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Impact of CEO change on Stock Prices in Norwegian Companies.

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Does a change of the CEO in Norwegian companies listed on OSE impact their stock returns?

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Preface

We wish to thank our supervising professor Knupfer, Samuli for his helpful advice and support throughout the writing of this thesis. His feedback and contributions have been critical and without his guidance this thesis would not have been possible.
As it's said,
'The best teachers are those who tell you where to look, but don't tell you what to see.'

Also, we would wish to thank our families for their endless support and love, for always being there to encourage and motivate us throughout the whole Masters Programme here at BI Norwegian Business School.
For it is indeed true,
'The love of a family is life's greatest blessing.'

Abstract

This thesis is a research on the impact of CEO change on stock prices in Norwegian companies listed on OSE. Using an event-study with a sample size of 110 observations, we analyze the abnormal returns and find that the CEO change does impact the stock returns. However, the impact differs depending on various variables. In this research paper, we have chosen to focus on 5 CEO attributes we believe would have the most impact, the gender, age, education level, appointing an interim CEO and appointing an insider. We find strong, negative and long-term relation between firm performance and appointing an interim CEO or an insider. For the remaining variables we found weak but positive short-term effect on the firm performance.

Section 1: Introduction

A CEO's main responsibilities are to oversee the overall operations of the company and make important decisions that would set the tone and vision for the company. In a company, the CEO stands at the top of the pyramid and hence his actions have implications that are far and wide. The role of a CEO varies from one company to another depending on the company's size and overall structure. In smaller companies, the CEO often plays a hands-on role whereas in bigger companies, the CEO only deals in higher-level company strategy as most other tasks are handled by other managers or departments. In our master thesis, we wish to study the impact of how the appointment of a new CEO of a company has an impact on the company's stock returns.

Because, the CEO holds such strong influence and power, sometimes under certain conditions, the jump or fall in stock prices can be dramatic when a new CEO takes over. A change in stock price when a new CEO takes over a company can occur due to several factors and many of these factors are based on the market perception of how capable the new CEO is of taking the company forward. The way the stock performs also depends sometimes on how the company manages the transition. For example, during June 2015, Deutsche Bank was going through a rough time with disappointing financial results for the first quarter of 2015 and a series of scandals including huge fines for its part in rigging the Libor Interbank lending and for

allegedly misstating financial reports. Shares of the company jumped 6% after it announced the resignation of Anshu Jain and Juergen Fitschen, the existing co–chief executives and appointed John Cryan as its new CEO who was on Deutsche Bank's supervisory board since 2013.

On the other hand, stock prices reacted negatively in January 2012, after Research in Motion (makers of Blackberry phones) which was battling global players such as Samsung and Apple amidst a decline in market share announced company veteran Thorsten Heins as their new CEO after the resignation of its co-chief executives Jim Balsillie and Mike Lazaridis. Investors were underwhelmed by the move and wanted a more noteworthy shakeup and as a result, RIM's stock price fell 8.5% after the announcement.

It is not entirely possible to predict the market reaction to a CEO change as there are several factors involved and the market will tend to take into account the situation as a whole. Our thesis is focused on Norwegian ASA companies listed on the Oslo Stock Exchange (OSE) and we will try to analyze if a change in CEO affects the stock returns of the company and how different CEO characteristics such as age, gender, qualifications etc if at all have any bearing in the stock price of the company as well.

The remainder of our thesis is structured as follows. Section 2 provides a review of previous studies that have been done on this subject, Section 3 gives an insight into data collection, Section 4 discusses the methodology and results whereas Section 5 ends with the conclusion.

Section 2: Literature review - relation between stock price performance and management changes from previous studies

There are several papers that have tried to explore the relationship between CEO turnover and its effect on stock prices. It is a well - researched topic and the results shown by the studies match up well with our results. Like Warner, Watts & Wruck (1988) find that there is an inverse relation between the probability of a management change and a firm's share performance i.e. information about management performance is reflected in stock returns. Another study, by

Lambertides (2009), strengthens our arguments for CEO change to have an impact on stock prices. The paper first shows that firms experiencing a CEO change have positive abnormal returns, suggesting that new CEOs raise the firm performance. Furthermore, this study provided strong evidence that outside successions help firms raise performance more than inside successions. Which we also can relate to in our study where we found a negative relation between abnormal returns and the firm performance.

Other studies look at the effects of different variables on stock returns, than those we have discussed in our thesis, with significant results, implying that there are other variables affecting the stock prices significantly. An example is the paper written by Bonnier & Bruner (1988) where they analyze the stock price reaction to management change in distressed firms and have found that management change following poor performance is associated with gains to shareholders. This study researches not only the relation between the stock prices and CEO attributes, but also the state of the firm, indicating the importance of how the performance of the firm have been in the past.

Furthermore, we found research papers not supporting our results, for instance Weisbach (1987) found that there is a stronger association between prior performance and the probability of a resignation for companies with outsider-dominated boards than for companies with insider-dominated boards. Implying that outsiders tend to perform worse than insiders, which is the opposite of our results. However, we believe this result to differ depending on the state and size of the firm and we can strengthen this hypothesis referring to Reinganum (1985) which analyzed stock prices of firms traded on the New York & American stock exchanges and found significant positive succession effects around the time of the announcement of a CEO change but only for external appointments in small firms. Showing that the size of the firm does matter on the impact of appointing an outsider.

Several researchers have also done studies between CEO attributes such as age, gender, education etc and company performance that we have discussed later in the thesis.

Section 3: Data collection and hypotheses

In the first half of this section, we will go through the data collection process and the limits of the data we have collected. The second half presents the hypotheses we are going to test, to answer our research question.

3.1. Oslo Stock Exchange

Setting a period from year 2000 to 2017, we started our data collection process, by extracting a list of firms from Oslo Stock Exchanges website, oslobørs.no. Oslo Stock Exchange is the only exchange trading securities in Norway, also the only independent exchange among the Nordic countries today. Limiting our data set, we decided to focus on domestic firms listed on OSE, thereby eliminating all foreign firms in our list. On the other hand, we wanted to differ our study by not restricting it to only the most traded securities, but included all domestic firms listed on OSE. This list consists of both the name of the firm and the ticker symbol to match it up with the rest of our data set.

3.2. Brønnøysund Register Center

The next step towards completing our data set was to manually register all CEO change announcements made for all firms in our data set. Brønnøysund Register Center (BRC), offers a register for business enterprises, where all operating businesses in Norway are obliged to register. Firms listed on OSE are in addition regulated by OSE, and must announce important changes, as for instance, change of CEO immediately. This information can be found in different ways, and the BRC is one of the reliable sources for this task. Starting with a list of 171 firms, we found 391 events. The announcements include the date for announcement and the name of the new CEO. Excluding firms without any CEO changes during our period of study, we were left with 115 firms.

3.3. Bloomberg

Share prices for all firms and market returns are collected from a well-known software system from which we can get reliable information, the Bloomberg

Terminal. The terminal contains vast information on real time and historical data about companies and is the perfect source to collect the data needed for our analysis. We specify that we want data from date 01.01.2000 to 31.12.2017, where weekends and holidays are excluded. Using the ticker symbols for each firm we made sure to find the stock prices for the right firms. Furthermore, we needed the market return for the same period and decided to use the Oslo Stock Exchange All-share Index (OSEAX) which contains all listed firms on OSE. This index is adjusted for dividend payments and corporate actions on a daily basis.

3.4. Various Sources

Furthermore, we used various other sources with publicly available information to cross check that the announcement date on BRC in fact is the date the information was first disclosed to the public. The best way to do this was searching through news articles from financial newspapers like DN and Hegnar, companies' press releases and annual reports found on their websites, Professional networks like Linkedin and financial databases like Bloomberg and Wall Street Journal. The same way, we manually screened through all information available, to find attributes of the CEOs. Collecting all information on the CEOs and the firm around the event date, we discovered multiple variables we believe would be important for our analysis. Restricting the variables, we finally decided to keep five CEO attributes:

1. Age - We want to test and analyze if CEO age has any bearing on the stock returns of the firm. There have been previous studies that have focussed on CEO age and firm performance. Serfling (2014) found that CEO age can have a significant impact on risk taking behaviour and firm performance. Consistent with the prediction that risk taking behaviour decreases as CEOs become older, his analysis revealed that older CEOs reduced firm risk through less risky investment policies. Specifically, older CEOs invest less in research and development, make more diversifying acquisitions, manage firms with more diversified operations, and maintain lower operating leverage. Davidson, Nemec and Worrell (2006) found a strong positive relation between successor CEO age and average board member age but the hiring of an age-similar CEO did not reduce the firms' subsequent financial performance.

