement.

4.3 High versus Low Strategies entities

We have split our sample into two sub-samples based on the variable "Strategic entities". The sample is split in High (Low) percentage of strategic entities ownership of the outstanding shares, we have created the split above(below) the median percentage share of 45.55%. We still use our baseline model to check if our results in the baseline model give the same results for the High vs Low. In the Low subsample, we expect to see a negative significant SUE^*NA. An increase in the number of articles decreases the effect of post-earnings announcement drift. Below are the descriptive statistics for each of the subsamples.

Table 8: Descriptive Statistics: Strategic Entities Ownership High

Variables	Observations	Mean	Standard Deviation	Min	Max
CAR	750	-0.011	0.233	-1.241	1.574
SUE	750	-0.003	0.027	-0.279	0.193
NA	750	10.42	15.61	0.00	98.00
STRAT	750	58.40	8.83	45.66	109.96
PRICE	750	136.19	412.12	2.47	8,677.17
CAP	750	56,049.39	132,152.10	607.93	1,198,264.66
TOTVOL	750	260.01	450.32	2.02	4,452.18

The table shows descriptive statistics of all our variables. The statistics include number of observations, mean, standard deviation, minimum value and maximum value.

Table 9: Descriptive Statistics: Strategic Entities Ownership Low

Variables	Observations	Mean	Standard Deviation	Min	Max
CAR	759	-0.007	0.270	-2.397	0.957
SUE	759	-0.036	0.985	-23.121	6.745
NA	759	11.70	26.86	0.00	123.00
STRAT	759	22.33	12.88	0.00	45.55
PRICE	759	196.43	689.23	2.49	7,967.69
CAP	759	43,085.38	90,300.44	599.73	714,473.50
TOTVOL	759	335.91	749.86.32	2.19	11,329.69

The table shows descriptive statistics of all our variables.The statistics include number of observations, mean, standard deviation, minimum value and maximum value.

Table 10: Comparison between High and Low Strategies Ownership

Variables	High	Low
SUE	-4.6814	0.9373
	(3.7004)	(0.5174)
NA	-0.0008	0.0007
	(0.0006)	(0.0004)
CAP	-0.000	0.000
	(0.000)	(0.000)
STRAT	0.0011	0.0004
	(0.0011)	(0.0010)
PRICE	-0.000	0.000***
	(0.000)	(0.000)
TOTVOL	0.000	0.000***
	(0.000)	(0.000)
SUE*NA	0.1333***	-0.0076***
	(2.6081)	(0.0023)
SUE*STRAT	0.0810	-0.0263**
	(0.0655)	(0.0125)
SUE*CAP	0.000	0.000
	(0.000)	(0.000)
SUE*PRICE	-0.0139	-0.000
	(0.0196)	(0.000)
SUE*TOTVOL	-0.0011***	0.0001
	(0.0004)	(0.0002)
Constant	-0.0769	-0.0630***
	(0.0701)	(0.0144)
Observations	750	759
R-squared	0.0260	0.0525
Fixed entity	Yes	Yes
Fixed Time	Yes	Yes

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

From Table 10, we identify that the interaction term is statistically significant in the model with low strategic entities sub-sample (t=-3.2391, 0.0023). The result indicates that retail investors are more reliant on news from Newspapers to collect information to make an investment decision. More mentions in the newspaper four weeks prior to the earnings announcement leads to a lower overreaction of the information in the quarterly earnings announcements. From the table, we also notice that the model fits firms with lower strategic entities ownership. We could also test if the coefficients from the Low (High) strategic ownership sub-sample are significantly different from the High (Low) strategic ownership sub-sample.

Calculating the difference between the variables from the model:

$$\Delta\beta = 0.1333 - (-0.0076) = 0.1408$$

Compute the standard error of the difference:

$$SE_{\Delta\beta} = \sqrt{0.0511^2 + 0.0023^2} = 0.0512$$

Computing the Z-score:

$$Z = \frac{0.1408}{0.0512} = 2.75$$

Calculating the P-value:

$$P\text{-value} = 2 \times (1 - \Phi(2.75)) = 0.0059$$

Φ is representing the cumulative distribution function(CDF).

From our Z-testing, we could say that the coefficient is statistically significant from each other on a one percentage level. We could say that we have a clear relationship that the companies with a low ownership of strategic entities lower the earnings announcements

drift for an increased number of mentions in articles. The result we get from splitting the sample supports our hypothesis 3.

4.4 Robustness Check

Multiple linear regression has a set of assumptions that ideally the model should meet for the results to be robust. In chapter 2 we noted these assumptions and we now want to discuss and test if our model meets the assumptions.

