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Learning by Failing, or Failing to Learn?

An empirical study of the effects of employing a CEO with bankruptcy experience in private companies in Norway

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i. Abstract

This thesis investigates the effects on company performance of employing a CEO with bankruptcy experience. Bankruptcy experience refers to that the incumbent CEO has previously filed for bankruptcy as CEO in another company. We have limited the treatment group to yield the first subsequent CEO positions after the former bankruptcy. Thus, our treatment group consists of 486 Norwegian private Limited Companies. The observation period is from 1998 to 2014. The treatment group is throughout the thesis compared to a control group with the same distribution by sector, year, pre-treatment revenues and profitability. By applying a four-step empirical strategy we analyze differences between the treatment- and control group with regards to credit rating, changes in profitability, drivers of company performance, and bankruptcy probability.

We find that CEOs with bankruptcy experience are employed in companies with significantly lower credit rating than what applies for the control group. Further, the profitability increases after hiring CEOs with bankruptcy experience, though from a lower level than in the control group. The ROA is on average negative in the treatment group for all three years following the CEO start. However, bankruptcy experience has no proven effect on the poor profitability. We have developed a bankruptcy prediction model, which yields significantly higher bankruptcy probability when adjusting for a CEO with bankruptcy experience. This suggests that employing a CEO with bankruptcy experience will increase the risk of filing for bankruptcy. By applying this improvement, investors and corporate banks will be able to better predict the bankruptcy risk for companies. The reason for the inferior performance and increased bankruptcy risk seems to lie in the selection of companies hiring such CEOs, rather than lack of skills in the treatment group.

This thesis supports existing literature with regards to effects from CEO turnover, CEO impact on corporate performance and potential effects from bankruptcy. Our findings contribute to the understanding of the interaction between Norwegian private companies, bankruptcy prediction and the CEO's previous bankruptcy experience.

Key words: Bankruptcy experience, Company performance, Bankruptcy prediction, CEO impact, CEO turnover.

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iii. Acknowledgements

With this thesis, we complete our Master of Science in Economics and Business Administration at the Norwegian School of Economics. Jørgen Færevaag completes his degree with a major in Business Analysis and Performance Management, and Lovise Sannes Krosby completes her double master's degree within Financial Economics and CEMS Master in International Management.

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1. INTRODUCTION

A bankruptcy could have great impact on the parties involved, on future professional opportunities, and future personal achievements. Considering CEO turnover, it is conceivable that a CEO's past success or failure might influence the current company's future performance and strategic direction. How a person manages to exploit life lessons from previous failure might be equally important as past accomplishments, with regards to future success.

Several thousand Norwegian companies file for bankruptcy each year. During the first six months in 2016, 2,515 companies filed for bankruptcy (Statistics Norway, 2016). To file for bankruptcy is somewhat associated with failure and considered a taboo in the Norwegian society. The Norwegian Trade and Industry Ministry, in cooperation with the Ministry of Justice, engaged Deloitte Advokatfirma in 2003 to conduct an analysis on the stigma on failure and legal consequences of bankruptcies in Norway. The report is built on a large survey of Norwegian business leaders, the Norwegian Advisory Council on Bankruptcy and organizations. The results demonstrate that it appears to be a strong stigma attached to bankruptcy among the public in Norway. The respondents believe that inexperience, financial problems, fraud, and managements' lack of knowledge may all be potential reasons for bankruptcy. Further, a vast majority of the respondents does not want to hire an insolvent person in their company. Those who hire such a person, are however unwilling to employ the person in executive positions, financial functions, or other positions that involve the management of substantial assets. This could suggest that Norwegian business leaders are somewhat hesitant to get involved with a person with recent bankruptcy experience. Thus, as a CEO of a Norwegian company that filed for bankruptcy, one are therefore likely to encounter skepticism in the society, and when seeking new employment. We will therefore investigate whether this is a reasonable skepticism or if CEOs with bankruptcy experience may possess valuable capabilities.

1.1. Motivation

To our knowledge, the effects on company performance from employing a CEO with previous corporate bankruptcy experience, is a field of study that is less researched. We find this to be an interesting topic, and have a strong desire to examine whether there is reason to expect that a former failure is predictive to future success, when employing a CEO with previous bankruptcy experience.

The analyses in this thesis are conducted on a large data set of Norwegian privately owned companies. The Norwegian principles of transparency and openness are essential for gaining access to such extensive data material. Privately owned companies constitute a greater part of the Norwegian economy than the attention given in academic research may suggest. Private companies account for 99.8% of all businesses in Norway and employ 78% of the Norwegian workforce. Nevertheless, the majority of research is done on publicly traded companies listed on the Oslo Stock Exchange (OSE) as these are very transparent and have easily accessible information (Berzins & Bøhren, 2009). We would like to oppose the academic norm where little attention is focused towards what is a significant part of the Norwegian business life. Our research is thus conducted on the most common company type in Norway, Limited Company (AS), and may be of interest to investors, suppliers, banks, and other stakeholders in the Norwegian business life. The use of data on privately owned companies in this thesis is will hence be a contribution to gain insight into a major part of the Norwegian business life.

The impact of the board and management may differ accordingly to the type of company. In a public company the board is responsible for the overall direction of the company, however, subordinate to the approval of the majority of shareholders. In a private company, the board of directors is the governing entity of the company. This implies that in private companies the control is within the firm through the board of directors, and is not directly related to external influence by shareholders. Further, the CEO in private Norwegian companies is usually represented in the board. Through the governance and responsibility, the CEO and board of directors therefore possess greater power to influence and execute in private companies than in public companies. Thus, investigating private companies is advantageously as the authority from external parties, e.g. shareholders, stock exchange, is not present to the same extent as in public companies. This will in hand result in that the control and authority is within the company, and the management would be able to affect the company performance more directly. The causal relationship is therefore more apparent to identify, when investigating private Norwegian companies and the impact of the CEO.

Further, since the board of directors and even chairman in Norwegian private companies generally have moderate influence over the daily operations of a company, we do not expect the responsibility for the bankruptcy to lie with them. Rather, the executive management would assumedly be the ones to truly gain experience from a bankruptcy. To limit our sample size to the presumably most influential role in private companies and the person formally in charge of

daily operations, we have exclusively researched the incumbent CEO of a bankrupt firm and followed this person's future career. The CEO's influence and power vary a lot between companies. Adams, Almeida and Ferreira (2005) found that factors affecting the power of the CEO include whether the CEO is the founder, if CEO is the only representative from the company in the board, and the size of the management group. We have not delved deeper into the CEOs' degree of influence and power in their respective companies, thus assuming the CEO is the most powerful decision maker in a company. Henceforth, the most interesting group to research with regards to bankruptcy experience and potential effects on company performance

We have formulated our research question on how private companies are affected financially by having a CEO with former bankruptcy experience. Further, we hypothesized if the CEO's first-hand experience with bankruptcy from former employment could influence the bankruptcy risk for a given company. Our literature review, addressed in section 2, on the field revealed no clear answers to these questions.

This thesis thus aims to shed light on the following research question:

What is the impact on company performance from employing a CEO with bankruptcy experience from their former CEO position?

Subordinately, we will examine the following three hypotheses:

1. CEOs with bankruptcy experience are employed in companies with the same credit rating as comparable companies.
2. A firm led by a CEO with bankruptcy experience will perform similar financially as comparable companies.
3. A firm led by a CEO with bankruptcy experience will have the same bankruptcy risk as comparable companies.

Hypothesis 1 will help us understand if there are any fundamental differences in the companies hiring CEOs with bankruptcy experience, which could affect the observed performance the companies employing such CEOs.

Hypothesis 2 address the core of our research as it could identify significant differences in performance between companies with and without a CEO with bankruptcy experience. The idea

that these CEOs should not perform significantly worse than their peers could be supported by the assumption that they "*may have gained valuable human capital as a result of the crisis experience*" (Eckbo, Thorburn, & Wang, 2014).

Hypothesis 3 assumes that the companies with CEOs with bankruptcy experience have the same bankruptcy risk as comparable companies. This idea is however not consistent with Kristiansen et. al.'s (2012) findings about the company structure NUF. They found that a NUF[1] company led by a person that during the last five years has been involved in a bankruptcy in another company, is statistically more prone to not complying with rules and regulations, and are more frequently filing for bankruptcy (Selseth, Thorsanger, Kristiansen, & Valmestad, 2012). This suggests that a specific company type may have higher bankruptcy frequency, which in hand inspired us to investigate if this prevails for Norwegian limited companies (AS). The relation between a CEO with bankruptcy experience and bankruptcy risk is central to our research question.

1.2 Structure

The remainder of the thesis is structured as follows: Section 2 briefly presents the most recent and relevant studies with respect to our research question. In section 3 the data set will be presented, including a description of the process of identifying the test population. Section 4 presents the experimental design including theoretical techniques, empirical strategies, and address how we will approach the research question. In section 5, descriptive statistics with regards to the data set is presented. Section 6 presents the conducted empirical analysis, results, and implications. Section 7 summarizes the findings, present concluding remarks, limitations, and offer suggestions for further research.

[1] NUF is a Norwegian Firm registered abroad (The Brønnøysund Register Center, 2016). See appendix 8.1 for a list of the most commonly used Norwegian company structures.

2. LITERATURE

In the following we present relevant literature with regards to CEO turnover, the role of the CEO, bankruptcy probability, and the financial and social effects of bankruptcy. However, existing literature does not demonstrate the interaction between private companies, the CEO's previous bankruptcy experience, performance, and bankruptcy prediction.

CEO Turnover

The change of CEO is a significant event for a company as it can impact future performance and strategic direction. Clayton, Hartzell and Rosenberg (2003) found that the equity volatility increases as a consequence of CEO turnover, regardless of whether it is a forced or a voluntarily departure. Forced departure increases the volatility even more than voluntarily departure, which is consistent with the assumption of large strategic changes in the event of forced departures. Further, when investigating public traded companies, Riise and Aune (2015) found that the market reacts positively to changes made to the company fundamentals, such as CEO turnover. However, none of the literature above address the effect of a CEO with bankruptcy experience in private companies following CEO turnover.

Role of CEO on Firm Performance

Gibson and Schroeder (2003) found that the CEO usually gets the blame for poor performance in a company, despite that a company has several important roles, positions, and people. The CEO position and the impact of the leader has been subject to extensive research and is a central part of management literature.

Mahoney and Weiner (1981) argues that the CEO has an impact on the variation in firm performance due to the influence on environmental and organizational issues, as well as the leadership style within the company. Adams, Almeida and Ferreira (2005) continue this line of argumentation, and their findings suggest that the interaction between the CEO's characteristics and organizational variables has significant consequences on firm performance. The profitability will thus vary significantly for companies lead by powerful CEOs that control the companies' decision making. Still, they do not address the consequences of having a CEO with bankruptcy experience. Several studies investigate CEO characteristics and how a certain skill set in a CEO affects a company's performance. Further, Bolton et al's (2009) results show that manager characteristics are important determinants of companies' financial policies. They find that overconfidence and resoluteness on one hand and empathy and team-related skills on the

other hand, are defining distinctions of managerial characteristics. Other literature revolves around the CEO as a person and how personality can impact leadership capabilities, and have a significant effect on company performance (Kaplan, Klebanoc and Sorensen 2012). Lastly, other studies examine the effect of general CEO characteristics, i.e. education, gender, undergraduate school, and family background (Gottesman, Morrey (2006) & Cox, Cooper (1989)). In sum, these studies are interesting as they in total can contribute to a better understanding of what kind of CEOs are likely to perform well in different settings based on key characteristics. The relevant studies examined in this thesis contribute to a better understanding of the role of the CEO. Nevertheless, this field of study is somewhat limited as the impact of a CEO's bankruptcy experience on company performance is not thoroughly researched.

Bankruptcy Effects

Although four to five thousand Norwegian private companies file for bankruptcy every year (Statistics Norway, 2016), there has been little research on how the CEO's career changes after this incident. However, a major contribution to the topic was made by Eckbo, Thorburn and Wang (2014), investigating the effects a bankruptcy has for the CEO involved. In their study the researchers follow American CEOs after a bankruptcy and examine the loss of future employment income and wealth. Their findings suggest that the median change in total annual compensation is not discernible for the CEOs that maintain full-time executive positions. However, there are CEOs failing to maintain full-time executive employment. For these CEOs, the median total compensation loss equal to 4.8 times the pre-departure income. Across the full sample of CEOs, the median human capital loss is $3.2 million or 3.1 times the pre-filing income (Eckbo, Thorburn, & Wang, 2014).

The common denominator for the papers we have reviewed and found relevant to the research is that they only examine one single dimension of a CEO turnover or bankruptcy effect. However, they do show that CEO turnover may impact future performance and strategic direction of a company, that the CEO plays an important role in a company, and that a bankruptcy has implications for the parties involved. Building on previous research, we investigate the companies of which CEOs with bankruptcy experience are employed, and examine if there are any changes in the companies' performance. If the CEO's previous bankruptcy experience is predictive for current company performance, our contribution to the literature would be of great interest to several stakeholders in the Norwegian business life.

3. DATA

This section explains the origin of our data material, and the process we have carried out to identify the test population for our research.

3.1 Data Sources

This thesis hails from four different data sources. Firstly, we have extracted all numbers that underlie our analysis from an accounting data set for all private Norwegian companies, from 1992-2014. The second data set includes enterprise and industry information from 1993 to 2014. Both data sets are derived from The Brønnøysund Register Centre[2], and have been collected and structured by SNF and Associate Professor Aksel Mjøs at the Norwegian School of Economics (NHH). The third data set includes all bankruptcies in Norway from 1993-2014. This data set is extracted from the Norwegian Register of Bankruptcies, an entity of The Brønnøysund Register Centre. The fourth data set is a register of all persons engaged in a formal role in Norwegian companies in the time-period 1998-2014. This data set is a separate extract from the The Brønnøysund Register Centre. We have gained access to this data through Finans|Bergen and Associate Professor Aksel Mjøs. As the time frame for the latter data set is shorter, the thesis is constrained by this time scope, 1998 to 2014. See appendix 8.2 for a complete overview of all variables in the data set.