2. Gender - Even though the proportion of female to male CEOs has increased over the years, women holding CEO positions are still scarce. Several studies have shown how increasing women in the workforce leads to better firm performance. According to a study 'Delivering through Diversity' by McKinsey (2018), companies in the top-quartile for gender diversity on executive teams were 21% more likely to outperform on profitability and 27% more likely to have superior value creation. Krishnan and Parsons (2008) find that firms with gender diversity in senior management are associated with higher earnings quality. They also find that, after the IPO process, firms with a higher number of women in senior management are more profitable and have higher stock returns than firms with fewer women in the management ranks. Also, Erhardt, Werbel, and Shrader (2003), based on Fortune 500 firms, find evidence that firms with a higher number of female executives have higher profitability relative to their average sector profitability, and Welbourne (1999), based on empirical findings, states that the results from long term study indicate that having women on the top management team results in high earnings and greater shareholders' wealth. Norway was one of the first countries to implement a law from January 2004 that required public limited companies to have at least 40% of its board members as women. Several other European countries have also taken steps to increase the gender ratio in the boardroom. We tried to see if gender of the CEO had a role to play in the abnormal returns of a stock.

3. Education - Another CEO attribute that we wanted to focus on was CEO education and wanted to see if the educational background of a newly appointed CEO had any effect on the performance of the company's stock. Gottesman & Morey (2006) examined the relationship between CEO education and firm performance and found very little evidence that firms with CEOs from more prestigious schools perform better than firms with CEOs from less prestigious schools. They also found that firms managed by CEOs with MBA or law degrees performed no better than firms with CEOs without graduate degrees. King, Srivastav & Williams (2016) studied the banking industry and found that banks led by CEOs with MBAs outperform their peers. Further they also found that the quality of education matters

since their results showed that CEOs who graduate from top 20 universities are able to realize superior firm performance.

4. If the appointed CEO was an insider - There has always been a raging debate as to whether to hire a CEO who is an insider or an outsider and through our thesis we have tried to see if this attribute has any effect on the stock returns of a company. Experts argue that hiring insiders are beneficial for 2 reasons. Firstly, insiders are more knowledgeable than outsiders about the various aspects of the firm and secondly insiders have established social networks through which they gain the information and support needed to perform their job. However, a survey by PWC's strategy consulting business Strategy& in 2016, found that of the 2,500 largest public companies, 22% of CEOs hired in a planned succession over the previous four years came from outside the company. Some of the reasons for hiring outsiders were if the company was low performing, the chairman did not have CEO experience in the same company and the former CEO was also an outsider. Chung, Rogers, Lubatkin & Owers (1987) found that insiders generally make good CEOs but are not necessarily superior to outsiders. Successful companies can benefit from hiring CEOs from outside their organizations, to the extent that they can have a significant impact on the stock price.

5. If the CEO was an acting CEO - An acting CEO is someone appointed by the company to assume the role of chief executive officer during a time of transition or as the result of the sudden departure of the company's previous CEO. In our thesis, we want to test if acting CEOs in Norwegian companies lead to abnormal returns for a firm or not. Ballinger and Marcel (2010) found that interim CEO succession processes are widely employed by publicly-traded U.S. firms, and that they are associated with lower performance during the period in which the interim serves.

3.5. Clean up

Before starting on the event study, we needed to clean up the data. To analyze the impact of CEO change on stock returns, we need to create some restrictions on our sample of observations. This is to be sure the impact is caused by the change of

CEO only and no other variables. Any event with impact on the stock price around the CEO change biases our results and we need to remove all observations like that.

All firms were given a number and each event was marked with an additional number to separate all firms and all events. The next step was to match up the date the firm was listed on OSE with the event date. Any event occurring before the firm was listed is removed as there would not be any data on the share price to conduct the event study. Furthermore, all events without enough data to cover the estimation window is eliminated leaving us with 81 firms and 232 events. Analyzing all the data we manually have collected on each firm and CEO around the event dates, we notice that some events occur at the same time as a merger or acquisition, which could bias our results and need to be removed from the data set. A last reason to remove events from the data set is when the firm seems to be in distress or there is major complication within the board resulting in multiple changes in CEO within a year. These circumstances make it impossible to analyze the effect of CEO change in isolation from other variables which makes it important to remove these events. This clean up finally leaves us with a data set consisting of 70 firms and 146 events.

After conducting the event study and testing the abnormal returns for significance, we discovered a few events having non-significant abnormal returns for the whole event window. These events are also removed from the data set making a collection of still 70 firms, but 110 events, which is the final numbers for the calculations of average abnormal returns (AAR) and cumulative average abnormal returns (CAAR). For the analysis of CEO characteristics, there is missing information on some of the different variables, which we have not been able to find. These events are removed to keep a complete data set, with 70 firms and reducing to 95 events.

3.6. Hypotheses

For us to be able to answer our research question, we have selected 6 hypotheses based on the AAR and CAAR. The first is quite general, and answers our main question, Does a change of the CEO in Norwegian companies listed on OSE impact their stock return? The next five hypotheses are related to CEO attributes, to test for how the characteristics of a CEO might affect the stock prices, in the case of a new CEO being appointed. The hypotheses are as following:

I.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

II.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing an acting CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

III.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing an insider.

Alternative Hypothesis: Reject Null-Hypothesis.

IV.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO with a master's -or a higher degree.

Alternative Hypothesis: Reject Null-Hypothesis.

V.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a female CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

VI.

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO with an age above average (55 years) among CEOs.

Alternative Hypothesis: Reject Null-Hypothesis.

Section 4: Methodology and Results

4.1. Event Study

An event study is an empirical analysis undertaken to investigate the effect of an event on a specific dependent variable. The stock price of the company is one of the most commonly used dependent variables in event studies. Other dependent variables used in event studies include stock trading volume, return volatility etc. The event study method is based on the efficient market hypothesis which assumes that markets are efficient and prices fully reflect all available information. Thus, assuming that, the market is efficient and given that no other event occurred on the event day, the change in an asset's price as a reaction to that event can be interpreted as the price effect of that event. The event study methodology also assumes that the event is unforeseen and that during the event window there are no other unexpected events other than the main one that could impact stock prices. In our thesis, we wish to conduct an event study and try to determine whether a change in the CEO of a company has an effect on stock prices of the company. We have referred to MacKinlay's article Event Studies in Economics & Finance (1997) and followed his methodology for conducting our event study.

There are several steps involved in an event study and they are as follows:

4.1.1. Determining the Event Window

The first step in an event study is to identify the period (event window) involved in the event. There are several papers that have tried to address the issue of the appropriate window length that should be used to measure the price reaction correctly. Hillmer and Yu (1979) find that the event window should end within hours of the initial announcement. Chang and Chen (1989) find that event windows should go on for a number of days as the market keeps responding to news. Krivin et al. (2003) point out that event window length may be related to the period of observation.

In order to conduct an event study, the first task is to define the event of interest and identify the period over which the security prices of the firms involved in this event will be examined which is called the event window. For example, in our case we are trying to see if the announcement of a CEO change affects the stock prices of the respective firms, the event will be the CEO announcement and the event window

will include the one day of the announcement. According to MacKinlay (1997), it is necessary to define the event window to be larger than the specific period of interest. This permits examination of periods surrounding the event. In practice, the period of interest is often expanded to multiple days, including at least the day of the announcement and the day after the announcement. This captures the price effects of announcements which occur after the stock market closes on the announcement day. The periods prior to and after the event may also be of interest. In our case, we would be looking at 4 different event windows of (-10, +20), (-10, +10), (-5, +5) and (-1, +1).

Below is a reference table comparing the event and estimation windows for similar research papers:

Author	Journal	Sample Period	Model	Event Window	Estimation Window
Nino & Romero (2007)	Latin American Business Review	1998-2004	Market Model	(-10,+10)	(-160,-11)
Bloom & Jackson (2016)	Tourism Economics	2003-2009	Market Model	(-30,+10)	(-210,-46)
Lambertides (2009)	Managerial Finance	2001-2006	Mean Adjusted + Market Model	(-30,+30)	(-230,-30) and (+30,+230)
Bonnier & Bruner (1988)	Journal of accounting and economics	1969-1983	Market Model	(-50,+50)	(-200,-101)
Furtado & Rozeff (1984)	Journal of financial economics	1975-1982	Market Model	(-60,+60)	(-210,-61)
Lubatkin et.al (1989)	Academy of Management Journal	1971-1985	Market Model	Moving window	Multiple
Reinganum (1985).	Administrative Science Quarterly	1978-1979	Market Model	(-2,+2)	(-42,-22)

4.1.2. Determining the Selection Criteria

After identifying the event, it is necessary to determine the selection criteria for the inclusion of a given firm in the study. There might be restrictions imposed due to availability of data. In our case, we have decided to do our thesis based on Norwegian firms listed on the Oslo Stock Exchange.