No Perfect Multicollinearity:
From table 3 we see the correlation matrix and we do not want the independent variables to be very highly correlated with each other. We are using a benchmark correlation of 0.8, and want the correlation to be under this. The highest correlation we see is just over 0.3 between CAP and NA and therefore we conclude that we have no perfect multicollinearity in our data.

Normality:
We conducted tests to check if the assumption about normality holds for our data. The first test is a quantile-quantile(Q-Q) plot. The Q-Q plot is a tool that compares the residuals of our data to a 45-degree line representing normally distributed data. From the curve representing our data we can analyse how our data possibly deviates from normality (of Standards and Technology, 2024). Figure 1 below is our Q-Q plot, which deviates significantly from the line representing normality.

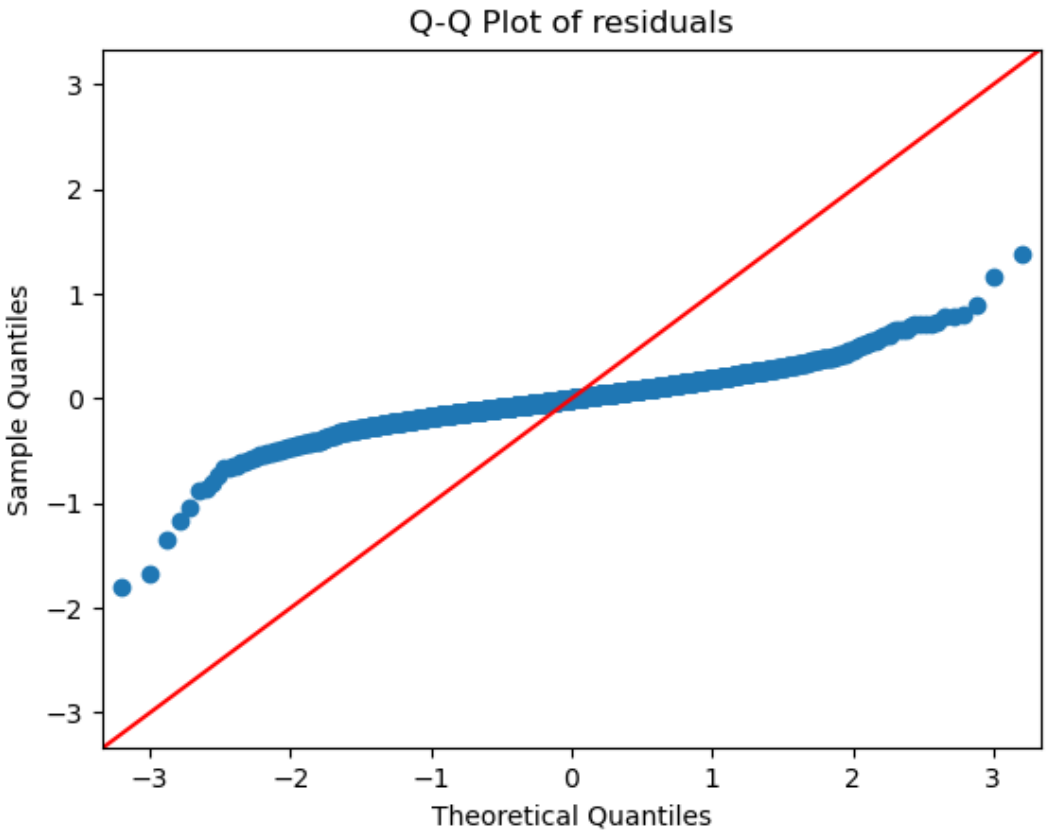


Figure 2: The Theoretical Quantiles against Sample Quantiles

We see that both tails of the curve deviate from the red line, and this indicates that we observe potential outliers in our data and more extreme values than what would be expected under normality. The central part of the curve follows the red line and follows to some extent normality. Because of the significant deviation on the tails, we see that the assumption about normality most likely does not hold for our model. To investigate this closer we would also like to conduct a Jarque-Bera test. In the end, we show how our residuals match against a normally distributed curve.

To conduct the test we first computed the test statistics, and from that found the p-value. If the p-value falls below a significance level which we set to 5% (0.05) then we reject that our dataset is normally distributed. The test statistics are calculated as follows:

$$JB = \frac{n * (\sqrt{b1})^2}{\frac{6+(b2-3)^2}{24}}$$

$$n = SampleSize$$

$$\sqrt{b1} = SampleSkewnessCoefficient$$

$$b2 = KurtosisCoefficient$$

$$\frac{1509 * (-0.527)^2}{\frac{6+(7.762-3)^2}{24}} = 350.75$$

This responds to a p-value of 0.0 and we reject the null hypothesis that our the residuals in the dataset is normally distributed. Since we now know that the data deviates from normality, we need to account for this when analysing our results. T-tests are being used when looking at variable significance, and these results may be biased due to non-normality.

