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CEO confidence on firm performance

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Abstract

This paper examines the effects of hiring a low confidence or highly overconfident CEO on the firm performance. A difference-in-differences regression was executed to accurately distinguish the effect of the low confidence CEO and highly overconfident CEO compared to a moderately confident CEO hire. The study was based on companies that are or once were part of the S&P1500. This paper finds that overconfident CEOs significantly increases firm risk and R&D intensity, but does not affect other investment measures, M&A activities, M&A value, nor firm performance. Low confidence CEOs however, lowers firm risk, investments and M&A activities. But overall, low confidence does not affect firm performance.

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4. Introduction

According to previous research on the behavior and characteristics of top leaders, being self-confident is one of the most important traits a manager should have to perform effectively (Bass & Bass, 2009). Effective managers are characterized as secure, decisive, and great at communicating their confidence to others. Meanwhile, ineffective managers are described by their display of personal insecurities and their timidness to make tough and risky decisions (Kaplan, 1986). Kirkpatrick and Locke (1991) also deemed confidence as one of the 6 most important traits all good leaders ought to possess. Self-confident leaders are, according to them, more likely to be assertive and decisive. With the role of leadership, a great deal of information needs to be gathered and processed, decisions need to be made, problems will need quick solving, setbacks must be overcome, risks need to be taken in times of uncertainty and competing interests must be satisfied. A leader with a lack of self-confidence and assertiveness will never be able to take all the necessary actions required to get the job done (Kirkpatrick & Locke, 1991). Naturally, getting the right people in leadership positions is an important task for every organization. A paper by Den Hartog, Caley, and Dewe (2007) analyzing how organizations recruit leaders, found that many of the qualities they look for in leaders do indeed come from key leadership literature, such as the ones discussed above. All this goes to prove that confidence is highly valued in a leader, and that companies will go out of their way to find and recruit Chief Executive officers (CEOs) with this characteristic.

Malmendier and Tate (2005) wrote a paper on how certain CEO traits would affect corporate investments. This paper however, showed evidence that too much confidence could cause a disruption in the corporate investment policies, and hereby brought to light the issue of being too confident in oneself capabilities. In the past, investment cash flow sensitivity and suboptimal investing behavior were explained by the more traditional corporate finance theories. The two main theories were the agency theory (Jensen & Meckling, 1976) and the information asymmetry problem (Myers & Majluf, 1984). The agency theory explains that there is a misalignment between managerial and shareholders' objectives. Managers would overinvest to reap private benefits such as large empires, entrenchment into the company, and other perks. The level of overinvestment would then depend on the level of cash flow on hand, also known as the free cash

flow problem. In this case, the higher the level of cash flow the more the managers will (over)invest, thus increasing the investment distortions. The second theory, the information asymmetry problem, illustrates that there is an information discrepancy between corporate insiders and the capital market. This theory in combination with the Pecking Order theory, which states that companies prefer internal over external financing, makes it so that managers will underinvest, by restricting external financing, when they believe that their company is undervalued to avoid further diluting the shares. This practice will occur regardless of whether the manager's valuation of the company is the correct one. According to this theory, companies will underinvest when they don't have sufficient cash flow. In this case, opposite to the agency view, cash flow increases investments but decreases the investments distortion. These two theories put together indicate a high degree of cash flow to investment sensitivity. If the cash flow is too small and a company is undervalued, managers will feel forced to underinvest to avoid diluting shares. But if the cash flow is too high, there exists a higher risk of a manager investing into their private benefits. Malmendier and Tate (2005) came up with an alternative explanation regarding the investment cash flow sensitivity, which leads to investment distortions. Rather than blaming the imperfect information within the market or mismatched goals of the owners and managers for the investment distortions, they related the investment decisions to the behavior of the top decision-maker in the firm. They built forth on the literature of Roll (1986) and Heaton (2002), which suggests that the important link between cash flow and investment lies between both the belief of the market and that of the CEO on the value of the firm. Roll (1986) argues that economists should listen more to psychologists as they consistently voice out that individuals do not make rational decisions under uncertainty, and that economists have a reputation of being arrogant among psychologists because this evidence is often ignored. When it comes to market prices and matters that involve valuation and decision-making by many people, most of the biases even themselves out and the market behaves as if it was rational. But when it comes to a single top decision-maker making investments decisions, this is certainly not the case. Roll (1986) states that even when managers have intentions to be fully consistent with their honorable stewardship of corporate assets, their actions can still turn out to be wrong. Hubris or overconfidence does not rely on conscious decisions against shareholder interest, but on the de facto act against shareholder interest as a result of misevaluations of firms and oneself ability. This paper opened the gate towards a more behavioral approach within this field.

The results of Malmendier and Tate (2005) showed that even when there is enough internal financing and that the CEO wishes to pursue the shareholders' objectives, the CEO will still underperform because of their biases. This indicates the importance of recruiting a qualified CEO, as there might be big repercussions when the confidence level of the CEO is not properly evaluated. What set the paper of Malmendier and Tate (2005) apart from others, was that they used several methods to detect and measure overconfident CEOs. After the publication of this paper, many other theorists followed up with their own research and measures of this "overconfidence" phenomenon.

Firstly, Malmendier and Tate (2008) followed up their research, by analyzing the effect of overconfidence on mergers and acquisitions (M&A) decisions. They found that overconfident CEOs are unconditionally more acquisitive and are more likely to engage in low value yielding acquisitions. Campbell, Gallmeyer, Johnson, Rutherford, & Stanley (2011), further expanded on the work of Malmendier and Tate (2005) by adding underconfident CEOs to the mix. By using nearly the same framework to measure confidence levels, they found that CEOs that are either too over- or underconfident will underperform and that those with moderate levels of confidence can maximize firm value. This finding is reinforced by their results that indicate higher forced turnover rate for too low- and high- optimism CEOs. Hirshleifer, Low and Teoh (2012) found that R&D investments of overconfident CEOs are better in generating innovation. In this context, CEO confidence is associated with riskier projects, greater investment in innovation, and a greater number of patent applications and citations. Although these findings were only applicable in highly innovative sectors, they contradict the conventional theory that overconfidence is undesirable. Ben-David, Graham and Harvey (2013), also, found that overconfidence leads to the CEO and CFO greatly miscalibrating the future stock returns because they wrongly assume a too small confidence interval in their estimation of the future returns. In fact, their research found that on average most CFOs are miscalibrated due to overconfidence. They further go on and find various links between corporate policies and overconfident CFOs. Their results point out that, rather than viewing overconfidence as a trivial psychological curiosity, it should be considered as a greater integral part of corporate modeling assumptions.

Tversky & Kahneman (1974), put out a theory that many decisions are made on beliefs concerning likelihood of uncertain events and that people often rely on heuristics to simplify complex tasks,

but these can lead to severe systematic errors. Unfortunately, both uneducated and experienced researchers are prone to these biases. Literature suggests that CEOs that are too extremely overconfident or underconfident will perform at a suboptimal level, by either taking too much or too little risk (Campbell et al., 2011). This paper will delve deeper into this phenomenon of overconfidence and examine what changes these CEO characteristics bring to a company. This paper aims to study the effect of different CEOs levels of confidence on firm performance. Unlike most of the other papers that did e regression on the relationship between overconfidence and a certain dependent variable, this paper will apply the method of difference-in-difference to examine the changes that the hiring of an over- or under-confident CEO brings to the firm. The research question of this thesis is as follows:

How does the hiring of an over- or low confident CEO affect changes within a firm?

In the second section this paper the academic literature relating to confidence and how it affects business will be presented. Chapter three will discuss the data set and statistical analyses required to perform this research. To examine how over and underconfident CEO affect the firm, this paper will measure the change in firm risk, investment intensity, M&A deals and value creation and lastly look at several performance measures. In the fourth chapter this results these analyses will be presented and discussed. The final chapter will present the most important findings, the importance and limitations of this paper.

2. Literature review

This section of this paper will give some oversight of the relevant existing literature relating to CEO overconfidence and its impact. Firstly, the traditional 8verage8e finance theories will be presented and subsequently the shift towards behavioral theories and the existence of biases will be discussed. Hereafter the relevant theories regarding confidence will be discussed.

2.1 Traditional corporate finance

Corporate finance is primarily concerned with the effective and efficient management of an organization. This involves planning and controlling provision resources, the allocation of resources, and the control over these resources. Whereas the ultimate goal is the optimal allocation of the scarce resources available to the company (Watson & Head, 2016). The corporate finance objective is to maximize the value of the company for its owners. As Milton Friedman (1970) famously put it "The Social Responsibility Of Business Is to Increase Its Profits", and following this the primary corporate objective is the maximization of shareholder wealth (Watson & Head, 2016). It's the role of the financial manager/CEO or CFO to make the required investment decisions to generate wealth. They are the ones to advise on the allocation of funds and on how to raise these funds. One of the key concepts in corporate finance is the relationship between risk and return (Watson & Head, 2016).

Up until 1950, the corporate finance theory was riddled with inconcinnities, it mainly concerned itself with optimal investments, dividends and financing policies. These theories were almost totally perspective oriented and lacked analytical techniques (Jensen & Smith, 1984). In the 1950s however, fundamental changes began to occur in the finance literature. Analytical methods and techniques traditional to modern-day economics began to be applied to problems in finance, completely transforming the literature from normative questions to normative theories (Jensen & Smith, 1984). Since then, a few major theories have been delivered which became the building block of modern-day financial economics. Some of these theories are the Portfolio Theory, Capital Asset Pricing Theory, Option Pricing Theory, Efficient Market Timing Theory, Agency Theory and Pecking Order Theory (Jensen & Smith, 1984) (Sorin & Luigi, 2009). The latter three theories are especially relevant to this paper and will be briefly discussed below.

2.1.1 The Efficient Market Theory

The role of the capital market is the allocation of ownership to the economy's capital stock. This means that it's a market where firms make production-investment and investors can purchase securities that represent ownership of these firms' activities under the assumption that these security prices always fully reflect all available information. A market in which prices always fully reflect all information is called an "efficient market" (Fama, 1970). In this way, the market value of the company changes in a similar fashion to that of the intrinsic value of the company (Degutis & Novickytė, 2014). Market efficiency refers to both the9 quality and speed of the price adjustment to the new information (Watson & Head, 2016). According to Degutis and Novickytė, (2014), in an efficient market, all available information is already incorporated in the stock prices and investors cannot earn higher than the market return. Market efficiency is divided into three levels of information efficiency: the weak form, the semi-strong form and the strong form. In the weak form, current prices reflect all historical information such as trading volume and previous prices (Watson & Head, 2016). This makes it impossible to make an excess return on the stock market by using technical analyses (Degutis & Novickytė, 2014). Share prices will change only when new information enters the market, and since information enters at random so will the price change occur at random (Samuelson, 1965). This is called the random walk hypothesis and entails that even if the current price at this period is known it is impossible the predict the price for the next period (Samuelson, 1965). It's exactly because of this that it's impossible the make excess return on the stock market. In the semi-strong form, the9 current prices not only reflect information about the historical prices but also all current publicly available information (Degutis & Novickytė, 2014). That means that prices react swiftly and accurately to new information. Because of this, it becomes impossible to earn abnormal returns in the semi-strong efficient market by using publicly available information or by using technical analyses (Watson & Head, 2016). The use of event studies is often used to test the validity of the semi-strong form of market efficiency. The results of these event studies have many times proven the existence of the semi-strong market efficiency (Degutis & Novickytė, 2014). While most agree that the market quickly responds to new information, there is some dispute however about the accuracy of the market reaction. It was found that sometimes after big positive (negative) news that the share prices would continue the rise (fall) for a substantial period after the announcement (Beechey, Gruen, & Vickery, 2000). A capital market is said to be strong if the current share price reflects all information, which includes private information that's not available to the public (Degutis & Novickytė, 2014). If markets behaved in this form, it would always be impossible to make abnormal returns, even if one were to trade on insider information (Watson & Head, 2016). While the first two forms have received a lot of empirical support, the results of the strong form

have indicated that the market is full of inefficiencies and thus rejected the presence of the strong form of market efficiency (Degutis & Novickytė, 2014).

