Does Ex-dividend Day Significantly Affect Norwegian Stock Performance?

("Trading activity in BOV surges (Bilde) ", 2017)

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Does ex-dividend day significantly affect Norwegian stock performance?

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Abstract

This study analyses the effect of ex-dividend day on Norwegian stock performance. Previous research of different theories and from different markets are obtained to clarify the topic and give us the tools to answer the thesis statement. Three research questions are stated, giving more depth to the analysis conducted. 1. Does the ex-dividend day affect stock performance depending on industry sector? 2. Is the size of the firms' market value relevant? 3. Is there a significant difference in stock performance before and after 2006? Through an event study the data is processed in three different segments; by sectors, levels of market value and periods before and after 2006. The findings revealed no overall significance that ex-dividend day affects stock performance in the Norwegian stock market. A scenario analysis is conducted to control the sensitivity of the results, and the overall output supports our conclusion.

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Heidi Veggeberg & Silje Vistnes Bø

List of Tables

List of Figures

List of Abbreviations

EEA	European Economic Area
EU	European Union
OSEBX	Oslo Stock Exchange Benchmark Index
CAP	Cumulative Abnormal Performance
NOK	Norwegian Krone
CSD	Central Securities Depository

Table of Contents

1 Introduction

The Norwegian stock market is relatively small compared to the UK, the US and other markets. At the same time, the Norwegian market consists of several international companies and has a large proportion of foreign shareholders. Figures 1 and 2 show the distribution of investors in 2001 and 2018. The presence of foreign investors is large in both periods, but there has been a decrease of almost 10% over the years. The firms listed on Oslo Stock Exchange are mainly in the industrials and energy sectors, which represent around 50% of all the listed companies. This is a natural result of oil and gas being Norway's largest industry.

The Norwegian Market

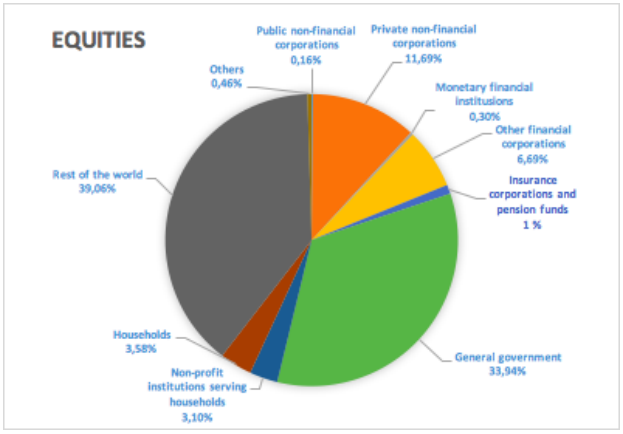

***Figure 1** - Investor grouping of the Norwegian market 2001*

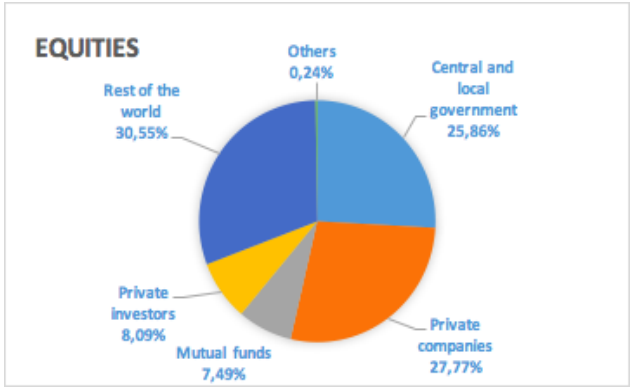

***Figure 2** - Investor grouping of the Norwegian market 2018*

Trading volume and price are important factors for establishing the investment strategy. The trading volume is also an important indicator to confirm price movements and to confirm a trend. A stock normally has a lot of movements where the price goes up and down several

times over a longer time frame, but an uptrend can be recognised by its "higher highs" and "higher lows". This means that the next price increase is higher than the previous peaks in a graph of price movements and the decreases are also smaller than the previous low prices. Oppositely, the characteristic of a downtrend is "lower highs" and "lower lows", where the price is generally lower than the previous ups and downs. Volume and price move in a direction depending on the trend. Volume generally increases if the price moves in the direction of the trend, and if the price moves in the trend's opposite direction, the volume will decrease. In an uptrend, the volume and price should move in the same direction, but in a downtrend the opposite is true. "The higher the trading volume the better the possibility to predict the development of an investment instrument" (Rudolf, 2014).

Tax is an important factor in the financial world. It can be the decisive factor for investors when choosing where to invest and which trading strategy to select. In 2006 a new tax reform was implemented in Norway. One of the main changes in the reform was the taxation of dividends. The new rules have most impact on personal taxpayers, both domestic and foreign investors. Now they are obligated to pay tax on dividends, which they in practice did not do before.

The main objective of this thesis is to study how the ex-dividend day affects the performance of stocks listed on the Oslo Stock Exchange. We will test and analyse the effect ex-dividend day have on trading volume and price. Dividing the analysis of the data into different segments, specifically, the total market, industry sector, levels of market value, and the effect of whether the events are happening before or after the tax law change in 2006 will strengthen the study. We were introduced to this specific topic through the tax law course "Skatt og avgift" at the University of Stavanger. Our contribution is the study of the Norwegian stock market after the tax reform in 2006. We expect that the stock prices and trading volume on Norwegian stocks have had interesting movements around the ex-dividend days the last years. From this we derive the research statement:

Does ex-dividend day significantly affect Norwegian stock performance?

To elaborate, the following research questions will be studied:

- *Does the ex-dividend day affect stock performance depending on industry sector?*
- *Is the size of the firm's market value relevant?*

- *Is there a significant difference in stock performance before and after 2006?*

Our thesis is inspired by the article by Dai and Rydqvist that was published in 2009. They investigated the price formation around the ex-dividend day in the Norwegian stock market from 1992 until 2006. We think it will be interesting to analyse the period from January 2000 to February 2018, to test if the results from their article are still valid, and if the changes in the tax law in 2006 had a significant effect on the trading volume and price around the ex-dividend day.

There is a lot of previous research on trading around the ex-dividend day. Information from the Norwegian Tax Administration confirms that the government allocates money and time to uncover and prevent exploitation of loopholes. The Norwegian Tax Administration have since 2010 worked to promote research on tax and related topics. Investigation of this topic has also been done in several markets around the world, for example in the US, Hong Kong and the Finnish market. The researchers have different opinions and have found different variables that explains the investor behaviour around the ex-dividend day. In section 2.5 we will discuss the articles of Elton & Gruber, Kalay, Heath & Jarrow, Bali & Hite, Frank & Jagannathan, and Rantapuska.

In our thesis we will use the event study methodology to investigate the research questions. Event study is the method of choice when we are going to analyse the effects of dividend on trading volume and price. The reason for this is that an event study will measure if the specific event made significant impact. When calculating the normal performance of a stock, we will use the market model and the constant mean volume model, on price and volume respectively. A scenario analysis will be conducted to validate the results arrived from the event study.

1.1 Structure of The Thesis

This thesis is divided into five chapters: introduction, theory and literature overview, methodology and data, results and discussion, and conclusion. Each chapter is divided into sections to give the reader a better overview of the content. Chapter 2 presents the 2006 tax reform, relevant theory and previous research on the thesis' topic. Chapter 3 introduces the

event study methodology, the data set and our expectations. Further, chapter 4 includes the execution of the tests, the results of the study, the scenario analysis and a discussion of the findings. The last chapter discuss and concludes the results and gives suggestions for further research.

2 Theory and Literature Overview

2.1 Laws and Regulations

Laws and regulations holds the Norwegian market in balance. The Financial Supervisory Authority is the independent government agency set to control the market. The agency enforces laws and regulations from the Norwegian government, the Ministry of Finance and the European Economic Area agreement, hereafter referred to as EEA agreement. Their main task is to contribute to financial stability and well-functioning markets. The overall goal for the securities market is that it should be a safe market for investment and savings purposes (Finanstilsynet, 2016).

The regulation of financial markets has become an international affair due to globalisation and free movement of capital. The EEA agreement Norway signed with the European Union, from now on referred to as EU, works like a link between the international standards and the countries' national standards. The main task when integrating the rules and regulations from the EU was removing discriminatory provisions from Norwegian laws and regulations. Through the implementation of the financial market regulation, Norway has no longer any national characteristics. The EEA agreement has given foreign actors access to the Norwegian market, which they have utilised. They have high market shares in important sectors in Norway, compared to how the situation is in other countries. Norwegian actors have in less degree exploited the access to the EU market (Mydske, pp. 5-6).

2.2 The Norwegian Tax System

The Nordic Dual Tax System was introduced in 1992 when a new tax reform was implemented. Then the taxpayers' income is divided in two groups; capital income and labour income. Capital income is taxed at a proportional rate and labour income is taxed according to progressive rates. The purpose of this tax system is to have a more neutral taxation on capital income and make it more attractive to invest in Norway. The Nordic Dual Tax System is still current after the 2006 tax reform, but Zimmer states that the reform probably was implemented to repair two weaknesses from 1992; The Sharing model and the design of the EEA law (Zimmer, 2006).