3.2 The Process of Identifying the Treatment Group

The treatment group that is subject to our research, consists of companies whose CEO has bankruptcy experience.[3] The conditions for being in the treatment group is that *(i)* the bankruptcy experience must origin from a company of a certain size, *(ii)* the CEO with bankruptcy experience must have the position as the incumbent CEO for the current company we are researching, and *(iii)* the CEO must have left the bankrupt company before entering the incumbent CEO position.

[2] The Brønnøysund Registre Centre is the central Norwegian company register, https://www.brreg.no/home/.

[3] Bankruptcy experience refers to a CEO in a company who has experienced a bankruptcy in previous employment. Previous employment will in this matter only account for a former CEO position, and the current CEO position must be the first subsequent CEO position after the bankruptcy. This is important in order to capture the effects of the experience when it is at its most recent.

Regarding criterion *(i)*, The Norwegian Law on Annual Accounts (Regnskapsloven) §1-6 defines large companies as those that fulfills two out of three following conditions: Revenues >70 MNOK, Total Assets >35 MNOK and >50 FTEs.[4] We argue that these limits represent a conservative approach, excluding potentially interesting observations from a sample. To capture more of the bankruptcies, we applied the conditions for company size defined by Lien & Knudsen (2012). These limits states that a company is of a significant size if Revenues >10 MNOK and Labor Costs >3 MNOK. Lien & Knudsen (2012) states no requirements or limit to the valuation of assets and liabilities. However, as we want to identify the effect of bankruptcy experience, we would argue that the bankruptcy should be in a company of a certain size to have a significant impact on the CEO experience. Such companies are eligible to have a minimum of assets, even though this highly depends on the nature of the business. By calculating the relationship between Lien & Knudsen's (2012) constraints and the Norwegian Law on Annual Accounts, we find a 1:7 ratio for Revenues. Calculating a limit for total assets in the same ratio, provides a 5 MNOK limit. We find this adjustment to be appropriate as we then ensure that the CEO has bankruptcy experience from a company with considerable revenues, labor costs, and total assets. By applying the least rigorous conditions, the treatment group increase from 456 to 2158 companies.

After identifying all private companies that filed for bankruptcy between 1998 and 2014, based on criteria *(i)*, we extracted the names of all incumbent CEOs in the companies that filed for bankruptcy. This information was found by utilizing the data set including all bankruptcies in Norway from 1993-2014 and data set on formal roles in private Norwegian companies.

Figure 1 illustrates the process of identifying the treatment group. A total of 1,209 (56%) CEOs were found to be in a new CEO role after their previous bankruptcy. We have removed companies that: are not Limited Companies (LC), filed for bankruptcy the same year as the CEO started, companies where the CEO were employed before they filed for corporate bankruptcy, and companies where the CEO was employed for one year only (or less). We have limited the treatment group to yield the first subsequent CEO position after the bankruptcy, to study the companies where the bankruptcy experience is at its most recent.

[4] FTE = Full-Time Equivalents

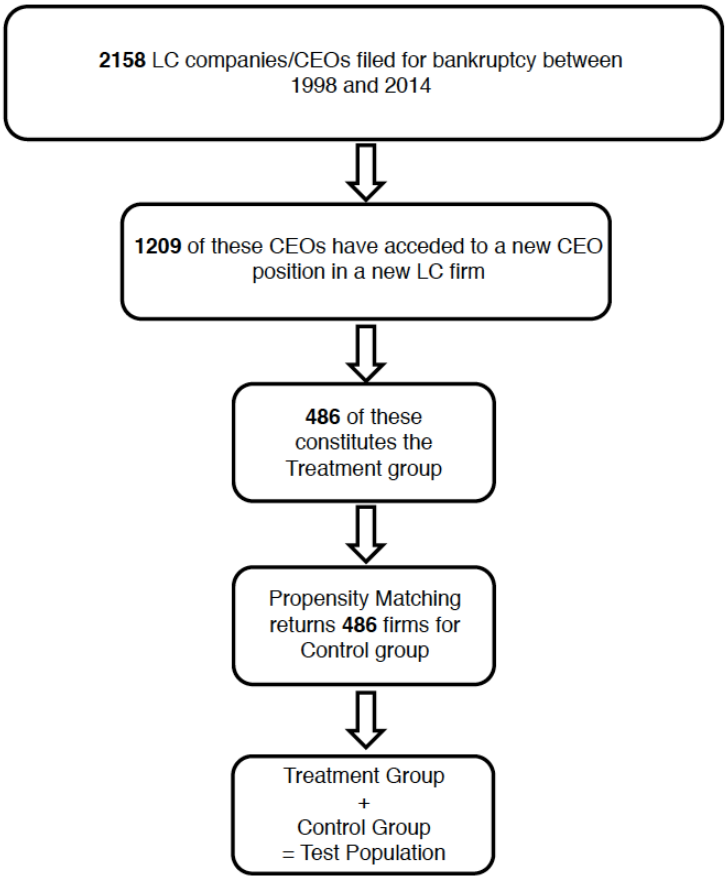


Figure 1: The Path to Identify the Test Population

The matching process is done utilizing the technique of propensity score matching. Ultimately 486 observations in 476 unique companies of 430 unique CEOs represent our treatment group. We have kept the 10 firms represented twice in the treatment group with different CEOs, as both observations of the company fulfill the criteria. The same yields for observations of the same CEO in different companies.

3.3 The Propensity Score Matching Process

We applied propensity score matching (PSM) to identify the companies that represent the best match for each company in the treatment group. The propensity score method is designed to mitigate the bias that may occur when comparing the effect of CEO's with bankruptcy experience between the treatment group and all other companies without such management characteristics. The method, first published by Paul Rosenbaum and Donald Rubin in 1983, computes a propensity score using a probit model. In the model the dependent variable is a dummy variable that in our thesis takes the value of 1 if the company has a CEO with bankruptcy experience, 0 otherwise. The independent variables are the matching criteria. After randomizing the population, the matching pair is found through the PSM process using the

PSmatch2 program in Stata, developed by Edwin Leuven and Barbara Sianesi in 2015. Despite being widely used and perhaps the most common method for researchers (Stuart, 2010), the propensity score matching is subject to criticism from several scientists, i.e. King & Nielsen (2016) and Moreno, Orzol, & Peikes (2008). King and Nielsen argue that propensity score matching in some cases may increase bias due to the attempt to approximate a completely randomized experiment, and that this, compared to a fully blocked randomized experiment, increases imbalance even relative to the original data. Further, nearest neighbor matching, our applied version of PSM, ignores the fact that some sample observations may have several close matches while other observations may only have one, as it picks the one best suited match regardless of the number and quality of matches (Stuart, 2010). As the propensity score matching is widely used in research and as there are no apparent better methods that obey the issues of bias, we use the PSmatch2. However, we acknowledge the issues of bias and the effects it may cause on the composition of our control group and the ensuing limitations this will have on our findings.

The companies are matched in year t_{-1}, to ensure that we have similar companies prior to the *treatment* for the treatment group. The *treatment* in this thesis indicates "employment of the CEO with bankruptcy experience".

An important delimitation for this thesis is that CEO turnover may impact firm performance, and we should ideally compare the treatment group with a control group that has changed their CEO at the same time. This would isolate the effects of bankruptcy experience, mitigating the interfering effects of a management change. However, adding a CEO turnover dummy as a matching criterion narrows the total test population to only a handful companies. This enforces a choice between considering CEO turnover effects or the performance variation between sectors and over time. This variation is considerable, and it is inexpedient to compare company performance across sectors and the entire observation period. Thus, the CEO turnover criterion has been abandoned to ensure intersectoral performance comparison, observations from the same business cycles, and a sufficiently large test population. Hence, the criteria for companies in the control group are:

i. The CEO does not have previous bankruptcy experience. That is, we know only this for certain within the period we have bankruptcy information from; 1993-2016.
ii. The company must be from the same sector.
iii. Accounting data must be from the same period as the treatment company.

iv. The total revenues, equity and liabilities and ROA should be as similar as possible.

Lastly, the treatment group companies were assigned with a "Sector-Year" variable, making 125 groups of the nine different sectors[5] for each of the 17 different years of observations. Henceforth, we used the nearest neighbor approach to assign a closest possible match for each treatment company within the "Sector-Year".

The propensity score matching process applies the following probit model[6]:

$$P(CEO\_With\_BankruptcyExperience = 1|X) = \theta(\beta_0 + \beta_1 Sector\_year + \beta_2 Operating\_revenues\_yearBefore + \beta_3 Total\_Assets\_and\_Liabilities\_yeareBefore + \beta_4 ROA\_yearBefore$$

The matching process returned a control group of 486 companies that we will use for comparison in the further analyses.

[5] See table 1, section 5, for an overview of the different sectors and the number of companies within each sector.

[6] See variable list, appendix 8.2.

4. EXPERIMENTAL DESIGN

This section presents the experimental design and the overall empirical strategy. By investigating credit rating, profitability, liquidity, solidity, and the risk of bankruptcy, we depict potential effects from having a CEO with previous bankruptcy experience. We have developed a four-step experimental design that address important influential factors derived from the hypotheses in section 1, and key theoretical techniques. The four-step experimental design, presented in figure 2, investigates the research question from different angles, providing a thorough analysis of the overall topic.

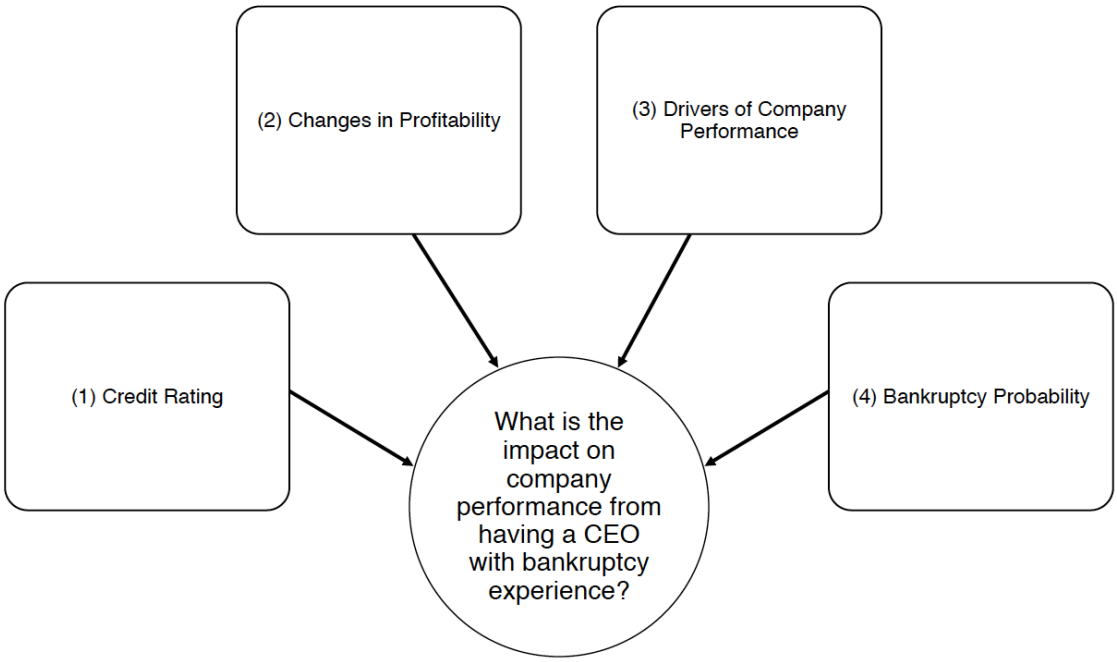


Figure 2: The Four-step Experimental Design

First, we aim to answer hypothesis 1 by examining the financial status of companies employing CEOs with previous corporate bankruptcy experience. This is interesting as it could connote the perception of bankruptcy in the Norwegian business life (Helsingeng, 2004). If CEOs with bankruptcy experience are employed in lower rated companies than the average in the control group, this could suggest that the perception of bankruptcy experience is negative and that CEOs with bankruptcy experience are perceived as having a negative effect on a company. Our sample consist of 486 pairs and 972 single observations, whereas half of the observations are companies having a CEO with bankruptcy experience. A paired t-test is an appropriate method for such a test population. Further, the t-test is relevant for our research as it may reveal the significance of the difference between the two groups (Student, 1908). This is examined on the industry data set, utilizing a two-sided paired t-test on the following hypotheses:

$H_0: \mu_T = \mu_C$ The population mean of the treatment group (μT) equals the hypothesized mean of the control group (μC).

$H_0: \mu_T \neq \mu_C$ The population mean of the treatment group (μT) does not equal the hypothesized mean of the control group (μC).

The findings and implications are presented in section 6.1

Second, we examine whether the companies' profitability changes after employing a CEO with bankruptcy experience. By investigating a wide range of different companies, it is inevitable that a common measure for all companies in the test population will have various precision and information value, especially across the different sectors. However, in the literature, a company's return on assets (ROA), which indicates whether a firm delivers sound profits relative to its investments, is a widely utilized measure for performance and profitability. For the rest of this thesis, ROA will be used as an indicator of performance. In step two, we have calculated ROA on a yearly basis for the companies in the test population, and examined the trend in ROA from t_{-3} to t_{+3}, where t_0 is the year the CEO was employed. This process is done on an aggregated level, and on a per sector basis. The analysis is based on accounting data and is interesting as we could identify potential significant changes in the profitability that could be caused by the CEO turnover. This analysis contributes to answer hypothesis two, and the findings and implications are presented in section 6.2.

