



The Impact of CEO Overconfidence on Managerial Financial Reporting

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Abstract:

This thesis examines how capital market investors respond to the presence of CEO overconfidence by measuring the market reaction after the firms' filing of the annual financial reports. Managerial overconfidence is a behavioural trait which claims that the overconfidence bias leads to optimistically biased misstatements in financial reporting because overconfident CEOs overrate their abilities to affect financial results and/or underestimate the probability of random events. This thesis makes use of two stock option-based proxies, which examines the CEOs' firm stock option exercising behaviour to detect overconfidence. The results of this implies that the capital market investors respond negatively to the filing of the firms' annual report that is headed by an overconfident CEO, as measured by the cumulative abnormal return. This negative influence is caused by the overconfident CEO's tendency to report optimistically biased financial numbers in the annual report due to the excessive forecast optimism of the overconfident CEO. The outcome of this thesis has several implications. First, the capital market investors should be aware of the presence of CEO overconfidence. Second, this thesis raises another question why firms still hire overconfident CEOs. Therefore, the firms' Board of Directors should optimize the monitoring functions to maximize firm value.

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1. Introduction

The purpose of this thesis is to examine how capital market investors respond to the presence of firms with overconfident Chief Executive Officers (from now "CEO") when assessing a firm's share value based on its annual report. More specifically, the thesis examines the relation between the presence of CEO overconfidence and the market reaction to this overconfidence and their associated announcement of (overestimated) financial numbers and attempt to answer the following research question:

"Do investors respond negatively to a capital market share of a firm headed by an overconfident CEO after filing the firm's annual financial report?"

Many researchers have investigated the presence of CEO overconfidence in capital markets and have linked this phenomenon to several relevant topics. For example, existing financial accounting research has shown evidence for a relation between CEO overconfidence and managers' corporate decisions including overinvestments (Malmendier & Tate, 2005a), mergers and external acquisitions (Malmendier & Tate, 2008), earnings management (Hribar & Yang, 2010) and the reaction of counterparties such as auditors and credit rating agencies (Hribar, Kim, Wilson, & Yang, 2013). However, prior research did not examine the relation CEO overconfidence and the market reaction of one of capital market investors. Currently, prior research did provide evidence for the existence of CEO overconfidence and its tendency to overestimate future returns. Consequently, the financial numbers in the annual reports of firms with overconfident executives are probably optimistically biased due to the overconfidence bias. Investors should be aware of the presence of firms on the stock market which are headed by overconfident CEOs. However, little research is done whether these market participants do take managerial overconfidence (to some extent) into consideration in their stock investment decisions.

Whereas prior research focussed on the effects of CEO overconfidence on other economic agents such as auditors and credit agencies, this thesis aims to contribute to the literature on behavioural corporate finance and the literature concerning CEO overconfidence and managerial financial reporting. There is a gap in the existing literature concerning the relation between CEO overconfidence and investors. Investors and analysts assess a firm's expected share price on these financial numbers and should take managerial overconfidence into consideration to correctly adapt an expected share price, because the expected returns on these shares are possibly overestimated. Therefore, the results of this thesis is of relevance for capital market investors who make their investment decisions based on the (overestimated) financial numbers. This thesis examines how the capital market investors reacts to managerial financial reporting and, more specifically, to the filing of

the annual financial report by overconfident CEOs, in which the financial statements are possibly optimistically biased due to the managerial overconfidence. By measuring the capital market reaction to a firm's share which is managed by an overconfident CEO at the moment of the filing of the firms' annual report, makes it able to investigate whether the investors take managerial overconfidence into consideration during their stock investment decisions. Furthermore, the outcomes of this thesis are also relevant for the firms' Board of Directors to assess the financial consequences on the capital market of being managed by an overconfident CEO and to improve the Boards' monitoring functions on CEOs' corporate actions. Prior research regarding CEO overconfidence both find positive and negative firm effects of hiring an overconfident CEO. Therefore, there seems to be a trade-off for firms to employ overconfident CEOs, since managerial overconfidence can be both beneficial to but also could affect firm value.

In this thesis two stock option-based measures of overconfidence are used, based on the personal portfolio decisions of a firm's executive. Both the stock-option based measures exploit the underdiversification of the CEOs personal portfolio (Malmendier & Tate, 2005a). To maximize the incentives provided by stock and option grants, these options are cannot be traded on the stock market and the sale of stock may be restricted. Furthermore, CEOs are not allowed to short-sell their company stocks, which makes it unable to perfectly hedge against the risk of the stock. The CEO's portfolio is underdiversified because its human capital is invested in the firm, since bad outcomes of the firm will both affect the personal portfolio and their outside employment options. Altogether, CEOs are highly exposed to the idiosyncratic risk of their company (Malmendier & Tate, 2005a). Therefore, a risk-averse CEO should exercise their options early given a sufficiently high stock price (Hall & Murphy, 2000) (Hall & Murphy, 2002). The following measures are used in this thesis to test whether a firm's CEO is assumed to be overconfident, based on their personal portfolio decisions:

1. Holder 67: This measure detects overconfidence by examining the timing of a CEO's company stock option exercising behaviour. If a stock option is at least 67% *in-the-money* at some point during his/her tenure as CEO, he/she should exercise the option. Otherwise, the executive in question is assumed to be overconfident (Malmendier & Tate, 2005a).
2. High overconfidence: This measure is derived from the first measure Holder 67 and therefore relies on the same underlying reasoning of managerial overconfidence as mentioned above. However, this measure examines overconfidence on a higher level of a stock options' *in-the-moneyness* to explore the effects of highly overconfident CEOs on the capital market reaction, again based on the CEOs' personal portfolio decisions. Therefore, executives who fail to exercise their options when the firms' stock option is at least 100% *in-the-money* are assumed to be highly overconfident (Campbell, Gallmeyer, Johnson, Rutherford, & Stanley, 2011).

This thesis investigates how capital market investors respond to the presence of firms with overconfident CEOs. In this research, a CEO is assumed to be overconfident if it meets at least the criteria of the overconfidence measures. This thesis examines this by measuring the cumulative abnormal returns (CAR) in a seven-day measurement window following the filing date of a firm's annual report with overconfident CEOs.

The relevant data is available through the databases of Wharton Research Data Services system. All relevant information concerning Chief Executive Officers (CEOs), such as title, stock ownership and compensation and set of option packages is available through Execucomp. Furthermore, the CRSP Daily Stock File database provides the required daily stock returns data to construct the dependent variable, the cumulative abnormal return (CAR). Annual accounting data on company level for U.S. firms are available through CRSP/Compustat - Fundamentals Annual database, which also provides data for the control variables in the regression models. The sample period will start in 2006 and will run through the year 2014. Subsequently, the relevant data are constructed into variables and prepared for the regression model, which are examined through the Ordinary Least Squares (OLS) multiple regression technique. This research design seems appropriate to examine the aim of this thesis and all data to measure the variables are available from the Wharton Research Data Services. Due to the large sets of data, the statistical program STATA is the most practicable program to merge the data of this thesis.

The final sample consists of 1,209 North American firms with data from 2006 to 2014, from which two CEO overconfidence measures are constructed, which examines the stock option exercising behaviour of CEOs. Based on 7,535 CEO year observations, the results provide evidence that that the personal stock portfolio decisions of executives is positively associated with the overconfidence bias and therefore the CEO's stock option exercising behaviour is an appropriate measure to detect managerial overconfidence. Furthermore, the outcomes of this thesis implies that the capital market investors respond negatively to the filing of the firms' annual report, which is led by an overconfidence CEO. Therefore, the results indicate that the presence of CEO overconfidence has a negative effect on the cumulative abnormal return, which is caused by the CEO's tendency to report optimistically biased financial numbers in the annual report due to the excessive optimism of the overconfident CEOs.

The findings of this thesis contributes to the CEO overconfidence literature in two ways. First, this thesis contributes to the existent literature on the relation between CEO overconfidence and managerial financial reporting. After prior research found evidence for optimistically biased statements and financial statement fraud (Schrand & Zechman, 2011) and higher probabilities of earnings management (Hribar, Kim, Wilson, & Yang, 2013) due to managerial overconfidence, this thesis provides evidence for the negative effects of managerial overconfidence on the capital market

reaction in response to the filing of the firms' annual reports headed by overconfident CEOs. Second, this thesis contributes to the discussion why firms still employ overconfident CEOs. Whereas prior studies concerning CEO overconfidence found evidence for the positive effects of managerial overconfidence on firm value, such as greater innovative success by overconfident managers (Hirshleifer, Low, & Teoh, 2012) and increasing firm value (Slothouber, 2010), other studies found evidence for overinvestment (Malmendier & Tate, 2005a), overacquisitiveness by overconfident CEOs (Malmendier & Tate, 2008) and decreasing levels of dividend pay-outs (Deshmukh, Goel, & Howe, 2009). In addition, this thesis contributes to the negative effects of hiring an overconfident CEO for firm value. As a result, the Board of Directors should optimize the firms' monitoring functions in such a way that the CEO's corporate actions are in the best interest of the firm. Therefore, the firms' monitoring function should be employed on the CEO's forecasting and investment decisions rather than monitoring the CEO's corporate innovation decisions.

The remainder of this thesis is organized as follows. Section 2 starts with the theoretical background, followed by the hypothesis development. In Section 3 the research design is described, including the dependent variable, the overconfidence measures, the control variables and the methodology used in this thesis is explained. Section 4 elaborates the results of the empirical analysis. Lastly, section 5 concludes the findings and provides the implications and limitations of this thesis, including recommendations for future research.

2. Theoretical background

My research draws from several directions of the academic literature. The first section starts by discussing the academic literature on managerial overconfidence as it has been explained by the literature of behavioural finance. Subsequently, this part reviews the accounting literature and concerning overconfidence. In the second section, the theory behind the overconfidence story from a social psychological perspective is clarified and the reasoning behind the stock option measures as measure of CEO overconfidence is explained. Finally, the related research and the theory together leads to the development of the hypotheses.