2.3 The Tax Reform 2006

In 2006 a new reform was implemented. The main change carried out was regarding the dividend tax law; the Shareholder Model and the Exemption Method were introduced. Former case law and sources about dividend were still applicable, because no changes were made by the legislator. The new rules affect personal taxpayers the most, because in practice they did not pay any tax on dividends before (Gjems-Onstad, Ferdowski, Folkvord, & Furuseth, 2015).

2.3.1 The Shareholder Model

The Shareholder Model applies to personal taxpayers. The purpose of the model is to reduce the difference in taxation on capital and labour. It is performed so that dividend and capital gain exceeding the risk-free return is considered as ordinary income and are taxed accordingly (Skatteetaten, 2006). Both dividend and capital gains follow the tax rate of ordinary income, and when the tax rate was scaled down in 2016, an adjustment factor was implemented. The dividends and capital gains get scaled up by 1,33 in 2018 to adjust the tax rate back to 27% (Zimmer, Bugge, & Rasmussen, 2014).

Previously, private shareholders did not pay tax on dividend. The allowance model worked in a way that the tax calculated for the dividend received was eliminated through an allowance. When it was time to sell the share, the input value was adjusted by a proportion of retained tax capital in the company from the time period the shareholder had ownership (Skatteetaten, 2006).

Foreign Shareholders

Dividend from Norwegian firms to foreign shareholders are taxable to Norway but are regulated by tax conventions between countries. It is then normal to operate with a withholding tax that is decided between the two participating countries. The EEA agreement makes EU citizens equal to Norwegian citizens when it comes to taxation on capital. It is not allowed to give them higher tax rates than people living in Norway. Personal shareholders living in an EU country are also entitled to a deduction equal the risk-free return on their dividend, before tax is calculated. There is no lawful claim to tax capital gains that personal shareholders have earned on shares in Norwegian firms (Zimmer et al., 2014). The same rules applied before the 2006 tax reform.

2.3.2 The Exemption Method

Dividends and capital gains are excluded from taxation when the shareholder is a firm. This is practiced to prevent double taxation (Zimmer et al., 2014). Before 2006 Norwegian firms paid tax on capital gains (Dai & Rydqvist, 2009).

Foreign Firms

The same rules apply for foreign firms located in the EU. They do not have to pay taxes on dividends and capital gains. The condition is that the firm's structure must be equivalent to Norwegian firms that are included in the Exemption Method (Zimmer et al., 2014, p. 330). Firms located outside the EU are taxable to Norway and must pay a withholding tax on dividends (Skatteetaten, 2017). There is no lawful claim to tax capital gains that foreign firms have earned on shares in Norwegian firms (Zimmer et al., 2014, p. 332). The same rules applied before 2006, but the firms in the EU were not covered by the Exemption Method (Dai & Rydqvist, 2009).

2.4 Clientele Theories

The different tax preferences in investor groups create clientele effects, in which the firm's dividend policy is optimised for the tax preference of its investor clientele. Clientele effect definition: "When the dividend policy of a firm reflects the tax preference of its investor clientele". Investors in the highest tax brackets[1] prefer stocks that pay no or low dividends, while tax-free investors and corporations prefer stocks with high dividends. In this case, the dividend policy of a firm is optimised for the tax preference of its investor clientele (Berk & DeMarzo, 2014, pp. 599-600).

The dividend-capture theory is developed by A. Kalay and we will mention this article in the section of previous research. It is a dynamic clientele effect where Kalay state that with no transaction costs the investors can trade among themselves around the ex-dividend day and then back again. The investors do not need to have a static trading strategy, it is possible to make the adjustments needed to capture maximum gain. In reality for ordinary dividend that

[1] Tax brackets: The divisions at which tax rates change. Income past a certain point will be taxed at a higher rate.

is normally small, transaction cost and the risk connected with trading will make the dynamic trading strategy unprofitable (Berk & DeMarzo, 2014, pp. 599-601).

By trading with each other around the ex-dividend day, investors can realise mutual gains at the expense of the government. This implies if the investors have different tax rate on dividend income and capital appreciation. The key argument of dynamic dividend clientele models is the tax heterogeneity that is leading to differential valuation of dividends. The tax heterogeneity is when investors that prefer dividends over capital gains will buy stocks cum-dividend, and investors who do not favour dividends will sell stocks cum-dividend, and these trades are afterward reversed on the first ex-dividend day. The ex-dividend day premium is not driven by only a single group of investors, it is driven by the cooperation of trading decisions by investors with different tax status. Dynamic dividend clientele models include risk and transaction costs in addition to taxes. These models have obtained empirical support in previous studies which have analysed price and volume data. Studies have found that trading volume on the ex-dividend day is increasing with tax heterogeneity and dividend yield, and it is decreasing with transaction costs and risk. Thus, the evidence of trading volume is consistent with the belief that investors exploit differences in the tax of dividends and capital gains around the ex-dividend day events, when potential gains are high and risks are low. These dividend clientele models will be further discussed in chapter 2.5 of previous research.

2.5 Previous Research

As stated earlier, in our search for previous research the article by Dai and Rydqvist is essential. They investigated the Norwegian stock market around the ex-dividend day from 1992-2006. As the article only investigates the years before the 2006 tax reform, we think it will be interesting to focus our thesis on the years both before and after the tax law change. Specifically, the years 2000-2017, to analyse if there are any differences in the market affected by the tax reform.

Dai and Rydqvist estimated the costly-arbitrage model of Boyd and Jagannathan, looking at the price formation around the ex-dividend day. They found ownership changes in the following sectors: foreign shareholders, non-financial corporations, and banks. The pre-audit

slope coefficient for foreign shareholders is negative cum-dividend and positive ex-dividend, while it is the opposite for corporations and banks. This shows a trend indicating that foreign shareholders sell stocks cum-dividend to domestic banks and corporations, and ex-dividend they buy back the stocks. Dai and Rydqvist conclude from the study's estimate that 0,55% of the outstanding stocks are traded for tax purposes, to avoid the withholding tax on dividends. This estimate is quite large compared to previous research on ex-dividend day trading, but it is a small estimate compared to the foreign ownership fraction of 30% of Norwegian stocks. Further, Dai and Rydqvist conclude that the tax-clientele model is rejected, that the evidence is mixed for the costly-arbitrage model, and that the risk averse model is consistent with the data (Dai & Rydqvist, 2009, pp. 583-595). Other researchers have also investigated different factors affecting the ex-dividend day. Dai and Rydqvist focus on the four explanatory variables: tax, dividend yield, transaction costs and risk, that affect the abnormal stock returns on the ex-dividend day. We will also focus on these explanatory variables using the references Dai and Rydqvist refer to.

Elton and Gruber are studying the ex-dividend behaviour of common stocks, because they believe it will provide data to calculate a firm's cost of retained earnings, support the clientele effect of Miller and Modigliani and illustrate one form of market rationality. The data used in the study is collected from the New York Stock Exchange, and the rules and restrictions affecting the research comes from the US market. They state that the marginal stockholder tax bracket can be revealed by observing the trading around the ex-dividend day of common stocks. The stock behaviour must be consistent to a rational market, and capital gains and dividend must be taxed at different rates. The tax rate is used to determine the optimal investment policy for firms. The knowledge is also important when it comes to dividend policy, and if there is a strong relationship between dividend policy and investor tax rates it would provide evidence supporting the clientele effect. To test the presence of the clientele effect they look at two variables that should affect stockholders' desire to invest; dividend yield and payout ratio. Their result is that the market prefers dividends over capital gains and they claim the American tax system can be an explanation for the outcome. Elton and Gruber conclude that firms attract rational clientele, so the firm's dividend policy is important (Elton & Gruber, 1970, pp. 68-73).

Even though Elton and Gruber found that the ex-dividend day relative price drop can be explained from the stockholders' marginal tax rates, Kalay on the other hand, does not agree

and challenge this argument. Kalay focuses on the role of costly arbitrage in the US market and argues that the transaction costs of arbitrage are reflected by the abnormal stock returns. Kalay re-examines the empirical evidence of past studies and the theory of stock price behaviour on the ex-dividend day. The evidence in Elton and Gruber's study is that the ex-dividend day price drop behaviour is significantly less than the dividend per share and there is a positive correlation between the ex-dividend relative price drop and the dividend yield. This evidence is subject to potential biases. The positive correlation can be the result of incompleteness in daily price movements that is adjusted and ex-dividend day closing prices that are used. Another bias is that there might be some dependent observations in the statistical significance of the measured correlation. Kalay's remeasured correlation after the adjustments for the potential biases is still positive, and the sample mean price drop is now statistically significant, but still less than one. The result of this study is that Kalay claim that it is not an evidence of a tax effect or a clientele effect, looking at the ex-dividend day behaviour of stock prices. Kalay state that the investors that are part of the trading population, pay higher taxes on dividend income than on capital gains (Kalay, 1982, pp. 1059-1068).

Heath and Jarrow claim that Kalay's hypothesis is based on a faulty premise. They state a theorem where the ex-dividend stock price drop can differ from the dividend and still no arbitrage opportunities exist in the US market when they exclude transaction costs. They have evidence that the stock price drop can both be less and more than the dividend, so they state that a short-term trader cannot make arbitrage profits around the ex-dividend day. The price drop difference reflects the equilibrium considerations of the long-term traders, the short-term traders, taxes, and the risk aversion. If the difference exceeds the required risk premium, then abnormal profits can be earned. Short-term traders and long-term traders are in the same category, because both must consider risk when trading around ex-dividend days. This argument contradicts the narrow allegation that short-term traders are generating riskless arbitrage profits (Heath & Jarrow, 1988, pp. 95-102).

