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How does the Norwegian stock market react to unexpected dividend announcements?

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Abstract

This study investigates the dividend signaling hypothesis by examining stock price reactions to unexpected dividend announcements on the Oslo Stock Exchange (OSE). While previous research relies on the market model, this study contributes to existing empirical research by focusing on the Fama-French three-factor model. A regression is also conducted to investigate if external factors (dividend yield, change in dividend yield, return on assets, Tobin`s Q and size), could explain the market reactions. The results indicate that OSE responds significantly to unexpected dividend announcements. However, external factors contribute to the market reactions. The results are considered as significant and robust. The evidence in this study presents support for the dividend signaling hypothesis in Norway, but no stronger than previous research conducted in the U.S.

Acknowledgements

We would like to express our special thanks and gratitude to our supervisor Hamid Boustanifar for the opportunity to write this intriguing thesis on the topic *"How does the Norwegian stock market react to unexpected dividend announcements?"*. Without your encouragement and devotion, a thesis of this magnitude would presumably not been feasible.

The process has been time-consuming and challenging, but educational in terms of attaining new knowledge.

"An investment in knowledge pays the best interest."

- Benjamin Franklin

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1.0 Introduction

The dividend-signaling hypothesis has been a subject of extensive research through the years, both empirical and theoretical. This is an important hypothesis in the field of financial economics, and can answer the question if dividends are informative. If dividends are informative, do they convey information to the market and cause abnormal returns? These questions are open ended. In corporate finance, these issues are still of great importance due to contradicting results from previous research. Therefore, we are motivated to review the empirical effectiveness of the dividend signaling hypothesis, by investigating the relationship between unexpected dividend announcements and market reactions on the Norwegian stock market.

Miller and Modigliani (1961) argued that firms pay dividend particularly because dividend can convey information about future cash flows. Accordingly, an increase in dividends can be a signal of a managers' confidence that future earnings will increase to sustain the increased dividend. In the same way, dividends are reduced when managers expect that future earnings will decline. Thus, an announcement of dividend increase is viewed as a positive signal (good news), and a decrease is viewed as a negative signal (bad news).

The dividend signaling hypothesis was developed by Lintner (1956) and further developed by Bhattacharya (1979), Miller and Rock (1985), and John and Williams (1985). They argue that dividends convey information to the market, especially about a firm's long-term prospect. Bhattacharya (1979) concluded in his paper that the cost of using dividend as a signal is the transaction costs linked to the share issues occurring from dividend payments. Miller and Rock (1985) believe that dividend-paying firms abandon positive NPV investments by paying dividends.

Asquith and Mullins (1983) analyzed US firms that initiate dividends after a 10-year layoff. They found evidence of relations between events of dividend initiations and stock price increase. Comparably, Lee and Ryan (2000) found evidence of significant share price reactions around the event of dividend initiations and omissions. Dielman and Oppenheimer (1984) conducted a study on firms with dividend consistency and found negative market reactions when dividend omissions was announced. A recent study by Apostolos et al. (2009) concludes that dividend initiations is followed by positive abnormal stock returns. Hence, according to the dividend-signaling hypothesis, our study should observe abnormal stock return on the event day of the unexpected dividend announcement.

Consistent with previous literature, we assume that the market is rational and reacts only to the unexpected dividend announcements. The abnormal stock returns are therefore only significant when the dividend announcements are unexpected. The main research question of this study is:

"How does the Norwegian stock market react to unexpected dividend announcements?"

The objective of this study is to examine the relationship between unexpected dividend announcements and the subsequent stock market reactions. This is done using 65 Norwegian firms listed at the Oslo Stock Exchange (OSE), in the time period 2010-2016. Simultaneously, we will also investigate if external factors can explain the stock market reactions rather than the unexpected dividend announcements.

Chou et al. (2009) argues that an increase/decrease in ordinary cash dividend, generally means that there is a long-term stable increase/decrease in expected earnings. As for extraordinary dividends, it is not sustainable for long-term horizons. Therefore, in this study an announcement will contain ordinary cash dividends. In order to draw a conclusion, the following hypothesis will be conducted:

$$H_0 = CAAR_{Dividend\ Increase} = 0 \qquad and \qquad CAAR_{Dividend\ decrease} = 0$$
$$H_A = CAAR_{Dividend\ increase} > 0 \qquad and \qquad CAAR_{Dividend\ decrease} < 0$$

The null hypothesis states that there is no cumulative average abnormal return (CAAR) that stems from unexpected dividend announcements. While the alternative hypothesis states that CAAR is statistically significant different from zero and the market reactions to unexpected dividend announcements are positively correlated. The latter would imply that dividend announcements convey information to the market, as the signaling theory suggests. CAAR is estimated using both the market model and the Fama-French three-factor model, where the latter is the primary focus in this study. Several tests have been conducted to get the result as robust as possible. The test statistics are based on different statistical properties, and adjusted for statistical inconvenience.

For event windows [-1,+1] and [-3,+3], we find that unexpected dividend increases lead to a positive CAAR of 1.43% and 1.91% for. While the results for unexpected dividend decreases show a negative CAAR of -2,33% and –1,82%, respectively. Compared to the empirical research conducted on the US stock market, the CAAR usually lies around 1-2% for dividend increases and -3-5% on dividend decreases (Laustrup, E. K., and Raaballea, J. 2006).

Our study differs from previous research on the dividend-signaling hypothesis, by applying the Fama-French three-factor model to calculate abnormal returns (AR). Although the Fama-French three-factor model yield similar results as the market model, our study contradicts the traditional approach where event studies relies mainly on the market model to calculate AR (MacKinlay, A.C. 1997). This study also performs a regression to investigate if external factors could explain the market reactions. To our knowledge, this has previously not been done using Norwegian data. The results indicates that change in dividend yield (+), dividend yield (-) and return on assets (+) can explain the market reactions with a 99% level of confidence. In addition to the three significant variables above, Tobin`s Q (-) and size (-) should according to previous research also explain the market reactions. Although, the signs of the coefficients support the evidence from previous research, the two variables (Tobin`s Q (-) and size (-)) are not as explanatory as presumed (Haw and Kim, 1991; Denis, Denis and Sarin, 1994).

The rest of our study is structured as follows. Section 2 consists of important theoretical framework on the subject. In section 3, the previous literature is presented, focusing on literature from the US and Europe. Section 4 explains the empirical methodology applied in this study. Data description and collection is presented in section 5. Finally, the empirical results is presented in section 6 and the conclusion for this study is presented section 7.

2.0 Theoretical Framework

The literature that investigates the relationship between market reactions and unexpected dividend announcements is to a large extent based on the theories of market efficiency and the information content of dividend hypothesis. This section provides a concise presentation of the market efficiency theory and the informational content of dividends

2.1 The Efficient Market Hypothesis (EMH)

A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices (Malkiel, B. G. 1989). Therefore, security prices will only change when new information is available. Since new information is unpredictable, price changes will also be unpredictable, resulting in security prices that will follow a random walk. For this reason, it should be impossible to outperform the overall market through securities selection or market timing. Unexpected dividend announcements can convey new information to the market, and the theory of the efficient market hypothesis is therefore relevant in our study.

According to Eugene Fama (1970), there exists three relevant informational subsets of market efficiency, weak form, semi-strong form and strong form (Fama, E. F 1970). The weak form of the EMH asserts that prices fully reflect the information contained in the historical sequence of prices. Thus, investors cannot devise an investment strategy to yield abnormal profits based on an analysis of past price patterns. It is this form of efficiency that is associated with the term ‘Random Walk Hypothesis’ (Malkiel, B. G. 1989). The semi-strong form of EMH asserts that current stock prices reflect not only historical price information, but also all publicly available information relevant to a company’s securities. If markets are efficient in this sense, then an analysis of balance sheets, income statements, announcements of dividend changes or any other public information about a company will not yield abnormal economic profits (Malkiel, B. G. 1989). The strong form of EMH asserts that all information that is known to any market participant about a company is fully reflected in market prices. Hence, not even those with privileged information can make use of it to secure superior investment results. There is a perfect revelation of all private information in market prices (Malkiel, B. G. 1989).

2.1.1 Efficient market hypothesis contradictions

Eugene Fama (1970) concludes, "In short, the evidence in support of the efficient market hypothesis is extensive and contradictory evidence is sparse". Many studies have tested the efficient market hypothesis and found it consistent with data from different markets (Degutis, A and Novickyte, L. 2014). On the other hand, previous studies have also found evidence of contradictions to the efficient market hypothesis. The size effect is one of many contradictions to the EMH. Banz (1981) found that smaller firms had a higher return on average, than larger firms did, which is evidence that the capital asset pricing model (CAPM) is misspecified (Banz, R. W. 1981). Seasonality is another contradiction to the EMH, best known as the January effect. This effect states that, underperforming stocks in the fourth quarter of the previous year tend to outperform the markets in January. Keim and Reinganum (1983) found evidence that in nearly 50% of the average magnitude of the size effect of small firms was due to the January effect. Although the size effect has decreased considerably since it first was documented by Banz in 1981 (Schwert, G. W. 2003), empirical evidence indicates that the January effect is still going strong after all these years (Haugen, R. A and Jorion, P. 1996).

2.1.2 The Efficient market hypothesis and event studies

Event studies has become a strong financial research methodology due to the EMH. The EMH states that security price changes must reflect new information since the price already reflect all information currently available. Thus, an event study will help to estimate the impact of an event on a firm's share price by measuring price fluctuations during the period in which the event occurs (Bodie, Z. 2009). Fama (1991) argues that, "…because they come closest to allowing a break between market efficiency and equilibrium-pricing issues, event studies give the most direct evidence on efficiency."