4.1.3. Choice of Model for Determining Returns

To measure the event's impact, we need to measure the abnormal return. The abnormal return is the actual return of the security over the event window minus the normal return of the firm over the event window. The normal return is the return that would be expected if the event did not take place. For a firm i and event T, the abnormal return is given by

$AR_{iT} = R_{iT} - \mathrm{E}\,(R_{iT}/X_T)$

where AR_{iT} is the abnormal return, R_{iT} is the actual return and E (R_{iT}/X_T) is the normal/ expected returns respectively for time period T.

There are several models for measuring normal performance of a given company or security. According to MacKinlay (1997), there can be 2 categories of models - statistical and economic. Statistical models rely on statistical assumptions concerning the behaviour of asset returns whereas economic models are based on both statistical assumptions as well as assumptions concerning the investor's behaviour. Some of the models are:

A. Constant Mean Return Model: The constant mean return model assumes that the mean return of a given security is constant through time.

Let μ_i be the mean return for asset i. Then the constant mean return model is given by

$$R_{iT} = \mu_i + Z_{iT}$$

E (Z_{iT}) = 0 and Var (Z_{iT}) = σ_{zi}^2

where R_{iT} = the period T return on security i, Z_{iT} is the time period T disturbance term for security i with an expectation of 0 and variance σ_{zi}^2.

B. Market Model: The market model assumes a stable linear relation between the market return and the security return.

For any security i, the market model is given by

$R_{iT} = \alpha_i + \beta_i R_{mT} + \epsilon_{iT}$

E (ϵ_{iT} = 0) and Var (ϵ_{iT}) = $\sigma_{\epsilon i}^2$

where R_{iT} and R_{mT} are the period T returns on security i and the market portfolio respectively and ϵ_{iT} is the zero mean disturbance term. α_i, β_i and $\sigma_{\epsilon i}^2$ are the parameters of the market model. The market model is better than the constant mean return model because by removing the portion of the return that is related to variation in the market's return, the variance of the abnormal return is reduced. The market model is the most commonly used model for event study methodology. It looks at the actual returns of a baseline reference market and tracks the correlation of a firm's stock with the baseline.

C. Other Statistical Models: There are several other statistical models. A general type of statistical model is the factor model. Factor models are

motivated by the benefits of reducing the variance of the abnormal return by explaining more of the variation in the normal return.

D. Economic Models: Two of the most common economic models are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). The CAPM due to Sharpe (1964) and John Lintner (1965) is an equilibrium theory where the expected return of a given asset is determined by its covariance with the market portfolio. The APT due to Stephen Ross (1976) is an asset pricing theory where the expected return of a given asset is a linear combination of multiple risk factors.

4.1.4. Determining the Estimation Window

The next step would be to decide on the estimation window. The most common choice is to use the period prior to the event window for the estimation window. Generally, the event window itself is not included in the estimation period in order to prevent the event from influencing the normal performance model parameter. In our case, we have taken an estimation window of (-250, -15) i.e. 235 days.

4.1.5 Calculation of Abnormal Returns, Testing for Significance and Inference:

The abnormal return (AR) which is actual return minus the expected return needs to be calculated next for each event and for each day in the prespecified event window. The cumulative abnormal return (CAR) for each event window needs to be also calculated which is just the sum of a firm's abnormal returns over a certain period around, prior to or after an event. As an example, consider the three days symmetrically surrounding an event, abbreviated [-1, +1]. The respective CAR is just the sum of the firm's abnormal returns on the day before the event, the event day itself, and the day after the event. The average of each firm's AR and CAR over a certain period of trading days in the event window is called average abnormal return (AAR) (for the event day) and cumulative average abnormal return (CAAR) (for several days in the event window), respectively.

We then need to test if the average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) are significantly different from zero on a statistical basis and give our inference.

We have decided to do the event study on Excel and it included the following steps:

1. Extracted stock prices for each firm and for our reference market index from Bloomberg. We have taken the Oslo Børs All Share Index (OSEAX) as our market reference index and it consists of all shares listed on Oslo Børs. The index is adjusted for corporate actions daily and the current outstanding number of shares.
2. Calculated the returns of the firm's stock prices as well as the returns of the market reference index. For each event we calculated the actual returns = ln (Pt / Pt-1) where Pt is price of stock/market index today and Pt-1 is price of stock/market index yesterday.
3. For each event, identified the firm and market returns that had to be included in the estimated window. In our case, we had an estimation window of (-250, -15) i.e. 235 days.
4. Calculated the alpha, beta and sigma coefficients for each event using Excel formulas for intercept, slope and stey x respectively.

The equation for the intercept of the regression line a is:

$$a = \bar{y} - b\bar{x}$$

The equation for the slope of the regression line is:

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

where x and y are the sample means AVERAGE (known_x's) and AVERAGE (known_y's).

The equation for the standard error of the predicted y is:

$$\sqrt{\frac{1}{(n-2)}\left[\sum (y - \bar{y})^2 - \frac{\left[\sum (x - \bar{x})(y - \bar{y})\right]^2}{\sum (x - \bar{x})^2}\right]}$$

where x and y are the sample means AVERAGE (known_x's) and AVERAGE (known_y's), and n is the sample size.

5. Used the alpha and beta values of the event to calculate expected returns throughout the event window. In our case, we plan to do the event study on the basis of 4 event windows of (-10, +20), (-10, +10), (-5, +5) and (-1,+1).
6. Calculated abnormal returns by deducting expected returns from the actual returns of the firm's stock throughout the event window.
7. Divided the abnormal returns by the root mean square error gave us the t values for significance testing.

4.1.6. Disadvantages/Limitations of event study:

1. It is generally assumed that the effectiveness of an event study is based on strong assumptions and in case such assumptions are violated the results may be biased and inaccurate. Due to market inefficiency, observed stock prices may not fully reflect all information. Furthermore, events might be anticipated in some situations, while unforeseen coexisting events could also have an effect on the sample stocks, which could lead to biased stock returns. Therefore, abnormal returns may not entirely be the result of market reaction to the specific event of interest.
2. Secondly, variations in estimation and test periods are commonly found in event studies. Precise estimation periods are not easy to determine. Moreover, the estimation period is difficult to control for other confounding effects if we select long test periods, or long event windows.
3. Thirdly, the choice of model to estimate expected returns will have a bearing on the results in the magnitude and the significance of abnormal returns. Ritter (1991) also documents that using different market indices to calculate market-adjusted returns can show differences in long term performance results. More importantly, if the expected return is incorrectly estimated, other factors that are not properly controlled could lead to biased information in the event study results.
4. Fourthly, not all stocks trade every day. For example, stock and market returns might not be available on the selected days throughout the estimation period if we apply the market model or Fama-French three factor model.
5. Lastly, calendar time clustering of events is a problem of cross-sectional dependence if test periods, or event dates of sample stocks are clustered in the same calendar time period (Brown and Warner, 1980). When the test

periods of those stocks overlap in calendar time, the problem of cross-correlation in abnormal returns could exist. However, in traditional large sample studies, the event of interest is assumed to be isolated from other effects. Calendar time is not expected to be problematic because the effects of other events are supposed to be cancelled out across the large sample of firms.

4.2 CEO attributes

We want to test what effect certain CEO attributes have on the stock prices. To do this, we need to create a few dummy variables. Giving the value 1 or 0 to the variables of choice. For appointing an acting CEO, we give the value 1 if the CEO appointed is an acting CEO and 0 otherwise. The same is repeated for the variable Male, Insider, Higher Education (master's degree or higher). For age we chose to calculate AAR and CAAR depending on if the age was above average across our sample. The dummy created for age is 1 if above or equal to average (in this case 55 years), otherwise 0. Using this information, we calculated a new AAR and CAAR for each variable. This way we can test for the effect of the specific variable on the AAR and CAAR, and at the same time compare with the original AAR and CAAR calculated.

4.3 Testing for significance

Choosing the right test is of importance for our results to be robust and valid. We find that the student t-test is the default test statistic used for event studies (Rose & Søpstad, 2015), and chose to use this to test our hypotheses. However, looking at the descriptive statistics to check for skewness in our CAR, we find that the skewness is different from zero for AR and all CAR, but that is only realistic to have some degree of skewness in the data. What we need to do, is to make sure that the skewness is within acceptable ranges. Generally, a skewness between (-1, +1) should be acceptable. However, AR, CAR (-10, +10) and CAR (-10, +20) are within the range of (-1, +1), while CAR (-1, +1) and CAR (-5,+5) are closer to 2, we decided to add another test, skewness corrected test.

4.3.1. Student t-test

This is a test where the values follow a t-distribution. This test is used when the sample size is small, and the population standard deviation is unknown. However, even if the t-distribution is bell-shaped compared to the normal distribution as the numbers of observations increase (Gujarati & Porter, 2009), we must be aware that the tails are thicker. And that the values have a bigger chance to fall within the tails than a normal distribution.