Bali and Hite propose an alternative to the tax-based explanations and propose microstructure-based arguments. They look at actual dividend rather that rates of return and dividend yields. This study tries to seize which rounding rule the market uses. Bali and Hite conclude that the hypothesis capable of explaining the data in the US market is not only the

tax-induced dividend clientele hypothesis. They claim that price discreteness[2] has an important impact on explaining the observed ex-dividend day stock price changes, as dividends typically are small. They show that abnormal returns on the ex-dividend day are too small to lead to arbitrage profits, because trading is limited to tick[3] multiples and they are even smaller than the rounding error caused by discreteness. The study concludes that the discreteness hypothesis fits the data at least as well as the dividend clientele model (Bali & Hite, 1998, pp. 127-156).

As well as Bali and Hite, Frank and Jagannathan also propose arguments that are an alternative to the tax-based explanations. Frank and Jagannathan look at the Hong Kong market, a market with no tax on neither dividends nor capital gains. They found that on average the stock prices drop by less than the amount of the dividend on the ex-dividend day. Looking at the tick size effects, Bali and Hite showed that it was large relatively to the value of dividend, while Frank and Jagannathan found that the tick varies with the stock price in Hong Kong. When the stock is newly trading ex-dividend, the trading volume will have a larger drop. This indicates that the tick size has implications for investor behaviour, as Bali and Hite stated. Frank and Jagannathan conclude that even though the Hong Kong market does not have taxes on dividends or capital gains, they found similar pricing effects to the US market. They explain the price drop on the ex-dividend day by recognising the trades that generally have a trend. This tends to occur at the bid price on the last cum-dividend day and at the ask price on the ex-dividend day. The result of this is a rise in stock prices on average on ex-dividend days, independent of the amount of the dividend (Frank & Jagannathan, 1998, pp. 161-186).

It can also be useful to study an article that investigates the ex-dividend day in a Nordic country to compare it to the Norwegian market, as it may have many similarities. Rantapuska studied the Finnish stock market, investigating the trading behaviour of all investors around the ex-dividend day. As the dynamic dividend clientele theories suggest, domestic taxable investors prefer dividend income and they buy stocks cum-dividend and sell ex-dividend. On the other hand, mutual funds and foreigners sell stocks cum-dividend and buy ex-dividend. The dynamic dividend clientele theories have been supported by studies that found the ex-

[2] Price discreteness: Market frictions
[3] Tick: Minimum price movement of a trading instrument

dividend day trading volume to be increasing with tax heterogeneity and dividend yield, and it is decreasing with transaction costs and idiosyncratic risk. Thus, the investors derive benefit from the differences in dividends and capital gains taxation around ex-dividend day events, as the potential gains are high and risks are low around the ex-dividend day. Rantapuska investigated if traders buy or sell within a wider window than only the last cum-dividend day and the first ex-dividend day. He investigated a window of 22 days, including ten days before and eleven days after the ex-dividend day. The result was that there are six times more traders buying on the last cum-dividend day and selling on the first ex-dividend day than on the other trading days. From the study, Rantapuska found that his results are consistent with the dynamic dividend clientele theories, where the following factors are affecting the trading decisions around the ex-dividend day; the transaction costs, dividend yield, beta risk and idiosyncratic risk. The conclusion of this study is that investors change behaviour around the ex-dividend day and trade differently, depending on their tax status. He also found that investors take part in overnight trading around the ex-dividend day when there are low transaction costs and high dividend yield. The study shows that many investor groups trade around the ex-dividend day to benefit from the different tax rates (Rantapuska, 2008, pp. 355-373).

3 Methodology and Data

3.1 Event Study Methodology

To investigate the research statement, a quantitative method is used. Event study is the method of choice when measuring the effects dividend has on trading volume and price. The reason why is that an event study will measure if the specific event made significant impact.

The strength of this methodology is that it reflects the effect of an event immediately in security prices, given rationality in the marketplace (Mackinlay, 1997). This method also has some weaknesses. McWilliams and Siegel (1997) state a weakness of this method, the use of a long event window. One of the assumptions for significance using this method, is the assumption that there are no confounding effects during the event window. This assumption is critical, because if other relevant events are happening during the event window, it is hard to distinguish the effects between the specific events. The longer the event window, the more difficult to control for confounding effects. Using a long event window will decrease the power of the test statistic, which will lead to wrong conclusions about the significance test of the event. Therefore, the shorter the event window the better. The event window should be long enough to measure the significant effect of the event, and at the same time be short enough to eliminate any confounding effects. Other critical issues with the event study methodology are the sample size, nonparametric tests to identify outliers, and explanation of the abnormal returns. The sample size is a concern because the test statistics used in this methodology are based on normality assumptions associated with large samples (McWilliams & Siegel, 1997).

When conducting an event study, the first step is to prepare the data and identify the event window and estimation window. In this case, the event window is the five days before and after the ex-dividend day (day zero), in total eleven trading days. This is to capture the investors that are trading the days before and after the ex-dividend day. These investors may exploit the laws and regulations related to dividend, as they are losing and gaining the right to receive the dividend from the ex-dividend day. It is normal to determine an event window longer than the period one is interested in. Longer event windows are favourable in terms of

information leakage and longer periods of information processing. At the same time, shorter event windows are better concerning confounding events (eventstudytools.com, 2018).

The estimation window is the period before the event window. It involves more trading days, because the purpose is to capture the normal activity prior to the ex-dividend day. In this study the estimation window is set to 60 trading days, which will be from day –6 to –65 trading days prior to the ex-dividend day. This is to collect enough trading days and include firms with both annually and quarterly dividend payouts. The longer the estimation window, the more precise estimation, because it implies a larger sample of performance. There is also a risk with longer estimation windows, because of the risk of confounding effects (eventstudytools.com, 2018). The time line is shown in figure 3.

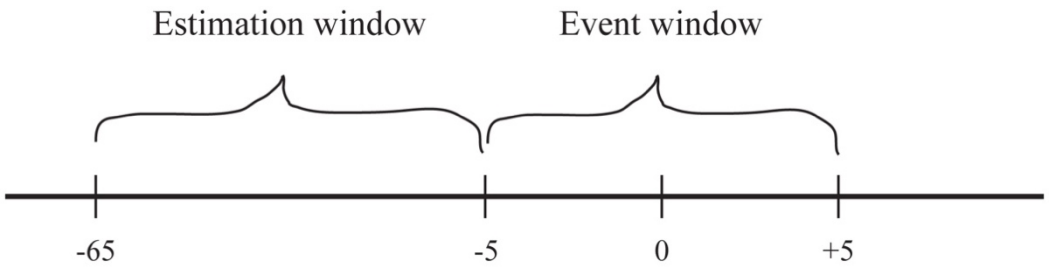

Figure 3 *- Time line for the event study*

3.1.1 The Market Model

There are several models to choose from when calculating the normal performance of a security. In this thesis it is statistical models that will be used. They only rely on statistical assumptions on the behaviour of asset performance.

The first characteristic of the Market Model is that stock returns are jointly normally distributed and driven by one common factor. The common factor is a macroeconomic variable affecting all firms. The sources of uncertainty can be divided into macro risk and firm-specific risk. In this thesis the Oslo Stock Exchange Benchmark Index, hereafter referred to as OSEBX, is used as the common factor. The second characteristic is that the return variance arises from two uncorrelated sources, systematic and firm specific. The third characteristic is that the common factor generate correlation across stocks, and firm-specific risk is uncorrelated across firms. The last characteristic is that each firm is assigned a

sensitivity coefficient, beta, to macro risk, because some are more sensitive than others to macro-economic shocks (Bodie, Kane, & Marcus, 2014, pp. 257-258). Mackinlay states that the Market Model is considered the best alternative compared to other statistical and economic models. It is better than the simple Constant Mean Return Model, because it reduces the variance of the abnormal return when removing the return related to the variation in the market return. The ability to detect event effects may be increased. Multifactor models are considered needless, because additional factors' marginal explanatory power is small. Then the reduction in the variance of the abnormal return is small. The Market Model also dominates economic models, because there are little to gain using the Arbitrage Pricing Theory. Statistical models eliminate the same biases introduced by the Capital Asset Pricing Model (Mackinlay, 1997, pp. 17-19). The Market Model for calculating the normal return is defined as

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$
$$E(\varepsilon_{it} = 0) \qquad var(\varepsilon_{it}) = \sigma_\varepsilon^2$$

where R_{it} and R_{mt} are the returns of firm i and the market portfolio, ε_{it} is the unexpected factor of return due to unexpected firm specific events. The alpha, α_i, is the equation's intercept and the stock's expected return when the market return is zero. The beta, β_i, is the slope coefficient and the stock's sensitivity measure to the market. σ^2_ε is the variance connected to firm-specific uncertainty (Bodie et al., 2014, pp. 259-261). The normal return for each ex-dividend day is computed from the corresponding estimation window. By regressing the stock's return with the OSEBX market return, the part linked to variation in the market return is removed. This leads to a reduction in the variation of the abnormal return, which can increase the ability to detect event effects.