2.1.2 Agency Theory

During the late 90s economists explored risk-sharing among individuals or groups and came upon a risk-sharing problem. This phenomenon arises when risk-sharing parties have different attitudes towards risk (Eisenhardt, 1989). The agency theory broadened the risk-sharing literature by including the agency problems that occur when cooperating parties have both different goals and divisions of labor (Jensen & Meckling, 1976). Jensen and Meckling (1976) define the agency relationship as a contract under which a party (the principal) hires another person (the agent) to do a job on the party's behalf. The problem that arises is that if both parties are utility maximizers, the agent might not always act in the best interest of the principal (Jensen & Meckling, 1976). There are 2 kinds of agency problems that can present themselves, the first is a difference in goals between the principal and agent and the second is that the principal and agent might have a different attitudes towards risk (Eisenhardt, 1989). Three factors contribute to the agency problem (Watson & Head, 2016). The first problem is that there exists a divergence of ownership and control. The second factor is that as humans, agents, look to maximize their own wealth (utility). This creates a divergence in the goals (or risk) of the principal and the agent. And the final factor is that there exists an asymmetry of information between the agent and the principal. The agents who perform the task will possess all the relevant information while the principles will only receive some updates. This makes it very difficult and expensive for the principal to verify the work of the agent (Watson & Head, 2016; Eisenhardt, 1989). Agency problems manifest themselves in the investment decisions that a manager makes (Watson & Head, 2016). Agents (managers) are known to be more risk-averse within their company because of their inability to diversify their employment, while the principles (shareholders) can easily diversify their portfolio by investing in other companies, becoming seemingly risk-neutral towards that company (Eisenhardt, 1989). Managerial reward systems are usually based on short-term performance, and managers, therefore, choose projects that emphasize short-term returns and that reduce unsystematic risk (Watson & Head, 2016). Managers diversifying and choosing less risky investments, to reduce risks in order to safeguard their job, are seen as value-destroying activities by shareholders who have already more efficiently diversified their portfolios (Watson & Head, 2016). Another manifestation of the agency problem is that managers will prefer equity finance above debt, to avoid high interest payments. But shareholders prefer debt because equity increases the cost of the

company's capital (Watson & Head, 2016). There are two aspects of the agency problem cited in the formal literature. The first one is "moral hazard", which means the agents are not putting forth the agreed-upon effort (shirking). The second is "adverse selection", which occurs because the principal cannot verify the agent's real capabilities before hiring or while the agent is working (Eisenhardt, 1989). The agent can misrepresent his/her skill by claiming to have skills that he/she doesn't possess. In the case of these two unobservable behaviors, Jensen and Meckling (1976) suggested two methods to minimize their effects and encourage goal congruence. The first one is the monitor the action of the agents, this method, however, is very costly and time-consuming. Another issue with this method is that small shareholders will often free ride on the larger shareholders, who have more to lose and thus more incentive to monitor the agent (Watson & Head, 2016). The second method of dealing with agency problems is an outcome-based approach that entails including clauses in the contractual agreement with the agent that promotes goal congruence (Eisenhardt, 1989). The two most popular ways to do this is through performance-related par and executive share option schemes (Watson & Head, 2016). The downside of these methods is that more risk will be transferred to the agent (Eisenhardt, 1989).

2.1.3 Pecking Order Theory

The Pecking Order Theory, created by Myers (1984), states that firms have a fixed order of preferences when it comes to sources of finances, with respect to their availability. The Pecking Order Theory has been very influential and is an integral part of literature that attempts to find an empirically successful theory of corporate financing (Frank, Goyal, & Shen, 2020). This theory was developed to address the irrelevance proposition of Modigliani and Miller (1958). The Pecking Order Theory goes directly against the trade-off theory which suggests that firms must aim for a unique combination of debt and equity to minimize the cost of capital and maximize firm value (Watson & Head, 2016). The Pecking Order is as follows: 1) Firms prefer internal finances over external. 2) Firms tend to adapt their dividend payout to their investment opportunities so as not to miss out on valuable investment opportunities. 3) If investment outlays are more than cash flow, the firm will first use its cash balance or liquid securities portfolio. 4) If external finance is required, firms will first use their safest security, which is debt. And hereafter hybrids (debt and equity) and as last resort, equity will be used.

Before this theory became formalized by Myers (1984), Donaldson (1961) already reported that management would strongly prefer internal funds as the source for investments, even to the extent of excluding external funds except for some occasional "bulges". According to Myers (1984), this preference

is so skewed that for all non-financial firms throughout 1973-1982, internally generated cash covered on average 62% of the capital expenditures, including investment in inventory and other current assets. In this period, new stock issuance was never more than 6% of the external financing (Myers, 1984). This reliance on internal finance is according to Myers (1984)and Donaldson (1961) not directed at maximizing shareholder wealth. The initial explanation for these preferences involves the issue cost and the ease with which the sources could be accessed (Watson & Head, 2016). But according to Myers (1984) managers would avoid external financing because it would subject them to the discipline of the capital market. This behavior emerged from the existence of information asymmetry between the company and capital markets (1984). A manager, who possesses superior (insider) information, would be signaling information to the market when announcing its financing sources. Because of this, the manager will try to avoid going to the market in order to not give the impression that their firm is lacking in internal funds (Myers, 1984). They will however issue equity, in rare occasions, if they believe their stock to be overvalued by the market (Myers, 1984)

2.2 Behavioral finance

During the 1990s a new academic field known behavioral finance began to emerge, its traces however, could be seen since the 1800s (Ricciardi & Simon, 2000b). According to Ricciardi and Simon (2000b), behavior finance is a mixture of psychology, sociology and finance. Although many see it as a paradigm shift within economics, some see it as returning economic thinking to the way it began (Thaler, 2016). Two incidents seem to have separated "traditional" economics from psychology (Camerer, 1999). The first was that economists worked primarily on mathematically formalizing economics while using physics as inspiration. While psychologists were inspired by natural experimental traditions rather than mathematical tools (Camerer, 1999). This created a rift in which economists used mathematical tools and numeric reasoning for creating theories, and psychologists used verbal construct and themes that organize experimental regularities to create theories. This difference in methods used to acquire and express knowledge pushed these two fields apart. The other incident was that in the 1940s economists took up logical positivism with a special twist, called the F twist (after Milton Friedman) (Camerer, 1999). The F-twist allowed economists to completely ignore psychology, because some theories with completely false human assumptions would still make surprisingly accurate economic predictions. The F-twist allowed agents to be assumed as completely rational, willful, judging probabilities accurately and that agents

always maximizing their wealth is useful. Even though the psychology literature shows that these assumptions are systematically false (Camerer, 1999).

The standard models seem to make assumptions that managers and investors have well-defined preferences and unbiased beliefs and make optimal decisions based on these beliefs, implying that they have infinite cognitive abilities. And also, that their primary motivation is always self-interest. These assumptions define what is known as the Homo economicus. Behavioral economics seeks to replace the Homo economicus with Homo sapiens, as these managers and investors are in fact just regular humans (Thaler, 2016). The goal of behavioral economics is not to replace but to increase the explanatory power of economics by adding realistic phonological foundations (Wilkinson & Klaes, 2017). Behavior finance emerged as a branch that captures the human side in decision-making (Prosad, Kapoor, & Sengupta, 2015).

2.2.1 Human Biases

As behavioral finance tries to capture the human side of the decision-making process it also needs to capture human biases (Prosad et al., 2015). Shefrin (2002) classified these biases into 2 groups: "Frame dependent biases" and "Heuristic-driven biases". Framed dependent biases are biases that come about because of the way financial practitioners frame their options. Frame is the form used to describe a problem (Shefrin, 2002). Frame dependence can be traced back to Kahneman and Tversky (1979). Traditional finance claims that frames are "transparent", so to say that the rational manager/investor can always see things clearly. But because people are not always rational, at times the situation could be seen as "opaque" (Shefrin, 2002). Shefrin (2002) claims that when someone is experiencing difficulties seeing through an "opaque" frame, their decisions depend on the frame that they are using. Biases caused by incorrect framing include loss aversion, narrow framing, mental accounting and the deposition effect (Prosad et al., 2015). Heuristic refers to the approach of enabling someone to learn/discover something for themselves. Introduced by Tversky and Kahneman (1974), these are mental shortcuts or "rule of thumbs" to help people reach a decision quickly and easily, avoiding the complex tasks of calculating probabilities and predicting values. Such heuristic-driven biases include the representativeness, availability anchoring and, the ones relevant to this paper, excessive optimism and overconfidence (Prosad et al., 2015). Behavioral biases can also be categorized into cognitive and emotional biases.

Emotional biases include loss aversion, endowment bias, status quo and excessive optimism. Cognitive biases include anchoring, framing and adjustment, representativeness, cognitive dissonance and overconfidence (Pompian, 2012).

The literature on behavioral finance is divided in 2 strands: investor bias and managerial bias (Malmendier, 2018). Most of the literature in the field of behavioral finance is about the interaction of irrational investors with rational managers (Malmendier, 2018). The literature on investor biases has mostly been characterized by systematic bias and misevaluation by the investor and how the rational manager reacts to takes advantage of these flaws (Baker & Wurgler, 2013). The second strand is the irrational managers, these are not rational moral hazard problems such as empire building or slacking off, but situations where the managers actually believe that they are maximizing firm value but are in fact deviating from that ideal (Baker & Wurgler, 2013). Managerial biases considered include reference dependence, experience effects, general "traits" not relevant to the standard model and, of course, overconfidence (Malmendier, 2018).

2.2.2 Overconfidence

Most of the literature on managerial biases has focused on the illusions of overconfidence and optimism (Baker & Wurgler, 2013). There are three main reasons why managerial biases have been so prevalent (Baker & Wurgler, 2013). Firstly, the findings of managerial bias have been extremely robust as seen in Ben-David et al. (2013). Secondly, managerial decisions tend to be complex and idiosyncratic, which reduces the change of debiasing through learning. Lastly, these biases are often easy to integrate into existing models. Overconfidence has been used as an explanation for war, litigation, stock market bubbles and entrepreneurial failures (Moore & Healy, 2008). A famous quote by Plous (1993) is that "no problem in judgment and decision making is more prevalent and more potentially catastrophic than overconfidence". There are three types of overconfidence found in the scientific literature (Moore & Healy, 2008). The first definition is the overestimation of one's ability, performance, chances of success and level of control. This is named "overestimation" by Moore & Healy (2008). An example of this is, when students believe they got 8 questions correct on a quiz but instead only have 3 correct. About 64% of empirical studies on overconfidence examined overestimation (Moore & Healy, 2008). The second face of overconfidence is when people think of themselves as better than others. This version of overconfidence is also known as "better-than-average" or "overplacement" and about 5% of the empirical studies on

overconfidence cover this version (Moore & Healy, 2008). An example would be, when a student believes that they are in the top 10% of the class when in fact the student is just at the median. The last variety of overconfidence, which makes up 31% of empirical studies in overconfidence, is the excessive confidence in the accuracy of one's beliefs and predictions. This type is called of overconfidence is called "overprecision" and "miscallibartion" (Moore & Healy, 2008). According to research subject's 90% confidence interval is less than 50% of the time correct, instead of 90% (Soll & Klayman, 2004). Ben-David et al. (2013) found that executives predict market returns with 80% confidence interval only 38% of the time. People tend to believe themselves more likely than average to experience positive future events and less likely to experience negative events (Weinstein, 1980). A test by Weinstein (1980) showed that people tend to make inaccurate images of others when making comparative decisions. While some of the overoptimism can be reduced when people are encouraged to think more carefully or provided more information, there remains a significant amount of overoptimism that cannot be explained (Weinstein, 1980). Humans are inclined to overestimate their own skills, abilities and predictions of success (Ricciardi & Simon, 2000b). While some people are born without this particular bias, the tendency to take greater responsibility for success than failure (attribution bias) may lead someone to become overconfident throughout time (Gervais & Odean, 2001).

Especially executives are particularly prone to overconfidence behavior, both in terms of better-than-average and overprecision. These findings are attributed to three factors: 1) managers have the illusion that they have more control over outcomes than they actually have. 2) managers have a high degree of commitment to good outcomes. 3) managers often have abstract reference points (Malmendier & Tate, 2005). According to research, overconfidence persist throughout time for a given CFO (Ben-David et al., 2013). This paper will maintain assumption that CEO overconfidence and underconfidence will also persist throughout time. Optimism and confidence are often used interchangeably in the finance literature, these are quite similar as one is used to refers to overestimation one's abilities and the other the overestimation of the accuracy of one's predictions. This paper follows Malmendier and Tate (2005), and defines overconfidence as the better-than average belief. The confidence levels will be divided in accordance with Campbell et al. (2011) as highly-overconfident, moderately-confident, and low-confident.