The t-value is calculated using this formula:

$$t_{AAR} = \sqrt{N}\frac{AAR}{var(AAR)}$$

4.3.2. Skewness corrected test

This test just adjusts for the skewness in the data when calculating the t-value. This method is introduced by Hall 1992, which uses the cross-sectional standard deviation and skewness estimation. Adjusting for the skewness, gives a t-statistic, asymptotically standard normally distributed.

The skewed t-value is calculated using this formula:

$$t_{skew} = \sqrt{N}(S + \frac{1}{3}\gamma S^2 + \frac{1}{27}\gamma^2 S^3 + \frac{1}{27}\gamma)$$

Where γ is given by the formula:

$$\gamma = \frac{N}{(N-2)(N-1)}\sum_{i=1}^{N}(\frac{x_i - \bar{x}}{s})^3$$

When we use the syntax skew(number1,[number2],…) in Microsoft Excel.

And finally N is the number of observations while S is simply:

$$S = \frac{CAAR}{\sqrt{var(CAAR)}}$$

4.3.3. Significance testing Hypothesis I

To test for the impact of CEO change on the stock price, we used the event study methodology to calculate AR and CAR for each event. Using these formulas:

$$AR_{i,t} = R_{it} - E(R_{it})$$

$$CAR_i(T_1, T_2) = \sum_{t=T_1}^{T_2} AR_{i,t}$$

Where CAR is specified to the different event windows in our study. Furthermore, we calculated the AAR and CAAR for all events using the following formulas:

$$AAR = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t}$$

$$CAAR(T_1, T_2) = \frac{1}{N}\sum_{i=1}^{N} \mathrm{CAR_i}(T_1, T_2)$$

Calculating the variance for AAR having Large L, where L is the length of the estimation window we get the following formula:

$$var(AAR_i) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_{\varepsilon_i}^2$$

The reason is that for large L, $\sigma^2(AR_{it}) \rightarrow \sigma_{\varepsilon_i}^2$ (Dasgupta and Laplante, 2001).

As L increases, the variance of the CAR for security i is:

$$\sigma_i^2(T_1, T_2) = (T_2 - T_1 + 1)\sigma_{\varepsilon_i}^2$$

Furthermore, the variance of CAAR is:

$$var\big(CAAR(T_1, T_2)\big) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_i^2(T_1, T_2)$$

4.3.4. Significance testing Hypotheses II-VI

To test these CEO attributes in relation to AAR and CAAR, we used the same variances and t-statistics as for the first hypothesis. Only difference is that we use the new values found for AAR and CAAR for each variable. All AAR and CAAR are calculated the way that AR or CAR for the event is either counted or zero. So, when the dummy variable has value one, the AR for that specific event is included in the new AAR, otherwise the value is zero. The number of observations here have reduced to 95 from 110. The rest of the calculations are the same as above.

4.3.5. Critical values and confidence levels

Since we have a sample of larger than 90 observations, we will be using these values to test for significance of our results. For a T-distribution we have the following critical values dependent on the number of observations and the confidence level.

N > 90

99% confidence level: t-value = 2,632

95% confidence level: t-value = 1,987

90% confidence level: t-value = 1,662

Our main criteria would be looking at the confidence level of 95 %, as this is the most common confidence level used in studies in general. Choosing the confidence level of 95% means that there is a 95% probability that the sample contains the true mean of the population. We should be aware that this also means that there is a 5% probability for type 1 error, implying that it is acceptable to falsely reject the null hypothesis with a 5% probability.

4.4 Results

In this section, we will be presenting our results and interpretation for each hypothesis. Including descriptive statistics and result tables.

4.4.1. Hypothesis I

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

Reading the descriptive statistics, we can see that the kurtosis is way above the acceptance range of (-3, +3), for AR and all event windows we have chosen. The

skewness is however, barely, still acceptable for AR, CAR (-10, +10) and CAR (-10, +20). For the remaining event windows, it is not acceptable, which is why we use both the student t statistic and the t statistic adjusted for skewness. The descriptive statistics are presented in the exhibits as exhibit 1.

Calculating the two t-values, we find that AAR and the CAAR for all the chosen event windows are statistically significant beyond a 99% confidence level, under both methods of calculating the t-value. Which implies that the results are significant at a 95% level as well and we can reject the null hypothesis, meaning that there is an effect from appointing a CEO on the share price. However, this does not say for sure if there is a positive or negative effect of a CEO change in a firm. The AR, along with CAR (-10, +10) and CAR (-10, +20) are on average significantly negative according to our results. While CAR (-1, +1) and CAR (-5, +5) are significantly positive on average reading from our results. Meaning that the immediate response from the investors is negative, but on short term positive and then turning back to negative. This is hard to argue for to be true. We suspect that there are other variables controlling the sign of the abnormal returns under these circumstances and that some variables affect the returns on a short term and some on long term. There are many variables that can explain this trend, but we have chosen to focus on the effect of CEO attributes further. Below we have presented the results for hypothesis I.

	AR	CAR(-1,+1)	CAR(-5,+5)	CAR(-10,+10)	CAR(-10,+20)
Average	**-0,0012**	**0,0024**	**0,0091**	**-0,0065**	**-0,0183**
Variance	0,0000	0,0000	0,0001	0,0003	0,0004
Standard Deviation	0,0035	0,0060	0,0116	0,0160	0,0194
Gamma	0,9687	1,3185	1,9870	0,9359	-0,0721
S	-0,3447	0,3981	0,7832	-0,4064	-0,9438
Square root(N)	10,4881	10,4881	10,4881	10,4881	10,4881
Skewed T-value	**-3,21**	**4,97**	**13,24**	**-3,73**	**-10,13**
Student T- value	**-3,61**	**4,18**	**8,21**	**-4,26**	**-9,90**

Results for Hypothesis I.

4.4.2. Hypothesis II

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing an acting CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

The kurtosis and the skewness are way out of the acceptance levels for AR and all CAR event windows. This may be a result of having very few observations of appointing an acting CEO in our sample. Still, both the normal t-value and the skewed t-value results show that AAR and CAR for all windows are statistically significant on a 95% and a 99% confidence level, rejecting the null-hypothesis.
Not only are the results highly significant, but for all event windows, appointing an acting CEO seems to have a negative impact on the return. The abnormal returns seem to be more negative over time, the longer the event window, the higher the negative value is on average when appointing an acting CEO. AAR are -0.0013 on the event date and decreases to -0.0158 for CAR (-10, +20). This result seems economically significant, as appointing an acting CEO usually is a result of a sudden CEO change and implies that the board have not yet found the right person for the position. According the research, appointing an acting CEO is disruptive and has a harmful impact on the firm. This effect may also not be reversed immediately, even after appointing a long-term CEO (Ballinger & Marcel, 2009).

4.4.3. Hypothesis III

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing an insider.
Alternative Hypothesis: Reject Null-Hypothesis.
Studying the descriptive statistics for the variable insider, we can see that the kurtosis and skewness is beyond the levels of acceptance and as for the variable acting CEO, we choose to test using both the regular t-value and the skewed t-value.
The results are all statistically significant at a 95% and a 99% level, for appointing an insider. Giving us the evidence, we need to reject the null-hypothesis. Though, just as for acting CEO, appointing an insider impacts the returns negatively. The results from our table for appointing and insider are quite similar to appointing an acting CEO. The average abnormal returns are negative, and the impact is stronger the bigger the event window is. The abnormal return on the event date is on average -0.0028 and decreases to -0.0251 for an event window (-10, +20). The impact seems to be even stronger than for appointing an acting CEO, but we believe that this is only because we have more observations of an insider being appointed than an outsider. Which also strengthens our argument for that these

variables do in fact influences the signs of the abnormal returns over time and across samples.

The result is economically significant on one level, as many studies suggest that appointing an insider might have no or negative impact on the firm, as appointing an outsider benefits the firm on many levels compared to an insider (Fahlenbrach, Low and Stulz, 2010). However, studies also suggest that there is higher probability of dismissal of a new CEO in case of an outside succession. Which implies that appointing an insider should have less negative effect on the firm (Zhang, 2008). It all depends on the state of the firm at the point of the succession. A firm in distress and great need of new input might benefit from an outsider who can make some impactful changes in the firm. Hiring an insider after firing a CEO results in negative abnormal returns (Borokhovich, Parrino and Trapani, 1996). A firm doing quite well already and losing their CEO due to retirement might on the other hand need someone to follow the steps of the previous CEO and should benefit from an insider (Chung, Rogers, Lubatkin and Owers, 1987). Generally, it can be difficult to make any conclusion on the effect of appointing an insider. However, comparing both variables results for acting CEO and insider with the AAR and CAAR values from hypothesis I, we can see that no matter what sign the AAR and CAAR has, the sign for these two variables are consistently negative. Indicating that no matter the average abnormal returns in general, the effect of appointing an insider or an interim CEO is negative to the firm's stock prices.