In previous research, the semi-strong form test of market efficiency was referred to as an event study (Fama, E. F. 1970). A reason for this was to measure the pace share prices reflected new public information, such as earnings announcements, repurchase, M&A announcements etc. Event studies have become an important part of financial economics (Fama, E. F. 1991). Still, the statistical pattern of event studies has not changed over time, the objective is still the same, to examine the mean and the cumulative abnormal return (CAR) at the time of the event (Kothari, S. P. and Warner, J. B. 2007).

2.2 The information content of dividend hypothesis

The terminology of informational content of dividends is extensively cited in the finance literature, and has been the subject of a significant amount of empirical and theoretical research (Daniels, K. et al. 1997). This hypothesis is a firm-specific hypothesis, which states that managers of a firm use dividend to signal information about the firm's future earnings. Determining a good dividend policy is an important financial decision for a firm. Dividend serve as a form of income for investors and a good dividend policy is therefore an important consideration for some investors (Vieira, E. S and Raposo, C. C. 2007). Whether dividend policy influences firm value has been the subject of extensive research through the years. Empirical literature has provided two theories on the subject, dividend irrelevance theory and dividend relevance. Both theories will be briefly discussed in the below subsections, with emphasis on the relevance of dividends.

2.2.1 The irrelevance of dividend

Miller and Modigliani's proposition I states that capital markets are perfect and complete. They showed that a firm's dividend policy does not affect a firm's value in perfect and complete capital markets. The only thing that affect firm value is its earnings, which is determined by the firm's investment policy and long-term prospects. Since the investor knows the investment policy, there is no need for any insight on the dividend history of the firm. Hence, its dividend policy is irrelevant. Further, they argue that when a firm pays dividend, the stock price will decrease and the potential gain for investors would be neutralized by the decrease in the market value of the stock (Miller, M. H. and Modigliani, F. 1961). Thus, dividend policy does not affect firm value or its cost of capital.

2.2.2 Dividend is relevant

Miller and Modigliani's proposition I about perfect and complete capital markets does not exist in reality (Miller, M. H. and Modigliani, F. 1961). There are other factors to consider in the capital markets (transaction costs, taxes, asymmetric information, etc.), hence there is a probability that dividend policy could affect firm value. In contradiction to the dividend irrelevance theory, Lintner (1962) and Gordon (1963) concludes that dividend payout policy affects firms cost of capital. They argued that investors prefer dividends from a stock to potential capital gain because dividends are less risky. This argument became known as the 'Bird in Hand' theory.

Lintner (1956) presented the most eminent theory on the field, the dividend-signaling hypothesis. Managers from 28 US companies was interviewed during a period of seven years, from 1947 to 1953, about their dividend policy. Based on his findings, new evidence on dividend payout policy emerged. According to his new findings, managers hesitate to cut or raise existing dividends. Cutting dividend will only occur if managers has no other option, but they will increase the dividend if they are highly convinced that it can be sustained in the future. Secondly, the level of dividend is fixed to significantly long-term earnings and payments are steady over time in order to reach the long-term target dividend payout ratio. The dividend signaling theory has since then been revised by Bhattacharya (1979), John and Williams (1985) and Miller and Rock (1985). They argue that dividends convey relevant information about firm's long-term prospects and that dividends are costly.

3.0 Literature Review

This section will present relevant literature and findings to support our study. It is important to examine what previous research have concluded to get an understanding on what to expect from the results in this study and to see if the results support the theoretical framework.

3.1 Unexpected dividend announcements

Literature from the US

The first empirical study on unexpected dividend announcements was conducted by R. Richardson Pettit (1972). He studied the AR from dividend announcements on US listed firms from 1964 to 1968 and found a positive relationship between dividend changes and share price changes. His study concluded that positive changes in dividend lead to positive AR and the opposite when the changes in dividend was negative. He found that an unexpected dividend increase resulted in a CAAR of 0.94% and that a decrease lead to a CAAR of -3.69%. Pettit (1972) findings show that unexpected dividend announcements convey information, he concludes in his paper, "The results of this investigation clearly support the proposition that the market makes use of announcements of changes in dividend payments in asses-sing the value of a security" (Pettit, R. R. 1972). Woolridge (1982) used the same event study methodology to examine unexpected dividend change announcements of 200 listed US firms over a six-year period. The study revealed that unexpected dividend increase resulted in a CAAR of 3.54% and an unexpected dividend decrease resulted in a CAAR of -6.93% for the sample period. Consistent with Pettit (1972), Woolridge (1982) found evidence that an unexpected dividend increase results in an increase in the share price. In 1980, Aharony and Swary conducted a study with a sample of 149 US listed firms. Unlike Pettit (1972) and Woolridge (1982), they used a naïve dividend model (a model that predicts no change in dividends from one period to another) to examine if quarterly dividend changes conveys information to the market. Aharony and Swary (1980) found a CAAR of 0.78% for dividend change increase. Conclusively, the tentative finding from Aharony and Swary (1980) could be a result of employing the naïve dividend model rather than an expected dividend model as Pettit (1972) and Woolridge (1982). The naïve dividend model is assumed to be inaccurate, due to the potential fluctuations in investors belief regarding period-to-period dividend payments. To fully capture the impact of unexpected dividend announcements, our study will apply the expected dividend model when classifying the dividend announcements.

Literature from Europe

Most of the previous literature on the subject of unexpected dividend announcements and market reactions has been conducted on the US market. The evidence is confined outside the US stock market. However, some findings from the European stock market will be presented below.

Amihud and Murgia (1997) conducted an event study using 200 of the most traded companies on the German stock market and examined how the German stock market reacted to unexpected dividend announcements. The CAAR was 0.965% for increases and -1.73% for decreases, using the market model. A comparable study was done in the UK by Lonie, et al. (1996). Using 620 UK firms, they investigated market reactions in relation to unexpected dividend announcements. Similar to Amihud and Murgia (1997), they applied the market model when calculating CAAR. The results show a CAAR of 2.03% for increases and -2.35% for decreases and they concluded that they found support for the dividend signaling theory. Like the study conducted in Germany and the UK, Raaballea and Laustrup (2006) and Capstaff, J. et al. (2006) performed a study on the dividend signaling hypothesis in Scandinavia. Both studies found significant results for both dividend increases and decreases, when using the market model as a benchmark to calculate CAAR.

In event studies, the market model is extensively used, and according to MacKinlay (1997) it is a good proxy to calculate normal returns. However, Fama and French (1996) states that the market model does not capture, over a longer period, the entire pattern of abnormal asset returns. Our study calculates normal returns with respect to both the market model and the Fama-French three-factor model. Both models will be explained in detail in section 4.2.1 – Model selection for measuring normal performance. However, the Fama-French three-factor model will be our primary target of investigation.

3.2 Dividend policy from Norwegian managers point of view

Baker et. al (2006) conducted a survey in 2004 of managers from Norwegian dividend-paying firms listed on the Oslo Stock Exchange about their views on dividend policy. They identified important factors for making dividend decisions and about managers' views on dividend-related subjects. The most critical factors of a firm's dividend policy are the level of current and future expected earnings, stability of earnings, current degree of financial leverage and liquidity constraints. Further, managers of Norwegian firms express stronger support for a signaling explanation for paying dividends than they do for a tax-preference explanation. Yet, the majority of responses appear ambivalent to whether investors generally use dividend announcements as information to help assess a firm's stock value. For firms in general, the evidence suggests that dividend policy plays a possible role as a signaling mechanism (Baker, H. K., Mukherjee, T. K., and Paskelian, O. G. 2006).

4.0 Methodology

In our study, the expected dividend model stems from Industrial Broker`s Estimate System (IBES) and the event study methodology is applied to investigate the Norwegian stock market reactions to unexpected dividend announcements. Finally, a regression model used to test if external factors could explain the market reactions is presented. This chapter provides a description of the empirical methodologies applied, and how the study deals with challenges met.

4.1 Grouping dividend announcements

To investigate how the Norwegian stock market reacts to unexpected dividend announcements, it is necessary to divide the announcements into different groups; increase, constant and decrease. The primary target of this study is to capture the effect of dividend announcements which deviates from the expected dividend. Therefore, the constant dividend group will be omitted and not take part in the analysis.

The unexpected change in dividends is the difference between the actual dividend and the expected dividend relative to previous dividend. This will determine the group, of which the dividend announcement belongs to. One would expect that this approach is best fitted, as a market reaction is triggered whenever public information deviates from market participant's expectations (Capstaff, J., Klæboe, A., and Marshall, A. P. 2004). The unexpected dividend increase (1) and decrease (2) are defined by the following equations:

$$UD\_I_{i,t} = \frac{Div_{i,t} - E[Div_{i,t}]}{Div_{i,t-1}} > 5\% \quad (1)$$

$$UD\_D_{i,t} = \frac{Div_{i,t} - E[Div_{i,t}]}{Div_{i,t-1}} < -5\% \quad (2)$$

$UD\_I_{i,t}$ = Unexpected dividend increase for company i announced at time t.

$UD\_D_{i,t}$ = Unexpected dividend decrease for company i announced at time t.

$Div_{i,t}$ = Actual dividend per share for company i announced at time t.

$E[Div_{i,t}]$ = Expected dividend per share for company i at announced time t.

$Div_{i,t-1}$ = Actual dividend per share for company i announced at time period t-1.