2.3 Risk taking behavior

Daniel Kahneman and Amos Tversky (1979) introduced the groundbreaking concept of Prospect Theory for the analysis of decision-making under risk. It was devolved as an alternative to the expected utility theory and became the backbone of behavioral finance. This theory presents the risk function of humans by analyzing their decision-making preferences. There are four elements upon which the prospect theory is built upon: 1) reference dependence, 2) loss aversion, 3) diminishing sensitivity, and 4) probability weighting. Reference dependence entails that people would assign utility to losses or gains, measured from a relative reference point rather than from the absolute level of wealth. Loss aversion means that people are much more sensitive to losses than they are to gains of the same magnitude. Diminishing sensitivity refers to the fact that people show risk-averse behaviors over gains and risk-seeking behaviors towards losses. This causes the risk function to be concave over the gains and convex over the losses. Probability weighting refers to the habit that people don't use objective probabilities but rather a so-called "decisions-probability". People treat almost-certain events (close to 0 and 1 probability) as if they are certain (Barberis, 2013). The value function of the prospect theory can be seen in figure 1.

Figure 1: Value function of the Prospect Theory
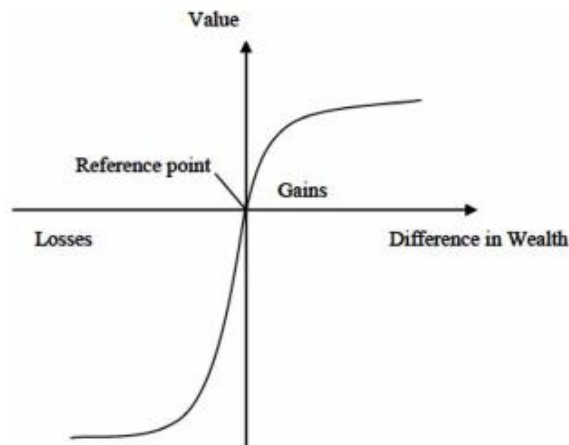
(Prosad, Kapoor, & Sengupta, 2015)

Over the years, many risks perception studies have been conducted and some academic studies show that perceived risk is more important than actual risk within the decision-making process (Ricciardi, 2008). The prospect theory shows that there are lasting biases that influence the individual's decisions under

distinct circumstances of risk-taking behavior and uncertainty. One of the biases that affect a person's perception of risk is overconfidence (Ricciardi, 2008). Ricciardi (2008) states that overconfident behavior extends to expert individuals as they often underestimate or ignore risks. When experts are required to make decisions based on their intuitive judgment, they are prone to making the same types of errors as novices. According to another paper on risk perception, there is a negative correlation between confidence and risk perceived, while age and gender, on the other hand, show a positive correlation with risk perception (Siegrist, Gutscher, & Earle, 2005). The results from multiple regressions showed that people who have a high level of confidence show a lower level of perceived risk while older people and women have a higher risk perception (Siegrist et al., 2005). As noted earlier, CEOs and shareholders have different risk attitudes. This is caused by the ability of the shareholders to diversify the risk over a company away by expanding their investment portfolio, while CEOs are unable to diversify their employment. Because of this, shareholders develop a risk-neutral attitude toward a company and CEOs remain risk-averse (Eisenhardt, 1989). The board of directors is responsible for hiring a CEO on behalf of the risk-neutral shareholders. This means that making the risk-averse CEO risk-neutral would increase the shareholder wealth. According to Page (2018) both shareholder- and firm value would increase by about 16.12% and 19.37% respectively, by the adjusted risk behavior. One of the "bright sides" of overconfidence is that it can counteract individual risk aversion (Malmendier, 2018). Overconfident CEOs will take on projects that "rational" managers would reject given their risk aversion (Malmendier, 2018). By being overconfident, managers will underestimate risk due to their distorted risk perception which leads them to become more risk-taking (Baker & Wurgler, 2013; Siegrist et al., 2005). Goel and Thakor (2008) show that under value maximizing corporate governance, the board will likely appoint an overconfident agent to CEO, but their true ability and decree of overconfidence is unknown and can only be observed after hiring.

2.4 Investment policies

CEO's have a high degree of the illusion of control and commitment to good outcomes, and abstract reference points which make it difficult to compare performance across individuals. Because of this, a CEO who handpicks a project is likely to believe he can control its outcome and likelihood of failure (Langer & Roth, 1975). Malmendier and Tate (2005), argues that overconfident CEO systematically overestimate the returns on their investments. If they have enough internal funds for investing and are not disciplined by either the market or corporate governance mechanism, they overinvest relative to the first-best investment level. Overconfident managers who do not have enough internal funds will underinvest

relative to the first-best level. Believing that their company stock is undervalued by the market, they exhibit reluctance to issue equity and as such, they won't have enough capital for investing. Additional cash flow would provide an opportunity to invest closer to their desired level (Malmendier & Tate, 2005).

Malmendier and Tate (2005) however only examined the extreme level of overconfidence, ignoring the moderate level of confidence which could be positive for firm value. Campbell et al. (2011) extends the literature by splitting the confidence levels into low-confidence level, moderately-confidence, and highly-overconfidence. Just like Page (2018), Campbell et al. (2011) also theorizes that risk-neutral CEO, with zero optimism, would maximize firm value by choosing the first-best investment level. By taking on the assumption of sufficient internal funds for any desired level, it can be shown that an increase in risk aversion lowers the CEO's desired investment level away from the first best level for optimal firm value (Campbell et al., 2011). Since overconfidence increases risk taking behavior, then there exists a confidence level where a risk-averse CEO still chooses the first-best investment level. **Figure 2** demonstrates the relationship that risk-aversion and optimism level have on the investment levels.

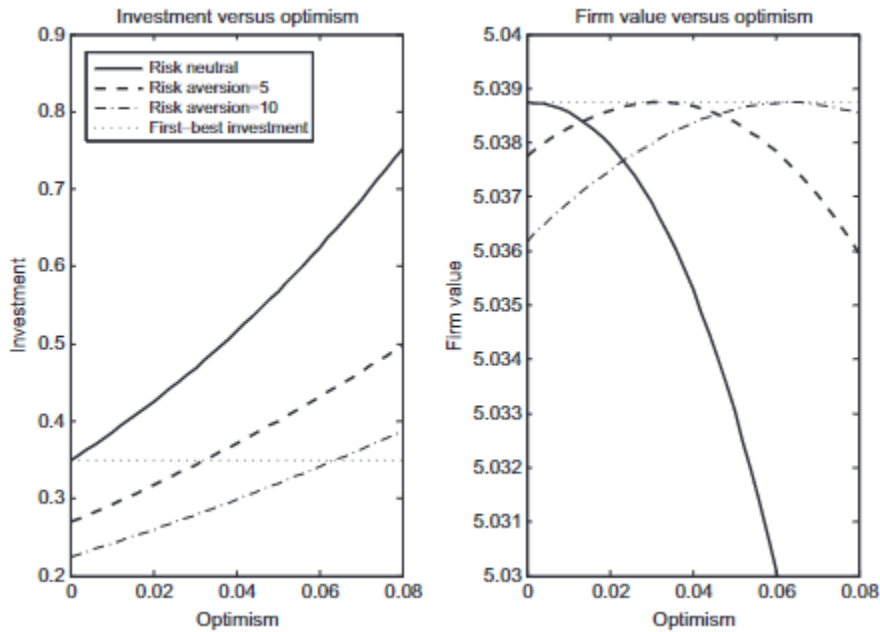*Figure 2: effect of overconfidence on investment level & performance*

Figure 2 shows how different levels of risk-taking behavior are affected by optimism. Note this paper used "optimism" to refer to overestimation. Campbell et.al (2011)

As can be seen, a risk-neutral CEO with zero overconfidence will invest at the optimal level. And risk-averse CEOs need a certain amount of overconfidence in order to reach to first best level. But too much overconfidence would cause them to overinvest. Likewise, Goel and Thakor (2008) found that overconfidence can make up for the risk-averse behavior of the CEO, but too much would cause them to overinvest. According to Ben-David et al. (2013), CFOs greatly underestimate their internal rate of return. They found that on average CFO's predicted surprisingly small volatility of only 5.3%, as compared to the average historical S&P 500 volatility of 13.9%. When regressing overprecision and optimism on investment activity, it showed that increase of one standard deviation of overprecision would increase investments intensity by 0.6 percentage points, relative to the 8.7 percentage points average. Hirshleifer et al. (2012) found similar results, CEO overconfidence, measured by stock holding, would increase R&D investments by 27%. A twist in the investment activities was found by Goel and Thakor (2008), whose results showed that as a CEO becomes more overconfident, he would underinvest in information acquisition about his investments.

Ben-David et al. (2013) also investigated the change of CFO on company investment policy. The results show that if the new CFO is one standard variation more positively miscalibrated, compared to the old CFO, the investment intensity would increase by 0.7 percentage points (relative to the average investment intensity of 8.7 percentage points).

2.5 Mergers and Acquisitions

US firms spent more than $3.4 trillion between 1980 and 2001, and even though the joint effect for the acquirer and target may be positive, the acquirers seem to be on the losing end. Acquirers have reportedly lost over 220 billion at the announcement of mergers during this period (Malmendier & Tate, 2008). According to Amihud and Lev (1981), the reason behind the high number of merges is due to agency costs. Managers are risk-averse and, unlike shareholders, are unable to diversify the firm risk away through portfolio selection. This means that their income risk is closely related to the firm risk. Other than income risk, failure to achieve good results, or bankruptcy will result in losing their job and hurting their prospects of finding future employment (human capital risk). Risk-averse managers can therefore be expected to diversify their income- and human capital risk by engaging in conglomerate mergers (Amihud & Lev, 1981).

As mentioned before, agency costs can be avoided by rewarding the agent when they optimize shareholder value, by giving for example stock options bonuses (Watson & Head, 2016).

Roll (1986) came with an alternative explanation for the high number of M&A: the hubris hypothesis. The hubris hypothesis claims that the excessive corporate takeovers are explained by the manager's overconfidence. In this case, the managers are wrongly convinced that their valuation of the target company is correct and that the market has undervalued the target company. This would cause the bidder company to pay too much for their targets (Roll, 1986). This explanation would mean that agency cost prevention cannot stop the corporate takeovers, since they are motivated by a skewed perception of the target company's value. Malmendier and Tate (2008) followed up on Roll's (1986) hubris hypothesis by adding their overconfidence measures and directly regressing the effect of overconfidence on M&A activity. **Figure 3** shows the merger frequencies of overconfident CEO, compared to the rest.

Figure 3: merger intensity of overconfident vs. the rest of the CEOs
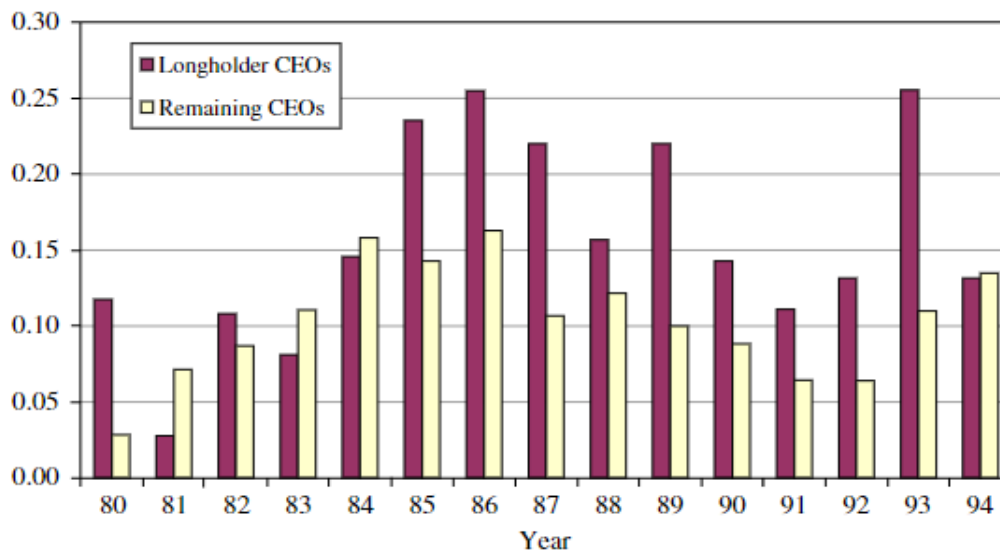
Figure 3 shows the average number of mergers throughout 1980-1994. A comparison in merger activity between overconfident CEOs (Longholder) and the remaining CEO is shown (Malmendier & Tate, 2008)

Malmendier and Tate's (2008) results show overconfident CEOs are significantly more likely to make acquisitions than other CEOs. This result, unlike their paper on investment intensity (Malmendier & Tate, 2005), showed there is an increase despite the cash flow level. Malmendier and Tate's (2008) attribute

this to the unobservable relation between the overestimated gains of M&A and perceived own-company undervaluation. When overconfident CEOs do more mergers, it was found that these create less value compared to other CEO's. It was shown that the market reactions to M&A announcements are more negative when the CEO is overconfident. This result coincides with the research of Goel and Thakor (2008), who showed that overconfident CEOs invest less in information acquisition for their investments and that they overestimate the returns on investments (Malmendier & Tate, 2005).