2.1 Literature review

This thesis is related to literature on the effects of behavioural bias on the CEO's corporate decision making. Despite the presence of many corporate governance mechanisms within a company, such as the Board of Directors, outside directors, compensation committees and shareholder's meetings, the executives' characteristics play an important role in the firm's corporate decisions. As mentioned earlier, previous research has investigated the impact of CEO overconfidence to different relevant subjects, such as its effect on firm value and its effect on shareholders' value. Prior research did find evidence in favour of hiring overconfident CEOs. For example, the findings Hirshleifer et al. (2012) indicate that managerial overconfidence leads to greater innovative success measured by the research and development (R&D) expenditures. More specifically, these researchers found that the managerial overconfidence leads to higher expenditures in innovation and have more patents in their possession. Also, managerial overconfidence leads to more effectively exploit growth opportunities, although this finding only holds for CEOs in innovative industries (Hirshleifer, Low, & Teoh, 2012). Additionally, research by Slothouber (2010) concerning CEO overconfidence found similar results. This research found evidence for a positive relation between high CEO overconfidence and firm value, which implies that moderate levels of overconfidence is not in the best interest of the firm. The positive influence of higher levels of managerial overconfidence is due to lower cost of debt and greater innovation success (Slothouber, 2010). Furthermore, Malmendier et al. (2007) found evidence that overconfident CEOs prefer corporate financing choices as stated by the pecking-order theory. This means that overconfident CEOs are less likely to issue equity than their not overconfident CEOs. More specifically, for every additional dollar of external financing, overconfident CEOs issue more about 30 cents more debt than other CEOs. Also, they provide evidence for a positive relation between managerial overconfidence and the level of debt conservatism (Malmendier, Tate, & Yan, 2007). However, prior research in the behavioural corporate finance literature concerning CEO overconfidence also found evidence for the negative effects of the overconfident CEOs' corporate decisions on firm value and the shareholders' value. For example, Malmendier and Tate (2005)

examined whether personal characteristics and, more specifically, CEO overconfidence attributes to investment distortions by large corporations. Rather than account firm-level characteristics for these distortions, this research found evidence that managerial overconfidence leads to overestimating returns on investments and therefore overinvest more when cash flows increase in comparison with non-overconfident executives (Malmendier & Tate, 2005a). Another thesis by these researchers is focussed on managerial overconfidence and their corporate decision-making concerning acquisitions. They provide evidence that overconfident managers are more actively taking over other firms and are more likely to engage in lower quality acquisitions than their non-overconfident peers. In contrast to empire-building CEOs, these overconfident executives believe they act in the best interest of their shareholders (Malmendier & Tate, 2008). However, the results provide evidence that overconfident CEOs destroy shareholder value by undertaking acquisitions. Furthermore, overconfidence managers are more likely to overpay target firms and over-invest in projects they perceive as less risky (Malmendier & Tate, 2008). Moreover, research by Desmukh et al. (2009) found that firms managed by overconfident CEOs pay lower levels of dividend relative to CEOs that are not classified as overconfident. Further, the effect of lower dividend pay-out caused by managerial overconfidence is stronger in low-growth firms, firms with low cash flows and firms with greater information asymmetry. Besides, this research found that the capital market reaction towards an increase in dividend pay-out is less positive for firms managed by overconfident CEOs in comparison with firms headed by rational CEOs (Deshmukh, Goel, & Howe, 2009).

Also, managerial overconfidence is related to the accounting literature and, more specifically, is related to managerial financial reporting, which is also the main subject of this thesis. Firstly, previous research found that firms that missing their own forecasts are less experienced with forecasting and also have less flexibility in their accounting decisions (Chen, 2004). In addition, Hribar & Yang provide evidence that managerial overconfidence affects forecasting decisions. First, overconfident managers have greater probabilities to provide overestimated forecast numbers because they overrate their ability to affect the financial results and/or underestimate the probability of random events. Managerial overconfidence affects forecast precisions in such a way that the range forecasts of these executives are of a narrower width (or even a point estimate). Second, the results indicate that overconfidence leads to the use of aggressive accounting techniques for earnings forecasts, by increasing the use of discretionary¹ accruals (Hribar & Yang, 2010). Furthermore, Schrand and Zechman (2011) found a positive relation between CEO overconfidence and the likelihood of financial statement fraud. Also, this effect holds even in case of increasing internal or external monitoring mechanisms (Schrand & Zechman, 2011). These findings provide evidence that

¹ Line items in financial reporting that are commonly used to increase income.

overconfidence, either intentional or unintentional, leads to a greater probability of optimistically biased misstatements in financial reporting. Lastly, Millo and Wisniewski (2014) document that companies have a tendency to disclose financial information with a positive tone, which even often leads to positive market reactions (Millo, Wisniewski, & Yekini, 2014). This tendency to communicate positively could be even stronger for companies with overconfident CEOs.

In this thesis, the consequences of CEO overconfidence on the capital market reaction of investors are examined. The existence of the overconfidence bias is retrievable from either the CEO's excessive optimism about future firm performance or they underestimate the influence of random event affecting future performance. Overconfident managers are more likely to issue optimistically biased forecasts because they overrate their skills to affect financial results and/or underestimate the probability of random events (Hribar & Yang, 2010). Also, managerial overconfidence leads to a greater probability of optimistically biased misstatements (Schrand & Zechman, 2011). However, the first evidence for overconfidence by individuals is retrieved from several social psychological researches, in which the better-than-average effect² claims that individuals overestimate all kinds of skills relative to the average of the sample group, when assessing their own skills. For example, one thesis states that individuals tend to be unrealistically optimistic about their chances of future life events (Weinstein, 1980). Also, another research found that car drivers assess their own driving skills as above average, illustrating that they are more skilful and less risky than peer drivers (Svenson, 1980). Furthermore, Larwood and Whittaker (1977) claim that individuals are exposed to the self-serving bias, believing that people are more skilful than others which may lead to more risky planning in the future (Larwood & Whittaker, 1977).

2.2 Theory

The explanation behind the existence of overconfidence in finance is retrieved from this social psychological researches and explains why over-optimism affects economic decision-making. One of the first findings concerning overconfidence in corporate decision-making is the phenomenon of managerial hubris, which explains corporate takeovers and why executives are likely to overpay for the target firms (Roll, 1986). The overconfidence bias is even more prone to executives for two reasons. First, a prior thesis states that the better-than-average effect is even stronger related to highly skilled individuals (Camerer & Lovallo, 1999). Second, this effect is also stronger when the complexity between actions and its outcomes is greater (Moore & Kim, 2003). Executives often deal with decision-making under uncertainty and major risks, which makes them more prone to the overconfidence bias.

² The better-than-average effect can be abbreviated as the BTA effect.

The related research have find evidence for the existence of managerial overconfidence in the financial world and its consequences on executives' corporate decision-making. All these findings are built on three main factors that attributes to overconfidence by individuals:

- 1) The illusion of control: Executives are evaluated as either successful or unsuccessful based on their historical actions. The degree of successful risk-taking reflects the differences in the ability to judge the risks of a project and the ability to pick the right investments between successful and unsuccessful executives. As a consequence of being a successful risk-taker, these executives think the probabilities of a project's outcome does not apply to them and that they can change a project's odds based on their experience (March & Shapira, 1987). Hence, when a firm's CEO chooses an investment project, he/she believes in its ability to control its outcome and he/she is likely to underestimate the likelihood of failure.
- 2) A high degree of commitment to good outcomes: As mentioned earlier, individuals tend to be unrealistically optimistic about their chances of future life events. Cognitive and motivational considerations identified five event characteristics for this phenomena: the degree of desirability, perceived probability, personal experience, perceived controllability and stereotype salience (Weinstein, 1980). The characteristic 'degree of desirability' explains the optimistic bias of overconfidence CEOs to good outcomes. Among positive events, the more desirable the event, people tend to believe their own chances are greater than average. Therefore, overconfident executives commit to positive outcomes concerning corporate investment decisions. Since the CEO's personal wealth and his human capital value moves with the firm's stock price, executives are highly committed to good company performance (Malmendier & Tate, 2005a).
- 3) Difficulties with comparing performance across individuals due to abstract reference points: Individuals tend to have the perceived controllability to assign positive outcomes as a consequence of their actions. However, in fact it is not fully clear whether this positive outcome is entirely attributable to an individual (Weinstein, 1980). In terms of measuring the outcomes of corporate decision-making by a CEO, it is difficult to assess the absolute managerial skills because there are other factors that also influence overall firm performance. Therefore, it is hard to compare managerial skills between multiple CEOs.

As a result of this overconfidence, individuals expect their behaviour to produce success, they are more likely to claim success as a consequence of their actions, while bad outcomes are due to bad luck (Miller & Ross, 1975).

As mentioned earlier, in this thesis two option-based measures are used to determine whether a firm's CEO is assumed to be overconfident: Holder 67 and High overconfidence. These measures exploit the underdiversification of a CEO's stock holdings. Besides the base salary a CEO receives, the CEOs' total compensation depends largely on large stock option grants which tries to solve the agency problem between the executive and a firm's shareholders. Stock options are the largest component of compensation for U.S. executives (Hall & Liebman, 1998). However, stock options granted to executives have multiple restrictions in comparison with stock options for outside investors. Also, the stock options of executives are non-tradable and the sale of stock may be restricted. Furthermore, CEOs are not allowed to perfectly hedge against the risk, so they cannot go short on company stock. Since the CEOs' human capital is invested in their firms, bad firm performance also both affect the CEOs personal portfolio and their outside employment options, which makes a CEOs portfolio undiversified. Altogether, CEOs are highly exposed to the idiosyncratic risk³ of their company. Therefore, under these circumstances a risk-averse CEO should exercise their *in-the-money* options early⁴ given a sufficiently high stock price and if the options are fully vested (Lambert, Larcker, & Verrecchia, 1991) (Hall & Murphy, 2000). However, although standard models of decision-making under certainty indicate that a risk-averse CEO whose individual wealth depends on the stock options and is exposed to underdiversification should exercise the option (Hall & Murphy, 2002), many CEOs fail to exercise their options. In prior research and in this thesis, this stock option behaviour is used as an indicator of CEO overconfidence. This is because normally underdiversified CEOs should hold a minimum amount of company stock to reduce the idiosyncratic risk. However, due to their overconfidence, CEOs overestimate the firms' future performance and believe the stock price will increase in the future under their rule. Consequently, overconfident CEOs have incentive to postpone option exercise. Sometimes overconfident CEOs even acquire more company stock to benefit more from the expected future performance.

The Hall and Murphy (2002) framework states that the executive's stock option value is based on their initial wealth, their aversion against risk and the degree of underdiversification of his/her personal portfolio. Based on these factors, an executive should exercise options immediately after the vesting period if the stock option is at a certain percentage *in-the-money*. During this research, the threshold of 67% *in-the-money* of a stock option is used for overconfidence measure Holder 67, assuming that two-thirds of a CEO's wealth is tied to the company's stock. This threshold corresponds with a relative risk-aversion of three ($\rho=3$). These benchmarks are in line with the Hall and Murphy (2002) framework and are in line with prior research concerning CEO overconfidence such as

³ Also known as the company-specific risk.

⁴ Prior to expiration of the stock option.