Other studies often apply a similar model, but instead of subtracting the expected dividend, they subtract previous dividend. This is considered to be a naïve dividend model (3).

$$\Delta Div_{i,t} = \frac{Div_{i,t} - Div_{i,t-1}}{Div_{i,t-1}} \quad (3)$$

The naïve dividend model suggested by Thaler et al., (1997), is assumed to be less correct, due to possible fluctuations market participants has regarding dividend payments. For instance, a company can increase its dividends strongly every year, which would then be expected from the market. However, it may be considered as a dividend signal increase for method (3). This study will only apply equation (1) and (2) when grouping the dividend announcements, as it takes markets expectations into account and therefore assumed to have a better ability to capture market reactions.

4.2 Event study methodology

The intention of this event study is to investigate the magnitude of how unexpected dividend announcements impacts the Norwegian stock market. The event study methodology aims to separate company-specific events from market-specific events, and has often been used as evidence for or against market efficiency (Benninga, S., and Czaczkes, B. 2000).

4.2.1 Model selection for measuring normal performance

Measuring AR associated with an event requires a model of normal returns to be specified. MacKinlay (1997) describes two different approaches to estimate normal returns, more specifically statistical and economical models.

Statistical models depend on statistical assumptions regarding historical stock returns. These assumptions are according to MacKinlay (1997), that the asset returns are jointly multivariate normal and identical and independent distributed through time.

The economical models also depend on statistical assumptions, but more important, it relies on assumptions regarding investors' behavior. According to MacKinlay (1997) these models can be cast as restrictions on statistical models to provide more constrained normal return models. The two most common economic models which provide restrictions are Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). Sharpe (1964) and Lintner (1965) argues that CAPM is an equilibrium theory, where the expected return of a given asset is determined by its covariance with the market portfolio. While according to Ross (1976), APT is an asset pricing theory where the expected return of a given asset is a linear combination of multiple risk factors.

A general finding is that the most important factors behave like a market factor, and including more factors only add little to the explanatory power. Thus, the gains from using APT motivated models versus market model is relatively small (Brown and Weinstein, 1985). In this study one statistical- and economical model are examined, respectively the market model and Fama-French three-factor model, which is presented below.

The Market Model

The market model is a statistical one-factor model. Assuming a linear relationship between the return on the market portfolio and the return on each security i. For every security i, the market model states that normal returns are given by:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \varepsilon_{it} \quad (4)$$

$$E(\varepsilon_{it} = 0) \qquad Var(\varepsilon_{it}) = \sigma_{\varepsilon i}^2$$

Here, r_{it} and r_{Mt} represents the stock and market return on day t, and ε_{it} is the error term with the expectation value zero. The coefficients α_i and β_i are estimated by running an ordinary least square regression (OLS) over the estimation window. The key assumptions are that the error term (ε) is naturally zero, and the variance is assumed to be homoscedastic (constant). The market model is widely used in event studies due to its simplicity and explanatory power. The market model yields similar results when comparing with other sophisticated models. As Brown and Warner (1985) showed, the results in large sample of events are not especially sensitive to your choice of estimation model. However, if you are dealing with small sample you should explore alternative models.

Fama-French Three-Factor Model

As mentioned in earlier, previous empirical findings suggest that market model is a good proxy for estimating normal returns. However, for small samples it would be beneficial to scrutinize other models. Fama-French three-factor model is an economical multifactor-model. The model can be viewed as an extension from the CAPM by including two new factors in addition to the market factor, namely, SMB (Small Minus Big) which represents the market capitalization, and HML (High Minus Low) correspondingly book-to-market ratio. SMB accounts for the spread in returns between small-sized firms and large-sized firms. HML accounts for the spread in returns between value stocks and growth stocks. Companies with high book-to-market ratio (value stocks) outperform those with low book-to-market ratio (growth stocks). For each security i, the Fama-French three-factor model assume that security i returns are given by:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \beta_s SMB + \beta_v HML + \varepsilon_{it} \tag{5}$$

$$E(\varepsilon_{it} = 0) \qquad Var(\varepsilon_{it}) = \sigma_{\varepsilon i}^2$$

The statistical properties are equal to the market model. Using the OLS method, the parameters above was obtained. Even though the explanatory power of Fama-French three-factor model is marginally better than the market model, the challenging sample size in this study is too scarce to solely depend on the market model.

4.2.2 The estimation window and event window

Before being able to estimate normal returns from the market model and the Fama-French three-factor model, one need to specify the estimation window and event window. The timeline of an event study is illustrated in figure 4.1.

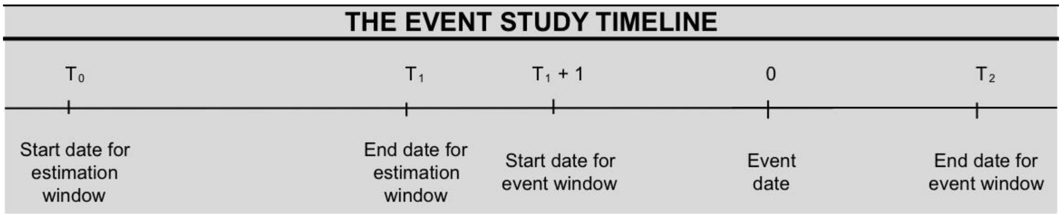

Figure 4.1 – Event study timeline.

The estimation window constitutes the period over which the parameters in the selected normal return models are estimated. Avoiding overlap between the estimation-and event window is important, due to the potential influence the event returns can provide to the estimators of the normal return models. One of the most common used estimation period lengths is 250 trading days, which is also suggested by MacKinlay (1997) i.e. one financial calendar year. The event window constitutes the period over which the stock prices of the firms involved in the event is examined. Previous literature has provided event studies with different event windows. The days prior to the event are examined to investigate potential leaks in the market, and the post-event days are examined due to the "delayed price reaction" argument by Ball and Kothari (1991).

The event day (T=0), is the dividend announcement day, where the market participants receives knowledge on new relevant information regarding upcoming dividend payment. When conducting an event study, obtaining the precise date of the announcement is critical. Strong (1992) argues that "in many event studies in practice, accuracy of event dates is likely to be more important than sophistication in modeling or statistical techniques".

4.2.3 Abnormal Returns

AR can be defined as the difference between returns occurred during an event, and returns that would have occurred if the event never took place. More expressly, the AR is the difference between the actual return, $r_{i,t}$ of a stock i, at time t, and the estimated return, $[r_{i,t}]$. The AR from the Fama-French three-factor model is defined as:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{Mt} + \beta_s SMB + \beta_v HML) \qquad (6)$$

As the length of estimation window increases, the sampling error term will approach zero, hence the variance on the AR can be approximated to:

$$\sigma^2(AR_{it}) \approx \sigma^2_{\varepsilon i}$$

4.2.4 Cumulative Abnormal Returns

Observing a long line of AR for an individual firm does not say much about the event of interest. Therefore, the AR must be aggregated across time and for each event firm. Aggregating the AR produces the subject of investigation, namely CAR. CAR is estimated using the following equation:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \tag{7}$$

Performing tests with only one event observation is unlikely to provide tenacious information. Therefore, before conducting any statistical inferences about the sample, one need to aggregate the AR across securities. Following the methodology by MacKinlay (1997), the sample average abnormal returns (AAR) for period t, t=T_1 +1,…, T_2, is defined as:

$$\overline{AR_t} = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{8}$$

And the sample variance of AR can be obtained using the following equation:

$$Var(\overline{AR_t}) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma^2_{\varepsilon i}$$

Next step is to aggregate sample AAR into one sample for each event day across all events. With this procedure, the AAR over t days in the event window are obtained. The AAR is then used to obtain CAAR, which is useful for statistical purposes since it captures the effect of the AR. For any interval in the event window, the CAAR is:

$$\overline{CAR}(t_{1,}t_2) = \sum_{t=t_1}^{t_2} \overline{AR_t} \tag{9}$$

And the sample variance of the CAR can be obtained in the following manner:

$$Var(\overline{CAR}(t_1, t_2)) = \sum_{t=t_1}^{t_2} Var(\overline{AR_t})$$

4.3 Test statistics

Several tests have been used to get the results as robust as possible. The test statistics are based on different statistical properties, and adjusted for statistical inconvenience. To diminish the probability of committing a type I or type II error, the tests were performed on both the market model and the Fama-French three-factor model.

According to Frost (2015) nonparametric tests don`t assume that your data follow a specific distribution, i.e. they are distribution-free. While parametric tests usually have more statistical power, thus it is more likely to detect a significant effect when there is one. All the tests are subject to the following null-and alternative hypothesis, respectively:

H0: CAAR = 0 HA: CAAR ≠ 0

4.3.1 Brown and Warner t-test

Brown and Warner (1980,1985) introduced a cross-sectional t-test, which is often used in event studies. An important assumption when using parametric t-test in event study methodology is normality in AR. However, Fama (1976) documents evidence that daily returns strongly deviate from normality and proposes a fat-tailed distribution, relative to a normal distribution. Brown and warner (1985) and Dyckman et al. (1984) reports that the degree of non-normality in daily returns does not exhibit a serious problem when specifying a correct test. Further, Brown and Warner (1985) argues that: “the Central Limit Theorem (CLT) guarantees that if the AR are in the cross-section of securities that are independent and identical distributed, then the distribution of the sample mean AR converges to a normal distribution”. The cross-sectional t-test is defined as:

$$\text{tcross} = \sqrt{N}\,\frac{CAAR(t1,t2)}{\sigma CAAR_{(t1,t2)}} \qquad (10)$$

Where the variance estimator of this statistic is based on AR and can be expressed in the following manner:

$$\sigma^2 CAAR(t1, t2) = \frac{1}{N(N-d)} \sum_{i=1}^{N} [CAR_i(t1, t2) - CAAR_i(t1, t2)]^2$$

4.3.2 Patell Z-score

Patell (1976) developed a standardized residual test. Each abnormal security return is normalized by its estimation period standard deviation:

$$SAR_{i,t} = \frac{AR_{i,t}}{S_{AR_{i,t}}}$$

The cumulative standardized abnormal returns $CSAR_i$:

$$CSAR_i = \sum_{t=t1}^{t2} SAR_{i,t}$$

Patell Z-score is then given by:

$$Z_{Patell} = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \frac{CSAR_i}{S_{CSAR_i}} \qquad (11)$$

Where S_{CSAR_i} is the standard deviation for each security i`s CSAR.