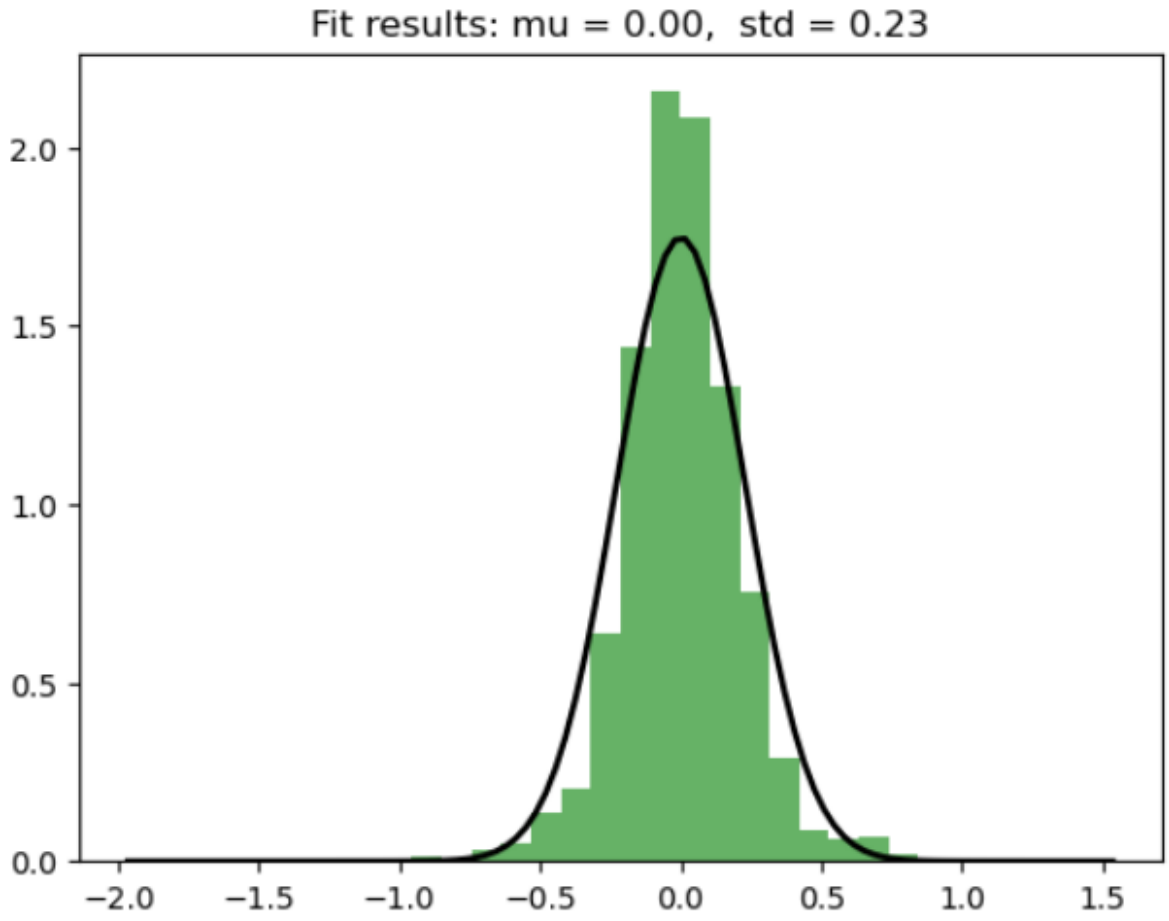


Figure 3: Histogram showing how the residuals match against a normally distributed curve

As mentioned the QQ-plot suggests that the residuals have heavier tails than that of a normal distribution. This is also reflected in the histogram with the presence of residuals further from the mean than what would be expected in a normal distribution.

4.5 Exogeneity and Endogenity

An important discussion to have is whether our explanatory variables are exogenous or if they suffer from endogeneity. Exogeneity is defined as the independent variables are not influenced by the dependent variables, but rather influence them in the opposite direction. If The dependent variable depends on the error term ϵ, then the independent variables cannot be correlated with the error term (Fingleton, n.d). If these requirements do not hold then it is said that the model is suffering from endogeneity which can lead to biased OLS estimators.