4.4.4. Hypothesis IV

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO with a master's -or a higher degree.
Alternative Hypothesis: Reject Null-Hypothesis.

Both the kurtosis and the skewness is quite high for AR, CAR (-1, +1) and CAR (-5, +5). However, both values seem to drop for longer event windows. Even though the kurtosis is still too high, the skewness level is acceptable for CAR (-10, +10) and CAR (-10, +20). Moving on to the t-values, our results suggest that AAR, CAR (-1, +1) and CAR (-5, +5) are statistically significant on a 95% and 99% confidence level for positive values. The abnormal returns go from event date AAR of 0.0010

to CAR (-5, +5) of 0.0099. The problem is that the returns seem to turn negative for larger event windows and drop down to -0.0090 for CAR (-10, +20). As all values are statistically significant except the value for CAR (-10, +10), we can reject the null hypothesis for AR and all windows except this one.

Now, there might be variables affecting longer event windows which are the reason for these results and that we have not been completely successful in isolating the effect on AAR and CAAR for the effect of higher education. Another explanation could be that the effect does not seem to last for long and have a negative impact on a long-term basis. However, the latter is less likely as it would not be economically significant that higher education leads to negative abnormal return. Though it may be the case that higher education does in fact play a role on short-term basis but has no effect long-term. Then it could be that the negative returns are other variables affecting the returns negatively, while the education has no say. Also, studies show that higher education does not have a significant role in performance of the firm although it has a positive impact on AR, it is only a short-term effect (Bhagat, Bolton and Subramanian, 2010).

4.4.5. Hypothesis V

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a female CEO.

Alternative Hypothesis: Reject Null-Hypothesis.

The kurtosis and skewness for the variable male is quite like education. Both are high at unacceptable levels, but the skewness is below 1 for the last two event windows. The t-values are high enough to reject the null hypothesis with a confidence level of 95% and 99% for CAR (-1, +1) = 0.0056, CAR (-5, +5) = 0.0092 and CAR (-10, +20) = -0.0111.

The tendencies here are the same as for variable education. The effect seems to have a short-term positive effect of hiring a female CEO, but it does not last, and long-term return is negative. Again, this does not mean for sure that appointing a female CEO results in long-term negative abnormal returns but might suggest that there is no long-term positive effects of hiring a female CEO. Economically this might be significant to a certain degree. The issue of lacking female presence on corporate boards is rising and more studies are researching on this topic and the impact of

female CEOs on the firm performance, but also on CEO compensation differences (Lam, McGuinness and Vieito, 2013). Other studies found suggest that appointing a female CEO has negative reactions from the investors compared to male CEOs, another point to consider is the match of appointing an insider female, which might have a more positive impact than an outsider female (Lee and James, 2007). It is difficult to say how the choice of CEOs gender might affect the abnormal returns, but as Norway is in fact one of the first countries to implement a gender balance law, it seems that it should be economically significant in one way as it is more acceptable and encouraged here than other places in the world. On the other hand, implementing a law also forces firms who do not have a female board member to appoint one, although it does not force them to appoint the female as a CEO. Concluding, we believe it to be both statistically and economically significant that appointing a female CEO had a positive effect on a short-term, but unknown effect on a long-term basis.

4.4.6. Hypothesis VI

Null-Hypothesis: There is no statistically significant AAR or CAAR when appointing a CEO with an age above average among CEOs.
Alternative Hypothesis: Reject Null-Hypothesis.

The descriptive statistics for age show that AR has high skewness and kurtosis, but even though the kurtosis keeps a high value throughout all event windows, the skewness is below 1.
The t-values for CAR (-10, +10) are too low for any level of statistical significance, while AAR and rest of the event windows are statistically significant on a 99% confidence level. For these we can reject the null-hypothesis. Age has the same signs as the other variables male and education. The AAR and CAAR are positive for CAR (-5, +5) but turns negative for larger event windows. Implying that age of the CEO has a short-term positive effect on the returns and negative long-term effect. The level of the abnormal returns over time for the effect of age seems to be variable. Having an age above average of the sample might have a small positive effect, but no effect long-term or even negative effect.
The age might have different effects on the firm performance conditional on the firms' state, size and industry (Bhabra and Zhang). As we have included all firm

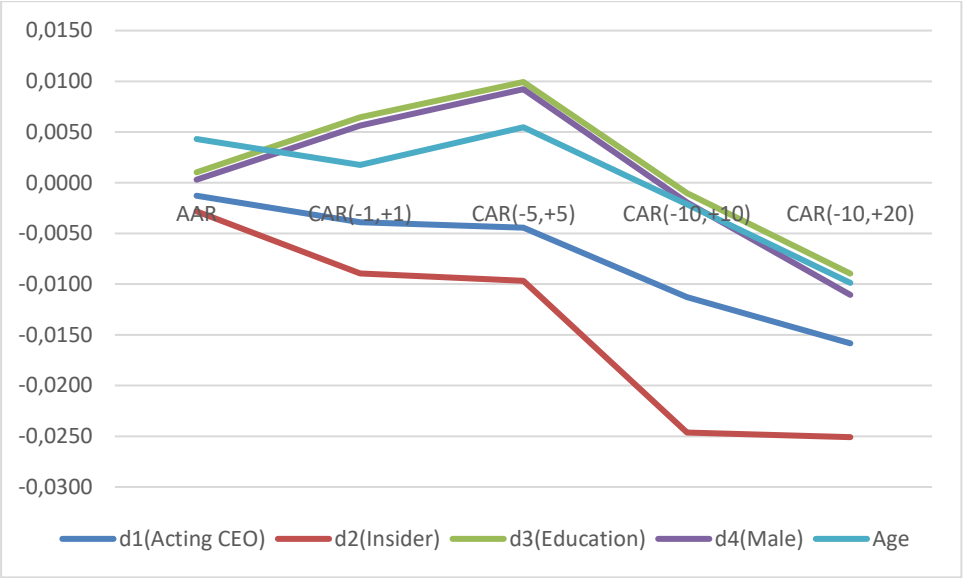
sizes, industries and the reason for CEO change varies across our sample, this can explain the varied results we have gotten. However, the age of the CEO is related to conservatism in the way of leading the firm and for firms in fast paced industries, this effect may be negative. On the other hand, in industries with stable and slow growth, the effect might be opposite. Having an old CEO with conservative strategies and long tenure, would be the best option for the firm. In our sample we have observations with both examples, which might be affecting the results to vary across event windows.

Generally, the economy does keep changing and at a faster pace for every year. The international trade barriers are becoming lower than ever and international business on all levels is on the rise for even smaller economies as Norway. With so many changing factors externally, the long-term effect should be economically significant with a negative effect of higher age of the CEO. Although we are not looking at years but days, we cannot conclude with CEO age having a certain effect on the firm performance.

Following is a table with the final results for hypotheses II-VI and a figure showing the trend in the AAR and CAAR over the different event windows.

	AAR	CAR(-1,+1)	CAR(-5,+5)	CAR(-10,+10)	CAR(-10,+20)
d1(Acting CEO)	-0,0013	-0,0039	-0,0044	-0,0113	-0,0158
d2(Insider)	-0,0028	-0,0090	-0,0097	-0,0246	-0,0251
d3(Education)	0,0010	0,0065	0,0099	-0,0010	-0,0090
d4(Male)	0,0003	0,0056	0,0092	-0,0019	-0,0111
Age	0,0043	0,0017	0,0055	-0,0021	-0,0099

Results for Hypothesis II-VI.