The advantage of Patell Z-score is that they weight individual observations by the inverse of the standard deviation. This implies that more volatile observations get less weight in the averaging than less volatile observations. Hence, more reliable observations are obtained (Kolari and Pynnönen, 2010). Under the assumption that AR are uncorrelated, and variance is constant over time, the standardized residual test is robust against heteroscedasticity.

4.3.3 BMP Z-score

BMP (Boehemer, Musumeci and Poulsen, 1991) constructed a test that is robust to event-induced variance increases of security returns. By combining the standardized residual test with an empirical variance estimate based on the cross-sectional securities of the event-window AR. The BMP-statistic gained popularity over the Patell (1976) statistic, due to the robustness associated with volatility changes with the event (Kolari and Pynnönen, 2010).

$$t_{BMP} = \sqrt{N}\ \frac{\overline{SCAR}}{s_{\overline{SCAR}}} \qquad (12)$$

Where $\overline{SCAR}$is the averaged standardized cumulated abnormal returns across N firms, with standard deviation:

$$S^2{}_{\overline{SCAR}} = \frac{1}{N-d}\ \sum_{i=1}^{N}(SCAR_i - \overline{SCAR})^2$$

4.4 Inferences with clustering

As stated earlier, the parametric tests conducted in this study assumes normality in the securities returns and that they are independent from each other and have same variance. Independency and homoscedastic variance may be violated relative to clustering, and therefore biased results could occur (MacKinlay, A.C. 1997). Neither of the test statistics above have adjusted for cross-sectional correlation. Since stock returns are usually positively correlated, ignoring such correlations leads to an underestimation of the AR variance. This give rise to biased standard errors (SE) and an over-rejection of the null hypothesis could occur. To adjust the SE, this study uses the fixed effect command in Stata and applies the cluster option:

$$xtreg\ y\ x1\ \ldots xk, fe\ cluster(csid) \qquad (13)$$

Appendix A provides a full description of the Stata code. By having a cross section identifier for the cluster option (csid), the resulting SE are completely robust to any kind of serial correlation and heteroscedasticity (Wooldridge, 2011).

4.5 Controlling for external factors

This study progress to see if external factors have any impact on the abnormal market reactions. Since these reactions could be caused by other mechanisms rather than unexpected dividend annuncements, this study performs a regression to scrutinize if the abnormal market reactions roots from external factors. The following regression were conducted:

$$CAR_{i,t} = \alpha_i + \beta_1 CHG_{YLD_{i,t}} + \beta_2 Tobin`s\ Q_{i,t} + \beta_3 DIV_{YLD_{i,t}} + \beta_4 SIZE_{i,t} + \beta_5\ ROA_{i,t} + \varepsilon_{i,t} \qquad (14)$$

$CAR_{i,t}$ is the cumulative abnormal return for security i at time t.

$CHG_{YLD(i,t)}$ is the change in dividend yield for security i at time t.

Tobin`s $Q_{(i,t)}$ is the market value of assets over book value of assets, for security i at time t.

$DIV_{YLD(i,t)}$ is the dividend yield for security i at time t.

$SIZE_{(i,t)}$ is the sixe component, log of assets, for security i at time t.

$ROA_{(i,t)}$ is the profitability component, the return on assets for security i at time t.

5.0 Data Collection

5.1 Data description

This study investigates the Norwegian stock market reactions to dividend change announcements during the period January 2010 to December 2016. The data were collected from DataStream, Bloomberg Terminal, Morningstar, OSE`s NewsWeb and from Professor Bent Arne Ødegaard`s asset pricing data. After some adjustments, the final sample set consisted of 65 firms listed on OSE (Oslo Stock Exchange). A total of 225 unexpected dividend announcements were obtained during this period, containing 131 announcements of unexpected increase in dividends and 94 announcements of unexpected decrease in dividends. IBES (Industrial Brokers´ Estimate System) is a system that gathers and complies different estimates made by analysts, which also includes consensus estimate of next dividend payment.

As stated earlier, the correct declaration date of dividends announcements is critical in an event study. The declaration dates were collected manually from OSE’s NewsWeb, and further cross-checked with Morningstar’s declaration dates. Any deviation in declaration dates between the two sources would lead to an omitted observation.

5.1.1 Oslo Stock Exchange Characteristics

Compared with the US capital market, where dividend signaling has been a large subject of investigation over the past years, the Norwegian stock market differs from the magnitude of stocks traded. There are also multiple exchanges in the US capital market, whereas there is only one in Norway, the Oslo Stock Exchange. The Norwegian government attempt to ensure shareholders right by interfering and heavily regulating business in the Norwegian capital market as opposed to the US.

The State Ownership Report of 2016 report that approximately 32,02 % of the market value on the OSE is owned by the Norwegian government (Norwegian Ministry of Trade, Industry and Fisheries, The State Ownership Report of 2016). This makes the Norwegian market an interesting environment to test the dividend signaling hypothesis because this market will experience fewer agency problems due to its corporate ownership (Capstaff, J., Klæboe, A., and Marshall, A. P. 2004). In addition, the neutral tax system in Norway which differentiates tax on income and capital income is proven to have little influence on a firm's dividend policy (La Porta et al,. 2000).

5.1.2 The thin trading problem

The frequency of traded stocks constitutes a major problem in event study analysis. Bartholdy et.al (2007) argues that event studies must deal with stocks that are not traded every day, also known as thinly traded stocks. Including thinly traded stocks in the data set, can provide potential biased estimators for the event study models, which subsequently will affect the empirical results.

There are different methods to adjust for thinly traded stocks, Bartholdy et.al (2007), conclude that the trade-to-trade (T2T) is the best approach. However, this study will simplify the approach, and set limit to the stock trading frequency. The approach in this study has one condition for the volume of trades for each stock. If a stock is traded less than 85% of the days, it will be considered as a thinly traded stock and will be omitted from the dataset.

5.2 The estimation- and event window

The parameters from both the market model and the Fama-French three-factor model are estimated using an OLS approach on an estimation window of 250 days. More specifically, the parameters were obtained using daily returns in the window between [-270, –20] relative to the announcement day.

As a result of using end of day closing price, the effect of the unexpected dividend announcements is expected to be captured at the announcement day (T=0). The following four event windows are examined; 21 days [+10, -10], 11 days [+5, -5], 7 days [+3, -3] and 3 days [+1, -1]. The aim for including days prior to the announcement day is to investigate potential information leaks in the market, while post- announcement days are included due to the market reaction time.

6.0 Empirical Results

As stated earlier, the days closest to the dividend announcement is assumed to have an eminent impact on CAAR. Therefore, the event windows [-1,+1] and [-3,+3] are most crucial when analyzing the results. Both the Fama-French three-factor model and the market model produced similar results, thus this section will focus on the Fama-French three-factor model and the results for the market model are presented in appendix B. The purpose of this study was to examine how stock prices reacts to unexpected dividend announcements, this was accomplished by focusing on the event windows CAAR. The sample examined is split into two categories, unexpected increase and unexpected decrease. Finally, a regression was performed in order to identify if external factors could explain the market reactions.

6.1 Unexpected dividend increases

Figure 6.1 illustrates how the market reacted to unexpected increases in dividend announcements. By using CAAR, the pattern of four event windows – T = [-10,+10], [-5,+5], [-3,+3] and [-1,+1] are graphically presented below.

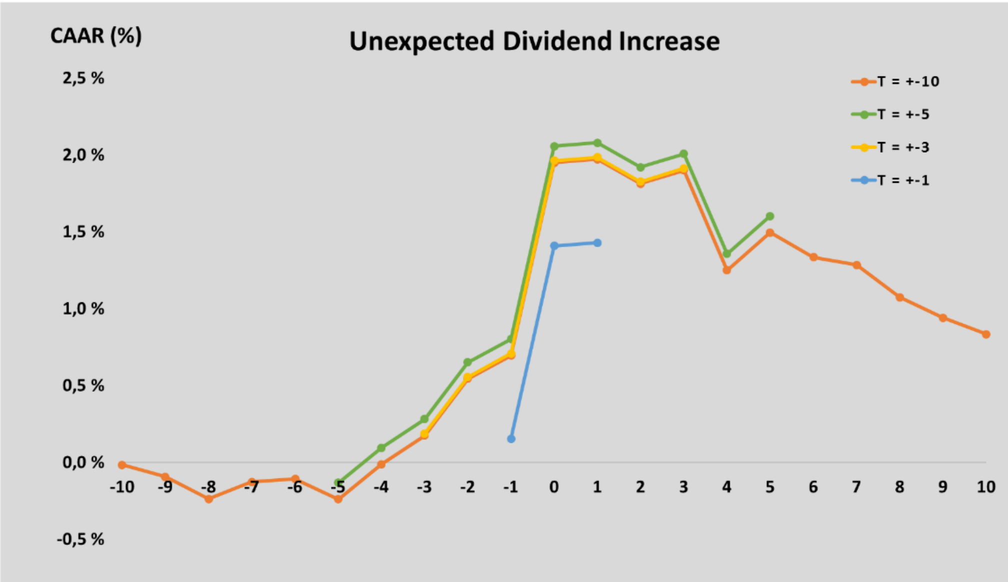

Figure 6.1 – CAAR for unexpected dividend increase, using Fama French three factor model.