2.6 Performance

According to various papers, managers maximize firm value when CEOs have a risk-neutral attitude toward investing, this investment intensity is referred to as the "First-best level" (Campbell et al., 2011; Page, 2018). According to Malmendier and Tate (2005), an overconfident CEO will often either overinvest relative to the first best level when it has sufficient cash flow or underinvest when it does not have enough cash flow. This points to the fact that overconfidence will always lead to a less than ideal investing level. Malmendier and Tate's (2008) found the overconfident CEO is more likely to engage in M&A activities despite cash flow level. But they also found that these M&A create less value than those from non-overconfident CEO. Both these papers show that being overconfident results in suboptimal investing and M&A policies.

Campbell et al. (2011), following the literature that a risk-neutral CEO would perform at the first-best level, suggested that a certain amount of overconfidence could counterbalance the risk-averse CEO. Campbell et al. (2011) theorized that there exists a "moderate" level of overconfidence where a risk-averse CEO would still perform at the first-best level and maximize firm value. The more risk-averse a CEO is, the more overconfidence he needs to be to reach the first-best level. Unlike the papers of Malmendier and Tate (2005; 2008), who grouped all overconfidence together, Campbell et al. (2011) split them up in order to distinguish moderately- overconfidence from extreme-overconfidence.

In **figure 2** it can be seen how the relationship between risk and overconfidence affects the investment activity and how this in turn affects the firm value. The results from Campbell et al. (2011) showed that highly overconfident and low-confident CEO are more likely to face forced turnover. This result implies that a moderately overconfident CEO maximizes firm value,but being too overconfident or too underconfident will decrease firm value.

Goel & Thakor (2008) show support for this theory as their own results also suggests that CEO overconfidence attenuates some of the underinvestment inefficiency caused by CEO risk aversion. But they also found that CEO overconfidence effect on firm value is nonmonotonic. As the confidence level rises, they invest in portfolios that have a lower probability of high payoff, making firm value increase at a decreasing rate with overconfidence up to a certain point. At a certain level, they even start to accept projects that shareholders want to reject, making firm value decline with further increased overconfidence.

2.7 Hypotheses development

Siegrist et al. (2005) paper on risk perception claims that general confidence negatively influences risk perception. Because of this distorted risk perception, overconfident people tend to underestimate or completely ignore risks. (Ricciardi, 2008). Malmendier (2018) and Campbell et al. (2011) also claimed that that overconfidence will increase risk-taking. As confidence and risk perception negatively correlated, low confidence CEO should have a higher risk perception making them overestimate risk (Siegrist et al.,2005). This causes them to "play it safer" making the firm risk decrease.

Hypothesis 1a: High overconfidence increases risky behavior.

Hypothesis 1b: Low confidence decreases risky behavior.

Malmendier and Tate (2005), claims that because of CEO overconfidence CEO systematically overestimate the return on their investments, making them more eager to invest. Campbell et al. (2011) also showed that higher levels of overconfidence led to more investing. As the opposite of overconfidence, low confidence CEOs underestimate their return on investments, causing them to decrease investment level (Campbell et al., 2011).

Hypothesis 2a: High overconfidence leads to increased investments.

Hypothesis 2b: Low confidence leads to decreased investments.

Just like in the case of investing, Malmendier and Tate (2008) found results that supported that overconfident CEO are more willing to attempt M&A. Roll's (1986) hubris hypothesis claims that CEO overconfidence is to blame for the excessive M&A and high deal sizes. This paper will follow this theory

and extend it to the low confident CEOs. If a high confidence level increases M&A activity, low confidence should reduce it.

Hypothesis 3a: High overconfidence leads to increased M&A activity.

Hypothesis 3a: Low confidence leads to decreased M&A activity.

Malmendier and Tate (2008) found that the increased M&A activity done by overconfident CEOs is coupled with a decrease in value creation of the M&A. Just like with hypotheses 2, this paper extends the theory on value creation to the low confidence CEO. Low confidence CEOs are expected to have higher value creation for M&A.

Hypothesis 4a: High overconfidence leads to less value creation M&A.

Hypothesis 4b: Low confidence leads to more value creation M&A.

Campbell et al. (2011), showed results that a moderate level of overconfidence will increase risk-taking and therefore investment activity to the optimal level. CEOs that have low confidence or too much overconfidence will perform worse by underinvesting or overinvesting, relative to the moderate overconfident CEO.

Hypothesis 5a: High overconfidence decreases firm performance.

Hypothesis 5b: Low confidence decreases firm performance

3. Data and Methodology

This section of the paper will shed light on the data and methodology used in this paper. The first part will present the variables and the databases they were acquired from. The second part will explain the measures of the dependent and independent variables. Hereafter, the statistical models in this research will be described. Lastly, descriptive statistics of the sample will pe presented.

3.1 Data collection

To collect data for this research, multiple databases needed to be accessed. The most important variable in this paper is the different levels of CEO confidence, and this will be measured through the CEOs option hold/exercise behavior. To retrieve data on individual CEOs, Compustat's Execucomp was used. Execucomp is a large database which has yearly data on the executive level for all companies that were once part of the S&P 1500 index and are still trading, which is retrieved from each company's annual proxy DEF14A. New reporting requirements due to changes in accounting standards at the end of fiscal year 2005 caused some variables prior to 2005 to change or be discontinued. For this reason, this paper has chosen to use a sample for the period 2006-2021. Execucomp contains a dummy variable for each executive who is serving as a CEO, as well as the dates the executive became CEO and left this position. The variables collected for measuring overconfidence are the values of the unexercised but exercisable options and the amount of unexercised exercisable options available. For measuring low confidence, the value of the option exercised and the amount of option that were exercised was retrieved. Other than these two, other variables such as CEO age, gender, total compensation, and percentage of company owned were also retrieved as control variables. Like Hirshleifer et al. (2012) utility firms (sic code 4900-4999) and financial firms (sic code 6000-6999) are removed from the sample. This paper's goal is to measure the changes within a firm after hiring an overconfident or low confident CEO. For this reason, the CEO confidence level needs to be classified at a certain confidence level before they get hired. This sample contains 16931 classifiable CEO years and 168 CEOs got rehired at different companies within this sample. After matching these groups, a sample size of 148 CEO hires remains, 6 of which is overconfident, 19 low confidence and 123 have a moderate confidence level.

For each of the 148 companies who hired one of the classified CEOs, the before and after of firm risk, investing activities and performance needed to be measured. For this purpose, Compustat's North American Fundamentals Quarterly was accessed. This database contains quarterly data on balance sheets, income statements and cash flow statements for nearly all public companies in the U.S. This database provided common equity, stock closing price, total assets, common shares outstanding, depreciation and amortization, Income before extraordinary items., invested capital, net income, R&D costs, capital expenditures market value and long-term investments. Three years prior and three after the CEO got hired, measured in fiscal quarters, was taken as range to examine the changes throughout time. The post hiring period will start the first fiscal quarter in which the CEO has been working at least 30 days. This was done to avoid matching a firm performance to a CEO who barely took office e few days prior and has not had a chance to make some changes. After matching the 148 CEO hires sample with the firm items data, there remains 18 firms with low confidence, 114 firms with moderate and 6 firms with overconfident CEO hires remains. This sample will be referred to as Sample 1.

To measure M&A activity and its value creation ThomsonONE and the of WRDS event study tool was accessed. ThomsonONE contains data on M&A announcements and the value of the transaction. To research the M&A activity, all M&A announcements of the 148 firms were downloaded between the period the CEOs got hired until they left office. The ThomsonONE database accepted 139 of the 148 company identifiers and gave out M&A activities regarding 92 firms. This difference can be due to missing data or that the missing companies simply have not done any M&A's. Of the 92 firms, 12 are managed by low confident CEOs, 75 by moderate confident CEOs and 5 by overconfident CEOs. These firms have done 125, 303 and 31 M&As respectively, for a total of 459 M&A's. Using the WRDS event study tool, the value creation in terms of cumulative abnormal returns (CAR) per M&A announcement was calculated. Out of the 459 M&A announced 443 CAR was retrieved, 120 of low confidence, 292 moderate confident and 31 were from overconfident CEOs. This sample will be referred to as Sample 2.

3.2 Measures of dependent variables

3.2.1 Firm risk measure

The first effect this paper wants to measure is the effect of CEO confidence level on the risk taking of a firm. According to economic literature, the level of risk a firm assumes and its returns are positively correlated. Many economists researched firm risk to check the validity of this famous theory, using different methods (Jegers, 1991). A paper by Fiegenbaum and Thomas (1988) measured firm risk as the variation of returns, using ROE as base. The variance of the return on equity (ROE) measure reflects the shareholders point of view, as only earning available to the owners are taken into consideration. Jegers (1991) argues that a managerial point of view is better when managers have more influence on the decision-making process and proposes the use of return on assets (ROA). This paper is interested in the decision-making process of the CEO as a consequence of different confidence levels, and thus will use the variance of ROA as main dependent variable as a measure of risk. The variance of ROE will also be used along with the variance of the return on invested capital (ROIC).

3.2.2 Investment intensity measure

Malmendier and Tate (2005) measured investments as capital expenditures and Hirshleifer et. Al (2012) measured investments innovation as with amount spent on R&D. Both papers normalized their investment measures relative to assets to get an investment intensity measure. In this paper, both will be used, along with long-term investments found in the Compustat database. All three measures are normalized to their total assets.

3.2.3 M&A activity measure

Malmendier and Tate (2008) used the frequency of M&As to measure the M&A activity and compared the frequency among the different levels of CEO confidence. This measure however, is out of the scope of this paper. Instead, the value of the transaction was studied as a measure of M&A activity. ThomsoneOne provided the value of the transaction, this value was then normalized by the total assets in the same way as the investment's measures.

3.2.4 M&A value creation measure

To measure the value of a M&A, Malmendier and Tate (2008) examined whether the M&A was a diversifying merger or same industry merger. The same industry mergers were defined by the 48 Fama and French industry groups. As mentioned before, diversifying measure are less desirable for shareholders because they have a more efficient way to diversify. Malmendier and Tate (2008) also used the stock price reaction to measure the value of an M&A. This paper will follow this method and use CAR as measure of value creation the M&A.

3.2.5 Firm performance measures

The last dependent variable of importance is the firm performance. To measure the effect that different confidence levels have on firm performance, the accounting-based measures of ROA, ROE ROIC will be used. In addition to these measures, Tobin's Q will also be used, as it serves as a proxy of firm value from an investors point of view (Wolfe & Sauaia, 2003). The formula for Tobin's Q is shown in **Equation 1**. Furthermore, market to book ratio will also be used as it is often used to measure a firm's value of intellectual capital (Chen, Cheng, & Hwang, 2005) .

$$Tobin\ Q = \frac{total\ assets + shares\ outstanding\ \times closingstock\ prce - common\ equity}{total\ assets} \tag{1}$$

3.3 Measure of the independent variable

3.3.1 Confidence measure

Confidence is a state of feeling and a behavior that is shown through actions and words. As such, it would be ideal to have psychologists, as experts in the field of human behavior, measure a person's confidence level. This method however, is costly and time consuming. Economist have found an alternative method to measure confidence by studying the overexposure of CEOs to the idiosyncratic risk of their company (Malmendier & Tate, 2005). As mentioned before, CEOs are heavily invested in their company, and the risk over their human capital cannot be diversified away (Amihud & Lev, 1981). On top of this, CEOs are

often rewarded with stock options that they are not allowed to trade or to hedge the risk of by selling short, which further increases their risk to that company (Malmendier & Tate, 2005). According to Markowitz's (Markowitz, 1952) portfolio theory, humans are risk-averse and want risk reduction. This can be achieved by diversifying their portfolio over different stocks/assets. Markowitz (Markowitz, 1952) explains that not all risk can be diversified away. There are two kinds of risk, namely systemic and unsystematic risk, the first of which is undiversifiable. Human capital is an example of systematic risk. Stock options, however, are unsystematic/idiosyncratic risk and are diversifiable. Given that CEOs are already overinvested and risk-averse, it is expected that they would diversify their options as soon as possible as long as the prices are sufficiently high (Malmendier & Tate, 2005).