Malmendier and Tate (2005a, 2005b, and 2008), Galasso and Simcoe (2011) and Hirshleifer et al. (2012). Following the benchmarks of overconfidence measure Holder 67, if a CEO's option is at 67% *in-the-money* at some point during his/her tenure and the option is vested, according to the theory the stock option should be exercised by the CEO. However, if this CEO fails to exercise this *in-the-money* stock option, the CEO in question is assumed to be overconfident in this thesis. The status of each CEO's option package is examined at the end of its vesting period. The CEO's option packages could include different duration of vesting periods. For comparability purposes, the sample only includes option packages of CEOs that are exercisable.

The other overconfidence measure, High overconfidence, relies on the same framework as explained by Hall and Murphy (2002), in which the executive's stock option value is again based on their initial wealth, their risk-aversion (ρ) and the degree of underdiversification of his/her personal portfolio. However, this measure controls for higher levels of managerial overconfidence, to examine whether the capital market investors respond differently (or, more negatively) against higher degrees of CEO overconfidence. In this case, a CEO still should exercise its options immediately after the vesting period when these are *in-the-money* beyond a rational benchmark. However, the benchmarks for the high overconfident CEOs for the risk-aversion and initial stock wealth differ from the benchmark used by the prior measure Holder 67. For this measure, the CEO in question is classified as highly overconfident if he/she do not exercise its stock options that are at least 100% *in-the-money*. More specifically, if a rational CEO's option is at 100% *in-the-money* at some point during his/her tenure and the option is vested, the CEO should exercise the option. Otherwise, this measure indicates that the CEO in question is classified as highly overconfident. Following Hall and Murphy (2002), the 100% *in-the-moneyness* corresponds to a risk aversion of three ($\rho=3$) by the CEO, just as it is the case for overconfident measure Holder 67. However, the level of individual wealth depending on the firm's stock is lower for this measure, in comparison with Holder 67. Whereas the CEO's wealth in firm stock is tied to 66%, the threshold of 100% *in-the-money* corresponds to a percentage of wealth in company stock that is equal to 50%. In other words, half of an executive's total compensation depends on its firm's stock options, whereas the other half of its income consists of safe cash compensation/salary.

2.3 Hypothesis development

In the last decade many researchers did investigate the presence of CEO overconfidence and its effect on firm value and its effect on shareholders' value. The literature on behavioural corporate finance did find evidence in favour of hiring overconfident CEOs, but also provide results that indicates the negative firm effects of managerial overconfidence. As mentioned earlier, overconfident CEOs tend to destroy value, having a suboptimal investment behaviour (Malmendier & Tate, 2005a) and by undertaking unprofitable mergers and acquisitions. Prior research also examined the reaction of

several counterparties to the presence of managerial overconfidence on the capital market. For example, the capital market investors respond negatively to mergers and acquisitions undertaken by overconfident CEOs (Malmendier & Tate, 2008). Also, counterparties such as auditors and credit rating agencies take the presence of managerial overconfidence into account by increasing the risk premium, demand a higher agency cost of debt, or classifying a firm with a higher credit risk (Hribar, Kim, Wilson, & Yang, 2013). Furthermore, firms managed by overconfident CEOs pay lower levels of dividends to their shareholders. However, overconfident CEOs on average yield higher investment returns and obtain number of patents (Hirshleifer, Low, & Teoh, 2012), leading to a positive effect on firm value and lower cost of debt (Slothouber, 2010). However, there is little research how capital market investors respond to the actual presence of managerial overconfidence. More specifically, investors, who make stock investment decisions based on information provided by a firm's CEO, could be negatively affected by their overconfidence and accompanying announcement of (overestimated) financial numbers. As mentioned earlier, prior research concerning CEO overconfidence and managerial financial reporting found that managerial overconfidence leads to a greater probability of optimistically biased misstatements and financial statement fraud (Schrand & Zechman, 2011), which negatively affects the investors' stock investment decisions. Further, overconfident CEOs have higher probabilities to miss their own earnings forecasts and have a higher likelihood of using earnings management (Hribar & Yang, 2010). Thus, the existing literature provides evidence that managerial overconfidence affects the precision of management forecasts and accompanying errors. Such research is important because it is unknown how the capital market investors respond to the presence of managerial overconfidence and, more profoundly, at the moment these CEOs provide the firm's (likely) distorted financial numbers.

Summarizing, several prior research concerning CEO overconfidence provide evidence that the stock option-based measures created by Malmendier and Tate (2005a, 2005b, 2008) are appropriate to detect managerial overconfidence. In addition to that, research by Campbell et al. (2011), Hirshleifer et al. (2012) and Humpherey-Jenner et al. (2015) also investigated the CEO's firm stock option behaviour to detect CEO overconfidence. Therefore, these stock option-based measures appear to be useful to detect CEO overconfidence. In imitation of these prior researches, in this thesis the CEO's personal portfolio decisions are examined in order to explore whether these stock option-based measures are appropriate measures to detect CEO overconfidence. During the empirical analysis part, this thesis tests whether the CEO's personal portfolio decisions are related to the overconfidence bias, by not exercising company stock options that are beyond the *in-the-money* benchmarks of the overconfidence measures Holder 67 and High overconfidence. The following hypothesis tests this claim:

Hypothesis 1: The personal portfolio decisions of the CEOs in the sample are positively associated with the overconfidence bias.

After the evidence for the presence of overconfident CEOs is found, based on their personal portfolio decisions concerning company stock options, the next step is to measure the capital market reaction to the presence of managerial overconfidence. As mentioned by section 2.1, previous research has investigated the impact of CEO overconfidence and its corporate action to its effect on firm value and its effect on shareholders' value and found that hiring an overconfident CEO has both positive effects as well as negative effects on firm value and shareholders' value.

More specifically for this thesis, concerning the effect of CEO overconfidence on managerial financial reporting, prior research by Hribar and Yang (2010) found evidence that CEO overconfidence increased the likelihood of forecasting highly optimistic (and biased) future earnings numbers. Also, Schrand and Zechman (2011) found a positive relation between CEO overconfidence and the likelihood of financial statement fraud. These results provide evidence that overconfidence, either intentional or unintentional, leads to a greater probability of optimistically biased misstatements in financial reporting.

As a consequence of these evidences, this thesis is interested in how the capital market investors respond to the presence of CEO overconfidence at the moment firms disclose their likely overestimated annual financial reports due to the overconfidence. Therefore, the capital market reaction is examined by measuring the Cumulative Abnormal Returns (CARs) after the filing of the annual financial report. Prior research concerning CEO overconfidence made also use of the CAR as measure for the capital market reaction (Malmendier & Tate, 2008) and is a commonly used measure in the accounting and finance literature studies (MacKinlay, 1997). After the event dates for the companies' filing dates of annual financial reports are identified, the cumulative abnormal returns are measurable following these filings, based on the market returns model. In this model, the return of firm i is compared with the return of the market portfolio.

Summarizing, the capital market reaction of firm i is measured as the cumulative abnormal return in a seven-day measurement window after the filing date of a firm's annual financial report of the overconfident CEO. This thesis predicts that capital market participants incorporate the presence of overconfident CEOs when assessing the annual financial report and therefore the capital market reaction after the filing of the firms' annual report is negative. The following hypothesis tests this claim:

Hypothesis 2: The capital market's reaction to stocks of firms with overconfident CEOs after the filing date of the annual financial report is negative.

3. Research design and Methodology

This section discusses the research design and the hypotheses used in this thesis. After briefly summarizing the theory behind the stock-option based measure of CEO overconfidence, the overconfidence measures Holder 67 and High overconfidence are explained and are constructed, which are the variables of interest in the model. Furthermore, the included control variables of the model and the data used in this research are discussed. Besides, all the variables discussed and explained in this section are also defined in Table 1 (Appendix).

3.1 Measuring overconfidence

The Libby boxes (Figure 1, Appendix) clarify the relation that is examined in this thesis. First, to decide whether a firm's CEO is exposed to the overconfidence bias, the CEO's personal portfolio decisions are investigated based on the overconfidence measures Holder 67 and High overconfidence. In line with prior research concerning CEO overconfidence, this thesis examines the measure Holder 67, which examine the timing of a CEO's stock option exercising behaviour to identify overconfidence (Campbell, Gallmeyer, Johnson, Rutherford, & Stanley, 2011) (Humphery-Jenner, Lisic, Nanda, & Silveri, 2015). This measure is commonly used to detect overconfidence in prior empirical research concerning CEO overconfidence (Malmendier & Tate, 2005a) (Malmendier & Tate, 2005b) (Malmendier & Tate, 2008) (Galasso & Simcoe, 2010) (Hirshleifer, Low, & Teoh, 2012).

This thesis makes use of a stock option-based measure of CEO overconfidence, developed by and used in prior researches of Malmendier and Tate (2005a, 2005b, 2008) concerning managerial overconfidence. More specifically, this thesis also makes use of the CEO's personal portfolio decisions as a measure of managerial overconfidence to capture their "revealed beliefs" concerning their firm's future performance (Galasso & Simcoe, 2010). The stock options give the executive the right to purchase stock in their own company, usually at the prevailing price on the date of the option grant. These options typically have a ten year life (Murphy, 1998), and are fully exercisable after a vesting period of four years (Galasso & Simcoe, 2010). In this model, executives are classified as overconfident if they hold firm stock options that are highly *in-the-money* after the options are fully vested and hence exercisable. In this research, overconfidence is assumed to be a persistent trait (Hirshleifer, Low, & Teoh, 2012), which means that a CEO remains overconfident over the full sample period (2006-2014) once⁵ a CEO is classified as overconfident by the overconfident measure .

⁵ Hirshleifer et al. (2010) added a robustness test in which a CEO was required to have valuable *In-the-money* unexercised exercisable stock options outstanding of 67% at least two times during their sample period. However, this condition did not altered their findings (Hirshleifer, Low, & Teoh, 2012).

3.1.1 Holder 67

Summarizing the theoretical framework in short, the Hall and Murphy (2002) framework states that the executive's stock option value is based on their initial wealth, their aversion against risk and the degree of underdiversification of his/her personal portfolio. Based on these factors, an executive should exercise the company stock options directly after the vesting period if the stock option is *in-the-money* beyond a rational benchmark. For this measure, the threshold of 67% *in-the-money* of a stock option is used for overconfidence, assuming that two-thirds of a CEO's wealth is tied to the company's stock. This threshold corresponds with a relative risk-aversion of three ($\rho=3$). More specifically, if a rational CEO's option is at 67% *in-the-money* at some point during his/her tenure and the option is vested, the CEO in question should exercise its company stock options. Otherwise this thesis indicate that the CEO in question is assumed to be overconfident. The status of each CEO's option package is examined at the end of its vesting period. The CEO's option packages could include different duration of vesting periods. For comparability purposes, the sample only includes option packages of CEOs that are exercisable.