Prior to the announcement day, event windows T = [-10,+10], [-5,+5] and [-3,+3] drifts upwards, which could stem from behavioral noise due to expectations from investors, or a leakage in the market. At the announcement day, all four event windows experience a substantial increase in CAAR. The three following days after announcement day, the stock price seem to stabilize before a decreasing trend occurs. This immediate decline is difficult to interpret, although one could argue that investors overreacted to the positive dividend information and consequently a market correction followed. The event windows daily AAR and CAAR- pattern is presented in appendix C.

Table 6.1 presents the results for the unexpected increase in dividend announcements. There is a significant abnormal stock return for event windows [-1,+1] and [-3,+3], with CAAR of 1,43% and 1,91%, respectively. It follows highly significant t-values of 5,14 and 3,76 (significant at the 1% level). The result implies that unexpected positive dividend announcements convey information to the market. Hence, the null hypothesis is therefore rejected, and unexpected dividend increase announcements conveys positive information to the market.

	Fama-French three-factor model			
	CAAR %	BW t-test	Patell Z	BMP Z
[-10,+10]	0,83 %	0,76	0,94	1,14
[-5,+5]	1,60 %	2,23 **	2,76 ***	2,78 ***
[-3,+3]	1,91 %	3,76 ***	3,87 ***	3,89 ***
[-1,+1]	1,43 %	5,14 ***	2,43 ***	3,93 ***

Table 6.1 – Test statistics for positive dividend announcements. CAAR % is the cumulative average abnormal return (N = 131). BW t-test is the Brown and Warner test statistic. Patell Z is the standardized residual test. BMP Z is a test that is robust to event-induced variance increases of security returns, constructed by Boehemer, Musumeci and Poulsen (1991). *, ** and *** constitutes the level of significance at 10%, 5% and 1%, respectively.

Confidence interval (CI) is the probability that a value will fall between an upper and lower bound with respect to the level of significance. The 95% CI is analyzed the interval before, on and after announcement day. If the confidence interval does not take value of zero, then the CAAR is significantly different from zero at a 5% level of significance (Cesarini, D. et al. 2006).

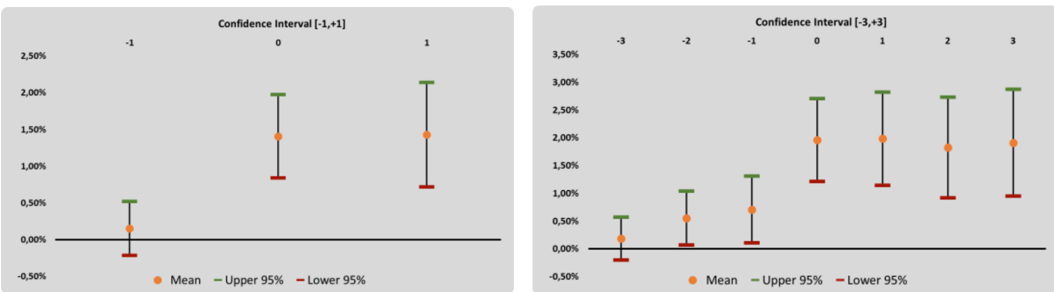

Figure 6.2 A and B – 95% confidence interval for unexpected dividend increase, with event window [-1,+1] and [-3,+3].

From figure 6.2 A the CI shifts from insignificant to significant at the announcement day. The CAAR is significant and higher the day after the announcement day. However, the p-value is weaker (higher) due to a larger standard deviation in CAAR.

Figure 6.2 B shows a significant result the two days prior to the announcement day. Even though the CI is close to the value of zero, it could imply that the event announcement was anticipated or leaked. Not surprisingly, at the announcement day, CAAR increases significantly and the CI suggests a strong level of significance throughout the event window. Figure 6.2 A and B supports the findings presented in table 6.1. The confidence interval figures for event window [-5,+5] and [-10,+10] are listed in appendix D .

6.2 Unexpected dividend decreases

Figure 6.3 provides an overview over the market reactions on unexpected dividend decreases. Similar to unexpected dividend increases, the CAAR drifts upward prior to the announcement day. As shown in the figure, at the announcement day there is a great decrease in CAAR. It follows a negative trend in CAAR the days after the announcement, which could be explained by the post-announcement effect, that it takes time for the market to absorb the event information.

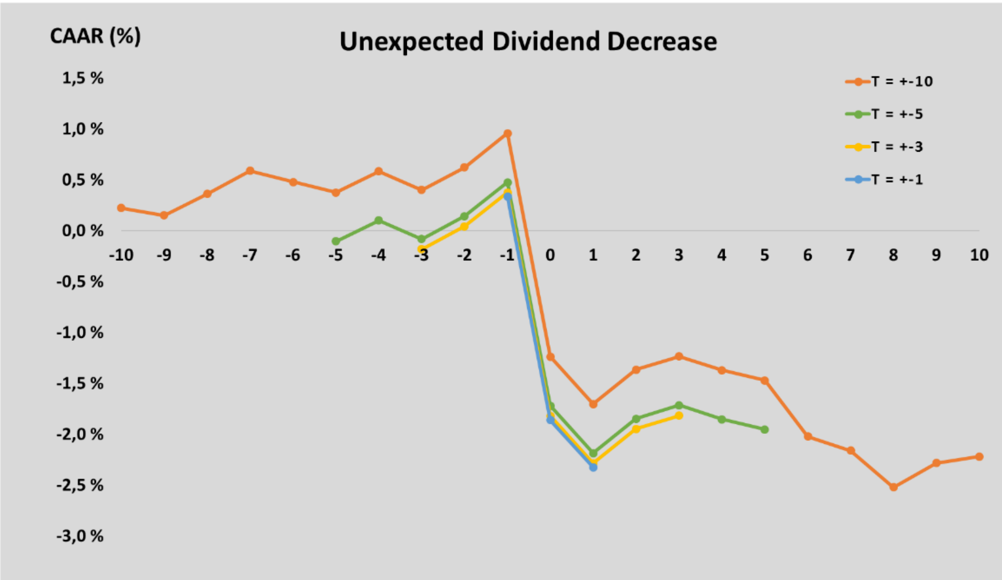

Figure 6.3 – CAAR for unexpected dividend decrease, using Fama French three factor model.

According to figure 6.3, the market response to bad news is of a larger magnitude than for good news. This is in line with the theory presented by Lintner (1956).

Table 6.2 displays the test results for the unexpected decrease in dividend announcements. There is a significant abnormal stock return for event windows [-1,+1] and [-3,+3], with CAAR of -2,33% and -1,82%, respectively. The t-values of -5,25 and -2,85 is significant at the 1% level. Therefore, the null hypothesis is rejected, and unexpected dividend decrease announcements conveys negative information to the market. The event windows daily AAR and CAAR- pattern is presented in appendix C.

	Fama-French three-factor model			
	CAAR %	BW t-test	Patell Z	BMP Z
[-10,+10]	-2,22 %	-2,31 **	-1,69 **	-1,87 **
[-5,+5]	-1,95 %	-2,58 **	-1,91 **	-2,28 **
[-3,+3]	-1,82 %	-2,85 ***	-1,69 **	-2,55 ***
[-1,+1]	-2,33 %	-5,25 ***	-2,86 ***	-4,48 ***

Table 6.2 – Test statistics for negative dividend announcements. CAAR % is the cumulative average abnormal return (N = 94). BW t-test is the Brown and Warner test statistic. Patell Z is the standardized residual test. BMP Z is a test that is robust to event-induced variance increases of security returns, constructed by Boehemer, Musumeci and Poulsen (1991). *, ** and *** constitutes the level of significance at 10%, 5% and 1%, respectively.

From figure 6.4 A and B the confidence intervals for unexpected dividend decreases does contain value zero before announcement day on both event windows. On the announcement day and the rest of the event window, the CI shows a significant result at a 95% level of confidence.

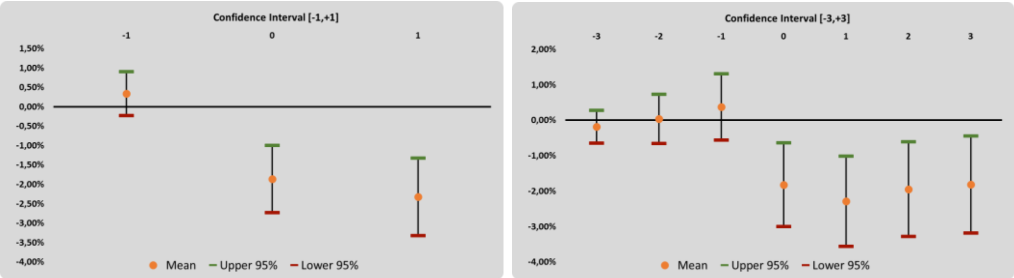

Figure 6.4 A and B – 95% confidence interval for unexpected dividend decrease, with event window [-1,+1] and [-3,+3].