Third, we examine the differences in performance between the treatment group and the control group, to identify whether the CEOs with bankruptcy experience cause any differences between the groups. We will investigate the differences in ROA between the groups using a two-sided paired t-test, explained in step 1. Further, to ensure a thorough analysis on drivers affecting company performance, we will present a difference-in-difference (DID) regression. This method is well suited to reveal the effect of a treatment, i.e. hiring a CEO with bankruptcy experience. We use DID to examine whether this treatment has causal effect on the profitability. The analysis is based on different accounting variables including a dummy variable on whether the company has a CEO with bankruptcy experience. We do not assume that one could identify effects in accounting data in the CEO's first year of employment (t_0). Implementing potential strategic changes together with the uncertainty of when during t_0 the CEO was employed, underpins the argumentation of excluding t_0 from the analysis. Further, we want to investigate the change in company performance after employing a CEO with bankruptcy experience. The difference between pre- and post-treatment ROA in the treatment group relative to the control group can be modeled as in the following simple DID regression:

$$ROA = \beta_0 + \beta_1(Treat) + \beta_2(Post) + \beta_3(Interaction) + \varepsilon$$

Where (*Treat*) is a dummy for whether the CEO has bankruptcy experience, (*Post*) is a dummy for if the observation is before (0) or after (1) the CEO start. (*Interaction*) is a dummy of value 1 when (*Treat*)=(*Post*)=1. Further we will expand the model running a difference-in-difference regression including additional explanatory variables, to capture more of what effects the ROA, and the difference from t_{-1} to t_{+1}.For the analyses to yield robust results, we have adjusted the extreme values in the upper and lower end of the observations by one percent, and applied robust variance estimates. The technique of trimming the sample is referred to as winsorizing. This analysis of change in ROA and the difference in change between the groups aims to answer hypothesis two. The findings and implications are presented in section 6.3.

Fourth, we address hypothesis three concerning bankruptcy risk for companies that have employed a CEO with bankruptcy experience. This is investigated through logit regressions. Further, to understand the potential effects from employing a CEO with bankruptcy experience, it is crucial to examine whether such companies have higher probability of filing for bankruptcy than companies without such CEOs. Thus, we have developed a prediction model calculating the probability of bankruptcy risk for the test population. The model is a logit-model based on the Norwegian Central Bank's highly acknowledged bankruptcy prediction model, SEBRA, conducted by Bernhardsen (2001). The model addresses a company's liquidity, profitability, solidity, age, size, and industry characteristics. There have been several versions of the model during the last fifteen years, however this thesis will apply the original model designed by Bernhardsen (2001) and the development by Bilberg (2013). We will not address the differences between our results and those presented by Bernhardsen and Bilberg as our test is conducted on a different test population. To provide sufficient answers on whether a CEO's former bankruptcy experience influence a company's probability of bankruptcy, this thesis aims to investigate this by further developing the SEBRA model, through including such a variable in the model. If a CEO with previous bankruptcy experience has an impact on the risk of bankruptcy, our research will benefit banks, other investors and stakeholders, and increase the validity of predicting the financial situation for companies in Norway, which the model is used for today.

The model has the following restrictions (Bernhardsen, 2001): (1) Only limited companies

(AS), (2) Governmental ownership should not exceed 50% due to the assumption these companies do not maximize profit, (3)Total assets must be larger than 250,000 NOK.

In part 6.4 we will present the results of the following logit analyses:

Model 1. Basic SEBRA, as presented Bernhardsen (2001)

$$(PBankruptcy = 1|X) = \beta_0 + \beta_1 eka + \beta_2 tkr + \beta_3 lik + \beta_4 lev + \beta_5 ube + \beta_6 a_1 + \beta_7 a_2 + \beta_8 a_3 + \beta_9 a_4 + \beta_{10} a_5 + \beta_{11} a_6 + \beta_{12} a_7 + \beta_{13} a_8 + \beta_{14} div + \beta_{15} taptek + \beta_{16} size + \beta_{17} meanlev + \beta_{18} meaneka + \beta_{19} sdtkr$$

Model 2. Basic SEBRA, including corporate group affiliation, as presented by Bilberg (2013)

Add: $\beta_{20} Part\_Of\_Corporation$

Model 3. Basic SEBRA, including corporate group affiliation and bankruptcy experience

Add: $\beta_{20} Part\_of\_Corporation + \beta_{21} CEO\_With\_BankEXP$

Defining the variables in the bankruptcy prediction model:

The *dependent variable*, Y, is a dummy variable on bankruptcy risk. The variable equals 1 if the company has filed for bankruptcy during the next three years. See appendix 8.3 for a thorough variable list for the model.

In the model, there are three variables for *liquidity*: lik (cash minus short term debt to revenue from operations), ube (outstanding payments to public dues) and lev (trade creditors to total assets). Bernhardsen (2001) comments that the need for liquidity is individual for the companies, thus one should be careful benchmarking based on measurements of liquidity. However, it is common that bankruptcy occurs due to liquidity issues, thus it is crucial to include this variable.

There is one variable that measures *profitability* (tkr), taking into consideration both driving factors for liquidity and solidity. This variable is necessary to include in the model as the profitability will influence the ability to obtain external finance. Henceforth, "the aspect of profitability is sought captured by a straight forward measure of return on capital" (Bernhardsen, 2001).

There are three variables for *solidity* in the model, eka, taptek and div. Bernhardsen (2001)

comments that for the contractual relationship between debtholders and shareholders, the capital structure is of great importance. The valuation of a company's assets is directly related to the book value of equity. Therefore, the eka variable could measure the company's exposure to financial risk, following that the financial risk is increasing with increased eka (Bernhardsen, 2001). As stated by the Private Limited Companies Act (Norway) §§8-1 and 3-4, a company in financial distress should not pay dividends if the risk of immediate insolvency is present. Under the assumption that legislation is obeyed, the variable dividend (div) is important to include as it could serve as a signal of solidity. Further, taptek measures "book value of equity less than the value of injected equity", and could give an indication on whether the company has lost equity during the financial year. This is important to include as it serves as a signal for solidity.

Further, there are 8 dummy variables that indicates the *age* of the company. The bankruptcy risk is assumed to be greater in the first couple of years as of a firm might need time to develop a functional organizational structure and sufficient management skills (Bernhardsen, 2001). Therefore, it is necessary to include this variable in the model.

Previous bankruptcy prediction models have found that the *size* of the company is a significant variable. However, Bernhardsen (2001) did not find this in his study. Bernhardsen found that if the "firm is sufficiently small, (administrative) bankruptcy costs will exceed the expected liquidation value of the firm, and thus the creditor may not want to initiate bankruptcy proceeding" (Bernhardsen, 2001). The size variable takes into consideration that smaller companies have a lower bankruptcy risk and is therefore important to include in the model.

Bernhardsen (2001) included 3 variables that are *industry* dependent, *meaneka*, *meanlev* and *sdtkr*. The variables are calculated based on a double-digit NACE industry code. The industry variables are traditionally used as a measurement of credit risk for Norges Bank and by including these variables we capture industry effects of the mean of "book value of equity to total assets", "trade creditors to total assets" and the variance of the profitability (tkr).

The variable *Part of Corporation* is included to capture potential effects from being part of a corporate group. We wish to include both sides of mutual transactions and will therefore use a dummy-variable including all companies with corporate group affiliation.

The variable *CEO With BankrEXP* indicates whether the CEO has bankruptcy experience. This represents a further development of the model. The purpose of including this dummy-variable is to identify whether bankruptcy experience could influence the bankruptcy risk of a company.

Lastly, the test population in this thesis differs from both Bernhardsen (2001) and Bilberg (2013). The sample is not chosen over *one* specific time-period but it is dependent on when the CEOs with bankruptcy experience were employed in the current company. This could lead to different coefficients and results than Bernhardsen and Bilberg found. However, it is not reasonable to assume that it will impact the validity of the results. The result from bankruptcy prediction supports and strengthens our research, and is highly relevant to present a thorough analysis of the research question. Lastly, it will be necessary to conduct tests of robustness, in order to address the validity of the new model.

Test of Robustness

Likelihood ratios test

A likelihood ratio test identifies the significance of including one or several new variables. The likelihood function is maximized by setting all coefficients equal to zero and then run the iteration process until it converges. The likelihood ratio can be calculated mathematically as follows (Tufte 2000): $G^2 = -2(L_0 - L_1)$

where L_0 is the log likelihood in the original model and L_1 is the log likelihood from the model including new variables. The test of significance has a G^2 distribution, which is approximately equal the chi-square distribution with the degrees of freedom given by the difference in the number of independent variables in the two models.

Pseudo R2

The logistic regressions equivalent to OLS' R^2 is the Pseudo R2, which is a "goodness of fit". The Pseudo R2 is defined by McFadden's (1973) approach:

$$Pseudo\ R2\ = \frac{\ln L_0 - lnL_K}{lnL_0} = 1 - \frac{lnL_K}{lnL_0}$$

L_0 is the log likelihood of the model that only includes the constants, thus having coefficients equal to zero. L_K is the log likelihood for the entire model. The Pseudo R2 will lie in the interval $\in \{0,1\}$. The interpretation of Pseudo R2 is challenging, however if Pseudo R2 increases by including new variables, it implies a better result (Kohler, Kreuter 2005).

The Receiver Operating Characteristic curve (ROC)

The ROC curve displays, in this thesis, the trade-offs between incorrect classifications of the non-bankrupt cases and the correct classifications of the bankruptcy cases (sensitivity). The measure of discriminatory power appears under the curve and above the 45-degree line, and identify the model's precision with regards to prediction. If the area under the curve equals 0.5, the model has no explanatory power (Bernhardsen, 2001). See appendix 8.8.

5. DESCRIPTIVE STATISTICS

This section presents key descriptive statistics on our test population. The data presented will in sum provide an overview of the sectorial, geographical and financial diversity for the companies subject to our research. It is necessary to understand the rationale behind our research, the key characteristics about the companies and incumbent CEOs in the test population, to further understand the justifications behind the analyses of performance and risk presented in section 6.

Table 1 presents the difference within the test population with regards to corporation affiliation, bankruptcy frequency, CEO gender, geographical location, and sectors.

CEO with Bankruptcy Experience	Control Group		Treatment Group		Test Population	
Part of corporation						
No	336	*69.1%*	271	*55.8%*	607	*62.4%*
Yes	150	*30.9%*	215	*44.2%*	365	*37.6%*
Bankrupt Firm						
No	460	*94.7%*	414	*85.2%*	874	*89.9%*
Yes	26	*5.3%*	72	*14.8%*	98	*10.1%*
CEO Gender						
K (female)	45	*11.3%*	19	*3.9%*	64	*7.2%*
M (male)	352	*88.7%*	467	*96.1%*	819	*92.8%*
Geographic Area						
INNLANDET	29	*6.0%*	24	*5.0%*	53	*5.5%*
NORD-NORGE	38	*7.8%*	45	*9.3%*	83	*8.6%*
SØRLANDET	27	*5.6%*	26	*5.4%*	53	*5.5%*
TRØNDELAG	27	*5.6%*	33	*6.8%*	60	*6.2%*
VEST-VIKEN	66	*13.6%*	60	*12.4%*	126	*13.0%*
VESTLANDET	129	*26.6%*	117	*24.2%*	246	*25.4%*
ØSTVIKEN	169	*34.8%*	179	*37.0%*	348	*35.9%*
Sector of Operations						
Agriculture	11	*2.3%*	11	*2.3%*	22	*2.3%*
Offshore/Shipping	11	*2.3%*	11	*2.3%*	22	*2.3%*
Transport	17	*3.5%*	17	*3.5%*	34	*3.5%*
Manufacturing	45	*9.3%*	45	*9.3%*	90	*9.3%*
Telecom/IT/Tech	20	*4.1%*	20	*4.1%*	40	*4.1%*
Construction	160	*32.9%*	160	*32.9%*	320	*32.9%*
Wholesale/Retail	104	*21.4%*	104	*21.4%*	208	*21.4%*
Finance	6	*1.2%*	6	*1.2%*	12	*1.2%*
Other services	112	*23.0%*	112	*23.0%*	224	*23.0%*

Table 1: Corporation Affiliation, Bankruptcy Frequency, CEO Gender, Geographical Location, and Sector of Operations for the Test Population

From the table, we observe that corporation affiliation seems to be more frequent in the treatment group. The variable identified as "part of a corporation", is defined as having a company investor owning more than half of the company, i.e. being a subsidiary.