3.1.2 Constant Mean Volume Model

The Constant Mean Volume Model is the model of choice when calculating the expected trading volume. The Market Model is not an option for volume, because there is no market index for volume. It is considered the simplest model to calculate normal performance, but Mackinlay states that the result is similar to the more sophisticated models. The Constant Mean Volume Model is defined as

$$R_{it} = \mu_i + \zeta_{it} \quad (2)$$
$$E(\zeta_{it}) = 0 \qquad var(\zeta_{it}) = \sigma^2{}_{\zeta_i}$$

where R_{it} is the normal performance in period t for firm i, μ_i is the mean performance for firm i and ζ_{it} is the disturbance term in time period t for firm i. The expected value is zero for the disturbance term and its variance is $\sigma^2{}_{\zeta_i}$.

3.1.3 Abnormal Trading Volume

Abnormal trading volume, as well as abnormal return, is calculated to appraise the event's impact. The abnormal trading volume is calculated as follows

$$AV_{it} = \frac{V_{it} - E(V_{it})}{\sigma_i} \quad (3)$$

where V_{it} and $E(V_{it})$ are the trading volume and the expected trading volume, respectively, where the expected trading volume is calculated as the mean, and σ_i is the standard deviation of trading volume for firm i in the estimation period.

If a firm announces a dividend increase, it sends a good signal to the market, which gives a reaction of a positive abnormal trading volume. On the other hand, if a firm announces a reduction in dividends, it gives a bad signal to the market. This usually gives a reaction of lower trading among investors than normal. The market considers the dividend reduction to forecast the uncertainty of the firm's financial future, which will prevent investors from buying stocks. Other firms send neutral signals to the market as they are paying out constant dividends. The market responds with negative trading volume to the announcement of no change in dividend (Dasilas & Leventis, 2011).

3.1.4 Abnormal Return

Abnormal return is calculated to appraise the event's impact. Subtracting the normal return of the stock's event window from the stock's return gives the abnormal return. The return used is the return in the event window. Thus, the abnormal return is computed as

$$AR_{it} = R_{it} - E(R_{it}|X_t) \quad (4)$$

where AR_{it} is the abnormal return for firm i and event day t, R_{it} is the actual return, $E(R_{it}|X_t)$ is the normal return defined as the expected return, and X_t is the market return.

Under the null hypothesis, the abnormal return will be jointly normally distributed with a zero conditional mean and conditional variance with two factors. One is the disturbance variance from the market model, the second is additional variance due to the sampling error in alpha and beta for each event when estimating the normal return. When the estimation window is wide, the second factor will approach zero (Mackinlay, 1997, p. 21).

3.1.5 Cumulative Abnormal Performance

The observations of abnormal performance need to be accumulated to make an interpretation of the overall event. First, this is executed over time on each firm in the data set. Then Cumulative Abnormal Performance, hereafter referred to as CAP, is calculated across firms and through time, based on which segment that is requested. If the estimation window is short the variance of the cumulative abnormal performance should be adjusted for the effects of the estimation error in the modelling of the normal performance parameters. It involves an adjustment in the second factor of the variance of the abnormal performance and the serial covariance of the abnormal performance. CAP is used to analyse the effect of the performance over several days, while abnormal return and abnormal trading volume analyse the effect of the return and volume on one day only. The Cumulative Abnormal Performance is the sum of abnormal returns or abnormal volume that are included from time t_1 to t_2.

$$CAP_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AP_{it} \quad (5)$$

where $CAP_i(t_1, t_2)$ is the cumulative abnormal performance from time t_1 to t_2, and AP_{it} is the abnormal performance for return and volume for firm i on event date t.

The Cumulative Abnormal Performance is normally distributed under the null hypothesis, H_0.

$$CAP_i(t_1, t_2) \sim N(0, \sigma_i^2(t_1, t_2)) \quad (6)$$

where CAP from time t_1 to t_2 is distributed normally with mean zero and variance σ_i^2 for firm i from time t_1 to t_2.

3.1.6 Testing

$$H_0 = \textit{The abnormal performance is zero} \quad H_1 = \textit{Reject the null}$$

Testing of the null hypothesis can be run when the null distribution of the abnormal return and cumulative abnormal return is given. It is necessary to aggregate the abnormal performance, as tests with only one observation are not expected to be useful. It is assumed that there is no clustering, which means that there is no overlap in the event windows of the included securities. In addition, the distributional assumptions are maintained, the abnormal performance and the cumulative abnormal performance will be independent across securities (Mackinlay, 1997). The presumption about the cumulative abnormal performance can be drawn by the below distribution, to test the null hypothesis that the abnormal performance is zero.

$$\overline{CAP}(\tau_1, \tau_2) \sim N\left[0, var(\overline{CAP}(\tau_1, \tau_{2)})\right] \quad (7)$$

The test is conducted by taking a regression of the cumulative abnormal performance for all events in the selected segment. It is the constant's p-value from the regression result that gives the significance of the cumulative abnormal performance for the current segment. By obtaining the robust standard errors, the statistics will be valid in the presence of heteroscedasticity. The size of the sample must be large for the robust standard errors and robust t-statistics to be justified, which is the case in the sample of this study with 944 events. A deeper presentation of the data set is given in section 3.2. The different segments of the events have large sample sizes as well, in almost every group. A couple of the sectors in the sector segment have few events, which can make the distribution of the robust t-statistic different from the t-distribution (Wooldridge, 2014, pp. 212-217). The significant level in the

tests that will be conducted is set at 5% level, because it is the most common used significance level.

3.2 The Data Set

The quantitative data of the Norwegian firms listed on the Oslo Stock Exchange is collected from Yahoo Finance in the beginning of February 2018. The specific data is daily stock prices, volume and ex-dividend days. The data set consists of 144 firms and 1004 events, where the events are the ex-dividend days. The collected data is historical stock prices, volume and ex-dividend days ranging from January 2000 to February 2018. The selection criteria for which firms to include in the data set was established through examination of previous research, literature and to best suit the research. The data set only includes firms listed on the Oslo Børs, because they must follow the EU requirements and have then the same environment as other European marketplaces. The firms listed on Oslo Børs are large, have long history and many shareholders, which makes it easier to collect data (Oslo Børs, n.y). The firms' home state and where they are primary listed must be Norway, because we are looking into tax rules applicable to Norway. Each firm in the data set must have minimum two dividend payouts. The historical data for each firm cannot have missing data in the event window and estimation window. When setting the criteria and selecting the firms for the sample data, potential biases may have occurred.

3.2.1 Event Date, Event Window and Estimation Window

The event date is the ex-dividend day, the first day that the company's security is traded without a previously declared dividend. Ex-dividend means without the dividend, so when the stock is trading ex-dividend the buyer does not have the right to receive the latest announced dividend. A stock is trading ex-dividend on and after the ex-date. The event window used is the five days before and after the ex-dividend day (day 0), from day –5 to +5, an event window of eleven trading days. The length of the event window may be perceived as wide. This is to capture abnormal trading activity connected to the ex-date. The dividend announcement is already known, which means that relevant trades may occur several days prior and past to the ex-dividend day. For the estimation window we use the 60 trading days before the event window, from day –6 to –65. This is to capture the normal trading behaviour

of the stock, to be able to calculate the normal performance. It is normal to set the estimation window wider than 60 days, but this data set includes stocks with quarterly dividend payouts. Therefore, a 60-day estimation window is not excluding any of the firms in the data set.

3.2.2 Cleaning the Data Set

To make the data set more accurate, we cleaned the data set and dropped undesirable firms and event observations. First, the ex-dividend days were merged with the stock prices to see which firms that had dividend payouts in their investment policy. Matching the dates of the stock prices and ex-dividend days, 37 firms that did not pay dividends were eliminated. Then 107 firms were remaining. Secondly, we started to examine for missing observations around the firms' ex-dividend days. This led to a drop of 20 events that were missing observations in the event- and estimation window. Missing data and events close to the end of the time period are the reason for the lack of observations. It was decided to drop twelve firms that only had one dividend payout throughout the time period. This was conducted to exclude firms with insufficient data to carry out an event study. Some of the events have less than 60 observations, particularly between 50-60 observations in the estimation window, this is due to missing data from the market index, OSEBX. Nevertheless, it was decided to keep these events as there was only a few days missing, and the event study test could still be carried out. It has been controlled for stock splits around the ex-dividend days. Only ten events are affected, which was expected not to make an impact on the results. Lastly, there was dropped 28 events in three specific firms, because of missing trading before 2013. Now, 94 firms are remaining, with 944 events. The data set is now ready for the event study.

3.2.3 Division of The Firms and Events

To expand our analysis, we are going to divide all the firms into different segments, in addition to looking at the total market. We divide the data into sectors, levels depending on the firm's market value, and lastly divide them into two time periods of events happening before and after 2006. The division of the segments is carried out to run the event study again, now looking specifically at each of the segments. In this way we can analyse more detailed what is affecting the results. We can study each segment's impact and look at possible reasons why this impact occurs, to get a better understanding of the results.

First, we divided all the firms into 11 different sectors, which is stated in Table 1. The division is set by the Oslo Stock Exchange. We are going to check how each sector is affected by the ex-dividend day. In figure 3, the diagram is divided into the different sectors by the number of events, while the numbers are showing how many firms per sector. As you can see, the industrials and energy sectors are the largest industry sectors, where more than half of the events, and 46 out of 94 firms are represented in one of the two.