Although the last CI value for [-3,+3] seems to approach zero, it is still significant at both the 5% and 1% level, as suggested in table 6.2. In appendix D, the CI figures for unexpected dividend decreases are listed for event windows [-5,+5] and [-10,+10].

These findings indicate a significant market reaction on the day of announcement for unexpected increase- and decrease, which is consistent with the dividend signaling hypothesis.

6.3 Adjusting for clustering

Stock returns tend to be positively correlated and ignoring such correlation leads to an underestimation of the AR variance, which again leads to biased SE (SE). In other words, clustering could affect the result such that a type I error is committed. By clustering the sample with respect to each security, the SE is adjusted for interference with clustering. Both tables 6.3 A and 6.3 B represents the regression results without clustering (naïve) and with clustering (robust), for unexpected dividend increases and unexpected dividend decreases, respectively.

		Fama-French three-factor model			
		Naïve		Robust	
	Coefficient	SE	t-stat	SE	t-stat
[-10,+10]	0,00833	0,00735	1,13	0,00756	1,10
[-5,+5]	0,01602	0,00578	2,77 ***	0,00606	2,63 **
[-3,+3]	0,01912	0,00494	3,87 ***	0,00514	3,72 ***
[-1,+1]	0,01428	0,00365	3,91 ***	0,00377	3,79 ***

Table 6.3 A –Standard error and test statistics for a regression without and with clustering for dividend increases. T-statistics that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively.

		Fama-French three-factor model			
		Naïve		Robust	
	Coefficient	SE	t-stat	SE	t-stat
[-10,+10]	-0,02220	0,01177	-1,89 *	0,01202	-1,7 *
[-5,+5]	-0,01953	0,00849	-2,30 **	0,00886	-2,19 **
[-3,+3]	-0,01816	0,00703	-2,58 **	0,00716	-2,49 **
[-1,+1]	-0,02326	0,00513	-4,54 ***	0,00559	-4,16 ***

Table 6.3 B –Standard error and test statistics for a regression without and with clustering for dividend decreases. T-statistics that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively.

Adjusting for clustering has a slightly increasing effect for the SE, as illustrated in both tables 6.3 A and 6.3 B. However, with intra-cluster correlation (ICC) lying between 0 and 0,14, the sample is relatively low affected by cross-correlation. By including clustering, the regressions test statistic decreases and becomes more robust. Despite lower test-statistics, the level of significance from the naïve– to robust regression does not change in the event windows [-3,+3] and [-1,+1]. Thus, the interpretation of the result remains unchanged.

6.4 Controlling for external factors

Table 6.4 shows the regression result from estimating equation (14) and adjusted for clustering according to equation (13). Spare and Ciotti (1999) states that change in dividend yield (CHG_YLD) can be viewed as a signal of management's confidence in generating future cash flows. Therefore, CHG_YLD should be positively correlated to CAR. According to Kariuki, Muturi and Kiragu (2016) the variable Tobin's Q, is used as a proxy for firm value and reflects firm-perspective regarding growth- and investments opportunities. Furthermore, they argue that a high Tobin`s Q signifies an overvaluation, which can trigger a negative market reaction. High dividend yield (DIV_YLD) may imply an unsustainable level of dividend payments. Hence, DIV_YLD could have a negative impact on CAR (Spare, A. E., & Ciotti, P. 1999). Log of assets is the SIZE component. Intuitively, if dividend payments are extracted from firm's assets, this will be reflected in the market reactions (Haw and Kim, 1991). Return on assets (ROA) can further be interpreted as a measure of profitability. It is argued that changes in profitability consequently reflect market reactions (Graham, J. R., Hughson, E., and Zender, J. F. 1999).

VARIABLES	(1) CAR FF3FM +-1	(2) CAR FF3FM +-1	(3) CAR FF3FM +-3	(4) CAR FF3FM +-3
CHG_YLD	0.0156***	0.0146***	0.0132**	0.0121**
	(0.00374)	(0.00449)	(0.00539)	(0.00609)
Tobin's Q	-0.000719	-0.000497	-0.00291	-0.00223
	(0.000911)	(0.00140)	(0.00103)	(0.00190)
DIV_YLD	-0.000908***	-0.00109***	-0.00196***	-0.00177***
	(0.000120)	(0.000355)	(0.000149)	(0.000481)
SIZE	-0.0366	-0.0449*	-0.0958**	-0.0900**
	(0.0327)	(0.0259)	(0.0327)	(0.0352)
ROA	0.00179***	0.00162***	0.00307***	0.00258***
	(0.000287)	(0.000474)	(0.000666)	(0.000643)
Constant	-0.00336	-0.000205	0.00699	0.00771
	(0.00475)	(0.00548)	(0.00527)	(0.00743)
Observations	172	172	172	172
R-squared	0.157	0.144	0.177	0.145
F-stat	28.463	21.562	33.784	22.366
Number of company_id	51	-	51	-

Table 6.4 –Standard errors are in parentheses. Due to missing values in some variables, the initial sample of unexpected dividend increase were reduced from 131 to 103 and the unexpected dividend decrease were reduced from 94 to 69, resulting in total sample decrease from 225 to 172 observations. Coefficients that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively.

Looking at the regression adjusted for clustering (1), the results in table 6.4 shows that the dividend variables CHG_YLD, DIV_YLD and ROA were highly significant in the event window [-1,+1]. These results indicate that CHG_YLD, DIV_YLD and ROA have an economically meaningful impact on CAR. The other explanatory variables (Tobin`s Q and SIZE) are not significant. However, the signs of the coefficients support previous literature (Haw and Kim, 1991; Denis, Denis and Sarin, 1994).

In event window [-3,+3], the regression fixed for clustering (3) provides similar results, both DIV_YLD and ROA are significant at 1%, whereas CHG_YLD is significant on a 5% level. Tobin`s Q did not have any significant impact. In contradiction to findings in event window [-1,+1], the SIZE variable explains market variance with 95% level of confidence.

The R-squared suggests that 15,70% and 17,7% of the variance in, respectively CAR[-1,+1] and CAR[-3,+3] can be explained by the variables. In addition, the F-statistics was 28,463 and 33,784 with a corresponding p-value of 0,00. Meaning that both regressions are jointly significant at a 99% level of confidence, implying that the independent variables are fitted to explain the variance in the market reactions (CAR).

7.0 Conclusion

This study examines the dividend signaling hypothesis in the Norwegian stock market, by investigating the stock market reactions to unexpected dividend announcements for firms listed on the Oslo Stock Exchange (OSE). In addition, a regression model is used to investigate if other variables could explain the market reactions.

The unexpected dividend announcements were examined using an event study methodology. The study sample consisted of 65 firms, with a total of 225 unexpected dividend announcements. More specifically, the announcements were distributed by 131 unexpected dividend increases, and 94 unexpected dividend decreases. To identify whether a dividend announcement was unexpected or not, a measure of expected dividend was required. This was done using a model based on analysts' forecasts (IBES).

Using the Fama-French three-factor model for event window [-1,+1] and [-3,+3], the results for both unexpected dividend increases– and decreases provides a significant results before and after adjusting for clustering. Respectively, there is a significant positive CAAR of 1.43% and 1.91% for dividend increases, and for dividend decreases, the CAAR is -2,33% and -1,82%.

This study controls for external factors using a regression model with multiple variables. The results show that the regression is capable to explain the market reactions, especially the significant variables: change in dividend yield, dividend yield and return on assets.

Conclusively, this study supports the dividend signaling hypothesis, and that a positive relationship between the Norwegian stock market reactions and the unexpected dividend announcements exists. However, the results from the regression indicates that there are external factors contributing to the abnormal market reactions. In order to generalize the findings of our study and get a more prominent understanding of the mechanisms that drives the abnormal market reactions, further investigation on the subject is needed.

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Source to table in appendix: Degutis, A., and Novickyte, L. (2014). The efficient market hypothesis: A critical review of literature and methodology. *Ekonomika*, *93*(2), 7.

Appendix

Appendix A

Stata Codes

```
import excel "C:\Users\AAL\Desktop\Regresion.xlsx", sheet("Ark1")
firstrow

ssc install outreg2

*Convert company_id to numeric value*

egen company_id = group(B)

xtset company_id

*OLS regression with and without company fixed effects*

* Market Model*

xtreg CARMKTM1 CHG_YLD TobinsQ DIV_YLD SIZE ROA, fe
outreg2 using Regression_tables.xlm ,replace sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

reg CARMKTM1 CHG_YLD TobinsQ DIV_YLD SIZE ROA
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

xtreg CARMKTM3 CHG_YLD TobinsQ DIV_YLD SIZE ROA, fe
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

reg CARMKTM3 CHG_YLD TobinsQ DIV_YLD SIZE ROA
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

*Fama-French three-factor Model*

xtreg CARFF3F1 CHG_YLD TobinsQ DIV_YLD SIZE ROA, fe
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

reg CARFF3F1 CHG_YLD TobinsQ DIV_YLD SIZE ROA
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

xtreg CARFF3F3 CHG_YLD TobinsQ DIV_YLD SIZE ROA, fe
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel

reg CARFF3F3 CHG_YLD TobinsQ DIV_YLD SIZE ROA
outreg2 using Regression_tables.xlm ,append sortvar (CHG_YLD
TobinsQ DIV_YLD SIZE ROA) label excel
```