According to multiple papers, overconfidence is known to distort the risk perception of people (Ricciardi, 2008: Siegrist et al., 2005). Malemendier and Tate (2005) would make use of this relationship to construct three methods to measure overconfidence. The Longholder focuses on the expiration date of the option packages. Malemendier and Tate (2005) would classify a CEO as overconfident if they hold their option until the last possible year. According to their sample, a typical option would be fully vested by year 5, while the expiration date is 10 years after option grant. This leaves the CEO with a 5-year interval to exercise their option. This method shows the habitual failure to diversify despite being overinvested. Malemendier and Tate (2005) show that 85% of the unexercised stock were in the money and the median was around 253% in the money. The second measure of overconfidence is the NetBuyer method. With this measure, CEOs seems to be pushing their idiosyncratic risk to the extreme. Instead of diversifying their portfolio by exercising their option, they are purchasing additional company stock. Malemendier and Tate (2005) would identify a CEO as overconfident if they bought more stock than they sold during the first 5 years of their tenure. The final method is the Holder67 measure. As mentioned, CEOs are expected to exercise their options as soon as possible if the prices are sufficiently high. This method takes both the timing and the price level into account. To maintain comparability, Malemendier and Tate (2005) would examine the first year in which the option packages are at least partially exercisable. Hereafter, they compute the percentage of moneyness of each package. Hall and Murphy (2002) recognized that CEOs are risk-averse and typically under-diversified. CEOs are expected to exercise early if they are utility utilizers. Hall and Murphy (2002) created an option-model by analyzing executive's option holding and exercising decisions. Their study revealed that CEOs with about 50% of their wealth invested in the firm are indifferent between receiving $300.000 cash and $500.000 worth of options. By tweaking the Hall and Murphy's (2002) option model, Malemendier and Tate (2005) arrived at the benchmark of 67% of in-the

money option that rational CEOs should exercise their option at. Malemendier and Tate (2005) would classify a CEO as overconfident with the Holder76 if at least twice in the subsample the stock was 67% or more in the money and the CEO did not exercise the stock.

Campbell et al. (2011) also studied CEO overconfidence and used the Holder67 as blueprint to construct a similar confidence measure. Unlike Malemendier and Tate (2005), who simply made a dummy variable of overconfident and not-overconfident CEOs, Campbell et al. (2011) wanted to measure multiple levels of confidence. Although they recognized 67% in-the-money as cutoff point to determine overconfidence, they instead used 100% in-the-money as benchmark to distinguish "extremely" overconfident CEO. In a similar manner Campbell et al. (2011) created a low-confidence group, these were CEOs who would exercise their options at or below 30% in-the-money. To be classified as high-overconfidence or low confidence, a CEO would have to exhibit the corresponding behavior at least twice in the sample but will be labeled as low-confidence or extremely-overconfidence beginning with the first time they do. The CEOs who do not fall under the low-confidence or extremely-overconfidence classification will be labeled as moderate-confidence as long as there's sufficient data on their option exercise/hold behavior.

This paper will follow the three stages of confidence classification method developed by Campbell et al. (2011). To calculate moneyness, CEO option data from ExecuComp and closing stock price from Compustat is used. The steps to calculate moneyness can be seen in **Equation 2, 3** and **4**.

$$Realizable\ value\ per\ option = \frac{option\ value}{option\ amount} \qquad (2)$$

$$Average\ strike\ price = \ Closing\ stock\ price - Realizable \qquad (3)$$

$$Moneyness = \left(\frac{Realizable\ value\ per\ optionn}{Average\ strike\ price} \ - 1 \right) \times 100 \qquad (4)$$

Note that the real option strike price was not available in the database, so the average exercise had to be calculated using Core and Guay (2002) approximation method. This paper makes use of the exact same databases and three formulas developed by Campbell et al. (2011). The results in classification should be similar. However, because this paper is studying the within firm changes of hiring a certain confidence-

level CEO, CEO confidence-level will be labeled after the second time that they exhibit a certain behavior. But the measuring of the CEO performance will instead only start after they are rehired in a new company. This differentiates from Malemendier and Tate (2005) and Campbell et al. (2011) who start measuring the effects since the first time a CEO exhibits said behavior. The caveat of using this method is that it makes the sample much smaller compared other papers. Campbell et al. (2011) assume the semi-permanence classification, meaning that once a CEO is labeled as either low-confidence or extremely-overconfidence, they will continue to be classified as such unless they meet the criteria of the opposite trait later in the sample. This allows low-confidence and extremely-overconfidence CEOs, at a later point, to be relabeled into extremely-overconfidence and low-confidence, respectively, but moderate-confidence will remain the same throughout the sample. Since this paper is looking at the within firm changes, CEOs will be classified according to their last trait shown before being rehired. This label is a permanent classification.

3.4. Control variables

For control variables, percentage of company owned by the CEO, CEO age, CEO compensation and CEO gender was taken out of Execucomp to account for their individual characteristics. Siegrist et al. (2005) claimed that age and the female gender have a negative correlation on risk perception. Gender is a dummy variable that is 1 when the CEO is male and 0 otherwise. To account for the differences in between firms, firm size was added as the log of total assets. Malmendier and Tate (2005) pointed out that an overconfident CEO will either overinvest or underinvest depending on the amount of cash flow available. For this reason, cash flow will also be added as a control variable. According to Rhodes-Kropf and Viswanathan (2004), M&A activities may be motivated by excessive overvaluation of the acquirer by the market. To control for this overvaluation, market to book ratio is added as control variable in Sample 2.

3.5 Statistical Models

3.5.1 Difference-in-Differences (DiD)

According to Roberts and Whited (2013), endogeneity is one of the most pervasive issues confronting the empirical studies in corporate finance. Endogeneity can loosely be defined as a correlation between

explanatory variables and the error term in a regression. Endogeneity can lead to inconsistent parameters estimates that make inferences almost impossible. In the severe cases, it can even reverse the qualitive inference. The sources of endogeneity are omitted variable bias, simultaneity bias and measurement errors. When doing a single cross-section analysis between a treated group and an untreated (control) group, after the treatment (independent variable) effect was already given, the OLS cannot get the casual effect of treatment variable if there are permanent unobserved differences between 2 groups. In this case, the OLS regression will wrongly assume the unobserved permanent differences between groups as part of the treatment effect (2013). The selection bias will only be none-zero if there are no unobserved differences between the groups. **Equation 5** shows the single cross-sectional estimator. In this equation, T is a dummy that equals one if it is the treatment group and zero otherwise. B1 attempts to capture the effect of the treatment on the group. Alternatively, doing a single time-series before and after treatment to analyze the results of the treatment on the observed variable also has its issues. This type of research is more common in the corporate finance literature (2013). The single time-series OLS regression will wrongly assume any other changes, within the observed variable, throughout time as part of the treatment effect. Here the selection bias will be none-zero if there are no unobserved changes throughout time. **Equation 6** shows the single time-series estimator where β2 attempts to capture the effect of the treatment. The time-series regression uses P as a dummy variable that equals 1 if it's in the post period after treatment has taken place, and zero otherwise.

$$Y = B_0 + B_1 \times T \tag{5}$$

$$Y = B_O + B_2 \times P \tag{6}$$

A solution to this omitted variable bias is to combine the two single difference estimators. The cross-sectional and the time-series can complement each other. The cross-sectional avoids the problem of omitted time trends by comparing treatment and control groups over the same period, while the time-series avoids the unobservable differences between the control and treatment groups by looking at the same two groups before and after the treatment. The Difference-in-Differences combines these two methods to take advantage of both methods' strengths (Roberts & Whited, 2013). **Equation 7** shows how the DiD model combines both **Equation 5** and **6** to eliminate their individual weaknesses.

$$Y = B_O + B_1 \times T + B_2 \times P + B_3 \times TP \tag{7}$$

In equation 6, T controls for the permanent differences between the treatment and control groups. Any permanent differences between treatment and control group will now be captured by B_1. While P controls for the differences across time, which allows B_2 to capture all the temporal differences which affects both groups. **Equation 6** introduces β3 and TP, TP is a dummy variable that equals one for observations of the treatment group after it has already received treatment and zero for all other observations. The variation that remains, after controlling for permanent differences between treatment and control groups and temporal differences, is the change in the treatment group relative to the change experienced by the control group. This variation is captured by B_3. **Table 1** shows an overview of the conditional estimates means of a DiD model.

Table 1: DiD conditional means

	Post-treatment	Pre-treatment	Difference
Treatment	β0 + β1 + β2 + β3	β0 + β1	β2 + β3
Control	β0+ β2	β0	β2
Difference	β1 + β3	β1	β3

Table 1 shows that doing a single cross-sectional on the treatment and control groups after treatment will give the estimator of β0 + β1 + β2 + β3) – (β0+ β2) = β1 + β3. Only when the permanent differences between the groups are zero (β1=0) will a cross- sectional give the true effect of the treatment. In the same way a single time-series only gives the correct estimator when there are no unobserved temporal changes (β2=0). The great appeal of DiD is its simplicity and ability to circumvent many of the endogenous concerns that may arise when comparing heterogeneous individuals, however its only appropriate when the treatments are random. Most of the debate around the validity of DiD estimates revolves around the endogeneity of the treatment themselves (Bertrand, Duflo, & Mullainathan, 2004). Another important issue is that the average change in the control group and treatment group should be the same over time. This is called the "parallel trends" assumption.

Because of endogeneity concerns regarding the CEO confidence levels on performance, this paper opted to uses a DiD model to capture the effect that hiring differently leveled confident CEO has on a company. A three-year pre- treatment and three-year post-treatment time interval with quarterly data obtained

from Compustat. The three-year interval was taken in accordance with Karaevli (2007) who studied the effects of pre- and post-succession effects of a new CEO on the performance of the company. Companies who hire a moderate confidence level CEO are used as the control group. While both low-confidence CEOs and high-overconfidence CEOs- hires were used as 2 different treatment groups.

3.5.2 Event Study

Malmendier and Tate (2008) used an event study to measure the value of M&A announcements. This paper will also make use of the event study to measure the value creation of M&A, to compare the value created by firms who are managed by CEOs with different confidence levels. Event studies measure the market's reaction the news by relying on the EMH. As mentioned before event studies work on the semi-strong form of EMH, because of the immediate market reaction to new public news (Degutis & Novickytė, 2014). Of Couse, this is also applicable to mergers or acquisition announcements.

To do an event study analysis, it is required to compare the price reaction of a public news on the expected price reaction that would have occurred if there wasn't any news. There are various methods to calculate the expected returns. A secure and easy method would be to compare the stock price of interest with an almost identical stock price volatility that experiences the same shocks as the stock price of interest. But this "control stock" should be completely unaffected by the news that is affecting the stock price of interest (van der Sar, 2015). Finding an identical stock that is similar in every way except for that one event of interest is a difficult and often even impossible task. For this reason, most of the time a large index that follows the market's movements is chosen. The stock in question will follow the markets movements in some extent, but the market index will not react to news specifically targeted at single company. Because of this its practical to use large indexes to compute the estimated normal return. One of the approaches of using a large index is called the Market Model, this model commonly gives the best results and is relatively simple to implement (Armitage, 1995).

$$R_{it} = \alpha_i + \beta_i \times R_{mt} + \varepsilon_{it} \qquad (8)$$

To generate the expected return, the linear relationship between the market index and the stock in question will be analyzed. In **Equation 8**, R_{it} is the real return of the stock, R_{mt} is the return of the market index and β_i and α_i are the variables of interest to predict expected returns, α_i represents

the constant different between the market and the stock returns and βi is the stock return sensitivity relative to the market movements. The relationship between the stock and market needs to be estimated in a control period, usually prior to the event. This control period is often referred to as the estimation window.

$$R_{it}^* = E(\alpha_i) + E(\beta\alpha_i)R_{mt} \qquad (9)$$

The next step is to generate the expected returns, R_{it}^*, over the event window. This is done by inserting the estimated β_i and α_i into **Equation 9**. The generated expected return will be labeled as the normal returns of the stock that would occur if it wasn't for the event.

$$AR_{i,t} = R_{it} - R_{it}^* \qquad (10)$$

$$CAR_{i,KL} = \sum_{t=k}^{l} AR_{i,t} \qquad (11)$$

By subtracting the expected returns from real returns as shown in **Equation 10**, the daily abnormal returns can be determined. Because of event day uncertainty, it is customary to measure an event window around the day of the event. Event day uncertainty refers to the uncertainty about when the news became public knowledge. This is done in **Equation 11** by simply adding up the daily abnormal returns (MacKinlay, 1997).

This paper uses the market model method to conduct the event studies with an estimation window of day (-277;-25) with day 0 being the M&A announcement date. Malmendier and Tate (2008) used an event window of (-1;1), but this paper will use (-5;5) to account for a broader event day uncertainty. The WRDS event study tool was used to conduct the event studies. This event study tool uses market returns from acquired from Kenneth French's website.