To investigate the hypotheses in this thesis, the measure Holder 67 is constructed to identify the presence of CEO overconfidence in the sample data. Since the required data for the construction of the overconfidence measures of Malmendier and Tate (2005) is not publicly available, the Execucomp data provides the data that makes it able to construct this overconfidence measure similar to the construction of Malmendier and Tate. Campbell et al. (2011) execute a validation analysis that validates that the Execucomp data are valid for the construction of this overconfidence variable. The database Compustat Execucomp provides information about the CEO's exercise behaviour of *in-the-money* company stock options, which makes it able to construct the overconfidence measures. This thesis computes the following equations to construct the overconfidence measure Holder 67, based on prior research of Campbell et al. (2011) and Humphery-Jenner et al. (2015) concerning CEO overconfidence. This overconfidence variable is based on the average percentage *in-the-moneyness* (Equation 1) of a CEO's company stock options in line with prior research concerning detecting CEO overconfidence. The average percentage *in-the-moneyness* is computed as the stock price at fiscal year-end (Compustat/CRSP Merged Fundamental annual variable: *Prcc_f*) divided by the average exercise price minus one.

$$\text{Average percentage of moneyness of option} = \frac{\text{Stock price at fiscal year end}}{\text{Estimated average exercise price}} - 1 \quad (1)$$

To be able to compute the *in-the-moneyness* of a CEO's stock options, first the average exercise price (Equation 2) is calculated by subtracting the realizable value per option from the stock price at the fiscal year end (Compustat/CRSP Merged – Fundamental annual variable: *Prcc_f*).

$$\text{Estimated average exercise price} = \text{Stock price at fiscal year end} - \text{Realizable value per option} \quad (2)$$

Subsequently, to yield the realizable value per option (Equation 3), the total realizable value of exercisable options by the number of exercisable options the CEO possesses. As mentioned earlier, the research goal is to identify CEOs who decide to hold their stock options that are already vested and therefore could have been exercised. For that reason, the variables from Compustat Execucomp that only includes exercisable options are used (Execucomp variables: *Opt_Unex_Exer_Est_Val* and *Opt_Unex_Exer_Num*).

$$\text{Realizable value per option} = \frac{\text{Total realizable value of exercisable option}}{\text{Number of exercisable options}} \quad (3)$$

After the moneyness of the CEOs' exercisable stock options in this sample are calculated, the data is able to construct the overconfidence variable which identifies the overconfident CEOs based on overconfidence measure *OC67* in the sample. Following prior research concerning managerial overconfidence, it is assumed that managerial overconfidence is a persistent trait (Hirshleifer, Low, & Teoh, 2012). Hence, the indicator variable for overconfidence called *OC67* equals one from the first CEO-year observation in which the CEO fails to exercise his/her options while these options are 67% or more *in-the-money*. More specifically, once a CEO fails to exercise its *in-the-money* stock options during the sample period the CEO in question is classified as overconfident. Note that CEOs who never have valuable outstanding stock options⁶ during the sample period are excluded from the data and therefore are classified as missing data for overconfidence measure Holder 67⁷.

3.1.2 High overconfidence

Following prior research concerning CEO overconfidence, another measure for this phenomenon is created based on the personal portfolio option exercising behaviour of executives (Campbell, Gallmeyer, Johnson, Rutherford, & Stanley, 2011). The measure High overconfidence is derived from the overconfidence measure Holder 67 and therefore follows the same theory as this

⁶ In other words, to be included in the data for this variable, a CEO should have a positive value for Estimated Value of *in-the-money* Unexercised Exercisable Options (STATA term: *Opt_Unex_Exer_Est_Val*) at least once during the sample period.

⁷ If CEOs without valuable stock options outstanding would be included in the sample data, these CEOs would be incorrectly classified as non-overconfident, while practically these executives never had the opportunity to decide whether or not exercise a valuable stock option. Therefore, the overconfidence trait is not observable for these CEOs.

measure, as explained in section 3.1.1. Also, the CEOs' stock options' *in-the-moneyness*, estimated average exercise price and the realizable value per option for this overconfidence measure are calculated with the same formulas as equation (1), equation (2) and equation (3), respectively, which are defined in section 3.1.1. However, High overconfidence differs from Holder 67 based on the overconfidence threshold. Whereas for the measure Holder 67 an executive is classified as overconfident from the moment he/she fails to exercise his/her options while these options are 67% or more *in-the-money*, the measure High overconfidence levels. For the measure High overconfidence the indicator variable *High_OC* equals one from the first moment a CEO holds stock options that are over 100% *in-the-money*. Lastly, just as for overconfidence measure Holder 67 (*OC67*), CEOs without any valuable (positive) outstanding stock options are excluded from the data and are classified as missing data for this overconfidence measure (Campbell, Gallmeyer, Johnson, Rutherford, & Stanley, 2011).

3.2 Measuring the Cumulative Abnormal Return (CAR)

After the presence of CEO overconfidence is proven through examining the personal portfolio decisions concerning company stock options based on the overconfidence measures Holder 67 and High overconfidence, this thesis focusses on answering the research question. The goal of this thesis is to examine the capital market reaction towards CEO overconfidence. More specifically, the research goal is to examine how the investors respond towards the optimistically biased annual reports of firms which are headed by overconfident CEOs. Prior research concerning CEO overconfidence found evidence for greater probabilities of biased misstatements in financial reporting (Schrand & Zechman, 2011), on which many investors rely their stock investment decisions. To measure the investors' reaction towards the sample firms' annual reports led by CEOs that are classified as overconfident by the overconfidence measures, the market returns model is used. This model calculates the firm's market return as the buy-and-hold daily returns minus the value-weighted market portfolio daily returns (including dividends) (MacKinlay, 1997). In formula:

$$\text{Market return firm } i = \text{Buy and hold daily return firm } i - \text{Value weighted daily return}$$

To measure the cumulative abnormal returns, the market adjusted returns is calculated, accumulated over the seven-day event window following the file date of the firms' annual reports for all sample firms⁸.

Also, this thesis includes another variable to check for the robustness of CAR. Therefore, this thesis also includes the robustness check in which the firm's market-adjusted returns is calculated as

⁸ In STATA terms: CAR = RET - VWREDT taken over the seven-day event window (0 to +7 days after the filing date of the annual report).

the buy-and-hold daily returns minus the equal-weighted market portfolio returns (including dividends) (MacKinlay, 1997). In formula:

$$\text{Market return firm } i = \text{Buy and hold daily return firm } i - \text{Equal weighted daily return}$$

Also for this robustness check variable, the cumulative abnormal returns is calculated as the accumulated market adjusted returns over the seven-day event window following the file date of the firms' annual reports. This robustness check variable is defined as *CARrobust* in section 4 of this thesis. Whereas the equal-weighted returns are weighted all equally, apart from its size or market capitalization, the valued-weighted returns are based on both the absolute and relative value of a firm's stock compared to other stocks.

3.3 Control variables

3.3.1 Firm size

According to the findings of LaFond and Watts (2008), firm size could negatively influence CAR and therefore is included in the regression as a control variable. These researchers document that larger firms produce more public info, leading to less information asymmetry which reduces the demand for conservatism in financial reporting (LaFond & Watts, 2008). Therefore, firms with an overconfident CEO could be even more prone to report less conservative. However, Hribar and Yang (2010) found that larger firms are less likely to miss their forecasts (Hribar & Yang, 2010). Hence, the effect of firm size on CAR is predicted as ambiguous. Following LaFond and Watts (2008), the log of Total Assets in year t (CRSP/Compustat Fundamentals Annual: *AT*) is the measure of firm size.

3.3.2 Investment level

The firms' investment level is included as an additional proxy to control for CEO overconfidence. According to prior studies, managerial overconfidence affects corporate decisions through a firm's investment, financing, accounting and dividend policies (Hwang, Cha, & Yeo, 2014). Therefore the level of investments could negatively affect the cumulative abnormal return. Following Hwang, Cha and Yeo (2014) the capital expenditures in year t (CRSP/Compustat Fundamentals Annual: *CAPX*) divided by the Total Assets (CRSP/Compustat Fundamentals Annual: *AT*) is the measure of investments for firm i .

3.3.3 Market fluctuation

Following Chang et al. (2010), the CRSP value-weighted return is included in the regression to control for market movements. In other words, the value-weighted return measures the normal market reaction at the moment of the event. In the case this market return is (extremely) high, this market reaction could be caused by a fluctuation in the market at the moment of the event (Chang,

Agnes Cheng, & Reichelt, 2010). Therefore the regression test statistics could be affected by the market movements.

3.3.4 Industry and time effects

Following Yermack (1995), industry and year dummies are included in the regression in order to control for industry and time effects. To control for industry effects, dummy variables for every two-digit SIC industries is used to control for firm effects on the cumulative abnormal return. Furthermore, year dummies are included in the sample to control for the effect over time (Yermack, 1995).

3.4 Sample data and data analysis

The sample data of this research consists of firms included in the Execucomp database for the years 2006 until 2014, including North American companies only. The data sample starts at the year 2006 because from this year on the data provide more detailed on option values in comparison to the years prior to 2006⁹. Because the research goal is focussed on the effects of the capital market's reaction to the presence of CEO overconfidence both CEO data and company data is included in the sample data. Execucomp provides all relevant information concerning CEO compensation to construct the overconfidence measures, such as the *in-the-moneyness* of the CEO's stock options. The dataset CRSP - Daily Stock File provides in the capital market data to examine the cumulative abnormal returns (CARs). More specifically, this dataset contains data concerning the companies' stock market returns and the market portfolio return indexes, for which the CRSP Value-weighted index and the CRSP Equal-weighted market portfolio return index are used. Furthermore, the data from CRSP/Compustat Merged – Fundamental Annual is used to construct certain dependent- and control variables, which are illustrated in section 3.3.

CEO observations with missing data in the stock returns are excluded from the sample and observations with missing data in the CEO overconfidence measures are excluded for the variables Holder 67 and High overconfidence. Furthermore, following prior research concerning CEO overconfidence, financial firms (SIC 6000-6900), regulated utilities (SIC 4900-4999) and regulated telephone companies (SIC 4813) are deleted from the sample as a consequence of the specific nature of their business (Deshmukh, Goel, & Howe, 2009). Table 2 (Appendix) provides the sample selection criterion for this thesis after the required datasets are merged and the event windows are created. The statistical program STATA makes it able to construct event windows. In the empirical analysis of this thesis, for each CEO year observations a seven-day event window after the filing of the firms'

⁹ The variable Estimated Value of *in-the-money* Unexercised Exercisable Options (STATA terms: Opt_Unex_Exer_Est_Val) provides more detailed information, starting from the year 2006. Prior to 2006, this variable provides the value of *in-the-money* Unvested Options at fiscal year, reported by the firms (Slothouber, 2010).