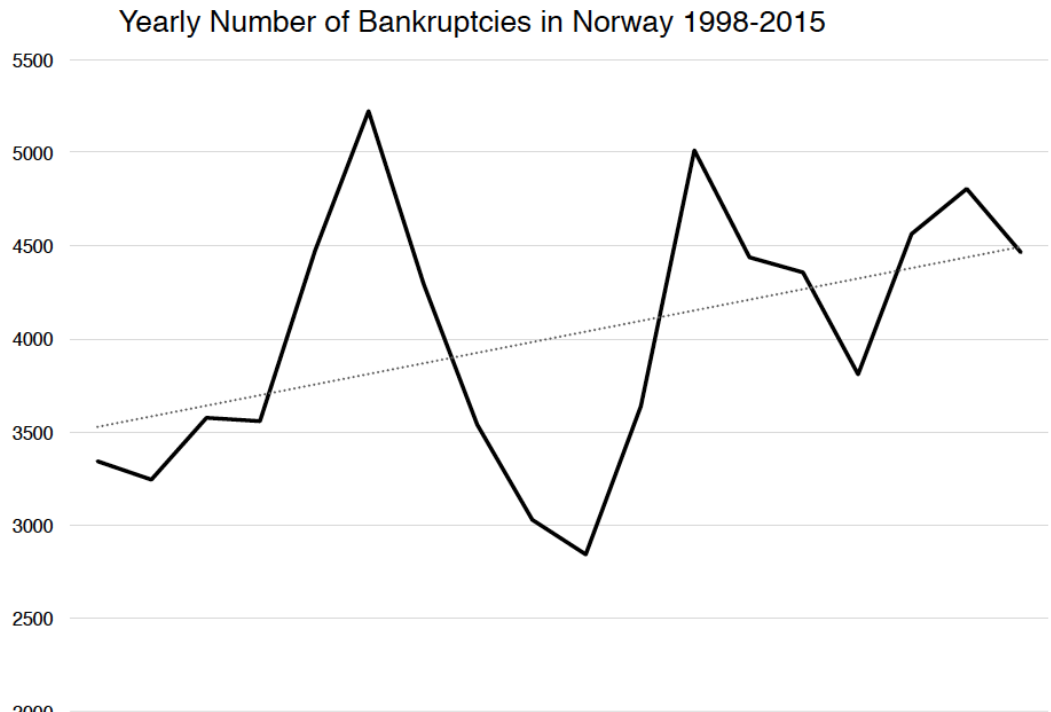
The bankruptcy frequency, defined as how many companies that filed for bankruptcy between 1998 and 2014, is almost three times higher in the treatment group. This is relevant to hypothesis 3 from section 1, as we intend to investigate whether there is a significant difference in the probability of filing for bankruptcy when employing a CEO with bankruptcy experience (treatment group) compared to a CEO without such characteristics (control group). To put the numbers on bankruptcy frequency into context, in 2015 there were 209,557 LC (AS) companies registered in Norway (Statistics Norway, 2015), of which 3,115 (1.49%) filed for bankruptcy (Statistics Norway, 2016). The bankruptcy rate in our test population is 11.2%, which is higher than for the average of the same company type in Norway.

Further, equal gender distribution is not present in either groups, but it is more unevenly distributed in the treatment group. There are 89 companies in the control group lacking gender data, thus the total is 883, not 972. In the control group, 11.3% of CEOs are female, while the frequency is only 3.9% in the treatment group. This suggest that more men than women have filed for bankruptcy. The geographical distribution of the companies is widespread, with more abundant representation from Vestlandet and Østviken, which is consistent with the population distribution in Norway[7]. Lastly, the control group is matched on the combination of sector and year, and hence assume the same sectorial distribution and yearly distribution as the treatment group. From table 1, we observe that the Construction and Wholesale/Retail sectors account for more than half of the companies in the test population. The sector Other Services is also significant. However, one should be careful when interpreting any findings and results from this sector, because companies in the treatment group were assigned to the sector Other services before the matching process if they were not registered with a sector.

Table 2 shows the fluctuation over time in number of bankruptcies on a yearly basis between 1998 to 2015. The trend curve shows an increase in number of bankruptcies over time,

[7] See appendix 8.4 for a map of Norway and the location of the area addressed

consistent with the increase in total number of firms in Norway. These numbers are for all company types across all sectors, and areas in Norway (Statistics Norway, 2016).



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
# of Bankruptcies	3347	3243	3576	3562	4473	5223	4297	3540	3032	2845	3637	5013	4435	4355	3814	4564	4803	4462

Table 2: Bankruptcy Frequency in Norway 1998-2015, the x-axis Illustrates Year and Number of Bankruptcies

From table 3, below, we observe when the 98 bankruptcies in the test population occurs. The distribution over the period is quite even with two notable peaks in 2005 and 2009. The peak in 2009 may be related to the financial crisis in 2008, that caused an increase in bankruptcies in Norway (see table 2). The peak in 2005 is not obviously related to any macro economical events, as there was no peak in bankruptcies in Norway from 2005 in table 2. Lastly, the majority of the company observed in our study is from the last six years.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	*Sum*
Bankruptcies per Year	1	3	7	7	9	13	7	7	7	12	7	3	7	6	2	*98*
Observations per Year	4	20	46	48	74	54	40	44	48	90	80	76	90	184	74	*972*

Table 3: Bankruptcies in Test Population by Year

The number of bankruptcies for each CEO in the treatment group is relatively even with 89% of the CEOs having one or two bankruptcies to draw experience from. Table 4 illustrates that of the 430 CEOs in the treatment group, 301 have only experienced one bankruptcy as incumbent CEO. 82 CEOs have experienced two bankruptcies, 27 have experienced three

bankruptcies, 11 have experience four bankruptcies, and 8 have experienced five, six or seven bankruptcies. Lastly, one single person has experienced 29 bankruptcies. It is important to note that for the CEOs that have experienced several bankruptcies the reasons could be interdependent, i.e. being part of a corporate group.

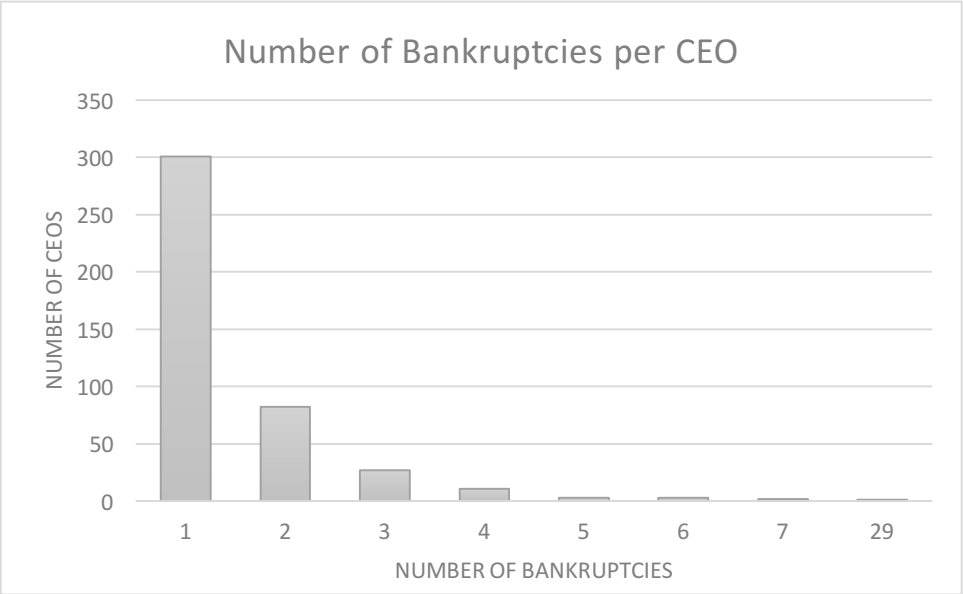


Table 4: Bankruptcies per CEO in Treatment Group

From table 5, the age distribution for the CEOs is about the same in the treatment- and the control group. The median age is 55 years in both groups. The average age is 55.19 and 55.55 years in the treatment- and control group, respectively. Note the slightly uneven distribution across age groups, with a higher frequency of young leaders under 40 years in the control group than in the treatment group. This could imply that young leaders are not more prone to having bankruptcy experience.

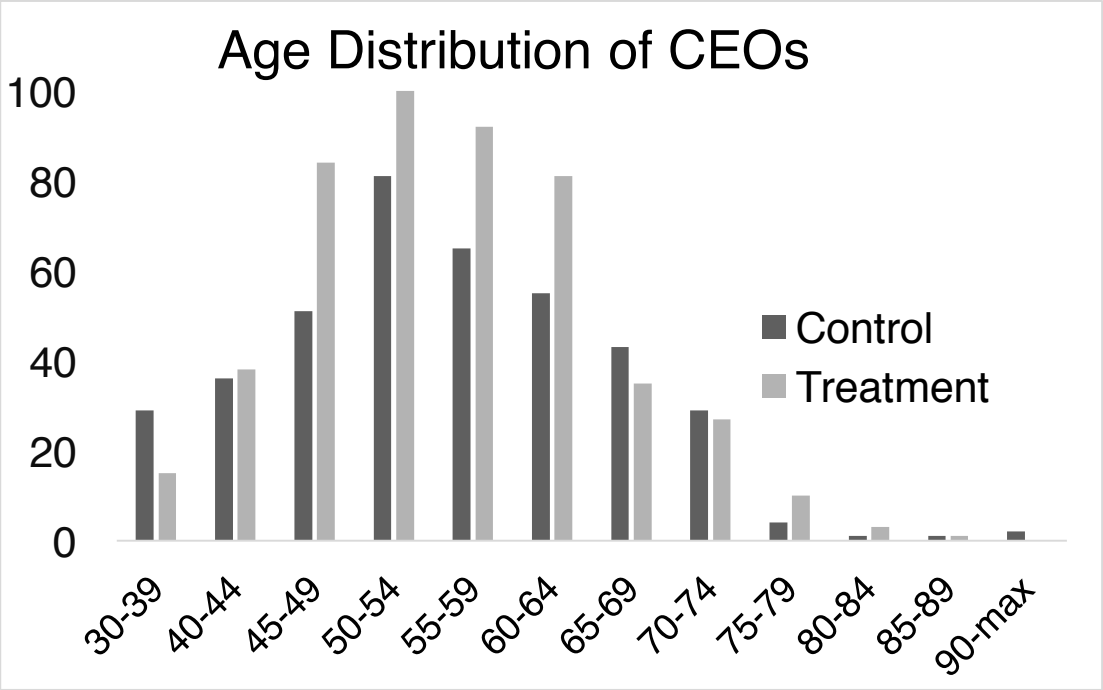


Table 5: Age Distribution in Test Population

Summary of Descriptive Statistics

Summing up, the descriptive statistics show that the geographical and sectorial distribution is similar between the treatment group and the control group. However, the frequency of corporation affiliation and bankruptcies is greater in the treatment group than in the control group. Further, we observe that there are less companies being part of corporate groups that file for bankruptcy than the reverse. There is an apparent contradiction that the treatment group are both more frequent part of a corporation and has a higher frequency of bankruptcies. The age distribution is the same in the two groups. The representation of female CEOs in the treatment group is 3.9% while it is 11.3% in the control group. The fact that only 19 women have bankruptcy experience is interesting, however it is not reasonable to draw any conclusions based on this, as it merely could be a result of more men holding leading positions than women. Lastly, 89% of the CEOs in the treatment group have one or two bankruptcies to draw experience from, while the remaining have experienced more than two.

6. EMPIRICAL ANALYSIS

This section presents the different analyses conducted and the results they yield. The four-step experimental design from section four provides a structure for the analyses, and each step is presented with concluding remarks and implications.

6.1 Credit Rating

The first step in our analysis is to investigate whether CEOs with bankruptcy experience are employed in companies with the same credit rating as comparable companies, i.e. control group. We examine this in two steps, (*i*) compare the differences in credit rating distribution in the treatment group, the control group and the average of NLCs, and (*ii*) investigate whether there are any significant differences in the credit rating between the companies in the treatment- and control group. The latter is analyzed using inferential statistics. The implications following this analysis will contribute to the understanding of the financial condition of the companies employing CEOs with bankruptcy experience. Further it will reveal if there is any apparent stigma against bankruptcy experience in the Norwegian business life, as addressed in the analysis conducted by Deloitte Advokatfirma (2004). We have analyzed the CEO start year (t_0)[8] as we want to investigate the credit rating at the time the CEOs from the treatment group were employed. The data is extracted from the industry data set on Norwegian Limited Companies between 1998 and 2014.

Table 6 address step (*i*) and displays the distribution of credit rating, from AAA to C[9] in the test population. 211 companies have "no rating" or missing values[10]. We observe some differences in credit rating between the treatment- and control group. In the treatment group, 62% of the companies have A to AAA rating, and in the control group 72% of the companies have such characteristics. Further, 22% of the companies in the treatment group have B rating and 11% have C rating, while for the control group, 18% have B rating and 3% have C rating.

[8] CEO start year for the test population vary from 2000 to 2014, table 3 (section 5).

[9] Credit rating in the data set (Dun & Bradstreet Inc, 2010): *AAA* (Highest credit worthiness), *AA* (Good credit worthiness), *A* (Credit worthy), *B* (Credit with safety measurements), and *C* (Credit advised against).

[10] Missing observations could be due to credit rating in the data set is only between 2005 and 2013 (Berner, Mjøs, & Olving, 2015).

CEO with Bankruptcy Experience	Control Group		Treatment Group		NLC	
D&B credit rating						
Not rated	10	*3 %*	6	*2 %*	33,046	*2 %*
C	13	*3 %*	44	*11 %*	6143	*3 %*
B	70	*18 %*	85	*22 %*	38326	*19 %*
A	114	*29 %*	136	*35 %*	766186	*38 %*
AA	123	*32 %*	84	*22 %*	525284	*26 %*
AAA	43	*11 %*	20	*5 %*	192626	*9 %*
Bankrupt/Terminated	16	*4 %*	13	*3 %*	77,679	*4 %*
Total	389		388		2,039,511	
Average rating	3.311		2.867		3.563	

Table 6: Credit Rating in Test Population (Note that AAA=5, AA=4, A=3, B=2, C=1)

From table 6, we observe that the average rating is 3.311 in the control group and 2.867 in the treatment group. Further, the average credit rating in all Norwegian Limited Companies is 3.563. Further, "not rated" and "bankrupt firms" are omitted from the test. From this we conclude that there are observable differences.

Table 7 addresses step (*ii*) and presents the results from the two-sided paired t-test. The model tests whether the credit rating is significantly different between the treatment group (TCR) and control group (CCR).