Notation	Sector
1	Finance
2	Industrials
3	Energy
4	Information Technology
5	Consumer staples
6	Utilities
7	Health care
8	Materials
9	Consumer discretionary
10	Real estate
11	Telecommunication services

Table 1 *- Sector description*

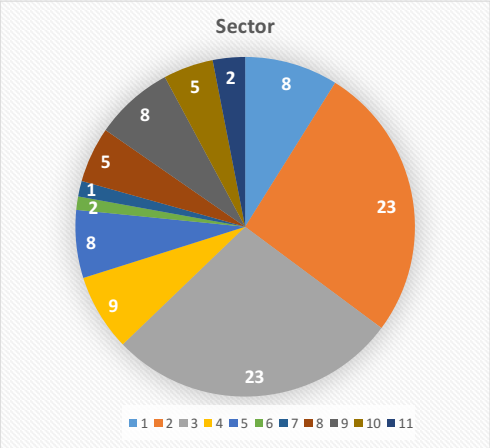

Figure 4 *- The division of sectors in the data set*

The chart shows the distribution of the events, and the numbers represent firms included in each sector.

Second, the levels of the firm's size are stated in Table 2. The size of the firms is divided into different levels of market value, in billions of Norwegian Kroners, hereafter referred to as NOK. The first level represents all the firms that have a market value lower than 1 billion NOK, the second level includes the firms with a market value higher than 1 billion NOK and lower than 10 billion NOK, and so on. The firms' market values are listed on the Oslo Stock Exchange. Figure 5 shows the number of firms representing each group of market value, divided in sections depending on the size of number of events. As you can see in figure 5, the firms with a market value between 1 and 10 billion NOK is the biggest group. It is representing almost half of the firms and events. In the segment of market value one firm is not included because of lack of data on market value.

Notation	Market Value (BNOK)
1	MV < 1
2	1 < MV < 10
3	10 < MV <30
4	30 < MV < 60
5	60 < MV

***Table 2** - Levels of market value*

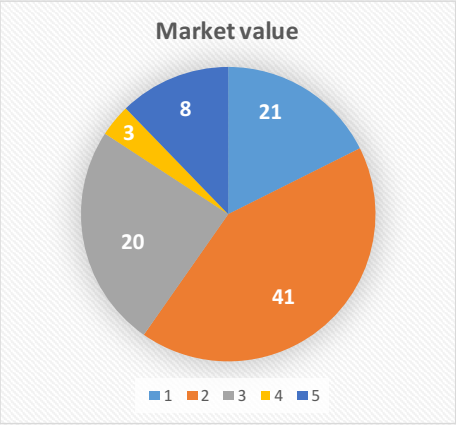

***Figure 5** - The division of levels on market value in the data set*

The chart shows the distribution of events, and the numbers represent firms included in each level of market value.

The last category is divided into two time periods, one with all the events happening before the tax law change in 2006 and the other one with all the events happening after 2006. As shown in figure 6, period 1 represents only 153 events before 2006, while period 2 represents the 791 events after 2006, which is when most of the events occur. The number of events before 2006 is significantly less than after 2006. This may be due to new firms listed on the Oslo Stock Exchange in the time period after 2006 and lack of data in the years before 2006.

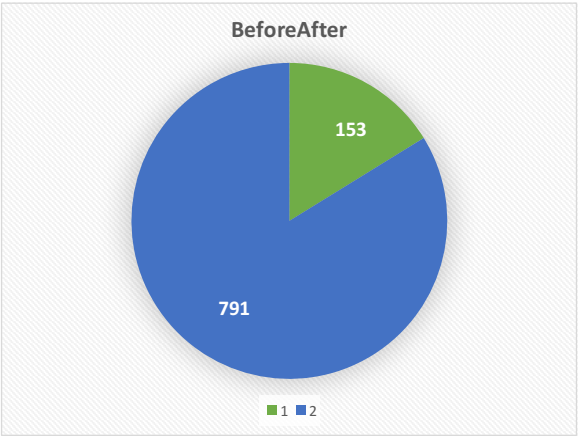

***Figure 6** - The division of events before and after 2006 in the data set.*

The chart and numbers show the distribution of events in each time period, before and after 2006.

3.3 Expectations

In this section we will state our expectations for the results of the tests we will conduct. We will justify our expectations with theory and articles discussed in chapter 2.5 and the composition of our data set.

As stated earlier, the trading volume is an important factor to predict the movements of price and trend. Volume and price will move in a direction depending on the trend, if it is an

uptrend or a downtrend. Generally, if the price moves in the direction of the trend, the volume increases, and if the price moves in the opposite direction of the trend, the volume decreases. Volume and price move in the same direction during an uptrend, yet in a downtrend they move in the opposite direction of each other. Thus, our expectations are that the overall trading volume in the Norwegian market will increase (decrease) as the price increases (decreases), if the market is in an uptrend, and the opposite will happen during a downtrend. Therefore, our expectations are that trading volume and price will affect each other.

The articles that we have read and utilised in the thesis have influenced our expectations to great extent. Especially the articles from the Norwegian and Finnish markets we consider to be fundamental, because of the market structure in the Nordic countries. Rantapuska calculated an ex-dividend day premium to analyse the trading around the ex-dividend day. His results implied a preference of buying cum-dividend and selling ex-dividend for domestic investors with a preference for dividend. Untaxed investors would gain by short-term trading and foreign investors by selling cum-dividend and buying ex-dividend. Dai & Rydqvist's results after the tax audit executed by the Norwegian tax authorities apply for the time period relevant for our thesis, 2000-2006. The pattern of their results prior to the tax audit suggests that foreign shareholders sell cum-dividend and buys them back ex-dividend. Domestic banks and corporations buy stock cum-dividend and sell them ex-dividend. They conclude that the change in ownership is temporary. Statistical insignificant post tax audit, suggest that the traders do not engage in tax-motivated trading anymore.

Sector

It is well known that the oil and gas industry and export of fish are two of the biggest industries in Norway. The industries are global with foreign interest in trade, which leads to investments. It is then natural to expect signs of systematic trading around the ex-dividend day in the sectors where foreign investors are located, because they can then achieve a possible tax benefit. From section 3.2 the number of firms and the event distribution is presented. The energy sector contains 23 firms, and the consumer staples, where raw materials are included, contains eight firms. In figure 4 we see that the sectors industrials, IT and finance also have a big number of firms present. It is easy to think that these sectors also have a global interest, because the products in the IT and finance world can easily be distributed worldwide. Our conclusion is that sectors with international business, respectively,

energy, consumer staples, industrials, IT and finance, will have significant values of abnormal performance.

Market Value

The Norwegian market and the Oslo Stock Exchange are small compared to the UK, the US and other markets, which is considered comparable. The Norwegian stock market is probably not the first choice for international investors. To get international attention, we expect market value and forerunners in the industry to be important factors. With higher market value, the more visible a firm will be in the investment community. With more visibility the probability of a global shareholder composition is higher. In our data it is the 3 lowest levels of market value that contain most firms and events. This confirms the composition of the Norwegian market. We are not excluding the possibility that there might be a significant outcome in level 1-4, which represents market values lower than 60 billion, because of Norwegian forerunners in the oil service industry. Nevertheless, our expectation is that there will be significant abnormal performance in level 5, which represents market values higher than 60 billion.

Before and After 2006

This thesis is built on the idea that there is a change in the stock performance around the ex-dividend days post 2006. With the legislative amendment in 2006 we have considerable expectations that there will be a difference in the stock performance before and after the year-end. Our data set contains primarily data after 2006, which can reduce the comparability of the two tests executed. The article written by Dai & Rydqvist is therefore implemented as a supplementary for the period prior to 2006, because of the lack of data in that period. They did not find any abnormal performance with significant results during this period. Thus, our expectation is that there will be significant abnormal performance in the period post 2006.

4 Results and Discussion

In the following chapter we are going to present the results and discussion of the findings. In section 4.1 we will present the execution of the tests, section 4.2 presents the results of abnormal volume, section 4.3 presents the results of abnormal return, section 4.4 presents the scenario analysis of our results and in section 4.5 we will discuss these findings.

4.1 The Execution of The Tests

We have carried out an event study in the statistical software program Stata to examine reactions from the Norwegian stock market to ex-dividend days. First, we cleaned the data and set the framework of the event study. Then we estimated the normal performance from the estimation window for each event, to predict a normal volume and return in the event window. The Constant Mean Volume Model calculates the geometric mean of the trading volume in each estimation period. The Market Model calculates the normal return by combining market and firm specific factors. Next, we calculated the abnormal return for each observation in the event window, and then the cumulative abnormal returns taking the sum of the abnormal returns for each company. Then we conducted the tests to check whether the cumulative abnormal return for volume and price was statistically different from zero at the 5% level. The tests were computed across all events and in different segments. Through a robust regression of the cumulative abnormal performance we get a p-value of the constant, which determines the significance of the different groups. The scenario analysis is added to expand the analysis. The different scenarios are based on changes that may occur in real life. For each scenario the current alteration is made, holding all else equal. Then we ran the test again and compared the different outcomes.

4.2 Results of Volume

Table 3 presents the test result across all events in the volume data set. The p-value of the test is 15,8%, which tells us that the abnormal volume is not statistically significant, we fail to reject H_0. This indicates that when all 944 events are included, ranging over a time span of 18 years it is not possible to say that the trading volume is abnormal around ex-dividend days compared to normal stock performance.