3.6 Descriptive statistics

In this section, the descriptive statistics of the variables used in this paper is provided and briefly discussed. For all variables the amount of observation, mean std deviation, the smallest and the biggest observation is presented. In this paper there are two different samples, the first sample is used to measure

firm risk, investment intensity, and firm performance. While the second sample is used to calculate M&A intensity and the value creation of M&A. In **Table 2** the descriptive statistics of Sample 1 is given. Note that in this sample the number of observations (N) represents firm-quarterly data. In **Panel A,** it is shown that about 13% of the firm-years are managed by low confidence CEOs, about 82% are managed by the moderate confidence CEOs and less than 5% are managed by highly overconfident CEO.

Table 2: Descriptive statistics Sample1

Variables	N	mean	Std deviation	Min	max
Panel A: Confidence levels					
L confidence	2962	0.132681	0.3392865	0	1
M confidence	2,962	0.820392	0.3839257	0	1
H overconfidence	2,962	0.046929	0.2115198	0	1
Panel B: Dependent variables					
Var_ROA	2946	0.150370	0.0868196	0.0121485	0.6498753
Var_ROE	2707	.493896	3.110319	0.0211328	45.21018
Var_ROIC	2946	.224860	0.3671893	0.0147325	4.609993
ROA	2850	0.00250	0.058163	-1.369566	0.8808125
ROE	2647	-2.59786	132.41	-6796.116	437.1269
ROIC	2850	-.008595	1.477482	-69.45277	35.8
LT invest intensity	2143	.022010	0.443072	0	0.6099614
R&D intensity	1771	.0133022	0.0161201	0	0.1497965
Capex intensity	2836	.0228013	0.0320423	0	0.4188724
Tobin's Q	2648	1.926245	1.335689	.5020916	11.90891
Market/Book ratio	2645	1.285341	1.338615	.0004463	11.18287
Panel C: Control variables					
CEO Gender	2962	.9625253	.189954	0	1
CEO Ownership %	1483	.2373945	.3961024	0	4.445

CEO Compensation	1753	8524.52	8620.326	11.885	72728.23
CEO age	2962	56.22248	6.11663	40	78
Cash flow	2793	.0136894	.0566696	-1.348772	.898160
Firme size	2854	8.168777	1.652306	-.8486321	13.10764

Panel B shows the dependent variables of the first sample. Note that the ROA, ROE, ROIC are a ratio of the net income in millions, divided by the total assets, equity and invested capital respectively. The mean of these accounting measures of performance are small and even negative for ROE and ROIC. The market-based measures, Tobin Q and Market to book ratio, are about 2 and 1.3 respectively. The long-term investment intensity and capital expenditure intensity show a similar mean at about 0.022 while R&D intensity is 0.013. The first three variables in Panel B represents the variance of each of these measures. The36veragee variance is about 0.15 for ROA, 0.50 for ROE and 0.22 for ROIC. There is a clear difference to be seen between the mean of the ROE variance and the other two. The variance was measured quarterly per company three before the hiring and then again three years after the hiring of the new CEO or until they left the company if they left earlier. Each firm has e before and after firm's risk measure making it easy to compare the change over time.

Panel C presents the descriptive statistics of the control variables. CEO gender is a dummy which equals 1 if the CEO is male. With an average of 0.96 most of the CEOs in this sample is male. CEO ownership is a percentage of total shares owned by the CEO; the mean shows a 0.23% ownership. The average CEO is about 56 years old and receives about 8500 in compensation. Note that unlike the other variables in this sample, the CEO specific data are yearly data.

Table 3 shows the descriptive statistics of sample 2. The observations (N) in this sample refer to the M&A announcements. Panel A shows that about 27% of the M&A are done by low confidence, about 66% by moderately confident and only 6% by highly overconfident CEO. The group of highly overconfident is very small in this sample.

Table 3: Descriptive statistics Sample 2

Variables	N	mean	Std deviation	Min	max
Panel A: Confidence levels					
L confidence	459	0.2723312	0.4456451	0	1
M confidence	459	0.6601307	0.4741814	0	1
H overconfidence	459	0.0675381	0.2512255	0	1
Panel B: Dependent variables					
Deal size	273	0.1528872	0.2375022	0. 079490	141.171
CAR	443	-0.0016488	0.0794903	-0. 559848	0.3171563
Panel C: Control variables					
CEO Gender	459	0.965142	0.183621	0	1
CEO age	459	57.72767	5.363.828	44	77
Cash flow	446	.0941093	.0944933	-.373005	.6364837
Market/Book ratio	442	1.612.223	1.422.447	.0784276	1.137.498
Firme size	446	8.634.414	158.422	4.693.721	118.415

Panel B shows the average of the dependent variables in Sample 2. Deal size is the value of the transaction normalized by the total assets at the beginning of the year. CAR has an average of a negative market reaction of -0.0016488. In **panel C**, the statistics of the control variables are presented. Approximately 97% of the CEOs in this sample are male with an average age of 57.7. The firm-specific control variables in this sample are cash flow, market to book ratio and firm size with a mean of 0.09, 1.6 and 8.6 respectively.

4. Results

In this section, the results of the analyses are presented, briefly described and then compared to the academic literature. The purpose is to check whether the hypotheses are rejected or not. Hereafter the meaning of the results will be discussed

Part 1: Confidence and risky behavior.

As mentioned previously, the literature on confidence reasons that overconfidence influences a person's perception of risk, deluding them to think the risk of a certain task is smaller than what it actually is (Ricciardi, 2008). A positive correlation was found between risk perceived and other and confidence levels, while women and older people have a higher risk perception (Siegrist et al., 2005). Ricciardi (2008) has shown that this behavior extends to professionals as well. Because of their distorted view, overconfident CEOs are expected to take more risks. Malmendier (2018) supported this claiming that one of the bright sides of overconfidence is that because of the CEO underestimation of risk they will engage in more risk-taking. As overconfidence will set agents up to underestimate risk, Campbell et al. (2011) show the exact opposite to be true for agents who exhibit low confidence. These CEO will overestimate the risk and will engage in less risk-taking.

To test the first hypotheses, which states that confidence increases risk-taking, a DiD analysis was executed, making use of Sample 1, with confidence level as the independent variable and the variance of various accounting-based performance measures as dependent variables of risk. This paper has compared both highly overconfident and low confidence CEOs to the moderate confidence level CEOs. A time interval of 3 years before and 3 years after the hiring was used as the pre-and post-period for the treatment and control groups. The first DiD analyses were performed by comparing the firms that hired an overconfident CEO compared to a firm that hired a moderate confidence level CEO. The DiD technique was performed with moderate confidence level CEO as the treatment group and the highly overconfident CEO group as the treatment group. According to the literature discussed above, a positive effect is expected from hiring a highly overconfident CEO on the riskiness of the firm, after accounting for the differences throughout time and the differences between the groups. T**able 4** shows the effect of a highly

overconfident CEO on the firm's risk-taking behavior. The variances of ROA, ROE and ROIC are taken as the dependent variable in regressions 1, 2 and 3 and then again in 4, 5 and 6 as the measures of firm risk. Regressions 1-3 show that the DID estimator from all three is positive. However, only Regression 1 shows a significant effect at the 1% level belonging to a positive 0.0618 coefficient. Furthermore, regression 1 has a negative coefficient of 0.0655 at the 5% level for the overconfidence dummy. Both regression 1 and 2 show a negative coefficient for the post period dummy at 1% significance. Regression 3 does not show any significant coefficients except for the intercept. In regression 4-6 the DiD models were reproduced but with cash flow, firm size, CEO age, CEO ownership and CEO compensation added as control variables along with firm fixed effects (FE) and time FE that account for economic trends. Both regressions 4 and 5 show a positive DiD coefficient of 0.0493 at 1% and 0.0441 at 5% significance level, respectively. All three regressions reveal negative coefficients at the 1% significance level for the post period dummy. The firm size and CEO ownership coefficients are significantly positive in both regressions 4 and 6.

Table 4: overconfidence on firm risk

A DiD model, with the variances of ROA, ROE ROIC as dependent variables representing the risk measure. The DID estimator is the variable of interest and gives the effect of high overconfidence on the firm risk. H overconfidence is a dummy variable that equals 1 when the CEO is overconfident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO ownership, and CEO compensation are added as control variables. Regression 4-6 are equipped with firm and time FEs.

	(1)	(2)	(3)	(4)	(5)	(6)
	Var_ROA	Var_ROE	VAR_ROIC	Var_ROA	Var_ROE	VAR_ROIC
DiD	0.0618***	0.399	0.0434	0.0493***	0.0904	0.0441**
	(0.00933)	(0.376)	(0.0365)	(0.0169)	(0.972)	(0.0222)
H overconfidence	-0.0655**	-0.739	-0.108	-	-	-
	(0.0317)	(1.266)	(0.157)	-	-	-
PostPeriod	-0.0073***	-0.363***	0.00856	-0.0141***	-0.721***	-0.0227***
	(0.00222)	(0.0882)	(0.0087 0)	(0.00359)	(0.213)	(0.00471)
Cash flow				-0.00167	-0.720	-0.0485
				(0.0256)	(1.498)	(0.0335)
Firm size				0.0173***	0.339	0.0209***
				(0.00448)	(0.261)	(0.00587)
CEO age				-0.00458	-0.107	-0.00616
				(0.00461)	(0.266)	(0.00605)
CEO ownership				0.0117*	0.266	0.0216**
				(0.00690)	(0.410)	(0.00904)

	(1)	(2)	(3)	(4)	(5)	(6)
CEO compensation				-1.78e-07	2.11e-06	-1.74e-07
				(2.28e-07)	(1.33e-05)	(2.99e-07)
intercept	0.159***	0.824***	0.240***	0.274	4.317	0.407
	(0.00712)	(0.289)	(0.0352)	(0.264)	(15.27)	(0.347)
Time FE	NO	NO	NO	YES	YES	YES
Firm FE	NO	NO	NO	YES	YES	YES
R-squared	0.0186	0.0074	0.0013	0.814	0.657	0.981
N	120	115	120	1,203	1,183	1,203

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Most of the academic literature focused only on having excessive confidence. This paper, however, will analyze both sides of the spectrum of confidence. A positive correlation between confidence and perceived risk indicates that low confidence CEO will decrease the firm risk compared to the moderate confidence level CEOs. The same analyses as above will be applied to the low confidence group. Table 5 presents the results of the DiD analyses. As before, regressions 1-3 are simple regressions without any control variables and fixed effects. Again, only regression 1 shows a significant effect, a negative coefficient of 0.0125 at the 5% significance level. The post-period dummies show negative coefficients at the 1% significance level for regressions 1 and 2. Regression 3 does not show any significant coefficient except for the intercept. Regressions 4-6 are the same as 1-3 but with added control variables and firm and time FEs. None of these regressions show a significant effect on the DiD estimator. The post-period dummy is negative at the significance level of 1% for all three regressions. Firm size is positively significant for regressions 4 and 6 at the 1% level.

Table 5: Low confidence on firm risk

A DiD model, with the variances of ROA, ROE ROIC as dependent variables representing the risk measure. The DID estimator is the variable of interest and gives the effect of low confidence on the firm risk. Low confidence is a dummy variable that equals 1 when the CEO is overconfident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO ownership, and CEO compensation are added as control variables. Regression 4-6 are equipped with firm and time FEs

	(1)	(2)	(3)	(4)	(5)	(6)
	Var_ROA	Var_ROE	VAR_ROIC	Var_ROA	Var_ROE	VAR_ROIC
DiD	-0.0125**	0.323	-0.0331	0.00297	0.423	0.00641
	(0.00601)	(0.218)	(0.0226)	(0.00705)	(0.383)	(0.00918)
L confidence	-0.0161	-0.676	-0.0661	-	-	-

	(-0.86)	(-0.93)	(-0.73)	-	-	-
PostPeriod	-0.00726***	-0.363***	0.00855	-0.0159***	-0.737***	-0.0247***
	(0.00221)	(0.0838)	(0.00834)	(0.00352)	(0.197)	(0.00459)
Cash flow				-0.00462	-0.701	-0.0525
				(0.0255)	(1.402)	(0.0332)
Firm size				0.0124***	0.323	0.0161***
				(0.00438)	(0.240)	(0.00570)
CEO age				-0.00265	-0.0794	-0.00380
				(0.00398)	(0.215)	(0.00518)
CEO ownership				0.00526	0.223	0.0114
				(0.00552)	(0.304)	(0.00719)
CEO compensation				-6.49e-08	4.68e-06	-2.03e-08
				(2.01e-07)	(1.10e-05)	(2.62e-07)
intercept	0.159***	0.824***	0.240***	0.201	2.708	0.304
	(0.00689)	(0.274)	(0.0335)	(0.228)	(12.36)	(0.297)
Time FE	NO	NO	NO	YES	YES	YES
Firm FE	NO	NO	NO	YES	YES	YES
R-squared	0.0085	0.0074	0.0010	0.808	0.656	0.979
N	2,807	2,580	2,807	1,355	1,335	1,355

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Based on regressions 4-6 of Table 4, two of the three measures of firm risk show a significantly positive coefficient. Going by the rule of the majority, this paper will fail to reject hypothesis 1a. Table 5 shows that the effect of low confidence on firm risk is insignificant. this paper rejects hypothesis 1b. In accordance with the literature on confidence, this paper found a positive effect of overconfidence on the firm risk level but was not able to find a negative effect of low confidence on firm risk. These results support the academic literature that overconfident CEOs significantly increase firm risk, but did not find the opposite results for low confidence CEOs. These results also indicate that after a new CEO is hired, the firm risk will decrease significantly compared to before. Furthermore, the results suggestes that larger firms tend to be riskier compared to smaller firms. This paper has not found a negative relationship of CEO age on firm risk.