To address the possibility that the model suffers from endogeneity we will discuss the variables that could potentially lead to endogeneity. Our dependent variable is CAR, and the independent variable we want to discuss is NA. To recall NA is the number of articles published in the 4-week window before the earnings announcement. This is determined before CAR, there is no possibility for a two-way causality at the same period. However, our concern lies in the fact that CAR could affect NA in the next quarter. If we think intuitively about it a high CAR would mean that a firm is performing well compared to similar sized firms the prior year. This performance could attract attention from news providers, and lead to more articles published before the next earnings announcement.

The same reasoning could also be used about the variable representing unexpected earnings (SUE). A large drift during the post-announcement period could influence analyst's estimate of the firm earnings, thereby directly influencing the unexpected earnings in the next period. This potential endogeneity issue is called reverse causality and is described as a causal relationship between Y and X but in a way that a change in Y influences X because the Y value is determined before X (Abadie, 2005). If our data is suffering from reverse causality the standard errors witnessed could potentially be biased and therefore lead to wrongly significance estimates.

In general, exogeneity is one of the critical issues with statistical analysis because variables can influence each other. To be able to pinpoint the cause of an anomaly can be extremely difficult. When dealing with variables affected by human behaviour, humans can be irrational and act upon previous returns. Therefore returns in previous period could have an impact on this period independent variables. Cumulative abnormal return is not the only factor determining for example NA and SUE, but there is a potential that it has some explanatory power. One measure to handle the reverse causality is the use of instrumental variables(IV). An IV should be correlated with the edogenous variable, but uncorrelated to the error term(Wooldridge, 2016). The method is done to isolate variation in the independent variable that is not influenced by the dependent variable. The method allows for a more accurate estimation of the causal effect.

4.6 Limitations and Further Research

Based on our data we have found significant evidence for Post-earnings announcement drift in the Norwegian market. The evidence suggesting that media publicity and strategic entities ownership do affect the drift. However, we want to elaborate on some limitations in our study that may affect the robustness of our results. These are limitations that are difficult to test for and therefore need to be accounted for when concluding the research. We also want to specify how we would open for further research surrounding this topic.

One limitation in our study arises from the data collection. initially, we wanted to include more securities from the Norwegian market, but many firms did not meet the criteria for being applicable to our sample. This means that our analysis is missing firms that potentially could have impacted the results. It is unclear how this would have affected the results and if we have observed different estimates in our analysis. When we compare our study to previous studies for example in the American market we see that our sample of firms is a lot smaller. Rong, Yukun, and Hang are using over 2000 firms in their analysis (Ding et al., 2023). Our small sample may lead to biased estimates that do not reflect the Norwegian market.

We also want to point out that when collecting data for articles published referring to firms. The site ATekst did not have data for all the relevant News providers of financial articles we wanted to include. We found data from "E24" and "Børsen", but we initially wanted to include data from "Dagens Næringsliv" and "Finansavisen". These are two other news sources that focus heavily on businesses, economics, and finance. By including these sources we would have strengthened our research and got a more representative variable showing firms publicity.

Another limitation of our study is the survival bias. Survival bias is defined as the tendency to view the performance of a stock or an analysis as overly optimistic because you are not regarding the firms that have gone bankrupt (Chen, 2021). In the context of our analysis, the only available data is from firms that are still listed on the exchange. This means that firms that have gone bankrupt or taken off the exchange during the time horizon are not accounted for in the analysis. This could have potentially influenced the

estimates.

In our analysis, we have specifically looked at how firms publicity in the media is affecting the post-earnings announcement drift. Another aspect of firm publicity is the social media coverage, and such discussion among investors on social media platforms is affecting the drift. In 2021 we fully saw to what extent social media can influence the stock price in the short squeeze of GameStop. We believe future research on post-earnings announcement drift should directly research how social media such as X (previously Twitter), Reddit, Facebook, and others platforms influence the drift. High interest in stocks in social media may either inform retail investors and lead reduction of the drift or maybe create uncertainty around stocks and contribute to the observed anomalies. A possible problem that arises from using social media is the sheer volume of forums, users, and sites that makes it challenging to effectively gather data. this was one of the reason why we decided to not focus on social media platforms in our analysis. New technologies such as artificial intelligence could make the data more accessible for future research purposes.

5 Conclusion and Discussion

In the thesis, we have investigated the presence of Post-earnings announcement drift in the Norwegian market. The study is based on larger research done in the American market. We have used the timeline Q1 2016 until Q3 2023 and found data for 58 primary quotas(see appendix) on the Oslo Stock Exchange. For measuring firms' publicity, we have used the largest provider of financial and economic news in Norway, E24, and additionally the homepage for the Oslo Stock Exchange. The research has enriched us with direct knowledge of behavioural finance and the occurrence of financial anomalies and to use the approach of previous studies to conduct research of our own. In addition, this has been a fantastic experience in the approach and structure to write an academic paper which we will surely have a great use for in future work and research.