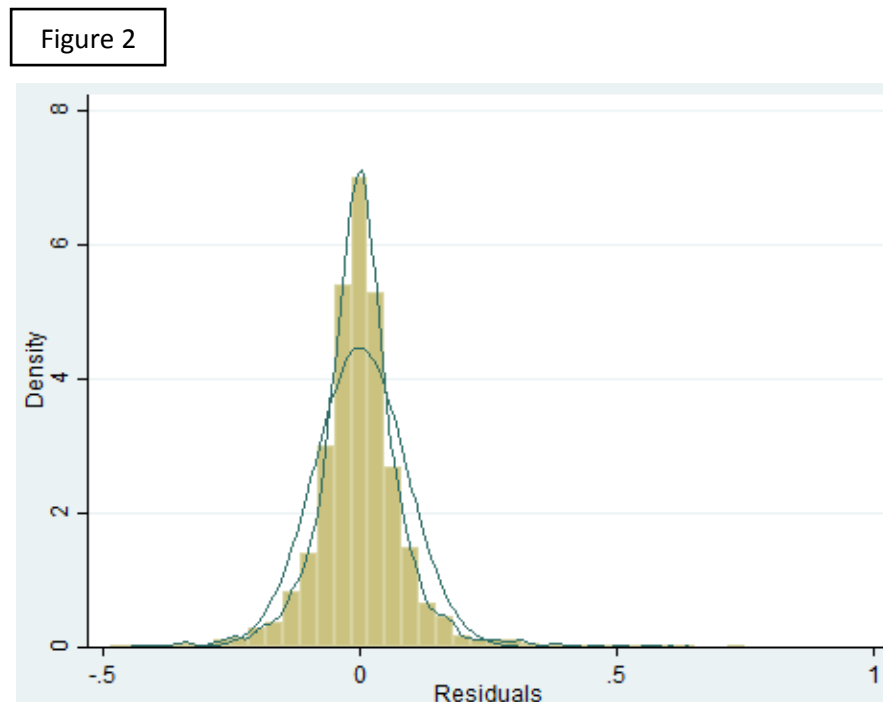
annual report along with an estimation window of 30 days. After these event windows and estimation windows are constructed, the final sample consists of 1,209 firms, 5,436 CEOs and 7,535 CEO year observations. For both the overconfidence variables OC67 and High overconfidence there are 5,968 observations.

3.5 Data gathering process

First of all, to reduce the problems of extreme values in the dataset, all independent and control variables are winsorized at the 1%-level in both tails. Therefore, the variables’ coefficients and p-values are less affected by these extreme values. Furthermore, the variables are tested for multicollinearity (Table 3, Panel A) to check for high correlations between variables. The Variance Inflation Factor (VIF) test shows that there is no high correlation observed between the independent variables (Table 4, Appendix). Nevertheless, three industry dummy variables (SIC2) contain higher VIFs which could indicate multicollinearity. However, these higher VIF values could be ignored. This is because the multicollinearity is detected in the control variable for industries and the variables of interest (the independent variables) do not have high VIFs. Therefore the coefficient of these variables are not affected by the multicollinearity and the performance of the control variables as control is not impaired (Allison, 2012).

Table 3: Multicollinearity and Heteroscedasticity	
Panel A presents the VIF test for multicollinearity. The mean Variance inflation factor (VIF) provides the mean level of multicollinearity (correlation between predictors) of the variables included in the regression model. Panel B presents the results of the Breusch-Pagan test for Heteroscedasticity, which tests for heteroscedasticity in the regression models.	
Panel A: Testing for multicollinearity	
Dependent variable	Mean VIF
CAR	3.37
CARrobust	3.33
Panel B: Testing for heteroscedasticity	
Breusch-Pagan test for Heteroscedasticity	
Chi-Square value	261.21
P-value	0.00

Besides, the Breusch-Pagan test for Heteroscedasticity (Table 3, Panel B) finds that the data contains heteroscedasticity. To mitigate the problems of heteroscedasticity, robust standard errors are used when testing the regressions. Therefore the test statistics leads to more accurate p-values due to the use of robust standard errors. Finally, the normality of the error variables are tested for which a histogram of the residuals of the models is made. The residuals seems to show normality (Figure 2).



3.6 Regression specification

Taking the nature of the variables in this research into consideration, the Ordinary Least Squares (OLS) multiple regression technique is the most useful testing method to examine the research goal¹⁰. The reason behind this is that the dependent variable, the cumulative abnormal return, is a continuous variable and the independent and control variables used in the model are either quantitative or dummy variables.

To test for *Hypothesis 2* that predicts that the cumulative abnormal returns are more negative after the filing of the annual financial report for a company's stock led by an overconfident CEO relative to non-overconfident CEOs, the following base regression specification is formulated (Equation 4):

¹⁰ This research method is commonly used in prior research concerning CEO overconfidence. For example Malmendier and Tate (2005a) and Hirshleifer, Teoh and Low (2010) used the OLS multiple regression technique in their researches.

$$CAR_{i,(0,+7)} = \beta_0 + \beta_1 OC67_i + \beta_2 Firm\ size_i + \beta_3 Investment_i + \beta_4 Market\ fluctuation_i + \beta_5 Industry_i + \beta_6 Year_i + \varepsilon_i \quad (4)$$

Where β_0 is the intercept, *Industry* and *Year* are industry and year dummies and ε_i is the error term. Besides the variable *OC67*, also the variable *High_OC* is tested using the equation above. Furthermore, as a robustness check, the regression of equation (4) is also tested in which *CARrobust*¹¹ is the dependent variable instead of dependent variable *CAR*. For the coefficients of both of the overconfidence variables *OC67* and *High_OC* are expected to be negative. Also, this thesis predicts that the coefficients of the control variables size and investment level are negative.

¹¹ The definition and explanation of this robustness check variable can be found in section 3.2 of this thesis.

4. Empirical analysis and results

This part includes the empirical analysis, which is the main subject of this research. In the first section the sample data is discussed by describing the descriptive statistics and by explaining the outliers. In the second part, the empirical tests are executed and the results of this analysis are presented. Subsequently, the regressions specifications are examined, which provides evidence that supports or rejects the hypothesis in this research.

4.1 Descriptive statistics

The descriptive statistics of this thesis are presented in Table 5. According to overconfidence measure *OC67*, about 23% of the CEO observations are classified as overconfident during the sample period, while about 15% of the CEO observations are classified as highly overconfident as measured by overconfidence measure *High_OC*. When examining the tendency of managerial overconfidence throughout the sample period, the percentage of overconfidence tend to move between approximately 20% and 30% for the measure *OC67* and for the measure *High_OC* between approximately 12% and 22%. Remarkably is that for the global financial crisis years (2008-2009) the level of overconfidence is lower for both overconfidence measures, in comparison with the other sample years. The results in this table provide evidence that examining the personal portfolio decisions of executives is an appropriate measure to detect managerial overconfidence. These findings detect that the overconfidence bias is present in the sample data, based on the sample CEOs' stock option exercising behaviour and therefore provides support for *Hypothesis 1*.

Table 5: Descriptive statistics

This table includes the number of observations, means, standard deviations, minimum value and maximum value of dependent variable, independent variables and the control variables used in this thesis. The variable *CAR* is the main dependent variable of interest, which is calculated as the cumulative returns within the seven-day event window minus the value-weighted returns. The variable *CARrobust* is included as a robustness check, which is calculated as the cumulative returns within the seven-day event window minus the equal-weighted returns. Furthermore, all the independent variables and control variables in this table are winsorized at the 1st and 99th percentiles.

Variable	Number of observations	Mean	Standard deviation	Minimum value	Maximum value
Dependent variable					
CAR	5968	0.001	0.091	-0.481	0.776
CARrobust	5968	-0.021	0.095	-0.495	0.695
Overconfidence measures					
OC67	5968	0.225	0.418	0	1
OC_High	5968	0.151	0.358	0	1
Control variables					
Firm size	5968	7.555	1.615	4.095	11.818
Investment	5963	0.049	0.049	0.002	0.276
Market fluctuation	5968	0.002	0.011	-0.026	0.046

Since both overconfidence measures *OC67* and *High_OC* are dummy variables, there are differences in descriptive statistics between overconfident CEOs and non-overconfident CEOs. Table 6 provides these differences, based on the mean and median of both overconfidence and gives indications of the relation between CEO overconfidence and CAR. The differences between the means are examined through the Wilcoxon rank-sum test, while the nonparametric equality of medians test is used to test for differences between the medians. The results in Panel A show that firms with overconfident executives, as specified by *OC67*, have a significantly more negative (smaller) mean and median CAR than non-overconfident CEOs. Also, these firms are smaller, however the differences in mean and median firm size are not significantly different between firms managed by overconfident CEOs and its non-overconfident peers. Furthermore, firms with an overconfident CEO invest significantly more than firms that is not led by a non-overconfident CEO. Also, there are no significant market fluctuations at the moment of the event date. Additionally, the results for robustness variable *CARrobust* are less significant concerning the capital market reaction to managerial overconfidence. These variable shows that firms with overconfident executives also have a more negative (smaller) mean.

Similar results are found for overconfidence measure *High_OC*, as presented in Panel B of Table 6. These results also indicate that firms with an overconfident CEO have a significantly more negative (smaller) mean and median CAR than firms that are led by a non-overconfident CEO. Likewise, firms with an overconfident CEO are smaller in size but do invest significantly more than their non-overconfident CEOs. Also, there are no significant market fluctuations at the moment of the event date. Finally, the results for *CARrobust* are less significant, just as it is the case for the overconfidence measure *OC_67*.

Table 6: Differences in descriptive statistics

This table provides the means and medians of the main dependent variable and its control variables, but also the robust dependent variable. Panel A presents the (differences in) means and medians for the overconfidence measure Holder 67, while Panel B provides these numbers for the high overconfidence measure. The Wilcoxon rank-sum test is examined to test for the differences between the means of firms with overconfidence CEO's and firms with non-overconfident CEO's. Also, the nonparametric equality of medians test is used to test for the differences between the medians. The asterisks *, ** and *** represents the significance of the difference on a 5%-, 1%-, and 0.1%-level respectively.