Appendix B

Graphs from Market Model

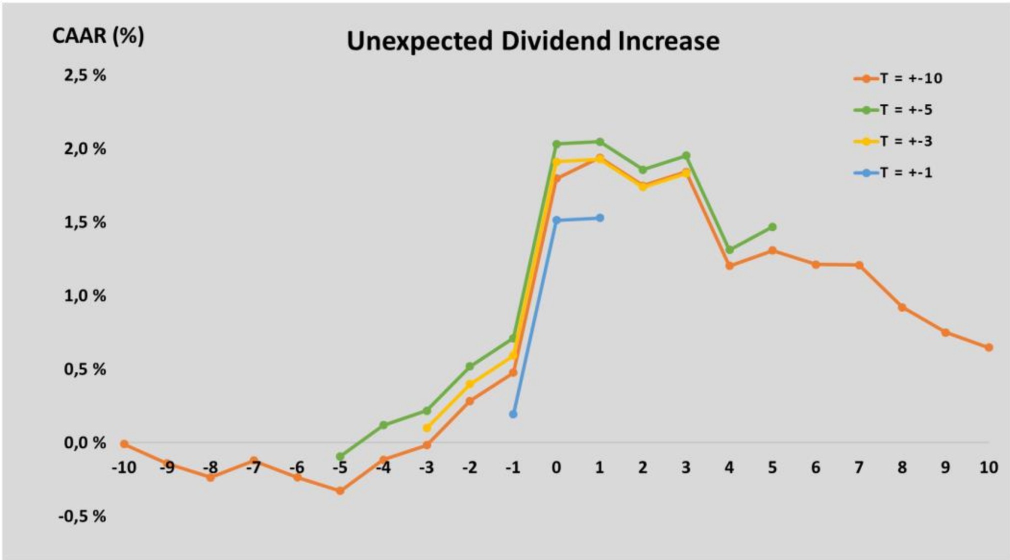

Figure 1 – CAAR for unexpected dividend increase, using the market model.

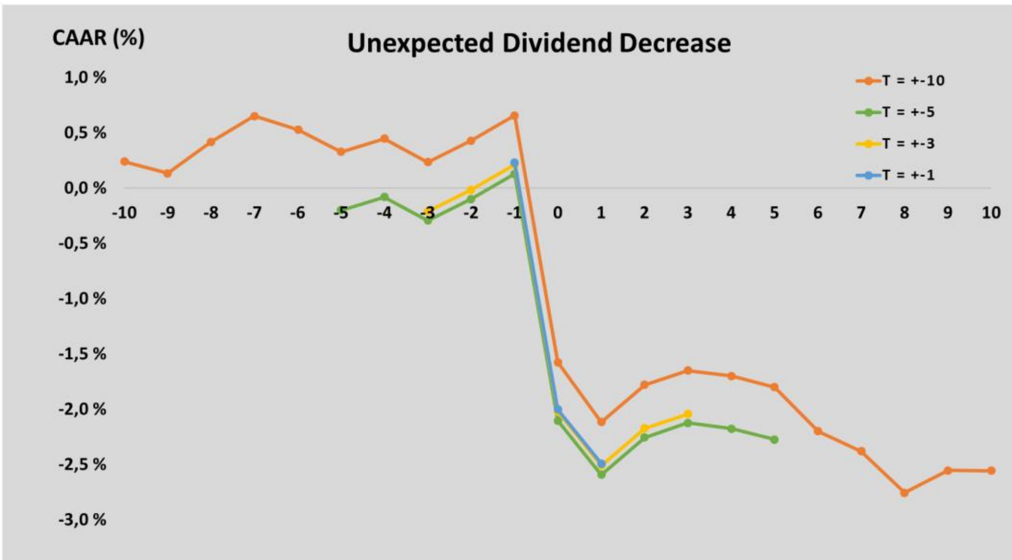

Figure 2 – CAAR for unexpected dividend decrease, using the market model.

Tables from Market Model

	Market model			
	CAAR %	BW t-test	Patell Z	BMP Z
[-10,+10]	0,65 %	0,81	0,59	0,74
[-5,+5]	1,47 %	2,36 **	2,42 ***	2,46 ***
[-3,+3]	1,83 %	3,92 ***	3,48 ***	3,86 ***
[-1,+1]	1,53 %	5,31 ***	2,30 **	4,43 ***

Table 1 – Test statistics for positive dividend announcements. CAAR % is the cumulative average abnormal return (N=131). BW t-test is the Brown and Warner test statistic. Patell Z is the standardized residual test. BMP Z is a test that is robust to event-induced variance increases of security returns, constructed by Boehemer, Musumeci and Poulsen (1991).
*, ** and *** constitutes the level of significance at 10%, 5% and 1%, respectively.

	Market model			
	CAAR %	BW t-test	Patell Z	BMP Z
[-10,+10]	-2,56 %	-2,40 **	-2,30 **	-2,14 **
[-5,+5]	-2,28 %	-2,65 ***	-2,84 ***	-2,62 ***
[-3,+3]	-2,04 %	-2,93 ***	-2,56 ***	-2,86 ***
[-1,+1]	-2,49 %	-5,42 ***	-3,53 ***	-4,8 ***

Table 2 – Test statistics for negative dividend announcements. CAAR % is the cumulative average abnormal return (N=94). BW t-test is the Brown and Warner test statistic. Patell Z is the standardized residual test. BMP Z is a test that is robust to event-induced variance increases of security returns, constructed by Boehemer, Musumeci and Poulsen (1991).
*, ** and *** constitutes the level of significance at 10%, 5% and 1%, respectively.

	Market model				
		Naïve		Robust	
	Coefficient	SE	t-stat	SE	t-stat
[-10,+10]	0,006476	0,00710	0,91	0,00726	0,89
[-5,+5]	0,014169	0,00578	2,45 **	0,00613	2,31 **
[-3,+3]	0,018318	0,00476	3,85 ***	0,00484	3,78 ***
[-1,+1]	0,015291	0,00347	4,41 ***	0,00363	4,24 ***

Table 3 – Standard error and test statistics for a regression without and with clustering for dividend increases. T-statistics that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively.

	Market model				
		Naïve		Robust	
	Coefficient	SE	t-stat	SE	t-stat
[-10,+10]	-0,02557	0,01153	-2,22 **	0,01193	-2,11 **
[-5,+5]	-0,02276	0,00860	-2,65 **	0,00889	-2,42 **
[-3,+3]	-0,02044	0,00705	-2,90 ***	0,00725	-2,82 ***
[-1,+1]	-0,02494	0,00512	-4,87 ***	0,00547	-4,56 ***

Table 4 – Standard error and test statistics for a regression without and with clustering for dividend decreases. T-statistics that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively

	(1)	(2)	(3)	(4)
VARIABLES	CAR MKTM +-1	CAR MKTM +-1	CAR MKTM +-3	CAR MKTM +-3
CHG_YLD	0.0159***	0.0149***	0.0137**	0.0125**
	(0.00433)	(0.00438)	(0.00598)	(0.00606)
Tobin's Q	-0.000769	-0.000541	-0.00252	-0.00171
	(0.00138)	(0.00137)	(0.00190)	(0.00189)
DIV_YLD	-0.00107***	-0.00125***	-0.00195***	-0.00172***
	(0.000371)	(0.000346)	(0.000513)	(0.000479)
SIZE	-0.0433*	-0.0499*	-0.0918**	-0.0836**
	(0.0260)	(0.0253)	(0.0359)	(0.0350)
ROA	0.00190***	0.00165***	0.00303***	0.00244***
	(0.000477)	(0.000462)	(0.000658)	(0.000640)
Constant	-0.00254	0.000997	0.00544	0.00616
	(0.00553)	(0.00535)	(0.00763)	(0.00740)
Observations	172	172	172	172
R-squared	0.180	0.163	0.179	0.137
F-stat	35.451	29.989	34.193	18.169
Number of sector_id	51		51	

Table 5 –Standard errors are in parentheses. Due to missing values in some variables, the initial sample of unexpected dividend increase were reduced from 131 to 103 and the unexpected dividend decrease were reduced from 94 to 69, resulting in total sample decrease from 225 to 172 observations. Coefficients that are significant different from 0 at the 1%, 5% and 10% level, are marked with ***, ** and *, respectively.