With empirical evidence, we find evidence to suggest that the drift is observable in the market and is positively affected by the degree of earnings surprise at a 5% significance level. Our results also suggest that firm publicity prior to earnings announcement significantly decreases the degree of PEAD, and this is consistent with prior literature stating poor information among retail investors as a cause. The evidence also suggests that firms with higher ownership of strategic investors including large institutions, government agencies, and firm executives experience the drift less. This also aligns with previous studies since we assume those strategic entities are more informed than retail investors. When it comes to the size of the firms, we could not find any effect that is close to our expectations. We expected the market capitalization to affect CAR negatively due to the assumption that investors are more informed about larger firms, but we were not able to see any significant effect.

To ensure robust results we investigated quarter-specific effects on CAR and found that especially quarters in and around the Covid years do have a significant impact on CAR. We therefore introduced time fixed effects to remove potential biases in the results stemming from quarterly effects being incorporated in variables. We also clustered the standard errors across firms and quarters to remove potential heteroscedasticity where standard errors are not constant across observations. Additionally, we investigated the importance of the strategic entities' ownership variable and found a statistically significant difference in

the interaction term $SUE^{*}NA$ by testing two different models where we split the strategic entities ownership variable into high and low. We found a significant variable for the sub-sample with a low percentage of strategic investors which aligns with our expectations and previous studies.

A weakness we found in our thesis was that the data deviates from the normality assumption. This does not invalidate our results but may induce biases in our estimates. The assumption in itself is difficult to meet since real-life data rarely follows the theoretical normal distribution. We found that the tails are heavier than for a normal distribution so one option could be to cut the tails to remove some extreme values. However, it is not ideal since we are removing the effects from those observations that may have a crucial impact on our results.

Additionally, we discussed the assumption regarding exogeneity, and we concluded that there is a probability that our data is suffering from reverse causality which may limit the credibility of our results. We did not handle the endogeneity issue, we considered its impact when concluding our findings. Despite these limitations surrounding normality and potential endogeneity, it does not invalidate our findings. Previous research on this topic has not done measures to account for this and measures on this would include cutting data or introducing lagged variables that we believe would negatively alter our model. Our study also contains a relatively small sample compared to similar studies in larger markets. Both due to the size of the Norwegian market, but also some limitations when collecting data. Ideally, we would include all primary quotas listed on the exchange, but this was not possible so it remains a question if we would still observe the effect with the inclusion of all primary quotas.

Although our analysis contains some limitations that limit the credibility of our results, we still conclude that the post-earnings announcement drift can be observed in the Norwegian market. The results are interesting because we have not found earlier studies in the Norwegian market. This also opens up further research about the direct effect of social media and online forums on behavioural biases and how this can create market anomalies such as the post-earnings announcement drift. We would have liked to observe the effect

from X(previously Twitter), Reddit and Facebook.

References

Abadie, A. (2005). Causal inference. In K. Kempf-Leonard (Ed.), *Encyclopedia of social measurement* (pp. 259–266). Elsevier. https://doi.org/https://doi.org/10.1016/B0-12-369398-5/00182-1

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research*, *6*(2), 159–178. Retrieved June 4, 2024, from http://www.jstor.org/stable/2490232

Ball, R., Kothari, S. P., & Watts, R. L. (1993). Economic determinants of the relation between earnings changes and stock returns. *The Accounting Review*, *68*(3), 622–638. Retrieved June 3, 2024, from http://www.jstor.org/stable/248205

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, *9*(1), 3–18. https://doi.org/https://doi.org/10.1016/0304-405X(81)90018-0

Bartov, E., Radhakrishnan, S., & Krinsky, I. (2000). Investor sophistication and patterns in stock returns after earnings announcements. *The Accounting Review*, *75*(1), 43–63. Retrieved May 31, 2024, from http://www.jstor.org/stable/248632

Basu, S. (1977). Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis. *The Journal of Finance*, *32*(3), 663–682. https://doi.org/https://doi.org/10.1111/j.1540-6261.1977.tb01979.x

Beers, B. (n.d.). P-Value: What It Is, How to Calculate It, and Why It Matters — investopedia.com [[Accessed 02-06-2024]].