Graph showing the trends of the various variables.

			d1(Acting CEO)	d2(Insider)	d3(Education)	d4(Male)	Age
AAR	**0,0005**	**AAR**	-0,0013	-0,0028	0,0010	0,0003	0,0043
		Std	0,0035	0,0035	0,0035	0,0035	0,0035
		Gamma	-0,8545	-1,2153	2,0973	1,7687	5,1948
		S	-0,3678	-0,8090	0,2967	0,0869	1,2299
		square N	9,7468	9,7468	9,7468	9,7468	9,7468
		T-Skewed	**-3,99**	**-10,77**	**3,56**	**0,92**	**55,72**
		T-test	**-3,58**	**-7,88**	**2,89**	**0,85**	**11,99**
			d1(Acting CEO)	**d2(Insider)**	**d3(Education)**	**d4(Male)**	**Age**
CAR(-1,+1)	**0,0070**	**CAR(-1,+1)**	-0,0039	-0,0090	0,0065	0,0056	0,0017
		Std	0,0060	0,0060	0,0060	0,0060	0,0060
		Gamma	-5,5081	-2,7796	1,6916	1,6838	-0,5915
		S	-0,6465	-1,4812	1,0683	0,9313	0,2889
		square N	9,7468	9,7468	9,7468	9,7468	9,7468
		T-Skewed	**-16,82**	**-43,36**	**17,97**	**14,67**	**2,65**
		T-test	**-6,30**	**-14,44**	**10,41**	**9,08**	**2,82**
			d1(Acting CEO)	**d2(Insider)**	**d3(Education)**	**d4(Male)**	**Age**
CAR(-5,+5)	**0,0096**	**CAR(-5,+5)**	-0,0044	-0,0097	0,0099	0,0092	0,0055
		Std	0,0116	0,0116	0,0116	0,0116	0,0116
		Gamma	-5,7893	-1,9512	2,1631	2,1753	0,1929
		S	-0,3828	-0,8358	0,8577	0,7964	0,4722
		square N	9,7468	9,7468	9,7468	9,7468	9,7468
		T-Skewed	**-7,25**	**-13,41**	**14,63**	**13,14**	**4,75**
		T-test	**-3,73**	**-8,15**	**8,36**	**7,76**	**4,60**
			d1(Acting CEO)	**d2(Insider)**	**d3(Education)**	**d4(Male)**	**Age**
CAR(-10,+10)	**-0,0024**	**CAR(-10,+10)**	-0,0113	-0,0246	-0,0010	-0,0019	-0,0021
		Std	0,0160	0,0160	0,0160	0,0160	0,0160
		Gamma	-5,8881	-1,3362	0,9492	0,9727	0,6967
		S	-0,7047	-1,5401	-0,0649	-0,1206	-0,1324
		square N	9,7468	9,7468	9,7468	9,7468	9,7468
		T-Skewed	**-20,83**	**-27,68**	**-0,61**	**-1,12**	**-1,24**
		T-test	**-6,87**	**-15,01**	**-0,63**	**-1,18**	**-1,29**
			d1(Acting CEO)	**d2(Insider)**	**d3(Education)**	**d4(Male)**	**Age**
CAR(-10,+20)	**-0,0132**	**CAR(-10,+20)**	-0,0158	-0,0251	-0,0090	-0,0111	-0,0099
		Std	0,0194	0,0194	0,0194	0,0194	0,0194
		Gamma	-8,6039	-1,0833	-0,2368	-0,1935	-0,3112
		S	-0,8148	-1,2907	-0,4611	-0,5690	-0,5080
		square N	9,7468	9,7468	9,7468	9,7468	9,7468
		T-Skewed	**-41,09**	**-19,37**	**-4,66**	**-5,75**	**-5,22**
		T-test	**-7,94**	**-12,58**	**-4,49**	**-5,55**	**-4,95**

Results for hypotheses II-VI.

The descriptive statistics can be found in the exhibit 2.-6.

Furthermore we have included the list of the events, with date, firm name, and the name of the CEO appointed in exhibit 7.

4.4.7 Limits of the results

We should keep in mind that the models we use have limits and there might for instance exist market inefficiency in the data. For longer estimation windows it can also be difficult to control for confounding effects. To reduce the likelihood of this, we have made sure to remove all events that overlap within the estimation window. We have only used one type of market index and different market index might give

different results, a further study could be to test of these effects. However, we chose the index for the firms we are studying, so we assume to have the index closest to avoid this. Our sample size is also limited and especially for the CEO attributes, it would be a disadvantage to not have enough observations of the different variables. Our results may not be exact but the tendencies we have found in our results can be supported by other studies on the same subject.

Section 5 : Conclusion/Inference

Conducting an event study, we have been able to test the impact of CEO succession on the firm performance. Our results show that CEO change in Norwegian companies listed on OSE does impact their stock returns. Although the impact of appointing a new CEO does have variable effect depending on different variables. The variables we have chosen to focus on are 5 CEO attributes, where we want to study if the variables have a positive or negative effect on the firm performance. Our results show that appointing an acting CEO or an insider does have a negative impact on stock prices. These results are both statistically significant and economically significant. As various studies suggest, there is empirical evidence supporting our results. These variables also have quite a strong and long-lasting impact, which might also be troublesome and expensive to reverse for the firm.

The last three variables, education, gender and age has more of a variable and weak effect on the stock prices. However, all these variables tend to have a positive short-term effect, and changes to negative abnormal returns for longer event windows. We argument that there are some other variables that are affecting these results and further analysis is needed to isolate the effect of these variables. The effect differs depending on the state of the economy in general, the state of the firm and the characteristics of the firm as size, industry and age.

To conclude, CEO change does have an impact on the stock prices, but it depends on various variables. Among which, CEO characteristics play a big role. Specifically, we have found that appointing an insider or an interim CEO has significant negative effects. Education, age and appointing a male CEO on the other hand tend to have weak but positive short-term effects.

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51) Does a Better Education Make for Better Managers? An Empirical Examination of CEO Educational Quality and Firm Performance – Gottesman & Morey (2006), SSRN

Exhibits

1.

Hypothesis I									
AR		*CAR(-1,+1)*		*CAR(-5,+5)*		*CAR(-10,+10)*		*CAR(-10,+20)*	
Mean	-0,0012	Mean	0,0024	Mean	0,0091	Mean	-0,0065	Mean	-0,0183
Standard Error	0,0045	Standard Error	0,0100	Standard Error	0,0139	Standard Error	0,0197	Standard Error	0,0232
Median	-0,0003	Median	0,0008	Median	-0,0046	Median	-0,0167	Median	-0,0269
Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	0,0468	Standard Deviation	0,1050	Standard Deviation	0,1454	Standard Deviation	0,2071	Standard Deviation	0,2431
Sample Variance	0,0022	Sample Variance	0,0110	Sample Variance	0,0212	Sample Variance	0,0429	Sample Variance	0,0591
Kurtosis	**7,2625**	**Kurtosis**	**13,6136**	**Kurtosis**	**12,7391**	**Kurtosis**	**4,7842**	**Kurtosis**	**4,5433**
Skewness	**0,9687**	**Skewness**	**1,3185**	**Skewness**	**1,9870**	**Skewness**	**0,9359**	**Skewness**	**-0,0721**
Range	0,3850	Range	1,0477	Range	1,3936	Range	1,4016	Range	1,8174
Minimum	-0,1532	Minimum	-0,4395	Minimum	-0,5175	Minimum	-0,5745	Minimum	-0,9460
Maximum	0,2319	Maximum	0,6082	Maximum	0,8761	Maximum	0,8271	Maximum	0,8714
Sum	-0,1323	Sum	0,2647	Sum	0,9973	Sum	-0,7150	Sum	-2,0176
Count	110	Count	110	Count	110	Count	110	Count	110

2.

Hypothesis II-VI									
AR									
d1(Acting CEO)		*d2(Insider)*		*d3(Education)*		*d4(Male)*		*Age*	
Mean	-0,0013	Mean	-0,0028	Mean	0,0010	Mean	0,0003	Mean	0,0043
Standard Error	0,0011	Standard Error	0,0025	Standard Error	0,0043	Standard Error	0,0045	Standard Error	0,0031
Median	0,0000	Median	0,0000	Median	0,0000	Median	0,0000	Median	0,0000
Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000
Standard Deviation	0,0105	Standard Deviation	0,0247	Standard Deviation	0,0422	Standard Deviation	0,0440	Standard Deviation	0,0300
Sample Variance	0,0001	Sample Variance	0,0006	Sample Variance	0,0018	Sample Variance	0,0019	Sample Variance	0,0009
Kurtosis	**19,2715**	**Kurtosis**	**4,6321**	**Kurtosis**	**11,9191**	**Kurtosis**	**9,9193**	**Kurtosis**	**36,5494**
Skewness	**-0,8545**	**Skewness**	**-1,2153**	**Skewness**	**2,0973**	**Skewness**	**1,7687**	**Skewness**	**5,1948**
Range	0,1063	Range	0,1703	Range	0,3513	Range	0,3513	Range	0,2812
Minimum	-0,0493	Minimum	-0,0957	Minimum	-0,1195	Minimum	-0,1195	Minimum	-0,0493
Maximum	0,0569	Maximum	0,0746	Maximum	0,2319	Maximum	0,2319	Maximum	0,2319
Sum	-0,1220	Sum	-0,2682	Sum	0,0984	Sum	0,0288	Sum	0,4078
Count	95	Count	95	Count	95	Count	95	Count	95

3.