Appendix C

Daily AAR and CAAR- pattern from the Market Model

Unexpected dividend increase

Event day	Good news AAR	Good news CAAR
-10	-0,01 %	-0,01 %
-9	-0,13 %	-0,14 %
-8	-0,10 %	-0,24 %
-7	0,11 %	-0,12 %
-6	-0,11 %	-0,23 %
-5	-0,09 %	-0,33 %
-4	0,21 %	-0,12 %
-3	0,10 %	-0,02 %
-2	0,30 %	0,28 %
-1	0,19 %	0,48 %
0	1,32 %	1,80 %
1	0,14 %	1,94 %
2	-0,19 %	1,75 %
3	0,09 %	1,84 %
4	-0,64 %	1,20 %
5	0,11 %	1,31 %
6	-0,10 %	1,21 %
7	0,00 %	1,21 %
8	-0,29 %	0,92 %
9	-0,17 %	0,75 %
10	-0,10 %	0,65 %

Table 6 – AAR and CAAR for good news [-10,+10]

Event day	Good news AAR	Good news CAAR
-5	-0,0928 %	-0,0928 %
-4	0,2120 %	0,1192 %
-3	0,0987 %	0,2179 %
-2	0,3007 %	0,5186 %
-1	0,1922 %	0,7108 %
0	1,3198 %	2,0306 %
1	0,0171 %	2,0477 %
2	-0,1902 %	1,8575 %
3	0,0935 %	1,9510 %
4	-0,6401 %	1,3109 %
5	0,1582 %	1,4691 %

Table 7 – AAR and CAAR for good news [-5,+5]

Event day	Good news AAR	Good news CAAR
-3	0,0987 %	0,0987 %
-2	0,3007 %	0,3994 %
-1	0,1922 %	0,5916 %
0	1,3198 %	1,9114 %
1	0,0171 %	1,9285 %
2	-0,1902 %	1,7383 %
3	0,0935 %	1,8318 %

Table 8 – AAR and CAAR for good news [-3,+3]

Event day	Good news AAR	Good news CAAR
-1	0,1922 %	0,1922 %
0	1,3198 %	1,5120 %
1	0,0171 %	1,5291 %

Table 9 – AAR and CAAR for good news [-1,+1]

Unexpected dividend decrease

Event day	Bad news AAR	Bad news CAAR
-10	0,24 %	0,24 %
-9	-0,11 %	0,13 %
-8	0,29 %	0,42 %
-7	0,23 %	0,65 %
-6	-0,12 %	0,53 %
-5	-0,20 %	0,32 %
-4	0,12 %	0,45 %
-3	-0,21 %	0,23 %
-2	0,19 %	0,43 %
-1	0,23 %	0,66 %
0	-2,23 %	-1,58 %
1	-0,54 %	-2,12 %
2	0,34 %	-1,78 %
3	0,13 %	-1,65 %
4	-0,05 %	-1,70 %
5	-0,10 %	-1,80 %
6	-0,40 %	-2,20 %
7	-0,18 %	-2,38 %
8	-0,38 %	-2,76 %
9	0,20 %	-2,56 %
10	0,00 %	-2,56 %

Table 10 – AAR and CAAR for bad news [-10,+10]

Event day	Bad news AAR	Bad news CAAR
-5	-0,2036 %	-0,2036 %
-4	0,1213 %	-0,0822 %
-3	-0,2122 %	-0,2944 %
-2	0,1939 %	-0,1005 %
-1	0,2279 %	0,1274 %
0	-2,2330 %	-2,1056 %
1	-0,4885 %	-2,5941 %
2	0,3372 %	-2,2569 %
3	0,1303 %	-2,1265 %
4	-0,0501 %	-2,1767 %
5	-0,0996 %	-2,2763 %

Table 11 – AAR and CAAR for bad news [-5,+5]

Event day	Bad news AAR	Bad news CAAR
-3	-0,2122 %	-0,2122 %
-2	0,1939 %	-0,0183 %
-1	0,2279 %	0,2096 %
0	-2,2330 %	-2,0234 %
1	-0,4885 %	-2,5119 %
2	0,3372 %	-2,1746 %
3	0,1303 %	-2,0443 %

Table 12 – AAR and CAAR for bad news [-3,+3]

Event day	Bad news AAR	Bad news CAAR
-1	0,2279 %	0,2279 %
0	-2,2330 %	-2,0051 %
1	-0,4885 %	-2,4936 %

Table 13 – AAR and CAAR for bad news [-1,+1]

Daily AAR and CAAR- pattern from the Fama-French three-factor Model

Unexpected dividend increase

Event day	Good news	
	AAR	CAAR
-10	-0,02 %	-0,02 %
-9	-0,08 %	-0,09 %
-8	-0,14 %	-0,24 %
-7	0,11 %	-0,13 %
-6	0,02 %	-0,11 %
-5	-0,13 %	-0,24 %
-4	0,23 %	-0,01 %
-3	0,19 %	0,17 %
-2	0,37 %	0,54 %
-1	0,15 %	0,70 %
0	1,25 %	1,95 %
1	0,02 %	1,97 %
2	-0,16 %	1,81 %
3	0,09 %	1,90 %
4	-0,65 %	1,25 %
5	0,25 %	1,50 %
6	-0,16 %	1,33 %
7	-0,05 %	1,28 %
8	-0,21 %	1,07 %
9	-0,13 %	0,94 %
10	-0,11 %	0,83 %

Table 14 – AAR and CAAR for good news [-10,+10]

Event day	Good news	
	AAR	CAAR
-5	-0,13 %	-0,13 %
-4	0,23 %	0,09 %
-3	0,19 %	0,28 %
-2	0,37 %	0,65 %
-1	0,15 %	0,80 %
0	1,25 %	2,06 %
1	0,02 %	2,08 %
2	-0,16 %	1,92 %
3	0,09 %	2,01 %
4	-0,65 %	1,36 %
5	0,25 %	1,60 %

Table 15 – AAR and CAAR for good news [-5,+5]

Event day	Good news	
	AAR	CAAR
-3	0,19 %	0,19 %
-2	0,37 %	0,55 %
-1	0,15 %	0,71 %
0	1,25 %	1,96 %
1	0,02 %	1,98 %
2	-0,16 %	1,82 %
3	0,09 %	1,91 %

Table 16 – AAR and CAAR for good news [-3,+3]

Event day	Good news	
	AAR	CAAR
-1	0,15 %	0,15 %
0	1,25 %	1,41 %
1	0,02 %	1,43 %

Table 17 – AAR and CAAR for good news [-1,+1]

Unexpected dividend decrease

Event day	Bad news	
	AAR	CAAR
-10	0,22 %	0,22 %
-9	-0,07 %	0,15 %
-8	0,21 %	0,36 %
-7	0,23 %	0,59 %
-6	-0,11 %	0,48 %
-5	-0,11 %	0,37 %
-4	0,21 %	0,58 %
-3	-0,18 %	0,40 %
-2	0,22 %	0,62 %
-1	0,33 %	0,96 %
0	-2,20 %	-1,24 %
1	-0,46 %	-1,70 %
2	0,34 %	-1,37 %
3	0,13 %	-1,24 %
4	-0,14 %	-1,37 %
5	-0,10 %	-1,47 %
6	-0,55 %	-2,02 %
7	-0,14 %	-2,16 %
8	-0,36 %	-2,52 %
9	0,24 %	-2,28 %
10	0,06 %	-2,22 %

Table 18 – AAR and CAAR for bad news [-10,+10]

Event day	Bad news	
	AAR	CAAR
-5	-0,11 %	-0,11 %
-4	0,21 %	0,10 %
-3	-0,18 %	-0,08 %
-2	0,22 %	0,14 %
-1	0,33 %	0,48 %
0	-2,20 %	-1,72 %
1	-0,46 %	-2,19 %
2	0,34 %	-1,85 %
3	0,13 %	-1,72 %
4	-0,14 %	-1,85 %
5	-0,10 %	-1,95 %

Table 19 – AAR and CAAR for bad news [-5,+5]

Event day	Bad news	
	AAR	CAAR
-3	-0,18 %	-0,18 %
-2	0,22 %	0,04 %
-1	0,33 %	0,37 %
0	-2,20 %	-1,82 %
1	-0,46 %	-2,29 %
2	0,34 %	-1,95 %
3	0,13 %	-1,82 %

Table 20 – AAR and CAAR for bad news [-3,+3]

Event day	Bad news	
	AAR	CAAR
-1	0,33 %	0,33 %
0	-2,20 %	-1,86 %
1	-0,46 %	-2,33 %

Table 21 – AAR and CAAR for bad news [-1,+1]

Appendix D

CI Graphs for the Fama-French three-factor Model

Unexpected dividend increase

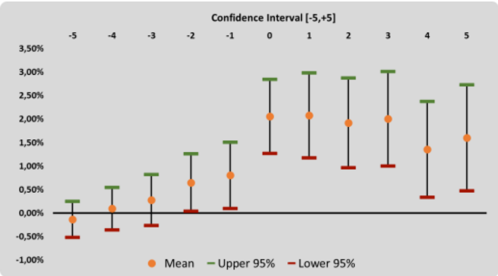

Figure 3 – 95% CI for CAAR, event window [-5,+5]

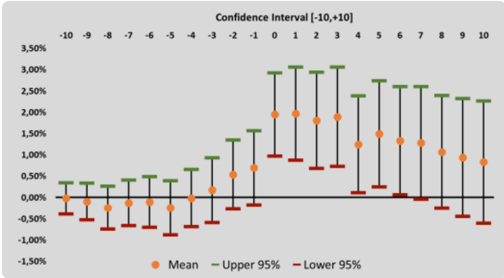

Figure 4 – 95% CI for CAAR, event window [-10,+10]

Unexpected dividend decrease

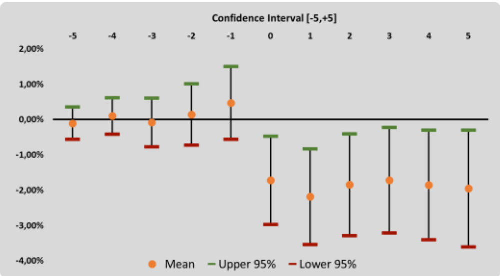

Figure 5 – 95% CI for CAAR, event window [-5,+5]

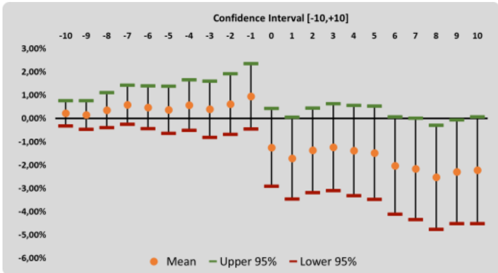

Figure 6 – 95% CI for CAAR, event window [-10,+10]