Linear regression

Number of obs	= 944
F(0, 943)	= 0.00
Prob > F	= .
R-squared	= 0.0000
Root MSE	= 252.54

cumulative~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	11.60802	8.219508	1.41	0.158	-4.522624	27.73866

Table 3 *- Test across all events, volume*

Table 4 presents the test results of the abnormal volume in different sectors in the market. Four of the sectors are statistically significant at the 5% level, leaving the seven remaining sectors insignificant. The significant sectors are finance, industrials, materials and consumer discretionary. Their p-values are 0,1%, 0,9%, 3,9% and 0,2%, respectively. This indicates that for these four sectors the trading volume is abnormal around ex-dividend days compared to normal trading activity.

Sector	Robust Standard Error	t-test	P>(t)	Obs
1	0,7371844	3,56	0,10 %	84
2	1,420141	2,64	0,90 %	248
3	29,6651	1,1	27 %	261
4	4,782343	1,73	8,80 %	69
5	1,039471	1,41	16 %	61
6	1,125055	1,12	29 %	12
7	0,4881526	-1,53	14,90 %	14
8	1,163607	2,12	3,90 %	50
9	1,62826	3,3	0,20 %	71
10	0,8429212	0,27	78,70 %	45
11	1,723292	1,53	13,80 %	29

Table 4 *- Test across sectors, volume*

Table 5 presents the test results of the abnormal volume for levels of market value. Three of the levels of market value are statistically significant at the 5% level. The levels are values under 1 billion NOK, between 10-30 billion NOK and above 60 billion NOK. The firm that was excluded from this test, because of the withdrawal from OSEBX in February, was not statistically significant.

Market Value	Robust Standard Error	t-test	P>(t)	Obs
1	1,695466	2,63	0,90 %	164
2	19,77571	1,21	22,90 %	392
3	0,5249858	4,19	0,00 %	228
4	1,212354	1,17	25,10 %	33
5	0,6633313	4,15	0,00 %	114

***Table 5** - Test across levels of market value, volume*

Table 6 presents the test result of the abnormal volume before and after 2006. The results show that the abnormal volume in the event window for events after 2006 is statistically significant at the 5% level. For events prior to 2006 we fail to reject the null. This is a result that could be interesting to look further into in the discussion in section 4.5, regarding the results of the total test of volume.

BeforeAfter	Robust Standard Error	t-test	P>(t)	Obs
1	50,62762	1,09	27,90 %	153
2	0,5505186	5,85	0,00 %	791

***Table 6** - Test of significance on events before and after 2006, volume*

4.3 Results of Return

Table 7 presents the test result of the abnormal return of the data set. The p-value is 6,8%, which tells us that it is statistically insignificant at the 5% level, and we fail to reject the null in both volume and return, when we treat all 944 events as a group. This confirms consistency in the two results.

```
Linear regression                               Number of obs     =        944
                                                F(0, 943)         =       0.00
                                                Prob > F          =          .
                                                R-squared         =     0.0000
                                                Root MSE          =     .37955

------------------------------------------------------------------------------
cumulative~n |      Coef.   Robust Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       _cons |   .0226443   .0123532     1.83   0.067    -.0015985    .0468872
------------------------------------------------------------------------------
```

***Table 7** - Testing across all events, return*

Table 8 presents the test results of the abnormal return in different sectors. Four of the sectors are statistically significant. This is the sectors 1, 5, 8 and 10, which is finance, consumer staples, materials and real estate. Two of the sectors are the same as those applicable in the test across sectors on volume, specifically finance and materials.

Sector	Robust Standard Error	t-test	P>(t)	Obs
1	0,0298185	3,78	0,00 %	84
2	0,0276601	0,66	51,10 %	248
3	0,0324873	-0,99	33,20 %	261
4	0,0131861	0,94	35,20 %	69
5	0,0317381	2,94	0,50 %	61
6	0,0149387	0,79	44,90 %	12
7	0,0147189	2,05	6,10 %	14
8	0,0355355	2,6	1,20 %	50
9	0,0113156	1,37	17,60 %	71
10	0,0188255	3,18	0,30 %	45
11	0,0082499	1,21	23,50 %	29

***Table 8** - Test across sectors, return*

Table 9 presents the test results of the abnormal return for the different levels of market value. Four of the levels are statistically significant at the 5% level. Only in the level of market value between 1-10 billion NOK, we fail to reject the null.

MarketValue	Robust Standard Error	t-test	P>(t)	Obs
1	0,0204939	3,4	0,10 %	164
2	0,0268186	-0,75	45,20 %	392
3	0,0102432	3,95	0,00 %	228
4	0,0551391	3,01	0,50 %	33
5	0,0165031	2,1	3,80 %	114

***Table 9** - Test across levels of market value, return*

Table 10 presents the result of the abnormal return of the events before and after 2006. The results show no statistically significance on the effect of time, with p-values of 32,7% and 11,9%.

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	0,0480513	0,98	32,70 %	153
2	0,0114579	1,56	11,90 %	791

***Table 10** - Test of significance on events before and after 2006, return*

4.4 Scenario Analysis

We have executed a scenario analysis to validate our results. For both volume and return we have changed the length of the event window and the magnitude of normal performance, all else equal. This is to see how sensitive the test results are to changes in the variables.

Volume

Table 11 presents the changes in significance for volume in the different segments, when the event window is reduced, all else equal. There are only four changes in significance and they occur when the event window is reduced to five days, day -2 to day 2 of the ex-dividend day. This tells us that the tests executed on volume are not very sensitive to changes in the event window. If there were big variations when reducing the length of the event window, it could have been a sign of other events disrupting the calculations of abnormal return in the tails of the event window. It is in the sector segment the four shifts occurred; telecommunication services, consumer discretionary and IT alters to significant and materials alters to insignificant.

Volume			
Event window	**11**	**9**	**5**
Total	✗	✗	✗
Sector			
1	✓	✓	✓
2	✓	✓	✓
3	✗	✗	✗
4	✗	✗	✓
5	✗	✗	✗
6	✗	✗	✗
7	✗	✗	✗
8	✓	✓	✗
9	✓	✓	✓
10	✗	✗	✗
11	✗	✗	✓
Market Value			
1	✓	✓	✓
2	✗	✗	✗
3	✓	✓	✓
4	✗	✗	✗
5	✓	✓	✓
Before After			
1	✗	✗	✗
2	✓	✓	✓

Table 11 *- Event window scenario analysis, volume*

Table 12 presents the changes in significance for volume in the different segments, when there is a 10% increase and decrease in the normal volume estimation, all else equal. Here we see that the changes have made a bigger impact on the test results. A total of eight shifts, in both the sector and market value segment. It occurs in both the increase and the decrease of the normal

Volume			
Normal volume	**-10 %**		**10 %**
Total	✗	✗	✗
Sector			
1	✓	✓	✗
2	✓	✓	✓
3	✗	✗	✗
4	✗	✗	✗
5	✓	✗	✗
6	✗	✗	✗
7	✗	✗	✓
8	✓	✓	✗
9	✓	✓	✓
10	✗	✗	✗
11	✓	✗	✗
Market value			
1	✓	✓	✓
2	✗	✗	✗
3	✓	✓	✗
4	✓	✗	✗
5	✓	✓	✗
Before After			
1	✗	✗	✗
2	✓	✓	✓

Table 12 *- Normal volume scenario analysis, volume*

volume. This tells us that the test is sensitive to changes in estimation factors. This is important, because it is the factor where we chose the Constant Mean Volume Model to represent reality in the best possible way.

Return

Table 13 presents the changes in significance for return in the different segments, when the event window is reduced, all else equal. Here, nine changes occur in three of four segments, where market value is the segment with no change. Every change is from insignificant to significant when the event window is reduced to either nine or five days. If a change of nine days occurs, it is applicable for five days as well.

Return			
Event window	**11**	**9**	**5**
Total	✗	✓	✓
Sector			
1	✓	✓	✓
2	✗	✗	✗
3	✗	✗	✗
4	✗	✗	✗
5	✓	✓	✓
6	✗	✗	✗
7	✗	✗	✓
8	✓	✓	✓
9	✗	✗	✓
10	✓	✓	✓
11	✗	✓	✓
Market value			
1	✓	✓	✓
2	✗	✗	✗
3	✓	✓	✓
4	✓	✓	✓
5	✓	✓	✓
Before After			
1	✗	✗	✓
2	✗	✓	✓

Table 13 *- Event window scenario analysis, return*

Table 14 presents the changes in significance for return in the different segments, when there is a 10% increase and decrease in the normal return estimation, all else equal. The adjustments of the normal return have no impact on the outcome of the tests.

Return			
Normal return	**-10 %**		**10 %**
Total	✗	✗	✗
Sector			
1	✓	✓	✓
2	✗	✗	✗
3	✗	✗	✗
4	✗	✗	✗
5	✓	✓	✓
6	✗	✗	✗
7	✗	✗	✗
8	✓	✓	✓
9	✗	✗	✗
10	✓	✓	✓
11	✗	✗	✗
Market value			
1	✓	✓	✓
2	✗	✗	✗
3	✓	✓	✓
4	✓	✓	✓
5	✓	✓	✓
Before After			
1	✗	✗	✗
2	✗	✗	✗

Table 14 *- Normal return scenario analysis, return*

4.5 Discussion

The following section presents a discussion of the results from the previous subchapters. We are going to answer the research statement, the research questions, and lastly discuss the research limitations of the study. The main objective of this study was to examine if the stock performance on Norwegian stocks is affected by the ex-dividend day. In particular, it focuses on abnormalities of the stock's volume and return around the event day. In reviewing previous research, relevant laws and regulations, combined with an event study and scenario analysis, the research questions in chapter 1 can be addressed:

Does the ex-dividend day affect stock performance depending on industry sector?