CAR(-1,+1)									
d1(Acting CEO)		*d2(Insider)*		*d3(Education)*		*d4(Male)*		*Age*	
Mean	-0,0039	Mean	-0,0090	Mean	0,0065	Mean	0,0056	Mean	0,0017
Standard Error	0,0025	Standard Error	0,0068	Standard Error	0,0108	Standard Error	0,0108	Standard Error	0,0074
Median	0,0000	Median	0,0000	Median	0,0000	Median	0,0000	Median	0,0000
Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000
Standard Deviation	0,0244	Standard Deviation	0,0664	Standard Deviation	0,1052	Standard Deviation	0,1057	Standard Deviation	0,0725
Sample Variance	0,0006	Sample Variance	0,0044	Sample Variance	0,0111	Sample Variance	0,0112	Sample Variance	0,0053
Kurtosis	**38,5781**	**Kurtosis**	**21,0111**	**Kurtosis**	**15,2037**	**Kurtosis**	**14,9431**	**Kurtosis**	**22,1514**
Skewness	**-5,5081**	**Skewness**	**-2,7796**	**Skewness**	**1,6916**	**Skewness**	**1,6838**	**Skewness**	**-0,5915**
Range	0,2508	Range	0,6878	Range	1,0477	Range	1,0477	Range	0,8138
Minimum	-0,1883	Minimum	-0,4395	Minimum	-0,4395	Minimum	-0,4395	Minimum	-0,4395
Maximum	0,0625	Maximum	0,2483	Maximum	0,6082	Maximum	0,6082	Maximum	0,3743
Sum	-0,3713	Sum	-0,8507	Sum	0,6135	Sum	0,5349	Sum	0,1659
Count	95	Count	95	Count	95	Count	95	Count	95

4.

CAR(-5,+5)									
d1(Acting CEO)		*d2(Insider)*		*d3(Education)*		*d4(Male)*		*Age*	
Mean	-0,0044	Mean	-0,0097	Mean	0,0099	Mean	0,0092	Mean	0,0055
Standard Error	0,0030	Standard Error	0,0086	Standard Error	0,0153	Standard Error	0,0152	Standard Error	0,0099
Median	0,0000	Median	0,0000	Median	-0,0006	Median	-0,0009	Median	0,0000
Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000
Standard Deviation	0,0291	Standard Deviation	0,0838	Standard Deviation	0,1486	Standard Deviation	0,1479	Standard Deviation	0,0969
Sample Variance	0,0008	Sample Variance	0,0070	Sample Variance	0,0221	Sample Variance	0,0219	Sample Variance	0,0094
Kurtosis	**37,7877**	**Kurtosis**	**15,6586**	**Kurtosis**	**13,6978**	**Kurtosis**	**14,0719**	**Kurtosis**	**15,1577**
Skewness	**-5,7893**	**Skewness**	**-1,9512**	**Skewness**	**2,1631**	**Skewness**	**2,1753**	**Skewness**	**0,1929**
Range	0,2662	Range	0,7987	Range	1,3936	Range	1,3936	Range	0,9960
Minimum	-0,2170	Minimum	-0,5175	Minimum	-0,5175	Minimum	-0,5175	Minimum	-0,5175
Maximum	0,0492	Maximum	0,2812	Maximum	0,8761	Maximum	0,8761	Maximum	0,4785
Sum	-0,4210	Sum	-0,9192	Sum	0,9432	Sum	0,8758	Sum	0,5193
Count	95	Count	95	Count	95	Count	95	Count	95

5.

CAR(-10,+10)									
d1(Acting CEO)		*d2(Insider)*		*d3(Education)*		*d4(Male)*		*Age*	
Mean	-0,0113	Mean	-0,0246	Mean	-0,0010	Mean	-0,0019	Mean	-0,0021
Standard Error	0,0055	Standard Error	0,0146	Standard Error	0,0216	Standard Error	0,0215	Standard Error	0,0149
Median	0,0000	Median	0,0000	Median	-0,0015	Median	-0,0135	Median	0,0000
Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000
Standard Deviation	0,0532	Standard Deviation	0,1422	Standard Deviation	0,2110	Standard Deviation	0,2096	Standard Deviation	0,1447
Sample Variance	0,0028	Sample Variance	0,0202	Sample Variance	0,0445	Sample Variance	0,0440	Sample Variance	0,0210
Kurtosis	**39,8880**	**Kurtosis**	**5,5480**	**Kurtosis**	**5,1837**	**Kurtosis**	**5,3731**	**Kurtosis**	**12,7111**
Skewness	**-5,8881**	**Skewness**	**-1,3362**	**Skewness**	**0,9492**	**Skewness**	**0,9727**	**Skewness**	**0,6967**
Range	0,4711	Range	0,9765	Range	1,4016	Range	1,4016	Range	1,3504
Minimum	-0,4209	Minimum	-0,5745	Minimum	-0,5745	Minimum	-0,5745	Minimum	-0,5709
Maximum	0,0502	Maximum	0,4019	Maximum	0,8271	Maximum	0,8271	Maximum	0,7795
Sum	-1,0708	Sum	-2,3401	Sum	-0,0986	Sum	-0,1832	Sum	-0,2011
Count	95	Count	95	Count	95	Count	95	Count	95

6.

CAR(-10,+20)									
d1(Acting CEO)		*d2(Insider)*		*d3(Education)*		*d4(Male)*		*Age*	
Mean	-0,0158	Mean	-0,0251	Mean	-0,0090	Mean	-0,0111	Mean	-0,0099
Standard Error	0,0104	Standard Error	0,0181	Standard Error	0,0253	Standard Error	0,0257	Standard Error	0,0186
Median	0,0000	Median	0,0000	Median	0,0000	Median	-0,0126	Median	0,0000
Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000	Mode	0,0000
Standard Deviation	0,1010	Standard Deviation	0,1766	Standard Deviation	0,2467	Standard Deviation	0,2509	Standard Deviation	0,1810
Sample Variance	0,0102	Sample Variance	0,0312	Sample Variance	0,0609	Sample Variance	0,0629	Sample Variance	0,0328
Kurtosis	**78,7201**	**Kurtosis**	**8,4725**	**Kurtosis**	**5,1254**	**Kurtosis**	**4,6627**	**Kurtosis**	**14,2346**
Skewness	**-8,6039**	**Skewness**	**-1,0833**	**Skewness**	**-0,2368**	**Skewness**	**-0,1935**	**Skewness**	**-0,3112**
Range	0,9651	Range	1,4606	Range	1,8174	Range	1,8174	Range	1,8174
Minimum	-0,9460	Minimum	-0,9023	Minimum	-0,9460	Minimum	-0,9460	Minimum	-0,9460
Maximum	0,0191	Maximum	0,5583	Maximum	0,8714	Maximum	0,8714	Maximum	0,8714
Sum	-1,5043	Sum	-2,3829	Sum	-0,8513	Sum	-1,0504	Sum	-0,9379
Count	95	Count	95	Count	95	Count	95	Count	95

7.

Firm	Name	Event Date	Firm nr
ABG Sundal Collier Holding	Knut Brundtland	05.04.2010	1
ABG Sundal Collier Holding	Jan Petter Collier	09.07.2004	1
ABG Sundal Collier Holding	Ronald Jay Gould	20.10.2001	1
AF Gruppen	Morten Grongstad	15.10.2015	2
AF Gruppen	Pål Egil Rønn	11.04.2007	2
Akastor	Karl Erik Kjellstad	11.12.2017	3
Akastor	Kristian Monsen Røkke	16.07.2015	3
Akastor	Frank Ove Reite	30.04.2014	3
Akastor	Leif Hejø Borge	16.06.2010	3
Akastor	Simen Lieungh	22.01.2008	3
Akastor	Martinus Brandal	06.03.2006	3
AKVA Group	Hallvard Peter Bogh Muri	30.06.2016	4
American Shipping Company	Pål Lothe Magnussen	08.12.2014	5
American Shipping Company	Dag Fasmer Wittusen	02.06.2011	5
American Shipping Company	Robert Kenneth Kurz	06.11.2007	5
Apptix	Christopher Ernest Mack	23.08.2016	6
Apptix	David E Ehrhardt	17.12.2007	6
Apptix	Amirali Pyarali Hudda	13.04.2005	6
Atea	Steinar Sønsteby	31.01.2014	7
Atea	Claus True Hougesen	09.08.2007	7
Atea	Arne Agner Jensen	05.11.2001	7