The hypothesis tested: $H_0: \mu_{TCR} = \mu_{CCR}$ $H_0: \mu_{TCR} \neq \mu_{CCR}$

Two Sided Paired T-test with Equal Variances

	Observations	Coefficient (mean)	Std. Dev
Treatment Group	363	3.311295	1.027016
Control Group	369	2.867209	1.0664
Test Population	732	3.087432	1.069669
Difference		0.4440861	

T-statistic = 5.7373 Ha: diff > 0
Degrees of freedom = 730 P (T > t) = 0.0000

Table 7: Two-sided Paired t-test on Credit Rating between the Treatment- and Control Group

From table 7, we observe that the difference is significant with a p-value of 0.0%, and that the companies in the control group on average is rated 0.444 higher than the companies in the treatment group. We can thus conclude that the credit rating for the companies employing CEOs with bankruptcy experience is significantly lower than in the control group. However, we may not conclude that the rating for the companies in the treatment group is poor in absolute terms, as table 6 shows that only 11% of the companies are rated with a C. On average, though, the rating grade is 0.444 lower in the treatment group than in the control group.

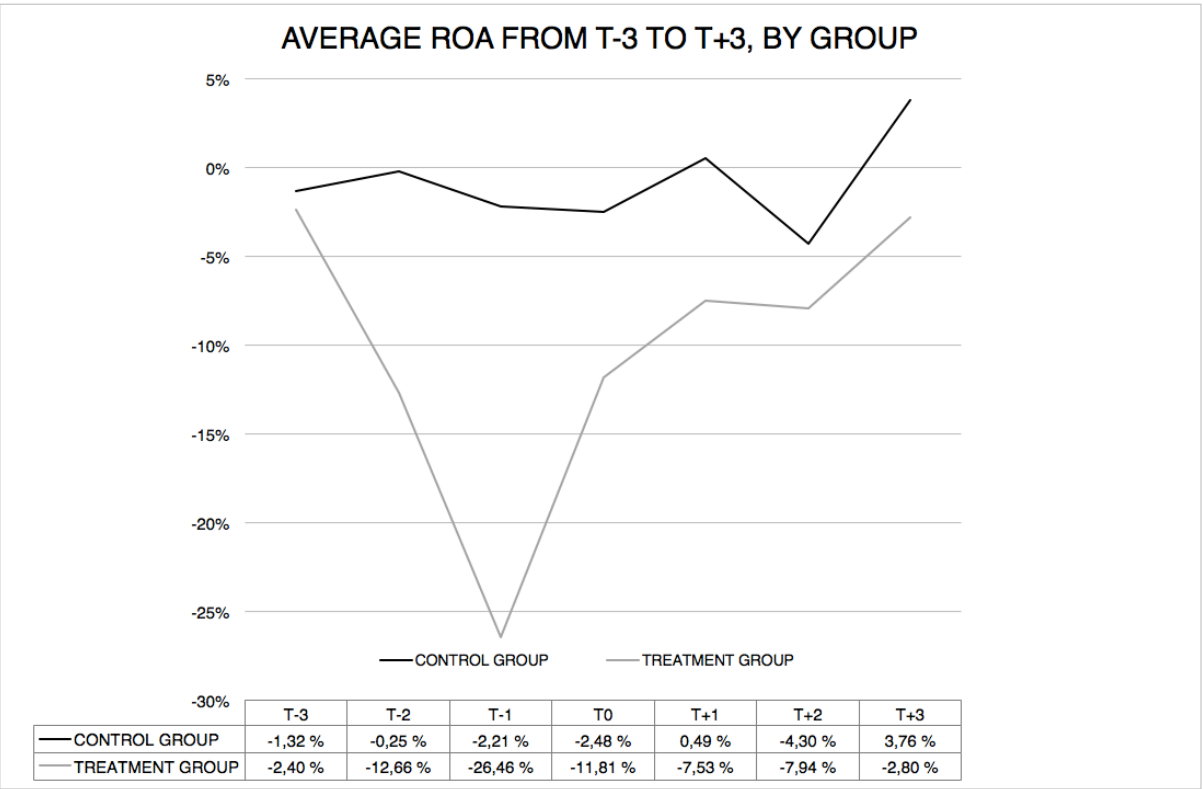
Summing up, from step (*i*) we observed that there are differences when comparing the credit rating distribution, and that the treatment group has observable lower credit rating than the control group and the average of NLCs. Further, from step (*ii*) we can conclude that there is a significant difference in credit rating between the control and treatment group. This could indicate that CEOs with bankruptcy experience encounter skepticism when applying for new employment. This is consistent with the analysis on stigma conducted by Deloitte Advokatfirma (2004), that suggested that Norwegian business leaders are somewhat hesitant to get involved with a person with recent bankruptcy experience. Further, the study conducted by Eckbo, Thorburn and Wang (2014) investigates how costly a corporate bankruptcy is for top executives, with regards to CEO career and human capital. The findings from the analysis above builds on this paper and shows that a bankruptcy could also influence the type of company that those who maintain full-time executive employment enter. However, this only accounts for the first executive employment after the corporate bankruptcy. Further our study is conducted on Norwegian Private companies while Eckbo, Thorburn and Wangs' (2014) study investigated US companies that filed for a chapter 11 bankruptcy. Hypothesis 1 should be rejected as we find significant evidence that credit rating of the treatment group is worse than in the control group, with 0.44 lower credit rating on average. This finding is a suggestion of that bankruptcy experience may delimit the career opportunities in the future.

Conclusion: Hypothesis 1 is rejected as the credit rating is significantly lower for companies that have a CEO with previous bankruptcy experience compared to the control group. We observe that the difference between the treatment group and the average rating of all Norwegian Limited Companies is even greater than the difference between the control and treatment group.

6.2 Changes in Profitability

In this section, we want to examine if the profitability for the companies in the treatment group has changed after employing a CEO with bankruptcy experience. The implications following this analysis will be valuable as of the contribution to the understanding of such an event and by presenting implications for CEO turnover in Norwegian Limited Companies. The analysis is simple, however, we argue that potential findings will be of importance for our research and is valuable for investors investing in Norwegian private companies.

Table 8 presents the difference in ROA from t_{-3} to t_{+3} for the treatment group and control group. Table 9 presents ROA for the treatment group and on a per sector basis. The ROA is winsorized on a 2.5% level to eliminate effects of extreme outliers. From table 8, we observe that the profitability of the companies in the treatment group increases from the year of CEO employment (t_0), however from a level of negative ROA. Further, the ROA does not on average reach a positive level within t_{+3}. The profitability in year t_{-3} to t_{-1} is low, i.e. with an average of negative 26.46% in year t_{-1}. This suggests that CEOs with bankruptcy experience are employed by companies with poor financial performance, which is consistent with the implication from 6.1. The ROA in the treatment group is lower in the control group over the whole period.



	T-3	T-2	T-1	T0	T+1	T+2	T+3
CONTROL GROUP	-1,32 %	-0,25 %	-2,21 %	-2,48 %	0,49 %	-4,30 %	3,76 %
TREATMENT GROUP	-2,40 %	-12,66 %	-26,46 %	-11,81 %	-7,53 %	-7,94 %	-2,80 %

Table 8: Average ROA by Year in Treatment and Control Group

Lastly, from table 8 we observe no clear drop in ROA after CEO start for the treatment group, rather the opposite. The decrease seems to take place prior to the employment. This implies there is no seemingly decline as of the hire of a CEO in the treatment group. The profitability in companies employing such CEOs is however much lower than in the control group.

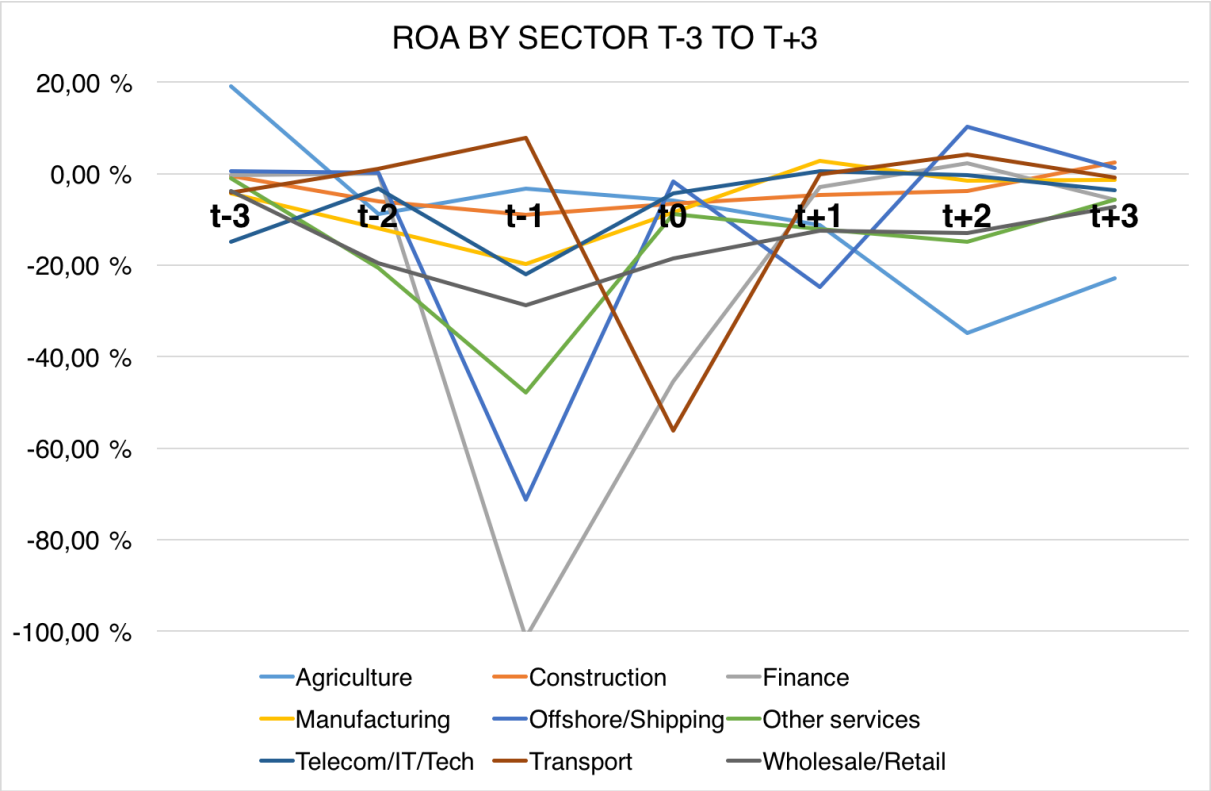


Table 9: Average ROA by Sector in Treatment Group

From table 9, we observe the variance of ROA between sectors in the treatment group. Construction, Wholesale/retail, and Other Services are the sectors where most companies are represented (see table 1, section 5). Nevertheless, we cannot observe any major changes in ROA within these sectors as of employing a CEO with bankruptcy experience. Agriculture changes from positive to negative ROA, on average, by hiring a CEO with bankruptcy experience. Finance, offshore/shipping and transport experience, however, experience a positive change in average ROA from hiring a CEO with bankruptcy experience.

In sum, the companies in our treatment group performs poorly prior to employing a CEO with bankruptcy experience, indicating that the CEOs on average are employed by companies with low profitability. This is in line with the analysis of credit rating, showing a significant lower credit rating in the treatment group, with a difference in the mean credit rating at 0.44. Further, a CEO turnover is a significant event as it could impact future performance and strategic direction for a company. Clayton, Hartzell and Rosenberg (2003) found that a CEO turnover could result in increased volatility as of large strategic changes, and henceforth a reduction in profitability as of divesting. This could further imply that the CEO's in the treatment group are performing well, despite the negative level of ROA. Additionally, we observe that the ROA

trend is shifting upwards after t_0, underpinning that the CEOs seem to perform well. However, the suggestions from Clayton, Hartzell and Rosenberg (2003) was concentrated on forced departures. Our thesis does not investigate each specific company the CEOs enter, thus we do not know the reason for the CEO turnover for the companies in the treatment group.

Conclusion: Our findings suggest that the CEOs with bankruptcy experience are employed in companies with poor financial performance with a negative ROA on average. Further, the CEOs account for considerable improvements in performance on average, despite that the improvement is within the range of negative ROA. This indicates that the CEOs manage to exploit life lessons of past failure, and that the CEOs with bankruptcy experience that are re-employed as CEOs, may manage to improve their company's performance.

6.3 Drivers of Company Performance

In this section[11], we will initiate the third step from the experimental design, investigating what drives the performance (ROA) for our test population, and if there are any differences in these drivers between the treatment group and the control group. In this way, we will answer hypothesis 2 stating that "*A firm led by a CEO with bankruptcy experience will perform similar financially as comparable companies*". The implications of our findings from this analysis is the essence of our research question, as any significant differences in financial performance due to employment of CEOs with bankruptcy experience, will be a key part of the total effects.

Using inferential statistics (see appendix 8.5), we have examined the difference in ROA between the Treatment and control groups from year t_{+1} to t_{+3}. We have not separated between CEOs starting in January and December, so the results from the CEO start year (t_0) are thus omitted. The tests indicated a difference for t_{+1} with 14,8% lower ROA in the treatment group with a p-value at 0,0028. In t_{+3} the difference is 8,3% lower ROA in the treatment group. The test for year t_{+2} was not significant. Our analysis shows that ROA is significantly different in two of the three years, suggesting rejection of the null hypothesis and concluding that ROA is

[11] Statistical significance level is measured using the p-value. The following notation *, ** and *** will annotate the statistical significance at a 10%, 5% and 1% level, respectively.

significantly lower for the companies in the treatment group than in the control group. However, the difference in year t_{+2} is not significant, suggesting to keep the null hypothesis. The variation in ROA between years hinder us to draw clear conclusions on the differences in our test population's performance at this point.