As presented in the results in chapter 4, the composition of significant sectors was different for volume and return. Four out of eleven sectors were significant in total for both factors. Finance and materials were the sectors that appeared significant for both. For volume, the sectors industrials and consumer discretionary were also included. Oppositely, consumer staples and real estate were applicable for return. As expected, finance, industrials and consumer staples were significant. In section 3.3 the three sectors' global presence in business was discussed, which can impact the composition of the sectors' shareholders. Figure 2 revealed that in 2018, 30,55% of the Norwegian stock market consists of foreign investors. The Norwegian tax law makes selling stocks before the ex-dividend day beneficial for foreign investors. One relevant interpretation of the base results of the sector analysis is that it indicates that tax could explain why this group of sectors appeared significant.

Materials, rather than energy, was significant in both volume and return. Materials includes firms with commodity related industry. It is well-known that commodity holds a central position in the investment world. It is surprising that the energy sector did not generate stock performance with significant abnormalities linked to volume and return. Energy is the biggest sector on the Oslo Stock Exchange with several oil and gas companies and oil service companies. The oil and gas industry is international and the Norwegian firms' expertise is well-known. Previous research in section 2.5 from Dai & Rydqvist confirms that prior to the Norwegian tax audit, different investor groups traded based on their tax status. Rantapuska arrived to the same conclusion with his findings in the Finnish stock market.

Through the scenario analysis in section 4.4, it is clear that volume is more sensitive to change than return. Especially changes made to the estimated normal performance led to several alterations on the volume results and zero for return. This can be an indication that the Constant Mean Volume Model is not the best fit for the estimations performed. Consumer staples and consumer discretionary can be significant in both factors, if the results from the scenario analysis are considered. This did not occur for the sectors industrials and real estate. Consumer staples' output for volume changed when we reduced the normal volume by 10%. The output of the return for consumer discretionary changed when we reduced the event window to five days. When four out of eleven sectors were significant in both factors and several alterations of significance occurred in the scenario analysis, it gives some indications that abnormal stock performance is linked to the market sectors. However, the overall conclusion from this study is that ex-dividend day does not affect stock performance depending on industry sector.

Is the size of the firm's market value relevant?

The output of volume and return was quite similar, as the results from three of five levels were equal. Level 2 was insignificant in both volume and return and contains the biggest group, 43,6% of the firms. Even though level 2 consists of a large portion of the sample, which can raise questions to the results, it is still the levels of market value that is examined. Nevertheless, it is not possible to exclude the possibility that a skew distribution of firms in each level is impacting the test. The result is not corresponding to the expectations that are set; that level 5 and a potential lower level is significant.

The scenario analysis strengthens the base result. It is shown in table 12, which contains the only changes for market value, that level 4 also was significant for volume when the normal volume estimation was reduced by 10%. Now, four of five levels were significant, which indicates that the size of the market value is not relevant when studying abnormal return and volume. However, when increasing the normal volume by 10%, level 3 and 5 are insignificant, as well as level 2 and 4, leaving only level 1 significant. For return, no changes of significance occured in the scenarios of a shorter event window and the magnitude of normal performance. Still, the conclusion is that the market value is not relevant for the stock performance around the ex-dividend day.

Is there a significant difference in stock performance before and after 2006?

Table 6 presents the test results of volume in the two periods before and after 2006. As expected, the period after 2006 was the one with the significant outcome. However, the test results of return in table 10 were insignificant. The conflicting results imply that volume and return react differently around the ex-dividend day in the period after 2006. This indicates that it is not possible to suggest that the new tax reform impacts the stock performance. In the period prior to 2006, the results of both volume and return were insignificant. This outcome is consistent with our expectations, but it is worth mentioning that the two periods' event distribution is skewed. Therefore, the study conducted by Dai & Rydqvist strengthens our result of the period before 2006. They conclude that after the tax audit and until 2006, traders do not conduct in tax motivated trades.

The results did not alter in the scenario analysis for volume, confirming the base test's strength. However, the scenario analysis performed on return revealed a different outcome. When the event window was reduced to nine days, the period after 2006 was significant, and when the event window was reduced to five days both periods were significant. The tests were significant when the event window got shorter. This tells us that the abnormal performance is located close to the ex-dividend day. Combining the base and scenario results it is accurate to conclude with a negative response to the research question. The results reveal that it is not possible to determine a significant difference in the stock performance before and after 2006.

Across all events

Looking at the tests conducted across all events, we can see that both volume and return were insignificant. The cause of this outcome may be the effect of the period prior to 2006. Stated in the paragraph above, this period is insignificant to abnormal performance around the ex-dividend day. From the scenario analysis it is revealed that the test result of return altered when the event window was reduced to nine and five days. The test results of volume stayed the same. The way the outcome of the tests conducted on volume and return behave when conducting the scenario analysis in the different segments are similar. This confirms our expectations of the trend that volume and return will affect each other. However, in the scenario analysis return was more sensitive to changes than volume. Return is in general more volatile to news and events in the market. Norwegian stocks are also considered less liquid

than stocks in larger markets. This combination may be a reason for the effect we saw in the scenario analysis.

The article by Frank & Jagannathan of the market in Hong Kong may also explain our results. They claim that they found similar pricing effects in a market without taxes on dividend and capital gains, to the US market. They concluded that a rise in the stock prices on ex-dividend days are on average independent of the size of dividend. This could be another explanation to the sensitivity we detected in the scenario analysis of return.

Through theory and research obtained, particularly Dai & Rydqvist's inspiring article, expectations were set. Although some of them were met, it did not lead to positive conclusions for the research questions. The overall conclusion of the research statement is a result of these findings, which means that the ex-dividend day does not affect stock performance in the Norwegian market.

4.5.1 Research Limitations

Through the process of writing this thesis we faced a challenge with collection of data that could strengthen our final conclusion. The desired data was information on investor groups' trading activity for the firms listed in our data set. We went through a long process with the Norwegian Central Securities Depository, from now on referred to as the Norwegian CSD, to ask if they could share the data with us. Due to long processing time, private policy rules and costs we were not able to get the data. The information on investor groups' trading activity could give us a more elaborated study.

When aligning reality and theory, simplifications and assumptions are made, which leaves room for uncertainty. One potential weakness of our analysis can be the length of the event window, as it may be too long, and the length of the estimation window, as it may be too short, to observe the true effect. In section 3.2 we elaborated the basis of our decision. Furthermore, the Constant Mean Volume Model may impair the estimation of normal volume, as it is affected by the length of the estimation window, and there is no market factor incorporated in the model. Another potential weakness with our analysis can be the implementation of the scenario analysis. It is a straight forward setup, which can lead to a too simple analysis of the test results. Relevant factors may have been overlooked, because it is

up to us to choose which scenarios to test. The scenarios chosen may also be too narrow or wide to capture the true effect.

Other possible events surrounding the event days can disrupt the test conducted to expose the effects of ex-dividend days. We have controlled for stock splits, only ten events for ten different firms have stock splits during the event window. This is not considered to make an impact on the analysis, when it is affecting only 10 of 994 events. A deeper investigation of each firm when it comes to other events, are not conducted. This can weaken the results of our study if relevant events have occurred around the event and estimation period. Such events can be firm specific news, like mergers and acquisitions.

5 Conclusion

The article *Investigation of the costly-arbitrage model of price formation around the ex-dividend day in Norway* by Dai & Rydqvist inspired us to learn more about the aspect of the ex-dividend day effect on stock performance. This subject contains a lot of previous research, and the impact the market structure has on the research result is fascinating. The objective of this thesis was to study how the ex-dividend day affects the stock performance on Norwegian stocks. Our contribution to the literature is the study of the Norwegian stock market after the tax reform in 2006. The three segments: industry sector, market value and the time periods before and after 2006, have been studied to analyse the effects on trading volume and price. The data collected to carry out the analysis contains 944 ex-dividend days, divided over 94 firms, in a time period stretching from January 2000 to February 2018. Through the event study methodology and scenario analysis the data is processed to answer the thesis statement.

The result of industry sectors' effect on ex-dividend day, we conclude as insignificant. The tests conducted revealed that two of eleven sectors got significant results for both volume and return. Only one of them, the finance sector, matched our expectations that sectors with international business have significant values of normal performance. The scenario analysis revealed that volume is more sensitive to change than return, which can be a result connected to the choice of model for the estimation of normal volume.

The size of market value, we conclude not to be relevant for the performance around ex-dividend days. Our expectation that firms with high market value are the ones most likely to have abnormal performance around ex-dividend days, are not met. The test results show that three out of five levels are significant for abnormal volume and four of five levels are significant for abnormal return. The scenario analysis strengthens the results with only one alteration on level 4 of volume.

The result shows that we cannot determine a significant difference in stock performance before and after 2006. A significant result of the period after 2006 was expected, because of the implementation of the new tax reform. The outcome revealed that volume and return react differently around the ex-dividend day in the period after the tax reform. The scenario analysis displayed a change when reducing the event window for return. The test of return

was significant when the event window was reduced to nine and five days. Nevertheless, our expectations are not met, because of the conflicting results of volume and return.