Panel A: Overconfidence measure OC67

Variable	OC67=0		OC67=1		Difference	
	Mean	Median	Mean	Median	Mean	Median
CAR	0.0037	-0.0001	-0.0067	-0.0030	0.0104**	-0.0029*
CARrobust	-0.0191	-0.0148	-0.0296	-0.0153	-0.0105	-0.0005
Firm size	7.579	7.471	7.474	7.434	-0.105	-0.037
Investment level	0.048	0.032	0.053	0.038	0.005***	0.006***
Market fluctuation	0.0021	-0.0002	0.0010	-0.0002	-0.0011**	0

Panel B: Overconfidence measure High_OC

Variable	High_OC=0		High_OC=1		Difference	
	Mean	Median	Mean	Median	Mean	Median
CAR	0.0028	-0.0007	-0.0067	-0.0019	0.0095*	-0.0012
CARrobust	-0.0199	-0.0151	-0.0263	-0.0141	-0.0064	0.001
Firm size	7.593	7.489	7.339	7.303	-0.254	-0.186
Investment level	0.048	0.033	0.054	0.037	0.006**	0.004**
Market fluctuation	0.0020	-0.0002	0.0007	-0.0002	-0.0013**	0

The results of the Wilcoxon rank-sum test and the nonparametric equality of medians test (Table 6) gives rise to further investigate the effect of CEO overconfidence to the capital market. These tests examine the differences in descriptive statistics based on the differences in the stock options exercising behaviour of the CEOs in the sample data. These differences show that stock option exercising behaviour and, more specifically, the behaviour of CEOs that fails to exercise their stock options ($OC67=1$ and $High_OC=1$) leads to significantly different market reactions.

4.2 Correlations

As mentioned earlier in section 3.5, the results indicates that multicollinearity is not an issue in this data sample. The Variance Inflation Factor (VIF) show that there are only high correlations between some industry dummies (SIC2), but these variables does not affect the coefficient estimates and p-values of the variables of interest.

Furthermore, Table 7 shows the pairwise correlations between CAR and the CEO overconfidence measures used during this research. The correlations of the $OC67$ and OC_High are both highly significant. The correlation between $OC67$ and OC_High obviously is high because these measure mainly rely on the same underlying reasoning and therefore are tested separately in different regressions. At last, the relation between both overconfidence measures $OC67$ and OC_High and CAR is negative, since both correlations with the dependent variable of interest are negative.

Table 7: Correlations

The table provides the pairwise correlations between dependent variable CAR and the two measures of CEO overconfidence. The significant levels, presented below the correlations in parentheses, are Sidak adjusted. The definitions of these variables can be found in Table 1 (Appendix).

	CAR	OC67	OC_High
CAR	1.000		
OC67	-0.0481 (0.0006)	1.000	
OC_High	-0.0373 (0.0119)	0.7825 (0.000)	1.000

4.3 Regression results

Next, this thesis examines the effect of the filing of the sample firms' annual reports by overconfident CEOs in order to test *Hypothesis 2*. This hypothesis claims that the financial numbers in the annual reports are (probably) overstated by the executives' overconfidence bias and therefore the capital market reaction to the annual report filing is negative. As a consequence, the market reaction to the filing of annual reports should be significantly more negative (lower) for overconfident CEOs than for CEOs that are not classified as overconfident.

As mentioned earlier, the firms' cumulative abnormal returns are calculated as the buy-and-hold daily returns minus the value-weighted market daily returns accumulated over the seven-day event window following the file date of the firms' annual reports. Also, as a robustness check, the cumulative abnormal returns are calculated as the buy-and-hold daily returns minus the equal-weighted returns instead of the value-weighted returns. The results of the OLS regressions are presented in Table 8 and Table 9, in which the CAR and *CARrobust* are the dependent variables, respectively.

Table 8: CEO overconfidence and CAR - OLS regressions

This table provides the OLS regression statistics in which CAR is the dependent variable and the overconfidence measure *OC67* and *High_OC* are the independent variables, as specified in Table 1. All standard errors in these regressions are robust, and the associated t-statistics are reported in parentheses. The asterisks *, ** and *** represents the significance of the corresponding coefficient on a 5%-, 1%-, and 0.1%-level respectively.

Dependent variable: CAR				
	(1)	(2)	(3)	(4)
OC67	-0.0062*		-0.0062*	
	(-2.42)		(-2.41)	
High_OC		-0.0042		-0.0041
		(-1.38)		(-1.35)
Firm size			0.0065	0.0065
			(0.78)	(0.78)
Investment level			0.0424	0.0406
			(1.10)	(1.06)
Market fluctuation			-0.0970	-0.0989
			(-0.61)	(-0.62)
Constant	0.0325	0.0323	0.0237	0.0236
	(1.85)	(1.83)	(1.22)	(1.22)
Observations	5968	5968	5963	5963
Adjusted R²	0.0335	0.0330	0.0334	0.0329
Industry fixed effects?	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes

The regression specifications of column 1 and column 2 of Table 8 do not include control variables, except for the industry and year fixed effects. Overconfidence measure *OC67* have a negative and significant coefficient, supporting the claim of *Hypothesis 2*. The market reaction to the filing of the sample firms' annual report by an overconfident CEO is -62 basis points¹² (bps). In other words, the average overconfidence effect towards the filing of the firms' annual report is -0.62% in cumulative abnormal returns. These findings are in line with the predicted sign as stated in *Hypothesis 2* and therefore provide supports the claim of *Hypothesis 2*. Furthermore, the coefficient of the regression specification that only includes overconfidence measure *High_OC* contains the predicted sign. Among firms with highly overconfident CEOs, the market reaction effect is -42 bps. However, the coefficient is not statistically significant on any level.

The regression specifications in column 3 and column 4 (Table 8) include all control variables. Thus, these regressions examines whether the effect of managerial overconfidence on the capital market reaction CAR holds after controlling for other factors that could influence the firms' CAR. In comparison with the simple OLS regression, the control variables does not significantly alter the effect of CEO overconfidence on CAR. For the Holder 67 overconfidence measure, the coefficient *OC67* is still negative and significant on a 5%-level. This value also captures economic significance; CEO overconfidence leads to a decrease in CAR of 62 basis points. The results for the overconfident measure *High_OC* (Column 4) are, after adding the control variables, also consistent with its simple OLS regression. High managerial overconfidence still has a negative effect (of -42 basis points) on CAR, however this effect remains statistically insignificant. Furthermore, the control variables included in the regression specifications do not significantly affect the relation between CEO overconfidence and the market reaction to the filing of annual reports. As shown by columns 3 and column 4 (Table 8), the capital market responds more positive to the annual reports of larger firms. However, this coefficient is statistically insignificant. Besides, in this sample, increasing the firms' investments has a positive but insignificant effect on CAR. Finally, the market fluctuation at the moment of the filing of a firm's annual report, do not significantly affect the investigated effect.

¹² One basis point (bp) is the percentage change in the value or rate of a financial instrument.

Table 9: CEO overconfidence and CARrobust – OLS regressions

This table provides the OLS regression statistics in which *CARrobust* is the dependent variable and the overconfidence measure *OC67* and *High_OC* are the independent variables, as specified in Table 1. All standard errors in these regressions are robust, and the associated t-statistics are reported in parentheses. The asterisks *, ** and *** represents the significance of the corresponding coefficient on a 5%-, 1%-, and 0.1%-level respectively.

Dependent variable: <i>CARrobust</i>				
	(1)	(2)	(3)	(4)
OC67	-0.0069*		-0.0066*	
	(-2.52)		(-2.41)	
High_OC		-0.0047		-0.0042
		(-1.45)		(-1.30)
Firm size			0.0012	0.0012
			(1.38)	(1.37)
Investment level			0.0708	0.0051
			(0.18)	(0.13)
Market fluctuation			-0.1151	-0.1173
			(-0.68)	(-0.69)
Constant	0.0213	0.0210	0.0103	0.0102
	(1.19)	(1.17)	(0.52)	(0.51)
Observations	5968	5968	5963	5963
Adjusted R²	0.0346	0.0340	0.0345	0.0339
Industry fixed effects?	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes

As a robustness check, regression specifications are included with *CARrobust* as dependent variable in Table 9. In column 1 and column 2, the simple OLS regressions include the main independent variables of interest, which are only controlled for industry and year fixed effects. These results reaffirms the findings found by dependent variable *CAR* in Table 8. For the overconfidence measure Holder 67, the coefficient *OC67* is even a bit more significant in comparison with the same regression specification in which *CAR* is the dependent variable; the coefficient is negative and significant on the 5%-level. Economically speaking, the overconfidence effect concerning the filing of the annual report by a firm of an overconfident CEO leads to an average decrease in *CARrobust* of 0.69%. For the overconfidence measure *High_OC*, also similar results are found compared to Table 8. Although the coefficient has the predicted negative sign and the market reaction to highly overconfident is -47 bps, the t-statistic is still not statistically significant on any level.

The regression specifications in column 3 and column 4 of Table 9 again include all control variables. Also these test statistics leads to similar results in the case *CAR* is the dependent variable (as presented by Table 8); again the control variables do not significantly affect the effect of CEO overconfidence on the capital market reaction during the filing of the firms' annual reports. First, the

results for overconfidence measure *OC67* are still negative and statistically significant, since the presence of CEO overconfidence leads to a negative *CARrobust* of 66 basis points. Therefore, through the use of a robustness check on the dependent variable, overconfidence measure *OC67* again provides evidence supporting the *Hypothesis 2* that managerial overconfidence leads to a negative capital market reaction at the moment of the filing of an annual report by firms headed by overconfident CEOs. The use of robustness check variable *CARrobust* as dependent variable instead of *CAR*, leads to a small but negligible increase in adjusted R^2 . Besides, highly overconfident CEOs has a negative effect of 47 basis points on *CARrobust*, but this coefficient is still insignificant at any level. Furthermore, consistent with its simple OLS regression, adding the control variables (Column 3 and 4, Table 9) do significantly alter the effects of CEO overconfidence on *CARrobust*. For both overconfidence measure *OC67* and *High_OC*, the capital market responds more positive to the filing of annual reports by larger firms. Further, the firms' investment level is positively related with *CARrobust*, but this effect is statistically insignificant. Also, the market fluctuation at the moment of the event date do not significantly affect *CARrobust*.

5. Conclusion, implications and limitations

In this part, the findings of the empirical analysis are summarized which makes it able to support or reject the claims made by the hypotheses. Furthermore, conclusions are made to give answer to the research question. Thereafter, the implications of this thesis are discussed. Finally, the limitations of this thesis and recommendations for future research are provided.

5.1 Summary and conclusion

The purpose of this thesis is to examine how capital market investors respond to the presence of CEO overconfidence. More specifically, this thesis examines the relation between the presence of CEO overconfidence and the market reaction to this overconfidence and their associated announcement of (overestimated) financial numbers in order to answer the following research question: *“Do investors respond negatively to a capital market share of a firm headed by an overconfident CEO after filing the firm’s annual financial report?”* Managerial overconfidence is defined as a behavioural trait, in which the better-than-average effect claims that individuals overestimate their skills relative to the average of the sample group, when assessing their own skills. More profoundly, the overconfidence bias leads to greater probability of optimistically biased misstatements in financial reporting. Overconfident managers are more likely to issue optimistically biased financial numbers because they overestimate their ability to affect financial results and/or underestimate the probability of risks and random events.