Difference-in-Difference regression

The t-tests revealed significant differences in ROA from t_{+1} and t_{+3}, yet a remaining question is where this difference derives from and whether the differences are random coincidences or the result of an intrinsic dissimilarity between the groups. A difference in difference (DID) regression may indicate if the difference between two groups could derive from a given treatment. If we find significant differences in this model, we can reject the null hypothesis. The Y-variable tested is the ROA (winsorized on 1%) in the year before CEO start as baseline (t_{-1}), and the year after CEO start as follow-up (t_{+1}). Thus, we are testing if the difference in the change in ROA is equal between the two groups over time. We have defined year t_0 as the treatment, implying that to hire a CEO with bankruptcy is what differs the treatment group from the control group. We present two versions of the DID test in table 10, as explained in section 4. Model 1 includes only the dummies for Treatment, Post and Treatment*Post. The latter represents the interaction between Treatment and Post, and indicates the effect of the treatment. This model suggests that the treatment has no significant impact, however the ROA in the treatment group is significantly lower than in the control group. In Model 2 we add variables addressed in section five that represent differences between the groups, and accounting variables.

Variables	Model 1	Model 2
Treatment	-.17700061* (0.078)	-.32053782 ** (0.035)
Post	.11565493 (0.248)	.00914039 (0.909)
Treatment*Post	.02088448 (0.864)	.16508138 (0.182)
TKR		.0945093 *** (0.003)
BIG_Auditor		.17305458 *** (0.001)
Dividend Paid		.34065368 *** (0.000)
Operating Profits		5.556e-06 ** (0.016)
Taxes		-.00001356 * (0.064)
Controls		-.01158632 (0.714)
Industry		.02785227 *** (0.004)
_cons	- .18906546 *** (0.006)	-.35011922 ** (0.019)
Observations	1,693	1,449
Mean VIF	2.26	1.81
R-squared	0.047	0.3451

Table 10: Difference In Difference regression for ROA

Table 10 shows the coefficients and p-values (in parentheses) for variables affecting the ROA in the test population. From Model 1 we see that the *Treatment* (employment of the CEOs with bankruptcy experience) has a significant negative impact on the ROA compared to the control group. However, the variable *Treatment*Post* is not significant, implying that the difference between the groups do not derive from the treatment in itself. For further investigations, we apply more explanatory variables.

From Model 2 we learn more about what factors affects the ROA, and note that the significance has increased and the coefficient for the CEO with bankruptcy experience has further declined. This implies an even greater difference in ROA between the two groups. The *Treatment*Post* variable is still not significant, and we cannot conclude that the difference we observe in ROA

is due to the *Treatment*. Nonetheless, we observe the same differences in performance revealed in section 6.2. Further, *TKR* measures the profitability from the operations and should thus explain a significant part of the ROA. *Big Auditor* refers to having an auditor from the Big Five[12], and is positively correlated with revenues, meaning that it can be viewed as a proxy on firm size. This variable has a positive effect on ROA. *Dividend* paid is a dummy indicating if dividend was paid in year t_0. The variable could be sought as a signal of being profitable as Norwegian Legislation states that a company in financial distress should not pay dividends if the risk of immediate insolvency is present. Henceforth, the variable represents a positive impact on ROA. *Operating profits* is positively correlated with ROA, being the main driver of profits. *Tax* reduces ROA, as we have used net profitability after tax as our measure. *Controls* is a clustered variable of fixed effects dummy variables addressing CEO gender, corporate group affiliation and if the firm went bankrupt during the researched period. The variable *Industry* is a cluster variable of all eight industry dummies, clustered in one group.

The explanation power of Model 2 is 34.5% and the mean VIF is 1.81, indicating that there is no severe multicollinearity in our data. The regression is applied with robust variation estimates, mitigating the bias of heteroscedasticity in our data.

In sum, the difference-in-difference regression shows that the effect on ROA from hiring a CEO with bankruptcy experience is not significant. However, the performance in companies with such CEOs is significantly lower than in the control group with a coefficient of -0.32. The effect is significant at a 95% level and corresponds with the lower credit rating, and lower ROA addressed in section 6.1 and 6.2, respectively.

We conclude that hiring a CEO with bankruptcy experience does not seem to have a significant negative effect on the ROA in our test population by itself. Nevertheless, the companies that employ such CEOs have significantly lower ROA than the control group. However, this difference seems to derive from the fact that such companies are significantly lower rated and performs poorly prior to the employment of such CEOS.

Conclusion: We reject hypothesis 2, stating that "*A firm led by a CEO with bankruptcy experience will perform similar financially as comparable companies*". Such firms perform

[12] Big Five auditors: PwC, EY, KPMG, Deloitte and BDO.

significantly poorer in terms of ROA for the subsequent year after CEO start, compared to the control group. However, an important addition is that the explanation of the lower ROA does not seem to derive from the fact that the CEO has bankruptcy experience, but merely the characteristics of firms that such CEOs attain CEO positions in.

6.4 Bankruptcy Probability

The final step is to address the hypothesis that a firm led by a CEO with bankruptcy experience will have the same bankruptcy risk as comparable companies in the same sector. To answer the research question, it is essential to address this hypothesis and examine whether bankruptcy experience could influence the probability of a company filing for bankruptcy.

From table 4, we observed that 89% of the CEOs in the treatment group have experienced one or two bankruptcies. Further, we also observed a higher bankruptcy frequency for the treatment group than for the control group, despite that the treatment group is more prone to be part of a corporation, which in turn seems to have a preventive effect on bankruptcy frequencies, addressed in table 1. This anomaly is reinforcing the question of the capabilities of a CEO with bankruptcy experience. However, it is still undetermined what causes this deviation from the observed pattern, hence we cannot conclude that CEOs with bankruptcy experience are less capable than CEOs that have no such experience. However, by predicting the bankruptcy probability for the companies in the test population, including factors of corporate group affiliation and bankruptcy experience, it will enable us to investigate the anomaly and address the question of the CEO capabilities.

In the following we will present the analysis of the three different versions of the SEBRA model, introduced in section 4, and identify potential improvements of the model as of including the variable of bankruptcy experience. All models are analyzed using a robust variance estimates method (White & MacKinnon, 1985) and is presented in table 11. As the third version of the SEBRA model is our further development of the model, we will in conclusion test the robustness of the model and see if it represents an improvement of the former versions developed by Bernhardsen and Bilberg.

Variables	Model 1	Model 2	Model 3
LIK	-0.0345358	-0.0437109*	-0.0331859
	(0.137)	(0.073)	(0.155)
UBE	1.441017*	1.458451*	1.334878*
	(0.087)	(0.065)	(0.090)
LEV	1.684705**	1.766049**	1.664339**
	(0.020)	(0.025)	(0.026)
TKR	-0.2778548	-0.3102446	-0.2516555
	(0.417)	(0.425)	(0.514)
EKA	0.2939992	0.2243704	0.1606792
	(0.262)	(0.406)	(0.531)
TAPTEK	0.6966929**	0.7021896**	0.6030387**
	(0.017)	(0.017)	(0.041)
DIV	-1.199524**	-1.188539**	-1.061334**
	(0.013)	(0.015)	(0.032)
a1	0	0	0
	(omitted)	(omitted)	(omitted)
a2	0	0	0
	(omitted)	(omitted)	(omitted)
a3	-0.4855594	-0.4365869	-0.7647384
	(0.372)	(0.432)	(0.173)
a4	-0.6246302	-0.6572092	-0.7487900
	(0.384)	(0.345)	(0.271)
a5	-0.5453798	-0.6701520	-0.9328925
	(0.586)	(0.510)	(0.363)
a6	0.4174768	0.4262896	0.257291
	(0.475)	(0.480)	(0.673)
a7	0.2468357	0.3042277	0.3074973
	(0.757)	(0.718)	(0.705)
a8	0.4225837	0.4237072	0.3103255
	(0.414)	(0.403)	(0.519)
SIZE	2.53e-06	-3.88e-06	-6.36e-07
	(0.591)	(0.490)	(0.913)
mean_EKA	1.215708	1.242545	1.252860
	(0.241)	(0.248)	(0.238)
mean_LEV	1.436454	1.515482	1.524624
	(0.283)	(0.260)	(0.257)
SD_TKR	0.2881664	0.2746772	0.2272268
	(0.188)	(0.200)	(0.282)
Part_Of_Corporation		-0.7092156**	-0.7435011**
		(0.036)	(0.023)
CEO_with_BankrEXP			0.7822568***
			(0.007)
Constant	-164.972	244.4812	37.1989400
	(0.583)	(0.496)	(0.920)
Observations	733	733	733
Log pseudolikelihood	-219.76325	-217.24808	-213.4012
Wald chi2 (18)	59.64	64.54	71.71
Prob > chi2	0.0000	0.0000	0.0000
Pseudo R-square	0.1444	0.1542	0.1692

Table 11: Predicting Bankruptcy Risk

This table presents the results from the logit regressions. Model 1 is the SEBRA model presented by Bernhardsen (2001). Model 2 includes a dummy variable for corporate group affiliation, as presented by Bilberg (2013). Model 3 includes dummy variables on corporate group affiliation and bankruptcy experience. The last model is a further development of the SEBRA model.
The dependent variable (Y) is a dummy variable on bankruptcy.
There number of observations in each model is 733. Test population was reduced from 972 to 852 as of the models' restriction, explained in section 4. Further there are 119 companies omitted as of insufficient financial information.
The age factors a_1 and a_2 are omitted from the model due to collinearity.
The p-values are presented in parentheses.

Observing model 1, from the significant variables we identify that increased outstanding leverage of public dues (*ube*) and trade creditors (*lev*) has a positive effect on bankruptcy risk. This implies that bankruptcy risk will increase by increased outstanding payments. Further if the company pays dividend (*div*), the probability of bankruptcy is reduced. This result is reasonable as of a firm in financial distress should not pay dividends if the risk of immediate insolvency is present, as stated by the Private Limited Companies Act (Norway) §§8-1 and 3-4. Lastly, the variable *taptek,* "book value to equity less than injected equity", is significant and indicates that the bankruptcy probability will increase if level of equity is less than what is being injected. This is reasonable as the profitability variable could give an indication on whether the company has lost equity during the financial year. Lastly, the model has a Pseudo R_2 of 0.1444.

From model 2 we observe that the liquidity variable, *lik*, is now significant and reduces the probability of bankruptcy, which is reasonable. Further, *part of corporation* is significant and will also reduce the probability of bankruptcy. This result is consistent with table 1, where we observed that companies with corporate ownership are less likely to file for bankruptcy. By including corporate group affiliation, we identify that the model has a higher pseudo R_2 of 0.1542 and that the significant variables in model 1, still appears significant. Hence, it appears reasonable to include the corporate group variable in the model.

From model 3, our new version of the SEBRA model, we identify that the liquidity variables *ube* and *lev*, the solidity variables *taptek* and *div,* and the variable *part of corporation* are significant. This result is consistent with the findings presented in model 1 and 2. However, in comparison with the result in model 2, we find that the variable *lik* is no longer significant. This could imply that the model has limited robustness. However, the new variable *CEO with bankruptcy experience* is significant on $p<0.01$. The coefficient is positive, implying that the probability of filing for bankruptcy within the next three years from time of observation is higher in companies that have employed a CEO with bankruptcy experience. This result is highly interesting and surprising as it suggests that CEOs with bankruptcy experience would have a negative effect on the performance in the companies that employ such CEOs. Further the model's pseudo R_2 has increased to 0.1692 which is a better result than Bernhardsen (2001) and Bilberg (2013) found. Nevertheless, the test population is different and found over a period of seventeen years, which could cause the differences. Lastly, another interesting observation is that by observing the coefficients of the variables *part of corporation* and *CEO with bankruptcy experience*, it appears that having a CEO with bankruptcy experience has a larger effect on the model than being part of a corporate group. This is also tested by excluding the

variable on corporate group affiliation from the model (see appendix 8.6). The test is conducted to identify how robust the results are. From the test, we observe that the liquidity variable *lev* and the solidity variables *taptek* and *div* are significant with $p<0.05$ and that the variable *CEO with bankruptcy experience* is significant with $p<0.01$. This is supported by the result from model 3, however the liquidity variable *ube* is only significant with $p<0.15$. Against, the model has a Pseudo R_2 of 0.1584, which is less than model 3. Thus, the model could not be assumed as being significantly better than model 3. Model 3 appears to be robust and presents better results than model 1 and 2.

Robustness of the results

In this section, the result of the three models will be tested with regards to significance, pseudo R_2 and the Receiver Operating Characteristic curve (ROC). Firstly, it is necessary to comment that both groups are represented with having companies that filed for bankruptcy post treatment, see table 1, implying that it is not reasonable to assume that the estimation population is skewed.

From the logit model presented in table 11, we found that the variable for CEO bankruptcy experience is significant with $p<0.01$. However, this does not necessarily imply that model 3 is more significant than the model 1 and 2. We have therefore calculated the likelihood ratios to identify the impact of a significant change in the models by including new variables, presented in table 12.

Test of Significance	G^2	Degrees of Freedom	P-value
Model 1 and model 2	5.03	1	0.0249
Model 1 and model 3	12.72	2	0.0017
Model 2 and model 3	7.69	1	0.0055

Table 12: Test of Significance - Bankruptcy Prediction Models

We observe that when testing model 1 against 3, and model 2 against 3, we find that the difference is statistically significant on a 99% confidence interval. This implies that model 3 fit the data significantly better compared with model 1 and 2.

From table 13, we observe that the pseudo R_2 increases when including new variables. Further, model 3 also has a higher precision power than model 1 and 2. In sum, the results imply that when including the variable of bankruptcy experience the model returns a higher explanatory - and precision power. We could therefore conclude that the model seems to be valid and yield robust results.

Model	Pseudo R_2	ROC (%)[13]
Model 1	0.1444	78.38%
Model 2	0.1542	79.37%
Model 3	0.1692	79.81%

Table 13: Pseudo R2 and ROC

Lastly, we have addressed a potential problem with regards to robustness of the model caused by a company having the same corporate owner. Being part of the same corporate group is likely to yield correlating financial results. However, we have investigated this by identifying duplicates on corporate group parent and find that this is only the case for 26 companies, see appendix 8.7. A potential correlation problem could therefore not be considered as present.