Bernard, V. L., & Thomas, J. K. (1989). Post-earnings-announcement drift: Delayed price response or risk premium? *Journal of Accounting Research*, *27*, 1–36. Retrieved May 31, 2024, from http://www.jstor.org/stable/2491062

Bhagwat, V., & Burch, T. R. (2013). Do social firms catch the drift? social media and earnings news. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2382962

Bhandari, L. C. (1988). Debt/equity ratio and expected common stock returns: Empirical evidence. *The Journal of Finance*, *43*(2), 507–528. https://doi.org/https://doi.org/10.1111/j.1540-6261.1988.tb03952.x

Bhushan, R. (1989). Firm characteristics and analyst following [SPECIAL ISSUE]. *Journal of Accounting and Economics*, *11*(2), 255–274. https://doi.org/https://doi.org/10.1016/0165-4101(89)90008-6

Brooks, C. (2019). *Introductory econometrics for finance* (4th ed.). Cambridge University Press.

Chae, J., Kim, R., & Han, J. (2020). Investor attention from internet search volume and underreaction to earnings announcements in korea [Received: 9 September 2020; Accepted: 12 October 2020; Published: 11 November 2020]. *Sustainability*, *12*(22), 9358. https://doi.org/10.3390/su12229358

Chen, J. (2021). What Is Survivorship Bias? Definition and Use in Investing — investopedia.com [[Accessed 02-06-2024]].

Christodoulou, D., & Vasilis, S. (2017). Regression clustering for panel-data models with fixed effects. https://journals.sagepub.com/doi/pdf/10.1177/1536867X1701700204

Dellavigna, S., & Pollet, J. M. (2009). Investor inattention and friday earnings announcements. *The Journal of Finance*, *64*(2), 709–749. https://doi.org/https://doi.org/10.1111/j.1540-6261.2009.01447.x

Ding, R., Shi, Y., & Zhou, H. (2023). Social media coverage and post-earnings announcement drift: Evidence from seeking alpha. *The European journal of finance*, *29*(2), 207–227.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, *25*(2), 383–417. Retrieved May 31, 2024, from http://www.jstor.org/stable/2325486

Fama, E. F. (1991). Efficient capital markets: Ii. *The Journal of Finance*, *46*(5), 1575–1617. https://doi.org/https://doi.org/10.1111/j.1540-6261.1991.tb04636.x

Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance1the comments of brad barber, david hirshleifer, s.p. kothari, owen lamont, mark mitchell, hersh shefrin, robert shiller, rex sinquefield, richard thaler, theo vermaelen, robert vishny, ivo welch, and a referee have been helpful. kenneth french and jay ritter get special thanks.1. *Journal of Financial Economics*, *49*(3), 283–306. https://doi.org/https://doi.org/10.1016/S0304-405X(98)00026-9

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, *10*(1), 1–21. Retrieved May 31, 2024, from http://www.jstor.org/stable/2525569

Fama, E. F., & French, K. R. (2004). The capital asset pricing model: Theory and evidence. *Journal of Economic Perspectives*, *18*(3), 25–46. https://doi.org/10.1257/0895330042162430

Fingleton, B. (n.d). Endogeneity, exogeneity and instrumental variables. https://www.cantab.net/users/bf100/pdf/iv_slides_fingleton.pdf

Fink, J. (2021). A review of the post-earnings-announcement drift. *Journal of Behavioral and Experimental Finance*, *29*, 100446. https://doi.org/https://doi.org/10.1016/j.jbef.2020.100446

Forner, C., Sanabria, S., & Marhuenda, J. (2009). Post-earnings announcement drift: Spanish evidence. *Spanish Economic Review*, *11*(3), 207–241. https://doi.org/10.1007/s10108-008-9048-4

Foster, G., Olsen, C., & Shevlin, T. (1984). Earnings releases, anomalies, and the behavior of security returns. *The Accounting Review*, *59*(4), 574–603. Retrieved May 31, 2024, from http://www.jstor.org/stable/247321

GARFINKEL, J. A., & SOKOBIN, J. (2006). Volume, opinion divergence, and returns: A study of post-earnings announcement drift. *Journal of Accounting Research*, *44*(1), 85–112. https://doi.org/10.1111/j.1475-679x.2006.00193.x

Getmansky, M., Lo, A. W., & Makarov, I. (2004). An econometric model of serial correlation and illiquidity in hedge fund returns. *Journal of Financial Economics*, *74*(3), 529–609. https://doi.org/https://doi.org/10.1016/j.jfineco.2004.04.001

Hirshleifer, D., & Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *The Journal of Finance*, *58*(3), 1009–1032. Retrieved May 31, 2024, from http://www.jstor.org/stable/3094570

Huntington-Klein, N. (n.d). The effect: An introduction to research design and causality. https://theeffectbook.net/ch-FixedEffects.html

Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics*, *6*(2), 95–101. https://doi.org/https://doi.org/10.1016/0304-405X(78)90025-9

Jones, S. L., & Netter, J. M. (n.d.). Efficient Capital Markets - Econlib — econlib.org [[Accessed 02-06-2024]].