The first hypothesis in this thesis tests whether these stock option-based measures are appropriate measures to detect CEO overconfidence in the sample data. To examine this hypothesis, this thesis counts the number of observations in which the overconfidence dummies are activated ($OC67=1$ and $High_OC=1$). In the case that the overconfidence are not activated ($OC67=0$ and $High_OC=0$), the CEOs are classified as non-overconfident. The results in the descriptive statistics provide evidence that examining the personal portfolio decisions of executives is an appropriate measure to detect CEO overconfidence. For the measure $OC67$, 25% of the CEO observations are classified as overconfident, based on their stock option exercising behaviour, whereas the other 75% of the CEO observations are classified as non-overconfident. Also, the measure $High_OC$ finds that 15% of the sample executives are even classified as highly overconfident, and the other 85% of the sample observations is classified as not highly overconfident. Also, as shown by the descriptive statistics, the differences in the market reactions between (highly) overconfident CEOs and non-overconfident CEOs ($OC67=0$ and $High_OC=0$) indicate that managerial overconfidence has significantly different influence on the capital market reactions. These findings provide supports *Hypothesis 1*, which claims that the personal portfolio decisions of a CEO are positively associated with the overconfidence bias.

The results of the Wilcoxon rank-sum test and the nonparametric equality of medians test also provide primary results supporting the claim of *Hypothesis 2*, which claims that the capital market reaction CAR to the filing of the annual report by an overconfident CEO is negative. These tests examine the differences in descriptive statistics based on the differences in the stock options exercising behaviour of the CEOs in the sample data. These differences show that stock option exercising behaviour and, more specifically, the behaviour of CEOs that do not exercise their stock options ($OC67=1$ and $High_OC=1$) leads to significantly more negative market reactions compared to non-overconfident CEOs. The differences in CAR means and medians between firms with overconfident CEOs and its non-overconfident peers are statistically significant. These findings are more profoundly tested through an empirical analysis on the effect of CEO overconfidence on the capital market reaction.

In the empirical analysis part, *Hypothesis 2* is examined through an OLS multiple regression on the effect of CEO overconfidence on the firms' cumulative abnormal return (CAR). The regression test statistics provides evidence that supports the claim of *Hypothesis 2*. First, the overconfidence measure $OC67$ have a negative and significant effect on CAR in both the simple OLS regression specification (but including industry and years fixed effects) and the OLS regression specification including control variables. These results are even slightly stronger for the robustness check variable CAR_{robust} , when the same OLS regressions are tested to examine the effect of CEO overconfidence on the capital market reaction to the filing of annual reports. Hence, for the overconfidence measure Holder 67, there is evidence that the capital market reacts negatively to the presence of overconfident CEOs and the filing of its firms' annual report. However, the predictability of these regression models (adjusted R^2) is relatively low. Although the regressions results indicate that capital market investors respond negatively to the filing of the annual reports that are managed by overconfident CEOs, there are possibly other factors that affect this relation which are not incorporated in the regression model.

The second overconfidence measure examines the effect of higher levels of managerial overconfidence on the capital market reaction to the filing of annual reports. Although $High_OC$ shows a negative effect on CAR, its coefficient is statistically insignificant on all levels.

Furthermore, this thesis examined whether one of the control variables is responsible for the results found in the empirical analysis. Adding the control variables firm size, investment level and market fluctuations, does not significantly alter the results of any of the regressions in this thesis. Therefore, the control variables used in the regressions do not account for the effects found.

Finally, the research question is answered to make a conclusion for this thesis. The research questions states: "*Do investors respond negatively to a capital market share of a firm headed by an*

overconfident CEO after filing the firm's annual financial report?" This thesis implies that the capital market investors respond negatively to the filing of the firms' annual report that is headed by an overconfident CEO, as measured by the cumulative abnormal return (CAR). This negative influence is caused by the overconfident CEO's tendency to report optimistically biased financial numbers in the annual report due to the excessive forecast optimism of the overconfident CEO.

5.2 Implications

The results of this thesis have several implications. First, this thesis raises another question why firms should not hire overconfident CEOs. Although prior research found evidence for the positive effects of employing an overconfident CEO, such as greater innovative success (Hirshleifer, Low, & Teoh, 2012) and the positive influence on firm value measured by Tobin's Q (Slothouber, 2010), this thesis provides evidence that managerial overconfidence negatively influences the firms' stock value on the capital market. More specifically, the capital market investors respond negatively to managerial overconfidence at the time that firms, managed by an overconfident CEO, file their annual financial reports. Prior research already found evidence for the negative effects of managerial overconfidence, such as overinvestments (Malmendier & Tate, 2005a), optimistically biased misstatements and financial statement fraud (Schrand & Zechman, 2011), higher probability of earnings management (Hribar & Yang, 2010) and negative market reactions towards overacquisitiveness of overconfident CEOs (Malmendier & Tate, 2008). Adding the findings of this thesis up with prior evidence of the effects of CEO overconfidence, the firms' Board of Directors should be more aware of the trade-off between the benefits and harms of hiring an overconfident CEO. Therefore, the monitoring functions in firms that employ overconfident CEOs should be more optimized, in which more monitoring should be focussed on controlling the CEOs' financial statement forecasts and investments decisions, and less monitoring should be focussed on the innovation decisions. Moreover, the results of this thesis are of relevance for the capital market investors. Overconfident CEOs provide optimistically biased financial numbers in the annual report, which is an important resource of information for investors on which they frequently base their stock investment decisions. Therefore, to minimize negative market returns on their portfolio, the capital market investors should be more aware of the presence of managerial overconfidence.

5.3 Limitations

This thesis faces several limitations. First of all, one limitation of this thesis is the endogeneity concerns. In the regressions specification it is assumed that CEO overconfidence is an exogenous variable. However, in case that the CEOs are hired based on their overconfidence directly or indirectly, this would lead to endogeneity concerns. Though, Malmendier and Tate (2005a) and Hirshleifer et al.

(2010) state that the use of different control variables such as firm size and industry effects alleviate these problems. The industry fixed effects also alleviate the endogeneity concerns of the absence of unobserved firm characteristics that could affect both CEO overconfidence and CAR. However, the industry fixed effects, together with including the control variables used in this thesis, alleviate these concerns.

Furthermore, the dataset itself contains several limitations. Malmendier and Tate (2005) designed three stock option-based measure to detect managerial overconfidence, namely: Holder 67, Net buyer and Longholder. However, the required data for the construction of these overconfidence measures are not publicly available. Therefore, based on the data available, it is not feasible for this thesis to construct the variable Longholder. In contrast to the other two overconfidence measures of Malmendier and Tate, this variable focusses on the expiration date of a CEO's stock option package rather than the end of the vesting period. In the case of Longholder, a CEO was assumed to be overconfident when he/she decides to hold an option until the last year of its duration rather than to exercise when it is fully vested. However, using this variable also has its limitations; since the duration of an option grant usually is ten years and few CEOs have a tenure of ten years by one specific firm, this overconfidence measure would probably have too little observations to make inferences.

Another limitation of the dataset was the shortage of observations for the overconfidence measure Net buyer. This variable focusses on the extent to which CEOs buy additions company stock, even though they are already highly exposed to idiosyncratic risk, as already explained in the theoretical background. The CEO in question is classified as overconfidence in the case the CEO is a net buyer of the firm's stock in more years than a net seller. Despite the construction of this variable is feasible for this thesis, the lack of observations makes it unable to make inferences for this measure. Also, this variable has its limitations because it is difficult to observe whether the company stock a CEO holds is part of the compensation or he increased the company stock itself, which is decisive information to classify a CEO as overconfident or not.

The next limitation of the dataset is that the research goal had to be adapted due to a lack of available data. The dataset I/B/E/S Guidance provides quantitative company expectations and, more specifically, estimations of future earnings, provided by the CEOs themselves. Therefore it would be interesting to examine the capital market reaction at the moment overconfident CEOs provides the firms' forecasted Earnings per Share (EPS), which are highly overestimated due to the overconfidence bias. This research presumably provides stronger evidence for negative market reaction towards CEOs' firm performance expectations.

Furthermore, the data sample period includes the global financial crisis years (2008-2009). The descriptive statistics show that the level of overconfidence measured in these years is substantially lower than for the other sample years. Therefore, it is unclear to what extent these crisis years affect the relation between CEO overconfidence and CAR in this thesis. Finally, the explanatory power of the regression models is relatively low. The use of robustness check variable *CARrobust* as dependent variable instead of CAR, leads to a small but negligible increase in adjusted R^2 . Moreover, adding more control variables to the regression models did not increase the explanatory power. For example, adding CEO ownership to the model, which measures the percentage of shares owned by the CEO, even decreased the explanatory power of the regression models.

Lastly, this thesis faced limitations during the research process. Due to a lack of time to more profoundly investigate the subject CEO overconfidence, this thesis possibly did not discuss all the research papers concerning CEO overconfidence that are publicly available.

Taking all the limitations mentioned above into consideration, a recommendation for future research is made. In order to find more accurate evidence for the effects of CEO overconfidence on the capital market reaction, the dataset with CEO overconfidence relevant data should be extended. Because the predictability of the regression model used in this thesis is relatively low, it is possible that other factors influence the investigated relation which are not incorporated in the regression models. If it is feasible to extend the I/B/E/S Guidance database, future research could provide more consistent and significant results for the relation between CEO overconfidence and the capital market reaction to the announcement of a firm's financial numbers provided by overconfident CEOs. Furthermore, the data examined in this thesis only include North American firms. To generalise the results of this thesis, future research concerning the effect of CEO overconfidence on the capital market reaction towards the announcement of a company's financial information should be examined on the capital markets in different countries/regions in the world.