Belships	Bernt Ulrich August Muller	28.04.2011	8
Bergen Group	Torgeir Nærø	08.11.2017	9
Bergen Group	Hans Petter Eikeland	28.08.2015	9
Bergen Group	Asle Solheim	07.05.2013	9
Bergen Group	Terje Arnesen	02.06.2011	9
Biotec Pharmacon	Christian Jørgensen	12.09.2017	10
Biotec Pharmacon	Svein Wilhelm Faye Lien	10.03.2010	10
Biotec Pharmacon	Lars Kåre Viksmoen	16.10.2006	10
Borgestad	Christen Knudsen	22.12.2003	11
Byggma	Geir Olav Drangsland	21.12.2008	12
Byggma	Per Jåtog	10.11.2005	12
Cxense	Christian Printzell Halvorsen	08.09.2017	13
Data Respons	Kenneth Ragnvaldsen	18.09.2003	14
Data Respons	Svend Heier	19.10.2002	14
Data Respons	Bent Brugård	14.03.2000	14
DNB	Rune Bjerke	28.06.2006	15
DNO	Bjørn Kenneth Dale	28.12.2012	16
DNO	Helge Eide	03.02.2000	16
DOF	Mons Svendal Aase	03.01.2005	17
Eidesvik Offshore	Jan Fredrik Meling	09.05.2005	18
Ekornes	Olav Holst Dyrnes	28.05.2014	19
Ekornes	Nils Fredrik Drabløs	03.12.2012	19
Ekornes	Øyvind Tørlen	23.06.2009	19
Electromagnetic Geoservices	Roar Bekker	30.01.2009	20
Element	Cecilie Grue	27.01.2017	21
Element	Henno Grenness	16.04.2013	21
Element	Jon Steen Petersen	10.01.2011	21
Element	Erlend Trygve Grimstad	04.04.2008	21
Element	Hans Christian Qvist	04.01.2007	21
Entra	Arve Regland	06.05.2015	22
Fred. Olsen Energy	Ivar Brandvold	12.08.2009	23
Goodtech	Eric Staurset	18.05.2016	24
Goodtech	Arve Teie	01.09.2014	24
Goodtech	Vidar Rune Låte	31.12.2005	24
Goodtech	Live Bertha Haukvik Aker	23.01.2002	24
Goodtech	Torbjørn Rene Richter Hoffstad	21.01.2000	24
Grieg Seafood	Morten Vike	06.03.2008	25
Gyldendal	John Tørres Thuv	27.05.2015	26
Hexagon Composites	Erik Espeset	29.06.2001	27
Hiddn Solutions	Jørgen Pleym Ulvness	13.12.2013	28
Hiddn Solutions	Geir Inge Solberg	04.08.2009	28
Hiddn Solutions	Simen Mørdre	10.03.2005	28

IDEX	Stanley Alvin Swearingen Jr	21.02.2018	29
Incus Investor	Bjørn Torkildsen	13.08.2015	30
Incus Investor	Jan Henry Melhus	31.10.2013	30
Incus Investor	Rolf Gunnar Roverud	29.08.2007	30
Incus Investor	Frode Alhaug	31.01.2005	30
Incus Investor	Odd Torland	22.12.2000	30
InterOil Exploration and Production	Pablo Creta	31.07.2017	31
InterOil Exploration and Production	Nigel John Duxbury	20.01.2015	31
InterOil Exploration and Production	Thomas Jonatan Nyegaard Fjell	19.12.2012	31
InterOil Exploration and Production	Rene Graf	08.03.2012	31
InterOil Exploration and Production	Tom Wolden	29.01.2010	31
Kitron	Lars Petter Nilsson	05.05.2014	32
Kitron	Dag Songedal	14.06.2013	32
Kitron	Jørgen Bredesen	18.05.2006	32
Kitron	Jan Thorstein Jørgensen	03.11.2004	32
Kongsberg Automotive	Henning Eskild Jensen	10.06.2016	33
Kongsberg Automotive	Hans Petter Havdal	12.02.2010	33
Kongsberg Gruppen	Geir Håøy	27.01.2016	34
Kongsberg Gruppen	Walter Hafslo Qvam	13.09.2007	34
Kværner	Idar Eikrem	23.02.2018	35
Lerøy Seafood Group	Helge Singelstad	19.11.2008	36
Medistim	Kari Eian Krogstad	14.11.2009	37
Navamedic	Per-Erik Håkan Josephsson	21.06.2013	38
Navamedic	Tom Juhani Ronnlund	23.04.2015	38
NEL	Erik Christensen	29.09.2006	39
NEL	Jon Andre Løkke	11.12.2015	39
NEXT Biometrics Group	Ritu Chanchal Favre	01.02.2017	40
Nordic Semiconductor	Sven Tore Larsen	06.05.2002	41
Norsk Hydro	Eivind Kristofer Reiten	13.12.2000	42
Norsk Hydro	Svein Richard Brandtzæg	12.01.2009	42
Norway Royal Salmon	Charles Høstlund	25.06.2014	43
Norwegian Energy Company	Scott Irving Kerr	19.05.2005	44
Norwegian Energy Company	Einar Gjelsvik	23.03.2011	44
Norwegian Energy Company	Svein Arild Killingland	13.05.2013	44
Norwegian Energy Company	Tommy Sundt	24.11.2014	44
Norwegian Energy Company	Silje Christine Augustson	13.10.2015	44
Norwegian Property	Svein Hov Skjelle	25.06.2015	45
Norwegian Property	Bent Oustad	19.10.2017	45

NRC Group	Håkon Jacobsen	15.02.2008	46
NRC Group	Dirk Blaauw	01.07.2009	46
NRC Group	Øivind Omar Horpestad	29.02.2016	46
NTS	Odd Ivar Løvhaugen	01.11.2001	47
NTS	Thomas Brobakken Geving	10.05.2012	47
NTS	Espen Ledang	07.10.2014	47
NTS	Harry Asmund Bøe	07.06.2016	47
Orkla	Finn Marum Jebsen	06.12.2000	48
Orkla	Dag Jakob Opedal	25.01.2005	48
Orkla	Bjørn Margido Wiggen	08.09.2010	48
Orkla	Åge Korsvold	28.04.2012	48
Orkla	Peter Arne Ruzicka	06.02.2014	48
Otello Corporation	Lars Rabæk Boilesen	05.01.2010	49
Panoro Energy	Jan Kielland	30.08.2012	50
Petroleum Geo-Services	Svein Rennemo	04.11.2002	51
Petroleum Geo-Services	Jon Erik Reinhardsen	21.02.2008	51
Petroleum Geo-Services	Rune Olav Pedersen	25.08.2017	51
Photocure	Kjetil Hestdal	17.12.2004	52
Protector Forsikring	Sverre Bjerkeli	20.07.2006	53
Q-free	Geir Ove Kjesbu	02.04.2004	54
Q-free	Øyvind Isaksen	14.06.2006	54
Q-free	Thomas Falck	06.01.2014	54
Reach Subsea	Svein Erik Thulin	12.05.2000	55
Reach Subsea	Trym Jacobsen	05.06.2007	55
Reach Subsea	Toril Eidesvik	14.05.2008	55
Reach Subsea	Kåre Johannes Lie	22.11.2012	55
Reach Subsea	Jostein Alendal	13.05.2014	55
REC Silicon	Ole Enger	30.03.2009	56
SalMar	Yngve Myhre	10.05.2011	57
SalMar	Leif Inge Nordhammer	13.01.2014	57
SalMar	Trond Williksen	11.05.2016	57
SalMar	Olav Andreas Ervik	09.04.2018	57
Sevan Marine	Reese Worth Mc Neel	10.10.2016	58
Storebrand	Odd Arild Grefstad	24.01.2011	59
Storm Real Estate	Einar Andre Pedersen	12.08.2016	60
Strong Point	Jørgen Waaler	27.02.2006	61
Targovax	Øystein Soug	01.11.2016	62
Techstep	Jørgen Bredesen	30.05.2003	63
Techstep	Teijo Petri Markkanen	25.10.2005	63
Techstep	Terje Walther Christoffersen	16.11.2007	63
Techstep	Karl Johan Torbjørn Sandberg	11.02.2009	63

Techstep	Anders Kjell Allan Harrysson	20.05.2011	63
Techstep	Lonnie Ray Schilling	12.12.2012	63
Techstep	Gaute Eskil Engbakk	19.10.2016	63
Techstep	Jens Haviken	28.11.2017	63
Telenor	Jon Fredrik Baksaas	26.04.2002	64
Telenor	Sigve Brekke	22.07.2015	64
TGS-NOPEC Geophysical Company	Robert Scott Hobbs	25.03.2009	65
TGS-NOPEC Geophysical Company	Kristian Kuvaas Johansen	09.03.2016	65
Tomra Systems	Amund Skarholt	01.03.2005	66
Tomra Systems	Hans Stefan Ranstrand	17.03.2009	66
TTS Group	Bjørn Gunnar Andersson	05.11.2013	67
TTS Group	Toril Eidesvik	25.04.2016	67
Veidekke	Arne Giske	06.12.2012	68
Voss Veksel- og Landmansbank	Einar Larsen	09.01.2014	69
Voss Veksel- og Landmansbank	Stig Gunnar Røthe	29.09.2017	69
Yara International	Jørgen Ole Haslestad	30.06.2008	70