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–291. Retrieved May 31, 2024, from http://www.jstor.org/stable/1914185

Kenton, W. (n.d.). What Is Behavioral Economics? Theories, Goals, and Applications — investopedia.com [[Accessed 04-06-2024]].

Klock, S. (2014). The januar the january effect: A t ect: A test of mark est of market efficiency. https://digitalcommons.longwood.edu/cgi/viewcontent.cgi?article=1136&context=etd

Kuhn, T. S. (1996). *The structure of scientific revolutions*. University of Chicago Press. https://doi.org/10.7208/chicago/9780226458106.001.0001

Lin, T. C. (2012). A behavioral framework for securities risk [Available at SSRN: https://ssrn.com/abstract=2040946]. *Seattle University Law Review*, *34*, 325.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The Review of Economics and Statistics*, *47*(1), 13–37. Retrieved June 5, 2024, from http://www.jstor.org/stable/1924119

Liu, W., Strong, N., & Xu, X. (2003). Post–earnings–announcement drift in the uk. *European Financial Management*, *9*(1), 89–116. https://doi.org/https://doi.org/10.1111/1468-036X.00209

Medietall. (2024). *Medietall - person tall*. Retrieved May 31, 2024, from https://medietall.no/?liste=persontall

of Standards, N. I., & Technology. (2024). 1.3.3.24. quantile-quantile plot [Accessed: 2024-06-16]. https://www.itl.nist.gov/div898/handbook/eda/section3/qqplot.htm

Rong Ding, Y. S., & Zhou, H. (2023). Social media coverage and post-earnings announcement drift: Evidence from seeking alpha. *The European Journal of Finance*, *29*(2), 207–227. https://doi.org/10.1080/1351847X.2021.2022508

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, *13*(3), 341–360. https://doi.org/https://doi.org/10.1016/0022-0531(76)90046-6

Schwert, G. W. (2003). Chapter 15 anomalies and market efficiency. In *Financial markets and asset pricing* (pp. 939–974, Vol. 1). Elsevier. https://doi.org/https://doi.org/10.1016/S1574-0102(03)01024-0

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk*. *The Journal of Finance*, *19*(3), 425–442. https://doi.org/https://doi.org/10.1111/j.1540-6261.1964.tb02865.x

Swart, D., & Hoffman, A. (2013). Analysis of the post-earnings announcement drift anomaly on the jse. *Investment Analysts Journal*, *42*(77), 17–34. https://doi.org/10.1080/10293523.2013.11082553

Thaler, R. H. (1987). Anomalies: The january effect. *Journal of Economic Perspectives*, *1*(1), 197–201. https://doi.org/10.1257/jep.1.1.197

Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach* (7th ed.). Cengage Learning.

A Appendix

Appendix 1:

Ticker	Company
AKRBP.OL	Aker BP
AFGA.OL	AF Gruppen
AKSOA.OL	Aker Solutions
ATEA.OL	ATEA
AUSS.OL	Austevoll Seafood
AGAS.OL	Avance Gas Holding
B2I.OL	B2 Impact
BORR.OL	Borr Drilling
BRGB.OL	Borregaard
BOUV.OL	Bouvet
BWO.OL	BW Offshore Limited
CRAYN.OL	Crayon Group
DNB.OL	DNB
DNO.OL	DNO
ELK.OL	Elkem
ELMRA.OL	Elmera Group
ENTRA.OL	Entra
EQNR.OL	Equinor
EPR.OL	Europris
FLNG.OL	Flex LNG
GJFG.OL	Gjensidige Forsikring
HAFNI.OL	Hafnia Limited
GSFG.OL	Grieg Seafood
HEX.OL	Hexagon Composites
KID.OL	KID
KIT.OL	Kitron
KOG.OL	Kongsberg Gruppen
LSG.OL	Lerøy Seafood