Conclusion and Implications

There is clear statistical evidence that employing a CEO with bankruptcy experience would lead to a higher bankruptcy risk. Further, corporate group affiliation will significantly reduce the probability of bankruptcy, which is consistent with Bilberg's (2013) findings. Nevertheless, the bankruptcy protection from a corporation is subjacent to the negative impact from having a CEO with bankruptcy experience. This suggest that CEOs with bankruptcy experience fails to exploit life lessons and that past failure will influence the first subsequent CEO position after the bankruptcy. However, we acknowledge that the model only capture effects based on financial factors, corporate group affiliation and previous bankruptcy experience, thus not including other factors that could impact the bankruptcy risk. Further, another implication is that the CEOs with bankruptcy experience are employed in pore companies, found in section 6.1 The pre-treatment performance of those companies could therfore drive the result. Nevertheless, the robustness of the models is verified with appropriate tests. Thus, we reject hypothesis 3, and conclude that companies with a CEO with bankruptcy experience has a significantly higher bankruptcy risk. Lastly, we will emphasize that we have improved the SEBRA model by including a variable on bankruptcy experience, and that this development increase the precision of the model originally conducted by Bernhardsen (2001).

[13] See appendix 8.8, ROC graphs for model 1,2 and 3.

7. Key findings and Conclusion

7.1 Key findings

This thesis aims to shed light on the overall research question: "*What is the impact on company performance from employing a CEO with bankruptcy experience from their former CEO position?"*. By investigating credit rating, profitability, CEO effects on performance and risk of bankruptcy, we have addressed the research question from four different aspects, providing a thorough analysis of the overall question.

The test population consists of 972 companies, whereas 486 has a CEO with bankruptcy experience and the other half is a control group matched on sector, year, operating revenue, total assets and liabilities, and ROA.

First, we find significant evidence for that CEOs with bankruptcy experience from a Norwegian private company are re-employed as CEOs in poorer credit rated companies than the average of the control group. The difference is 0.44 rating grades, implying that the treatment group firms are subordinate in terms of financial strength.

Second, the companies in the treatment group has on average low profitability in the year prior to CEO start. From the CEO start, and three years forth, the ROA increase, though averaging on negative ROA in all three years. This finding is in line with the results from the credit rating analysis, and suggests that the CEOs in our treatment group are employed in less profitable companies.

Third, the treatment group's performance is significantly inferior to the control group's performance for year one (t_{+1}) and three (t_{+3}), where t_0 is the CEO start year. A difference-in-difference test did not yield significant evidence for that the employment of the CEOs in the treatment group in itself is the causal reason for the difference in ROA. However, the regression showed that the profitability is significantly lower in the treatment group. Based on the lack of significance from the DID test of the treatment, and the findings in 6.1 and 6.2, we conclude that there are significant differences in financial performance between the treatment- and control group, and that this is more likely to be caused by the selection of firms that CEOs with bankruptcy experience are employed in, rather than the CEOs bankruptcy experience. Regarding the lack of significance in the results from the DID, a limiting factor is that the

control group does not have a corresponding event or treatment as the sample group, as we did not find a sufficiently large sample of control firms with CEO turnover.

Fourth, there is a significantly increased bankruptcy risk associated with employing a CEO with bankruptcy experience. Further, to be part of a corporate group significantly reduces the bankruptcy probability, this is consistent with Bilberg's (2013) findings. However, this apparent bankruptcy shield from a corporation is not strong enough to outweigh the negative impact from having a CEO with bankruptcy experience. Hence, the treatment group is more likely to file for bankruptcy than the comparable firms in the control group. By this we conclude that a CEO that files for bankruptcy is significantly more likely to go bankrupt again in the subsequent CEO position. Similarly, this conclusion is also most likely due to the firms hiring the CEOs with bankruptcy experience, rather than the performance of these CEOs.

7.2 Conclusion

The company performance in ROA of firms with a CEO with bankruptcy experience from their former CEO position, is on average negative, and lower than in the control group. The companies with such a characteristic are underperforming compared to other companies in the same sector in the same year. We have discovered that CEOs with bankruptcy experience encounter CEO positions in companies with poor credit rating and low financial performance. Even though this group on average improve the ROA in their first three years as CEOs, they do not on average deliver positive ROA in the same period. The bankruptcy risk is significantly increased with a CEO with bankruptcy experience. However, the reason for these findings seems to be that CEOs with bankruptcy experience are employed in firms with low profitability prior to employment. We find no evidence that supports the claim that such CEOs underperform after employment.

"It's fine to celebrate success,
but it is more important to heed the lessons of failure"
Bill Gates, founder of Microsoft

7.3 Limitations

The major limitation of our results is that the lack of CEO turnover in the control group in year t_0 may cause a bias in the researched population, and that the observed differences may be caused by the CEO turnover in the treatment group itself and not from the fact that the CEO has bankruptcy experience.

Clayton, Hartzell and Rosenberg (2013) found that forced CEO turnover increases the equity volatility under the assumption that forced departure could imply the likelihood of larger strategic changes. In that matter this thesis could be limited as of the lack of investigating the reason for the employment of the CEO. Hence, if the profitability in the company seems to be lower it does not necessarily imply that the new CEO is to blame as it could be caused by forced departure of the previous CEO and large strategic changes.

Further, Weisback (1994) emphasize the importance of CEO turnover as it can lead to reversals of poor prior decisions. Their findings suggest that declining results following a CEO hire may be due to restructuring and divesting. In a longer time frame these changes are positive for the companies. Our analysis suggests low financial performance for companies that employ a new CEO with bankruptcy experience. However, this result may be a consequence of changes in the management itself and the following new strategic direction.

We cannot rule out that the CEO positions are interrelated through e.g. complex owner structures or other agreements that cause more correlation between former bankrupt companies and new underperforming companies, than our analyses have uncovered. This would imply that leaving a bankrupt firm and attain a CEO position in a new firm that later files for bankruptcy may be caused by the same genesis. In our analysis, such relations may not be fully discovered, thus limiting the generality of our findings.

Lastly, this thesis is concentrated on the CEO role only, even though there are unquestionably several persons in both executive management and the board of directors involved in decision making that affects the firm's performance. To designate the full responsibility of company performance to the CEO is thus a simplification of the real managerial structure and influence. Despite being a necessary limitation to reduce the scope of the thesis, we then exclude several factors affecting performance. However, research supports that the CEO has an impact on the variation in firm performance, as the CEO holds the ultimate responsibility for the company (Mahoney and Weiner 1981).

7.4 Suggestions for Further Research

Following the main limitation, with a new study conducted on a sample of firms where both treatment and control group experience CEO turnover, one would be able to obtain a more isolated analysis of the bankruptcy experience factor.

Further on we acknowledge that there may be correlation between the bankruptcies that is not picked up by our research. A wider exploration of the interdependence between bankruptcies, either due to common owners, bank association or customer/supplier firms is necessary to see if the CEOs from former bankruptcies are somewhat predisposed to have another bankruptcy or if this could be viewed as two completely unrelated events.

Another interesting field to research is whether bankruptcy experience could have an impact on the CEO's network through the number of e.g. board position. A thorough investigation of other effects with regards to the career of the CEO would add even more understanding to the consequences of being involved in a corporate bankruptcy.

Lastly, we have focused on the 1209 CEOs that managed to maintain executive positions. We have not investigated the other half of CEOs with bankruptcy experience. Why are these not employed in new management positions? Considering the results of the survey by Deloitte Advokatfirma, it could be interesting to investigate potential differences in characteristics of the CEOs that do or do not find a new CEO position. This research could indicate whether the Norwegian business life manage to recognize whether the CEO were responsible for the previous bankruptcy, lacks experience and knowledge, or if the CEO is a proficient leader. Through investigating previous bankruptcy reports, the reason for the bankruptcies and whether the CEO is to blame or not, is not obvious. The reports only emphasize that the companies are insolvent. Thus, it appears to be challenging to quantify these characteristics as one would need more thorough research than what can be extracted from our available data sets.

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8. Appendix

8.1 Norwegian Company Ownership Structure

The following table shows an overview of the most common company types in Norway. In our research, we have focused solely on Limited Companies (Aksjeselskap).

Norwegian Company Types	**Translation**
Enkeltpersonforetak	Sole Proprietorship
Aksjeselskap (AS)	Limited Company (LC) Minimum capital NOK 30,000
Allmennaksjeselskap (ASA)	Public Limited Company (PLC) Minimum capital NOK 1,000,000
Ansvarlig selskap (ANS/DA)	General Partnership with Mutual Liability
Norskregistrert utenlandsk foretak (NUF)	Foreign Enterprise Registered in Norway

8.2 Variable Description

The table shows the complete overview of all variables we have used in our research. The list is in alphabetical order and the variables are extracted from the accounting data set, bankruptcy data set, industry data set and the data set including board information on Norwegian Private companies.

Variable Name	**Description**
Agriculture	Firm's sector label is Agriculture
anlvurd	Depreciation and write-down of fixed assets.
Annual_Profits	Result for the year in CEO start year
Annual_Profits1	Result for the year 1 year after CEO start year
Annual_Profits2	Result for the year 2 year after CEO start year
Annual_Profits3	Result for the year 3 year after CEO start year
Area	Which one of 7 different geographical areas in Norway the company operates in
Area_INNLANDET	One of seven different geographical areas in Norway
Area_NORD_NORGE	One of seven different geographical areas in Norway
Area_SØRLANDET	One of seven different geographical areas in Norway
Area_TRØNDELAG	One of seven different geographical areas in Norway
Area_VEST_VIKEN	One of seven different geographical areas in Norway
Area_VESTLANDET	One of seven different geographical areas in Norway
Area_ØSTVIKEN	One of seven different geographical areas in Norway
Auditor_Name	The company name of the firm’s auditor

avg_Operating_Revenues	Average Operating Revenues for the first 3 full years after 'Year'
avg_ROA	Average ROA for the first 3 full years after 'Year'
Bankrupt_Firm	The Firm is bankrupt by today. See 'Year_Of_Bankruptcy' for when it filed for bankruptcy
BIG_Auditor	The firm is audited by BDO, Deliotte, KPMG, EY or PWC.
cash	Bank deposits, cash in hand etc.
CEO_birth	The CEO's birth date (DD.MM.YYYY)
CEO_gender	Gender of CEO (M= Male, K=Female) Some firms lack information about CEO, and will have missing value.
CEO_name	The name of the CEO
CEO_With_BankrEXP	The firm's CEO is from our sample of identified CEO's who have filed for bankruptcy in their previous CEO position.
CEO_ZIPcode	The CEO's private ZIP-code
com_name_bankruptcy	The name of the company the CEO went bankrupt with
Construction	Firm's sector label is Construction
cont_birth	Contact person's(CEO's) name
cont_name	Contact person's (CEO's) birth date DD/MM/YYYY
dagl_skift	Dummy indicating if the CEO has changed this year
ebitda	Earnings Before Interest, Taxes, Depreciation, Amortization in start year
ebitda1	Earnings Before Interest, Taxes, Depreciation, Amortization in Year 1

ebitda2	Earnings Before Interest, Taxes, Depreciation, Amortization in Year 2
ebitda3	Earnings Before Interest, Taxes, Depreciation, Amortization in Year 3
ebitdamarg	EBITDA Margin of operating revenue in start year
ebitdamarg1	EBITDA Margin of operating revenue Year 1 after start year.
ebitdamarg2	EBITDA Margin of operating revenue Year 2 after start year.
ebitdamarg3	EBITDA Margin of operating revenue Year 3 after start year.
Employees	Number of employees in the first year. This data is somewhat lacking for other years.
Equity	Total Equity in start year
Equity1	Total Equity Year 1 after start year.
Equity2	Total Equity Year 2 after start year.
Equity3	Total Equity Year 3 after start year.
Finance	Firm's sector label is Finance
Firm_city	The firm's official city in the address register
Firm_ID	Firm's unique organization ID number
Firm_name	The full name of the firm (may change over time with the same Firm_ID still intact)
Firm_Name	Name of the firm
Firm_ZIPcode	The firm's official ZIP-code
Gross_Profit	Result before taxes in start year

Gross_Profit1	Result before taxes in year 1
Gross_Profit2	Result before taxes in year 2
Gross_Profit3	Result before taxes in year 3
konkaar_bankruptcy	The Year of Bankruptcy in the former firm of the CEO
Labor_Cost	Labor costs and social expenses in start year
Labor_Cost1	Labor costs and social expenses in year 1
Labor_Cost2	Labor costs and social expenses in year 2
Labor_Cost3	Labor costs and social expenses in year 3
levgj	Accounts payable
Longterm_Intrestbearing_Debt	Interest bearing long term liabilities in start year
Longterm_Intrestbearing_Debt1	Interest bearing long term liabilities in year 1
Longterm_Intrestbearing_Debt2	Interest bearing long term liabilities in year 2
Longterm_Intrestbearing_Debt3	Interest bearing long term liabilities in year 3
Manufacturing	Firm's sector label is Manufacturing
Mothers_Firm_ID	The Firm ID for the mother company.
Offshore_Shipping	Firm's sector label is Offshore/Shipping
Operating_Profits	Operating result in start year.
Operating_Profits1	Operating result. Year 1 after start year.
Operating_Profits2	Operating result. Year 2 after start year.
Operating_Profits3	Operating result. Year 3 after start year.
Operating_Revenues	Operating Revenues for the start year
Operating_Revenues1	Operating Revenues for the first year

Operating_Revenues2	Operating Revenues for the second year
Operating_Revenues3	Operating Revenues for the third year
orgnr_bankruptcy	The Form ID of the former bankrupt firm of the CEO
Other_services	Firm's sector label is 'Other_services'
Overdraft_Facilities	Bank overdraft Facilities in start year
Overdraft_Facilities1	Bank overdraft Facilities in year 1
Overdraft_Facilities2	Bank overdraft Facilities in year 2
Overdraft_Facilities3	Bank overdraft Facilities in year 3
Pair_ID	A generated variable. Identifies which company from treatment group each company in the control group is matched with. There are 126 pairs.
Part_Of_Corporation	This is a Dummy variable that takes the value 1 if there is a registered mother company owning >50% of the shares. The value is 0 if there is no known mother firm.
rgjeld_max	Total Interest bearing Liabilities MAX
rgjeld_min	Total Interest bearing Liabilities MIN
rkgjeld_max	Interest bearing current liabilities MAX
rkgjeld_min	Interest bearing current liabilities MIN
ROA	ROA is a profitability measure, calculated by (Gross profit - Taxes) / Total assets
ROA_year_before	The ROA of the Firm the Year before Observation period starts in 'Year'
ROA1	ROA for year 1 after start year of observations.
ROA2	ROA for year 2 after start year of observations.
ROA3	ROA for year 3 after start year of observations.