Part 2: Confidence and investments intensity.

The second part of this research focuses on the relationship between confidence levels and investment intensity. According to Malmendier and Tate (2005), overconfident CEOs systematically overestimate their return on investments because of their distorted perception of risk. Campbell et al. (2011) theorized that different levels of confidence will result in different levels of investment levels. Malemendier and Tate's (2005) results show that as long as a CEO is not financially constrained, they will increase investment intensity. Malmendier and Tate (2005) defined investment intensity as capital expenditures normalized by assets at the beginning of the year. This paper will also use this method as one of its three investment measures. Hirshleifer et al. (2012) found that overconfidence would increase investment intensity in R&D scaled by total assets by 27%.

To measure the effect of overconfidence on investment intensity a DiD analysis was conducted, making use of Sample 1. The hiring of the highly overconfident CEOs was used as the treatment group and the hiring of a moderate confidence level CEO as the control group, with the 3 years before and after hiring as the pre- and post-period. **Table 6** presents the results of the different DiD analyses. Regressions 1-3 show the DiD estimations with cash flow, firm size, CEO age and CEO gender as control variables. Only regression 2 shows a significant coefficient for the DiD estimator. A positive coefficient of 0.00904 at the 1% significance level. None of the coefficients of regression 1 show a significant effect. Regression 3 shows a negative coefficient at the 10% significance level for the post-period dummy. Both regressions 2 and 3 show negative and significant coefficients for cash flow. Furthermore, regression 2 has a significant negative coefficient for firm size and CEO gender, and regression 3 shows a positive coefficient at the 5% significance level for CEO age. In regressions 4-6, firm and time FEs are added. Only regression 5 show a significant DiD estimator, with a positive coefficient of 0.00868 at the 1% significance level. Cashflow has a negative and significant coefficient for all three regressions. The post-period dummy and CEO age in regression 6 are both highly significant at the 1% level with negative coefficients of 0.00470 and 0.0346. Both regression 4 and 5 show a significant and negative coefficient for firm size at the 10% and 1% levels.

Table 6: Overconfidence on investment intensity

A DiD model, with LT invest Intensity, R&D Intensity and Capex Intensity as dependent variables representing the investment level. The intensity was measured by normalizing LT investments, R&D spending and capital expenditure to the total assets of the firm. The DID estimator is the variable of interest and gives the effect of high overconfidence on the investment level. H overconfidence a dummy variable that equals 1 when the CEO is overconfident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO gender are added as control variables. Regression 4-6 are equipped with firm and time FEs

	(1)	(2)	(3)	(4)	(5)	(6)
	LT invest Intensity	R&D Intensity	Capex Intensity	LT invest Intensity	R&D Intensity	Capex Intensity
DiD	-0.00547	0.00904***	0.00200	0.00134	0.00868***	0.000293
	(0.00556)	(0.00149)	(0.00396)	(0.00564)	(0.00152)	(0.00356)
H overconfidence	0.00477	-0.00691	-0.00261	-	-	-
	(0.0139)	(0.00640)	(0.0110)			
PostPeriod	-0.00197	0.000162	-0.00229*	0.00136	-9.16e-05	-0.00470***
	(0.00183)	(0.00059)	(0.00127)	(0.00264)	(0.000730)	(0.00157)
Cash flow	-0.0104	-0.0361***	-0.0194**	-0.0216*	-0.0333***	-0.0190**
	(0.0120)	(0.00411)	(0.00833)	(0.0124)	(0.00430)	(0.00753)
Firm size	0.00216	-0.00420***	-0.00170	-0.00371*	0.00534***	-5.95e-05
	(0.00140)	(0.000548)	(0.00104)	(0.00215)	(0.000691)	(0.00133)
CEO age	-0.000539	-0.000106	-0.000701**	0.000433	-0.000974	-0.0346***
	(0.000408)	(0.000159)	(0.00030)	(0.00311)	(0.000842)	(0.00185)
CEO gender	0.000945	-0.0196*	-0.00400	-	-	-
	(0.0164)	(0.0107)	(0.0131)			
Intercept	0.0339	0.0719***	0.0829***	0.0245	0.110**	1.977***
	(0.0301)	(0.0147)	(0.0227)	(0.177)	(0.0480)	(0.105)
Time FE	NO	NO	NO	YES	YES	YES
Firm FE	NO	NO	NO	YES	YES	YES
R-squared	0.0040	0.1143	0.0187	0.606	0.848	0.676
N	1,850	1,470	2,415	1,847	1,469	2,414

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To test hypothesis 2b, several DiD analyses were performed, with low confident CEO hires as the treatment group and moderate CEO hires as the control group. The same method as described above, but with low confidence as the regressor. The results of the DiD analyses are shown in **Table 7**. Regressions 1-3 show the DiD model along with cash flow, firm size, CEO age and CEO gender as control variables. The DiD estimator of regression 1 is negative at 0.0132 with a significance level of 1%. Regression 2 also reveals a negative DiD estimator, at the 10% significance level, while regression 3 shows a positive coefficient of 0.00546 at the 5% significance level. The post-period dummy has a negative coefficient at 10% significance for regression 3. Both regression 2 and 3 have significant negative coefficients of 0.0309 and 0.0187 for the cash flow variable. CEO age is negatively significant for regressions 1 and 3. Regressions 4-6 are identical to the first three regressions but with firm and time FEs accounted for. Both regressions 4 and 5 have a negative DiD estimator of 0.0121 and 0.00219 at the 1% and 5% significance levels, respectively. Regression 5 however shows a positive DiD estimator of 0.00491 at the 5% significance level. All the coefficients of the post-period dummy are positive for regression 4-6, however, only regression 6 is significant. Cash flow is negative and significant for all three regressions and firm size significant and negative for regressions 4 and 5. Regressions 5 and 6, both show negative coefficients for CEO at 0.00147 with a 5% significance and at 0.0349 with a 1% significance level.

Table 7: Low confidence on investment intensity

A DiD model, with LT invest Intensity, R&D Intensity and Capex Intensity as dependent variables representing the investment level. The intensity was measured by normalizing LT investments, R&D spending and capital expenditure to the total assets of the firm. The DID estimator is the variable of interest and gives the effect of low confidence on the investment level. H overconfidence a dummy variable that equals 1 when the CEO is low confident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO gender are added as control variables. Regression 4-6 are equipped with firm and time FEs

	(1) LT invest Intensity	(2) R&D Intensity	(3) Capex Intensity	(4) LT invest Intensity	(5) R&D Intensity	(6) Capex Intensity
DiD	-0.0132***	-0.00177*	0.00546**	-0.0121***	-0.00219**	0.00491**
	(0.00418)	(0.000932)	(0.00257)	(0.00423)	(0.000942)	(0.00230)
L confidence	0.0143	0.00497	-0.00723	-	-	-
	(0.00969)	(0.00394)	(0.00668)			
PostPeriod	-0.00140	0.000379	-0.00209*	0.000800	0.000651	0.00549***
	(0.00185)	(0.000548)	(0.00124)	(0.00248)	(0.000643)	(0.00163)
Cashflow	-0.0176	-0.0309***	-0.0187**	-0.0254**	-0.0279***	-0.0181**
	(0.0118)	(0.00382)	(0.00812)	(0.0122)	(0.00399)	(0.00736)

Firm size	0.00121	-0.00355***	-0.00119	-0.00442**	-0.00453***	0.000394
	(0.00144)	(0.000493)	(0.00101)	(0.00214)	(0.000609)	(0.00130)
CEO age	-0.000741*	-0.000200	-0.000783***	0.000490	-0.00147**	-0.0349***
	(0.000417)	(0.000145)	(0.000291)	(0.00287)	(0.000708)	(0.00165)
Gender	0.00287	-0.00831	0.000123	-	-	-
	(0.0174)	(0.0139)	(0.0131)			
Intercept	0.0510	0.0607***	0.0792***	0.0298	0.132***	1.982***
	(0.0314)	(0.0169)	(0.0223)	(0.163)	(0.0401)	(0.0933)
Time FE	NO	NO	NO	YES	YES	YES
Firm FE	NO	NO	NO	YES	YES	YES
R-squared	0.0147	0.0852	0.0193	0.643	0.836	0.687
N	1987	1637	2646	1,984	1,636	2,645

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 shows that only R&D intensity is significantly affected by the overconfident hire. This effect is highly significant and follows hypothesis 2a. But because the other two measures do not show a significant effect, by the majority rule, this paper rejects hypothesis 2a. Unlike the majority of the papers on overconfidence, this paper did not find a significant positive effect. It is also interesting to note that even though the exact same investment measure was used as in Mamendier and Tate (2005), this paper has still not found the same effect while running a DiD regression. **Table 7** shows that all three regressions show a significant and negative effect. This paper fails to reject hypothesis 2b. Low confidence CEO will underinvest compared to the moderate group. The results also indicate that larger firms and older CEO engage in a lower degree of investment intensity. Unexpectedly, the results show that cash flow is negatively related to the investment intensity. This goes directly against the results of Malmendier and Tate (2005), this paper cannot explain this deviation from the academic literature.

Part 3: Confidence and M&A intensity.

The third part of this paper measures the relationship between the different confidence levels and M&A activity. Roll (1986) first introduced the idea that overconfidence is to blame for the high frequency of M&A attempts. Similar to theories on investing activities, literature and M&A also predict a positive relationship between M&A frequency and level of overconfidence. As mentioned before Malmendier and

Tate (2008) found a significant positive effect of overconfidence on the frequency of M&A. This positive relationship exists regardless of the cash flow level. This paper measured M&A activity as the value of the transaction normalized by the total assets. Sample 2 was used to conduct the analyses of confidence levels on the M&A activity. Table 8 presents the results of the analyses. A categorical variable was created that is equal to 1 if the CEO is labeled as moderate confident, 2 if labeled as low confident and 3 if highly overconfident. The moderate CEO group is taken as base in the regression. Regression 1 shows a cross-sectional regression of the different levels of confidence on the M&A deal size. The coefficient of low confidence level is negative at a 0.0809 and significant 5% level, while highly overconfidence shows an insignificant coefficient. For regression 2, control variables for firm size, cash flow, market to book, CEO gender and CEO age are added. The results from this regression a slightly smaller negative coefficient of 0.07 at 5% significance level. The highly overconfident CEO coefficient is still insignificant. The firm size control variable shows a negative coefficient of 0.0219 at the 5% significance level. Both market to book ratio and CEO gender show positive coefficients of 0.0259 and 0.158 respectively, at the 5% significance level.

Table 8: Confidence levels on M&A activity

An OLS regression with deals size as dependent variable. Deal size is the total value of the transaction divided by total assets. Moderate, low confident and high overconfident are the three categories of the confidence level variable used as independent variable. Firm size, Cash flow, Market/Book, CEO gender and CEO are the control variables.