MOWI.OL MOWI

MPCC.OL MPC Containers

NEL.OL NEL

NOD.OL Nordic Semiconductor

NHY.OL Norsk Hydro

NSKOG.OL Norske Skog

NAS.OL Norwegian Air Shuttle

OET.OL Okeanis Eco Tankers

ORK.OL Orkla

BAKKA.OL Bakkafrost

PGS.OL PGS

PHO.OL Photocure

PROT.OL Protector Forsikring

RECSI.OL REC Silicon

SALM.OL Salmar

SCATC.OL Scatec

SCHA.OL Schibsted Class A

SRBNK.OL Sparebank 1 SR-Bank

NONG.OL Sparebank 1 Nord-Norge

MING.OL SpareBank 1 SMN

SPOLS.OL Sparebank 1 Sørlandet

SVEG.OL Sparebanken Vest

SNI.OL Stolt-Nilsen

STB.OL Storebrand

SUBC.OL Subsea 7

TEL.OL Telenor

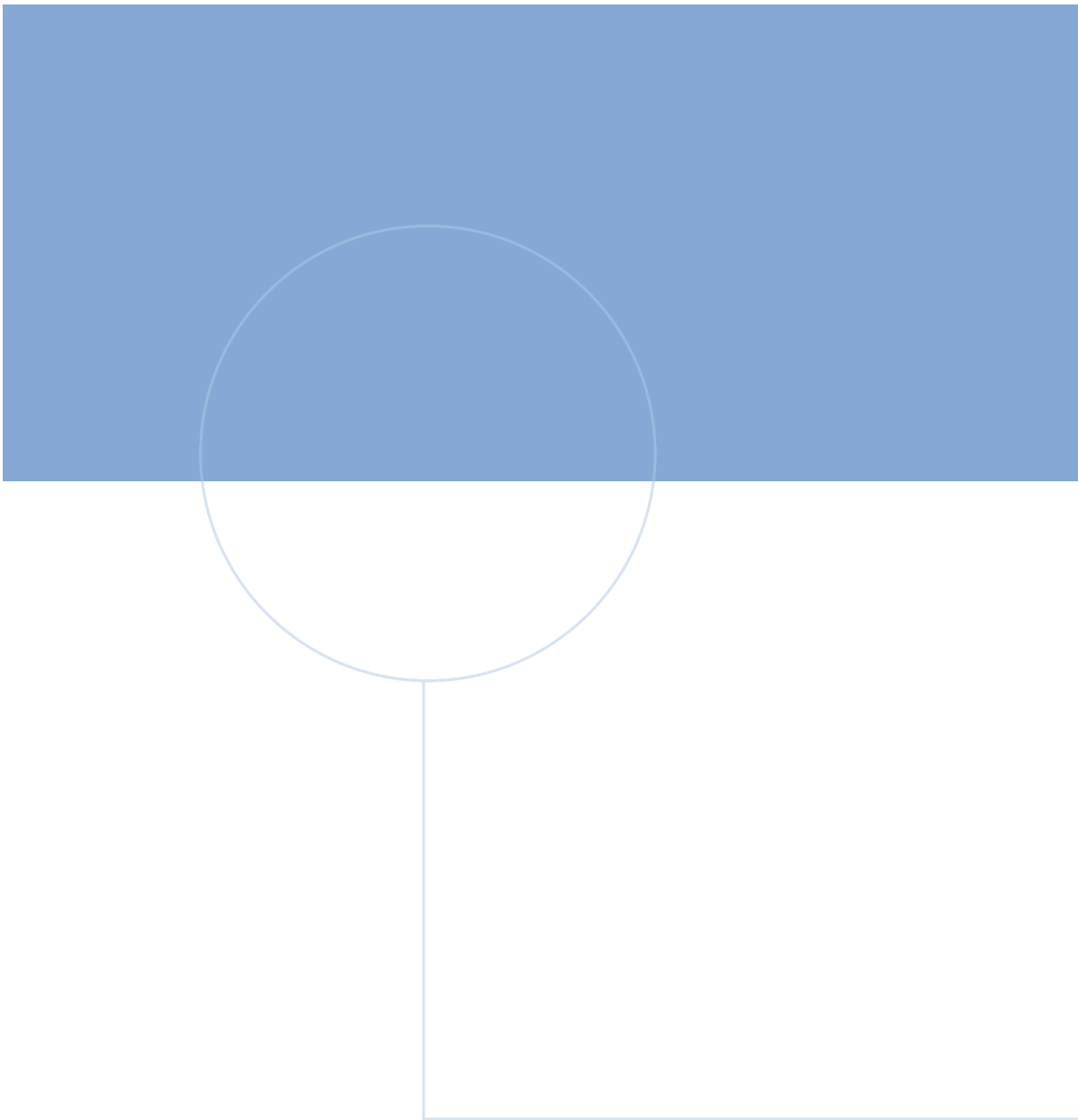
TGS.OL TGS

TOM.OL Tomra

VEI.OL Veidekke Gruppen

WAWI.OL Wallenius Wilhelmsen

YAR.OL Yara Group



NTNU

Norwegian University of
Science and Technology