Figure 1: Libby boxes

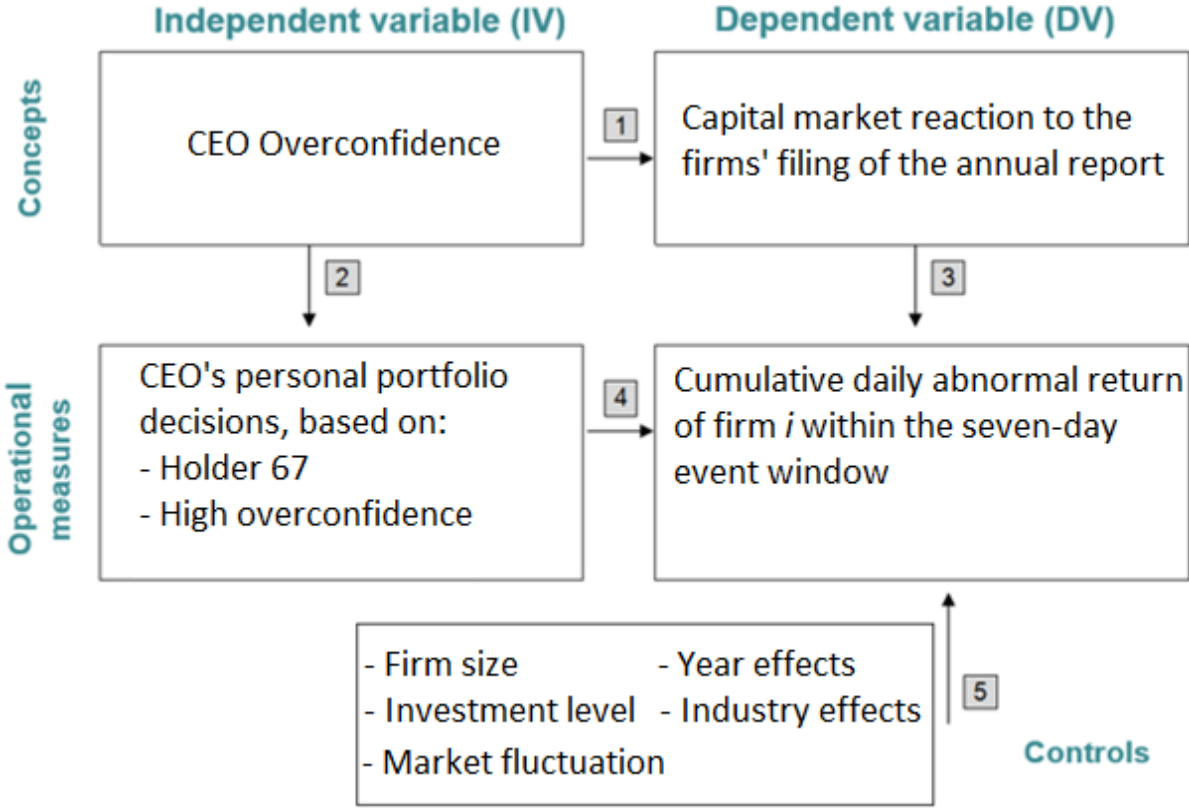


Table 1: Variable description

This table provides an overview of all the variables used in this thesis. The construction of these variables are more profoundly explained in section 3 of this paper: Research Design and Methodology.

Variable	Description
Dependent variable	
CAR	The sum of the daily buy-and-hold stock returns of firm i – the daily returns (including all distributions) on a value-weighted market portfolio within the seven-day event window
CARrobust	The sum of the daily buy-and-hold stock returns of firm i – the equal-weighted returns (including all distributions) on an equally-weighted market portfolio within the seven-day event window
Overconfidence measures	
OC67	Dummy variable that equals 1 from the first moment (price close annual fiscal / price close annual fiscal – (realisable value of exercisable options / number of exercisable options)) $-1 > 0.67$, and 0 otherwise
OC_High	Dummy variable that equals 1 from the first moment (price close annual fiscal / price close annual fiscal – (realisable value of exercisable options / number of exercisable options)) $-1 > 1$, and 0 otherwise
Control variables	
Firm size	Natural log of Total Assets
Investment	Capital expenditures (CAPEX) / Total Assets
Market fluctuation	Value-weighted market return at moment of event
Industry	Dummy variable for every two-digit SIC industry
Year	Dummy variable for every year included in the data sample

Table 2: Sample selection process

Selection criteria	Observations
Firms with available CEO overconfidence data from 2006 to 2011	5,125
Less: Firms excluded based on their firm specific nature:	
Financial institutions (SIC codes 6000-6999)	(1,553)
Regulated utility firms (SIC codes 4900-4999)	(147)
Regulated telephone companies (SIC code 4813)	(38)
	3,387
Less: Firms with insufficient information within the event window	(2,178)
Sample firms:	1,209

Table 4: Multicollinearity test

This table presents the VIF test for multicollinearity. The Variance inflation factor (VIF) provides the level of multicollinearity (correlation between predictors) of the independent variables included in the regression models

Dependent variable	Mean VIF
OC67	1.06
High_OC	1.06
Firm size	1.16
Investment level	1.83
Market fluctuation	2.24

7. Bibliography

- Ajinkya, B., Bhojraj, S., & Sengupta, P. (2005). The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of Accounting Research*, 343-374.
- Alicke, M. D. (1985). Global self-evaluation as determined by the desirability and controllability of trait adjectives. *Journal of Personality and Social Psychology*, 1621-1630.
- Allison, P. (2012, September 10). *When Can You Safely Ignore Multicollinearity?* Retrieved from Statistical Horizons: <http://statisticalhorizons.com/multicollinearity>
- Barber, B. M., & Odean, T. (2007). *All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors*. Oxford: Oxford University Press.
- Ben-David, I., Graham, J., & Harvey, C. (2007). *Managerial overconfidence and corporate policies*. Working paper: Ohio State University and Duke University.
- Bhojraj, S., Libby, R., & Yang, H. (2010). *Analyzing guidance at the firm level: The association between guidance frequency, guidance properties, and market reactions*. Working paper: Cornell University and University of Pennsylvania.
- Camerer, C., & Lovallo, D. (1999). Overconfidence and Excess Entry: An Experimental Approach. *The American Economic Review* 89, 306-318.
- Campbell, C. T., Gallmeyer, M., Johnson, S. A., Rutherford, J., & Stanley, B. W. (2011). CEO Optimism and Forced Turnover. *Journal of Financial Economics*, 695-712.
- Chang, H., Agnes Cheng, C., & Reichelt, K. J. (2010). Market Reaction to Auditor Switching from Big 4 to Third-Tier Small Accounting Firms. *Auditing: A Journal of Practice and Theory*, 89-114.
- Chen, S. (2004). *Why Do Managers Fail to Meet Their Own Forecasts?* Working paper: University of Texas.
- Deshmukh, S., Goel, A. M., & Howe, K. M. (2009). *CEO Overconfidence and Dividend Policy*. Chicago: Federal Reserve Bank of Chicago.
- Galasso, A., & Simcoe, T. S. (2010). CEO Overconfidence and Innovation. *Management Science*, 1469-1484.
- Griffin, D., & Tversky, A. (1992). The Weighing of Evidence and the Determinants of Confidence. *Cognitive Psychology* 24, 411-435.
- Hall, B. J., & Liebman, J. B. (1998). Are CEOs really paid like bureaucrats? *Quarterly Journal of Economics* 113(3), 653-691.
- Hall, B. J., & Murphy, K. J. (2000). Optimal exercise prices for executive stock options. *American Economic Review* 90, 209-214.
- Hall, B. J., & Murphy, K. J. (2002). Stock options for undiversified executives. *Journal of Accounting and Economics* 33, 3-42.
- Hirshleifer, D., Low, A., & Teoh, S. H. (2012). Are Overconfident CEOs Better Innovators? *The Journal of Finance*, 1457-1498.

- Hribar, P., & Yang, H. (2010). *Does CEO Overconfidence Affect Management Forecasting and Subsequent Earnings Management?* Working paper: University of Iowa and University of Pennsylvania.
- Hribar, P., Kim, J., Wilson, R., & Yang, H. (2013). *Counterparty Response to Managerial Overconfidence*. Working paper: University of Iowa.
- Humphery-Jenner, M., Lisic, L. L., Nanda, V., & Silveri, S. (2015). Executive Overconfidence and Compensation Structure. *The Journal of Financial Economics*, 533-558.
- Hwang, K., Cha, M., & Yeo, Y. (2014). Does Managerial Overconfidence Influence on Financial Reporting? The Relationship between Overinvestment and Conditional Conservatism. *Review of Integrative Business & Economics Research* 4, 273-298.
- LaFond, R., & Watts, R. L. (2008). The Information Role of Conservatism. *Accounting Review* 83, 447-478.
- Lambert, R. A., Larcker, D. F., & Verrecchia, R. E. (1991). Portfolio Considerations in Valuing Executive Compensation. *Journal of Accounting Research*, 129-149.
- Larwood, L., & Whittaker, W. (1977). Managerial myopia: Self-serving biases in organizational planning. *Journal of Applied Psychology*, 94-198.
- MacKinlay, C. A. (1997). Event Studies in Economics and Finance. *Journal of Economic literature* 35, 13-39.
- Malmendier, U., & Tate, G. (2005a). CEO Overconfidence and Corporate Investment. *The Journal of Finance*, 2661-2700.
- Malmendier, U., & Tate, G. (2005b). Does Overconfidence Affect Corporate Investment? CEO Overconfidence Measures Revisited. *European Financial Management* 11, 649-659.
- Malmendier, U., & Tate, G. (2008). Who makes acquisitions? CEO Overconfidence and The Market's Reaction. *Journal of Financial Economics*, 20-43.
- Malmendier, U., Tate, G., & Yan, J. (2007). *Corporate Financial Policies with Overconfident Managers*. Stanford: Stanford University.
- March, J. G., & Shapira, Z. (1987). Managerial Perspectives on Risk and Risk Taking. *Management Science* 33, 1404-1418.
- Miller, D. T., & Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin*, 213-225.
- Millo, Y., Wisniewski, T. P., & Yekini, L. S. (2014). *Market Reaction to the Positiveness of Annual Report Narratives*. Leicester: University of Leicester.
- Moore, D. A., & Kim, T. G. (2003). Myopic Social Prediction and the Solo Comparison Effect. *Journal of Personality and Social Psychology* 85, 1121-1135.
- Murphy, K. J. (1998). *Executive Compensation*. Los Angeles: University of Southern California.
- Roll, R. (1986). The Hubris Hypothesis of Corporate Takeovers. *The Journal of Business* 59, 197-216.
- Schrand, C. M., & Zechman, S. L. (2011). Executive Overconfidence and the Slippery Slope to Financial Misreporting. *Journal of Accounting and Economics* 53, 311-329.

- Slothouber, E. (2010). *The Influence of CEO Overconfidence on Firm Value*. Tilburg: Tilburg University.
- Svenson, O. (1980). Are we all less risky and more skillful than our fellow drivers? *Journal of Personality and Social Psychology*, 806-820.
- Weinstein, N. D. (1980). Unrealistic Optimism About Future Life Events. *Journal of Personality and Social Psychology*, 806-820.
- Yermack, D. (1995). Do Corporations Award CEO Stock Options Effectively. *Journal of Financial Economics* 39, 237-269.