Sales	Sales revenues in start year
Sales1	Sales revenues in year 1
Sales2	Sales revenues in year 2
Sales3	Sales revenues in year 3
sector	The firm's sector of operations
Sector_Year	Generated variable: combination of Year and Sector. 170 different Sector_Years. Used for matching purposes.
sectorid	Sector ID
skatteordr	Tax on extraordinary items
Taxes	Total Taxes start year
Taxes1	Total Taxes Year 1
Taxes2	Total Taxes Year 2
Taxes3	Total Taxes Year 3
Telecom_IT_Tech	Firm's sector label is Telecom/IT/Tech
Total_Assets	Total assets in start year
Total_Assets_and_Liabilities	Total equity and liabilities in start year
Total_Assets_and_Liabilities1	Total equity and liabilities in year 1
Total_Assets_and_Liabilities2	Total equity and liabilities in year 2
Total_Assets_and_Liabilities3	Total equity and liabilities in year 3
Total_Assets1	Total assets in Year 1
Total_Assets2	Total assets in Year 2
Total_Assets3	Total assets in Year 3
vardrmdl	Total Tangible Fixed Assets
Wholesale_Retail	Firm's sector label is Wholesale/Retail
Year	Year of observation for firm. If CEO has bankruptcy exp., YEAR = CEO start year.
Year_Of_Bankruptcy	Year of bankruptcy opening
Year1998	Dummy variable =1 if the observation is from 1998
Year1999	Dummy variable =1 if the observation is from 1999

Year2000	Dummy variable =1 if the observation is from 2000
Year2001	Dummy variable =1 if the observation is from 2001
Year2002	Dummy variable =1 if the observation is from 2002
Year2003	Dummy variable =1 if the observation is from 2003
Year2004	Dummy variable =1 if the observation is from 2004
Year2005	Dummy variable =1 if the observation is from 2005
Year2006	Dummy variable =1 if the observation is from 2006
Year2007	Dummy variable =1 if the observation is from 2007
Year2008	Dummy variable =1 if the observation is from 2008
Year2009	Dummy variable =1 if the observation is from 2009
Year2010	Dummy variable =1 if the observation is from 2010
Year2011	Dummy variable =1 if the observation is from 2011
Year2012	Dummy variable =1 if the observation is from 2012
Year2013	Dummy variable =1 if the observation is from 2013
Year2014	Dummy variable =1 if the observation is from 2014

8.3 Variable Description for the Bankruptcy Prediction Model

In the following table, we present a through overview of the different variables applied in the bankruptcy prediction (logit) models in part 6. The importance and rational for each variable is addressed in section 4.

Variable Name	**Description**
Bankruptcy	This variable is the dependent variable in the logit model. The variable is an endogenous dummy variable that equals 1 if "the company files for bankruptcy within 3 year". The current year in the model is the year of last registered account data".
Liquidity - lik	$lik = \frac{Cash\ and\ deposits\text{-}Value\ of\ short\ term\ debt}{Revenue\ from\ operations}$
Liquidity - ube	$ube = \frac{Outstanding\ payments\ of\ public\ dues}{Total\ assets}$
Liquidity - lev	$lev = \frac{Trade\ creditors}{Total\ assets}$
Profitability - tkr	$tkr = \frac{Result\ before\ extra\ ordinary\ items + Ordinary\ write\ offs + Depreciation\text{-}Taxes}{Total\ assets}$
Solidity - eka	$eka = \frac{Book\ value\ of\ equity}{Total\ assets}$
Solidity - taptek	A dummy variable that equals 1 if current book value of equity is less than the value of equity injected.
Solidity - div	$div =$ "Dividends paid current year" $(dummy)$
Age (a_x)	$a_x =$ "$Number\ of\ years\ since\ incorporation$", $x = 1, \dots, 8$ $(dummies)$ Example: If the company was established 1 or 0 years ago, then a_1 will equal 1, if not 0. If the age of the company is more than 8 years, there are no variable to indicate this as of 8 years since establishment is assumed as point of reference.
Size	$size = (\ln(Total\ assets)\text{-}8000)^2$
Industry Characteristics - meaneka	$meaneka = Mean\ value\ of\ the\ variable\ eka$
Industry Characteristics - meanlev	$meanlev = Mean\ value\ of\ the\ variable\ lev$
Industry Characteristics - sdtkr	$sdtkr = vairance\ of\ the\ variable\ tkr$
Part_of_Corporation	A dummy variable that equals 1 if the company is part of a corporate group.
CEO_With_BankrEXP	A dummy variable that equals 1 if the company has employed a CEO with former bankruptcy experience. Note that the current CEO position must be the first management position after the bankruptcy to ensure that the analysis capture the immediate effects, as addressed in section 3.

8.4 Map of the different Geographical Areas

The figure shows the different geographical areas of the location of the test population.

8.5 Two-sided paired t-tests on Performance in Test Population

The table presents the test statistics from a paired two-sided t-test of the Operating Revenue and ROA in t_{-1}, the year prior to CEO start identified by the treatment group. Further the test statistics also investigates year t_0, t_{+2} and the three-year average, from t_{+1} to t_{+3}. The tests show that the control group and the treatment group are not significantly different, though the ROA in the treatment group is already prior to CEO start somewhat lower.

	Observations	Mean	Std. Dev		
Operating revenues, Year t-1					
Control Group	486	27 028,07	181 803,79		
Treatment Group	486	26 262,34	14 731,40		
Combined	972	26 645,20	163 355,60		
Diff		765,73	t = 0.0730		
Ho: diff = 0			degrees of freedom	=970	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.5291		Pr(|T|>|t|) = 0.9418		Pr(T>t) = 0.4709
ROA, Year t-1					
Control Group	486	-0,1874024	1,5208680		
Treatment Group	486	-0,3170246	1,6093360		
Combined	972	-0,2522135	1,5662630		
Diff		0,1296222	t = 1,2905		
Ho: diff = 0			degrees of freedom	=970	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.9014		Pr(|T|>|t|) = 0.1972		Pr(T>t) = 0.0986 *
ROA, Year t0					
Control Group	483	-0,0733617	0,7616211		
Treatment Group	482	-0,1543157	0,7641520		
Combined	965	-0,1137967	0,7635653		
Diff		0,0809540	t = 1,6482		
Ho: diff = 0			degrees of freedom	=963	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.9502		Pr(|T|>|t|) = 0.0996 *		Pr(T>t) = 0.0498 **
ROA, Year t+1					
Control Group	415	-0,0341873	0,5727779		
Treatment Group	466	-0,1828297	0,8540235		
Combined	881	-0,1128109	0,7384132		
Diff		0,1486424	t = 2,9959		
Ho: diff = 0			degrees of freedom	=879	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.9986		Pr(|T|>|t|) = 0.0028 ***		Pr(T>t) = 0.0014 ***
ROA, Year t+2					
Control Group	309	-0,1604697	1,2845350		
Treatment Group	384	-0,1679196	0,9817511		
Combined	693	-0,1645978	1,1259980		
Diff		0,0074499	t = 0,0865		
Ho: diff = 0			degrees of freedom	=691	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.5345		Pr(|T|>|t|) = 0.9311		Pr(T>t) = 0.4655
ROA, Year t+3					
Control Group	250	-0,0072047	0,4221412		
Treatment Group	375	-0,0903712	0,5405902		
Combined	625	-0,0513409	0,4985519		
Diff		0,0831665	t = 2,4062		
Ho: diff = 0			degrees of freedom	=623	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.9918		Pr(|T|>|t|) = 0.0164 **		Pr(T>t) = 0.0082 ***
ROA, Average Year t+1 to t+3					
Control Group	416	-0,120537	0,9659325		
Treatment Group	466	-0,2089948	1,0006820		
Combined	882	0,1672732	0,9848798		
Diff		0,0884578	t = 1,3321		
Ho: diff = 0			degrees of freedom	=880	
	Ha: diff < 0		Ha: diff != 0		Ha: diff > 0
	Pr(T<t) = 0.9084		Pr(|T|>|t|) = 0.1832		Pr(T>t) = 0.0916 *

8.6 Predicting Bankruptcy Risk, Model 4

The table below presents the forth model conducted on predicting bankruptcy risk on the test population. This model, in comparison with model 3 in part 6.4, does not include the variable *Part_of_Corporation.* The analysis is done as part of investigating whether the results yield robust. We observe that variables *lev*, *taptek* and *div* is significant with $p<0.05$ and that the variable *CEO with bankruptcy experience* is significant with $p<0.01$. This is supported by the result in table 11. However, the variable *ube* is only significant with $p<0.15$, which could imply a less beneficial result. Against, the pseudo R_2 is only 0.1584. From this line of argumentation, we can conclude that model 4 does not present a significant better model than model 3, however based on pseudo R_2 the model appears to be better than model 2. Henceforth, the results from model 3 appear valid.

Variables	Model 4
LIK	-0.0249910 (0.256)
UBE	1.3290170 (0.118)
LEV	1.606322** (0.018)
TKR	-0.2046911 (0.544)
EKA	0.2376213 (0.348)
TAPTEK	0.6094148** (0.037)
DIV	-1.0776200** (0.028)
a1	0 (omitted)
a2	0 (omitted)
a3	-0.7906509 (0.149)
a4	-0.7141581 (0.311)
a5	-0.7828013 (0.437)
a6	0.2772219 (0.639)
a7	0.2242082 (0.775)
a8	0.326631 (0.503)
SIZE	5.98e-06 (0.222)
mean_EKA	1.23219 (0.225)
mean_LEV	1.428019 (0.281)
SD_TKR	0.2467867 (0.249)
CEO_with_BankrEXP	0.7530145*** (0.009)
Constant	-385.4460 (0.218)

Observations	733
Log pseudolikelihood	-216.15868
Wald chi2 (18)	64.64
Prob > chi2	0.0000
Pseudo R-square	0.1584

8.7 Identifying Potential Correlating Financial Results as of Corporate Group Affiliation in Test Population

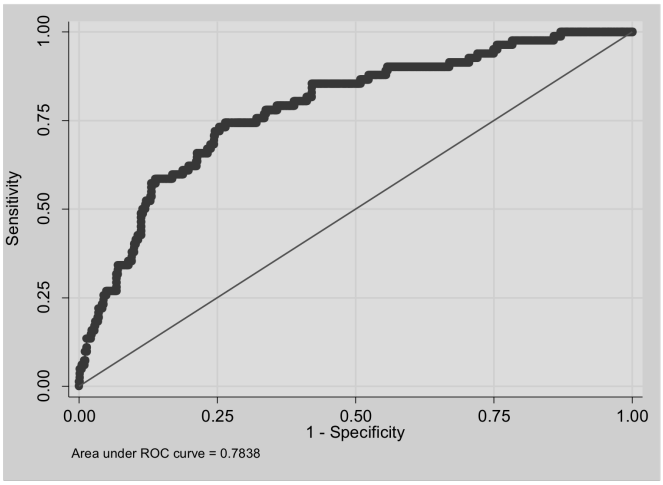
From the table, we identify that there are only 26 companies have a corporate group parent. A potential correlation problem with regards to financial results could therefore not be considered as present as of the small number of companies with corporate group affiliation.

Part of Corporate group			
	0	520	61,0 %
	1	332	39,0 %

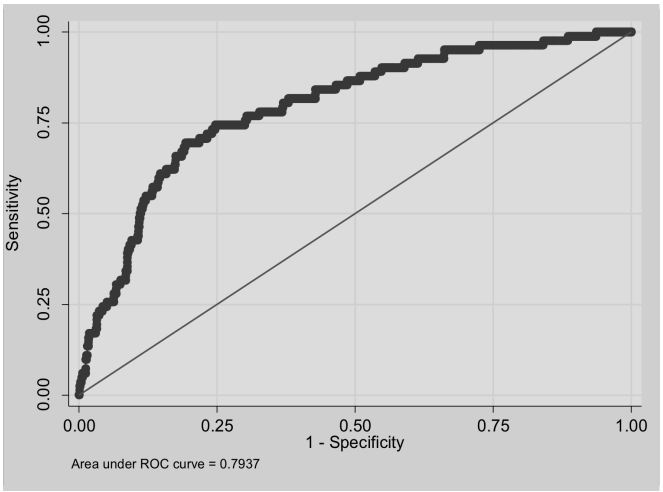
Corporation groups		Acc. # of firms
No mother company	520	520
Corporate group of 1 firm from test population	306	826
Corporate group of 2 firms from test population	8	842
Corporate group of 3 firms from test population	2	848
Corporate group of 4 firms from test population	1	852

8.8 Test of Robustness - The ROC Curves

Discriminatory Power, Model 1: Area under ROC Curve = 0.7838



Discriminatory Power, Model 2: Area under ROC Curve = 0.7937



Discriminatory Power, Model 3: Area under ROC Curve = 0.7981