Reviewing our research statement: *Does ex-dividend day significantly affect Norwegian stock performance?* Our findings are that we cannot conclude with a significant effect between the ex-dividend day and stock performance in the Norwegian stock market. This is derived from the conclusion of the three research questions.

5.1 Suggestions for Further Research

To strengthen the analysis of the stock performance around ex-dividend day, further research should be conducted. A deeper understanding of the behaviour of different investor groups could give the study higher quality. This will expose whether there truly is a connection between tax and stock performance around the ex-dividend day. Through our writing process we have become aware that this extension requires an application to the Financial Supervisory Authority, where the processing time is up to several months. They also have several requirements that must be fulfilled for the application to be accepted. The Norwegian CSD also informed us that the purchasing cost for the investor data can be around 100 000 NOK. We then suggest that this should only be conducted by researchers with enough time and funding.

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Appendices

Appendix A – Volume, 9 Days Event Window

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	252.47

cumulative~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	11.10478	8.217199	1.35	0.177	-5.021328	27.23089

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,6608651	3,3	0,10 %	84
2	1,197901	2,42	1,60 %	248
3	29,66713	1,08	28,00 %	261
4	4,774211	1,72	9,00 %	69
5	0,8556388	1,4	16,60 %	61
6	1,129387	1,02	33,00 %	12
7	0,5085933	-1,09	29,50 %	14
8	1,070602	2,02	4,90 %	50
9	1,58494	3,04	0,30 %	71
10	0,7338877	0,47	64,10 %	45
11	1,521053	1,77	8,70 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	1,24414	2,36	2,00 %	164
2	19,77676	1,18	23,80 %	392
3	0,4593609	4,54	0,00 %	228
4	1,134798	1,39	17,50 %	33
5	0,584406	4,3	0,00 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	50,62509	1,06	29,20 %	153
2	0,5313383	5,46	0,00 %	791

Appendix B – Volume, 5 Days Event Window

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	252.17

cumulative~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	10.16133	8.2074	1.24	0.216	-5.945556	26.26821

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,5603435	3,72	0,00 %	84
2	0,8229985	2,72	0,70 %	248
3	29,67104	1,05	29,40 %	261
4	0,8592674	3,94	0,00 %	69
5	0,5283811	1,05	29,90 %	61
6	0,7052232	-0,13	89,90 %	12
7	0,3982921	0,06	95,00 %	14
8	0,6752901	1,96	5,60 %	50
9	1,501816	2,75	0,80 %	71
10	0,4343211	0,81	42,20 %	45
11	1,064935	2,38	2,40 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	1,025678	2,7	0,80 %	164
2	19,75867	1,1	27,30 %	392
3	0,3160532	5	0,00 %	228
4	0,7219174	1,14	26,40 %	33
5	0,4253077	4,47	0,00 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	50,61952	1,04	29,90 %	153
2	0,2644696	7,27	0,00 %	791

Appendix C – Volume, 10% Increase on Normal Volume

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	252.58

cumulative~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	10.35827	8.220754	1.26	0.208	-5.77482	26.49136

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,7379041	1,67	9,90 %	84
2	1,424056	1,98	4,90 %	248
3	29,67035	1,05	29,30 %	261
4	4,789006	1,52	13,40 %	69
5	1,036373	-0,18	86 %	61
6	1,117112	0,5	63 %	12
7	0,4978368	-2,4	3,20 %	14
8	1,174046	0,63	52,90 %	50
9	1,625793	2,77	0,70 %	71
10	0,8645249	-0,91	37 %	45
11	1,687379	0,43	66,70 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	1,697862	2,29	2,30 %	164
2	19,77826	1,15	25,20 %	392
3	0,5232568	1,69	9,30 %	228
4	1,21249	-0,28	78,40 %	33
5	0,659328	0,44	65,80 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	50,63158	1,07	28,6	153
2	0,5511148	3,38	0,10 %	791

Appendix D – Volume, 10% Decrease on Normal Volume

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	252.51

cumulative~e	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	12.85777	8.218351	1.56	0.118	-3.270603	28.98614

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,7491801	5,36	0,00 %	84
2	1,417044	3,3	0,10 %	248
3	29,65996	1,16	24,90 %	261
4	4,77637	1,94	5,60 %	69
5	1,050161	2,97	0,40 %	61
6	1,160216	1,7	11,70 %	12
7	0,4806853	-0,64	53,60 %	14
8	1,172167	3,58	0,10 %	50
9	1,63466	3,81	0,00 %	71
10	0,8297738	1,5	14,20 %	45
11	1,783729	2,54	1,70 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	1,693575	2,98	0,30 %	164
2	19,77321	1,26	20,80 %	392
3	0,5308917	6,61	0,00 %	228
4	1,226278	2,59	1,40 %	33
5	0,6768682	7,71	0,00 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	50,6237	1,1	27,30 %	153
2	0,5515669	8,29	0,00 %	791

Appendix E - Return, 9 Days Event Window

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.38449

cumulative~n	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0340007	.012514	2.72	0.007	.0094422	.0585592

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,0292952	3,88	0,00 %	84
2	0,0304432	1,28	20,20 %	248
3	0,0311771	-0,41	68,40 %	261
4	0,0127022	0,75	45,70 %	69
5	0,0316593	2,92	0,50 %	61
6	0,0094943	1,4	18,80 %	12
7	0,0235044	1,58	13,70 %	14
8	0,0355308	2,64	1,10 %	50
9	0,0114735	1,45	15,20 %	71
10	0,0192166	3,21	0,20 %	45
11	0,0088906	2,14	4,10 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	0,0195515	3,64	0,00 %	164
2	0,0272903	0,09	92,90 %	392
3	0,0116203	3,86	0,00 %	228
4	0,0548901	3,05	0,50 %	33
5	0,0164596	2,23	2,70 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	0,0441693	1,75	8,20 %	153
2	0,0122447	2,09	3,70 %	791

Appendix F – Return, 5 Days Event Window

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.33292

cumulative~n	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0464197	.0108355	4.28	0.000	.0251553	.0676841

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,0282176	3,59	0,10 %	84
2	0,0239879	1,59	11,30 %	248
3	0,0283098	1,33	18,30 %	261
4	0,0121991	0,39	69,90 %	69
5	0,0315522	3,03	0,40 %	61
6	0,0111068	0,65	52,70 %	12
7	0,019456	3,19	0,70 %	14
8	0,0349114	2,62	1,20 %	50
9	0,0079111	2,08	4,10 %	71
10	0,0199688	3,02	0,40 %	45
11	0,0062219	2,19	3,70 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	0,0170345	4,6	0,00 %	164
2	0,236762	1,27	20,50 %	392
3	0,0081039	5,4	0,00 %	228
4	0,0555721	2,92	0,60 %	33
5	0,0161508	2,23	2,70 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	0,0413539	2,17	3,10 %	153
2	0,0101517	3,75	0,00 %	791

Appendix G – Return, 10% Increase on Normal Return

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.39166

cumulative~n	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.022551	.0127476	1.77	0.077	-.0024658	.0475679

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,0298631	3,72	0,00 %	84
2	0,0285302	0,68	49,90 %	248
3	0,0337742	-0,95	34,40 %	261
4	0,0132198	0,82	41,50 %	69
5	0,0318306	2,91	0,50 %	61
6	0,0149972	0,72	48,00 %	12
7	0,0148176	1,99	6,80 %	14
8	0,0355954	2,59	1,30 %	50
9	0,0114151	1,31	19,40 %	71
10	0,0188871	3,11	0,30 %	45
11	0,0083637	1,13	26,70 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	0,0211211	3,27	0,10 %	164
2	0,0277901	-0,69	49,20 %	392
3	0,0102574	3,84	0,00 %	228
4	0,0553542	2,96	0,60 %	33
5	0,0165309	2,05	4,20 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	0,0492531	0,98	33,00 %	153
2	0,0118751	1,48	13,80 %	791

Appendix H – Return, 10% Decrease on Normal Return

Linear regression

Number of obs	=	944
F(0, 943)	=	0.00
Prob > F	=	.
R-squared	=	0.0000
Root MSE	=	.36807

cumulative~n	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.0227376	.0119796	1.90	0.058	-.0007721	.0462474

Sector	Robust Standard Error	t-test	P<(t)	Obs
1	0,0297789	3,84	0,00 %	84
2	0,0268338	0,64	52,40 %	248
3	0,031258	-1,04	30,00 %	261
4	0,0131664	1,05	29,50 %	69
5	0,0316594	2,96	0,40 %	61
6	0,0149095	0,84	41,90 %	12
7	0,0147381	2,1	5,60 %	14
8	0,0354903	2,62	1,20 %	50
9	0,011232	1,42	15,90 %	71
10	0,0187682	3,25	0,20 %	45
11	0,0081713	1,29	20,80 %	29

MarketValue	Robust Standard Error	t-test	P<(t)	Obs
1	0,0199086	3,53	0,10 %	164
2	0,0258905	-0,82	41,30 %	392
3	0,0102423	4,05	0,00 %	228
4	0,0549316	3,06	0,50 %	33
5	0,0164847	2,15	3,40 %	114

BeforeAfter	Robust Standard Error	t-test	P<(t)	Obs
1	0,0469418	0,99	32,50 %	153
2	0,0110575	1,64	10,10 %	791