	(1) deal size	(2) deal size
M confidence	-	-
L confidence	-0.0809**	-0.0700**
	(0.0343)	(0.0355)
H overconfidence	-0.0602	-0.0479
	(0.0675)	(0.0661)
Firm size		-0.0219**
		(0.0103)
Cash flow		0.156
		(0.147)
Market/Book		0.0259**
		(0.0120)
CEO gender		0.158**

		(0.0712)
CEO age		0.00133
		(0.00245)
Intercept	0.174***	0.0663
	(0.0168)	(0.184)
R-squared	0.0215	0.1017
N	273	272

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Low confidence shows a negative significant effect on M&A deal size. This paper fails the reject hypothesis 3b. Low confidence CEOs engage in significantly smaller deal sizes compared to the moderate confidence level CEO. Highly overconfident CEOs do not appear to engage in a significantly larger M&A compared to moderate confidence CEOs. This paper rejects Hypothesis 3a. Highly overconfident CEO do not engage in larger M&A. Market to book is positively related to deal size of M&A. This is in line with previous literature which notes that overvaluation of the acquiring firm motivates M&A activity (Rhodes-Kropf & Viswanathan, 2004).

Part 4: Confidence and value creation M&A

According to the research of Goel and Thakor (2008), overconfident CEOs invest less in information acquisition for their investments, and Malmendier and Tate (2005) state that they frequently overestimate the returns on investments. By extrapolating this literature to M&A activities the same results should be expected. Malmendier and Tate (2008) found that the market reacted more negatively to M&A announcements of overconfident CEO. Using an event study this paper replicates the work of Malmendier and Tate (2008) but on three different levels of confidence. The CARs were calculated using the WRDS event study tool. **Table 9** shows the results of regressing the different levels of confidence on the CAR, with the moderate confidence level as the base. Regression 1 shows the regression of the categorical variables on CAR. The low confidence level shows a positive coefficient of 0.0183 at a 5% significance level. The highly overconfident coefficient is positive but insignificant. In regression 2 control variables for firm size, cash flow, market to book, CEO gender and CEO age were added. The low confidence level is still positive but now insignificant, while the highly overconfident CEO coefficient

remains positive and insignificant. Market to book ratio is the only variable with a significant coefficient in regression 2. A positive coefficient of 0.0111 at the 5% significance level

Table 9: confidence level on CAR

An OLS regression with CAR as dependent variable. CAR was measures through an event study on M&A announcement with a (5;5) event window. Moderate, low confident and high overconfident are the three categories of the confidence level variable used as independent variable. Firm size, Cash flow, Market/Book, Deal size, CEO gender and CEO are the control variables.

	(1) CAR	(2) CAR
M confidence	-	-
L confidence	0.0183**	0.0103
	(0.00858)	(0.0128)
H overconfidence	0.0243	0.0221
	(0.0149)	(0.0236)
Firm size		0.00367
		(0.00374)
Cash flow		-0.0835
		(0.0547)
Market/Book		0.0111**
		(0.00433)
Deal size		-0.00400
		(0.0220)
CEO gender		-0.00446
		(0.0256)
CEO age		-0.000369
		(0.000882)
Intercept	-0.00829*	-0.0143
	(0.00463)	(0.0665)
R-squared	0.0139	0.0343
N	443	268

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Based on the results of this table, this paper rejects both Hypothesis 4a and 4b. Both low confidence and high overconfidence does not significantly affect the value creation of M&A. These results contradict the

findings of Malmendier and Tate (2008). Measuring overconfidence with the "Longholder" method, Malmendier & Tate (2008) found a negative coefficient of 0.0193 at the 1% significance level as compared to the non-overconfident CEO. However, Malmendier and Tate (2008) did not differentiate between moderate and low confident level CEOs. A positive relationship was found however between the market to book ratio and the value creation of M&As. This result matches the theory that overvalued firms create more value for shareholders in M&A (Ang & Cheng, 2006).

Part 5: Confidence and firm performance

The last part of this research focuses on how low confidence and highly overconfident CEOs affect business performance relative to the moderate confidence level CEO. This last part is the culmination of all the other activities analyzed so far. Literature on confidence states that moderately overconfidence will maximize firm value by increasing investment levels to the first-best level (Campbell et al., 2011). Malmendier and Tate (2008) investigated both investment intensity and M&A activities. In both cases, they found that overconfident CEOs would significantly increase their investments and M&A activities. This growth is met with an increase in value-destroying M&As and investments compared to the moderate confident CEOs. As mentioned before, the root cause of the value-destroying activities lies in the fact that overconfident CEOs have a distorted perception of risk, making them often overestimate their returns on both investments and M&A deals (Ricciardi, 2008). Low confidence level, however, leads to the exact opposite effect according to Campbell et al. (2011) Low-confidence CEOs will severely drop investment levels and M&A deals relative to the first-best level. Because of the underinvestment of the low confidence CEOs, the performance of the firm will decline.

To measure to the effect that different level of confidence has on firm performance, a DiD estimation was executed on Sample 1. The Moderate confidence level group is taken as the control group while the highly overconfident hires and low confidence group are the two different treatment groups. **Table 10** shows the results of DiD analyses of highly overconfident CEO on the five firm performance measures (ROA, ROE, ROIC, Tobin's Q and market to book ratio. Table 10 shows the DiD regression without any control variables. All the DiD estimators show a negative coefficient although only the market-based measures, in regressions 4 and 5, show a significant effect. Regression 4 shows a coefficient of 0.471 at the 1% and regression 5 shows a 0.281 coefficient at the 5% significance level. Regression 1-3 does not show any

significant results. In both regressions 4 and 5 the highly overconfident dummy is positive and significant at the 1% level.

Table 10: overconfidence on firm performance

A DiD model, with ROA, ROE, ROIC, Tobin's Q and market/book ratio as dependent variables representing firm performance. The DID estimator is the variable of interest and gives the effect of high overconfidence on the firm performance. H overconfidence a dummy variable that equals 1 when the CEO is overconfident. Post period is a dummy that equals 1 after the new CEO has been hired.

	(1)	(2)	(3)	(4)	(5)
	ROA	ROE	ROIC	Tobin's Q	Market/Book
DiD	-0.00437	-5.589	-0.0801	-0.471***	-0.281**
	(0.0102)	(26.76)	(0.278)	(0.113)	(0.115)
H overconfidence	0.0127	6.051	0.0783	1.571***	1.228***
	(0.0108)	(20.10)	(0.212)	(0.438)	(0.456)
PostPeriod	-0.00119	5.581	0.0702	0.0121	-0.0239
	(0.00243)	(6.166)	(0.0658)	(0.0266)	(0.0270)
Intercept	0.000579	-6.035	-0.0524	1.791***	1.177***
	(0.00249)	(4.556)	(0.0502)	(0.0995)	(0.104)
Time FE	NO	NO	NO	NO	NO
Firm FE	NO	NO	NO	NO	NO
R-squared	0.0003	0.0002	0.0002	0.0085	0.0039
N	2470	2275	2470	2276	2273

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table **11** shows the same DiD regressions but with CEO age, firm size, cash flow CEO ownership and R&D Intensity as control variables with the firm and time FEs. After adding the control variables and FEs all DiD coefficients become insignificant and positive. Expect for the third regression all have a positive and highly significant coefficient for cash flow at the 1% level. R&D intensity is positive and significant for regressions 2, 4 and 5, while regression 1 shows a negative coefficient at the 10% significance level.

Table 11: over confidence on firm performance FE

A DiD model, with ROA, ROE, ROIC, Tobin's Q and market/book ratio as dependent variables representing firm performance. The DID estimator is the variable of interest and gives the effect of high overconfidence on the firm performance. H overconfidence a dummy variable that equals 1 when the CEO is overconfident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO share and CEO compensation are added as control variables. All regressions are equipped with firm and time FEs.

	(1)	(2)	(3)	(4)	(5)
	ROA	ROE	ROIC	Tobin's Q	Market/Book
DiD	0.000595	0.0997	-0.0241	0.394	0.469
	(0.00793)	(0.123)	(1.064)	(0.318)	(0.326)
H overconfidence	-	-	-	-	-
PostPeriod	0.000667	-0.0692***	0.171	0.0728	0.0509
	(0.00160)	(0.0251)	(0.215)	(0.0649)	(0.0665)
CEO age	0.00191	-0.0169	0.141	0.0485	0.0500
	(0.00194)	(0.0303)	(0.261)	(0.0783)	(0.0802)
Firm size	-0.00188	0.00302	0.340	-0.0492	-0.114
	(0.00215)	(0.0335)	(0.289)	(0.0866)	(0.0886)
Cash flow	0.934***	4.333***	0.372	1.533***	1.825***
	(0.0109)	(0.169)	(1.463)	(0.438)	(0.449)
CEO share	0.00257	0.0534	-0.717	0.0120	0.0734
	(0.00376)	(0.0584)	(0.505)	(0.151)	(0.155)
CEO compensation	1.86e-07*	-4.53e-07	-1.10e-05	5.05e-06	3.50e-06
	(1.03e-07)	(1.62e-06)	(1.38e-05)	(4.18e-06)	(4.28e-06)
RD Intensity	-0.127*	4.572***	-3.456	7.041**	6.544**
	(0.0704)	(1.091)	(9.438)	(2.822)	(2.889)
Intercept	-0.105	0.845	-10.52	-0.709	-0.900
	(0.113)	(1.752)	(15.10)	(4.535)	(4.643)
Time FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
R-squared	0.957	0.623	0.226	0.897	0.902
N	685	675	685	677	677

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To study the effects of low confidence on the firm performance, the same DiD analyses were repeated with the low confidence CEO hires as the treatment group. **Table 12** shows the results of the DID analyses. Regression 1-3 does not show any significant coefficients. Both regressions 4 and 5 show positive coefficients for the DiD estimators of 0.109 at the 10% and 0.154 at the 5% significance level.

Table 12: Low confidence on firm performance

A DiD model, with ROA, ROE, ROIC, Tobin's Q and market/book ratio as dependent variables representing firm performance. The DID estimator is the variable of interest and gives the effect of low confidence on the firm performance. low overconfidence a dummy variable that equals 1 when the CEO is low confident. Post period is a dummy that equals 1 after the new CEO has been hired

	(1)	(2)	(3)	(4)	(5)
	ROA	ROE	ROIC	Tobin's' Q	Market/Book
DiD	0.00909	-5.556	-0.0576	0.109*	0.154**
	(0.00632)	(15.24)	(0.168)	(0.0651)	(0.0667)
Low confidence	0.00934	6.048	0.0657	0.470*	0.407
	(0.00658)	(11.45)	(0.129)	(0.279)	(0.281)
PostPeriod	-0.00121	5.560	0.0703	0.0119	-0.0240
	(0.00236)	(5.851)	(0.0628)	(0.0250)	(0.0257)
Intercept	0.000584	-6.038	-0.0524	1.791***	1.177***
	(0.00244)	(4.356)	(0.0478)	(0.105)	(0.106)
Time FE	NO	NO	NO	NO	NO
Firm FE	NO	NO	NO	NO	NO
R-squared	0.0009	0.0002	0.0002	0.0017	0.0022
N	2713	2527	2713	2526	2523

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In **Table 13**, the same regression was executed, but with the control variables and firm and time FEs. The DiD estimator of regression 2 shows a positive coefficient of 0.102, while regression 4 shows a negative coefficient of 0.223. Both estimators are significant at a 5% level. Again, cash flow shows a positive coefficient for all regressions except for regression 3, at the 1% significance level. R&D intensity shows a positive and highly significant coefficient for regressions 2, 4 and 5 at the 1% level.

A DiD model, with ROA, ROE, ROIC, Tobin's Q and market/book ratio as dependent variables representing firm performance. The DID estimator is the variable of interest and gives the effect of low confidence on the firm performance. low overconfidence a dummy variable that equals 1 when the CEO is low confident. Post period is a dummy that equals 1 after the new CEO has been hired. Cash flow, Firm size, CEO age, CEO share and CEO compensation are added as control variables. All regressions are equipped with firm and time FEs. Below each coefficient the standard errors is given within parathesis.

	(1)	(2)	(3)	(4)	(5)
	ROA	ROE	ROIC	Tobin's' Q	Market/Book
DiD	0.00501	0.102**	-0.177	-0.223**	-0.169
	(0.00359)	(0.0405)	(0.349)	(0.105)	(0.107)
Low confidence	-	-	-	-	-
PostPeriod	-0.000664	-0.0830***	0.192	0.122**	0.0954
	(0.00198)	(0.0225)	(0.193)	(0.0582)	(0.0597)
CEO age	0.00221	-0.00912	0.0923	0.0520	0.0542
	(0.00203)	(0.0229)	(0.197)	(0.0592)	(0.0606)
Size	-0.00129	0.00339	0.234	0.0172	-0.0280
	(0.00253)	(0.0287)	(0.246)	(0.0743)	(0.0762)
Cash flow	0.936***	4.279***	0.360	1.489***	1.763***
	(0.0136)	(0.154)	(1.321)	(0.398)	(0.408)
CEO share	-0.00151	0.0389	-0.213	-0.103	-0.110
	(0.00301)	(0.0409)	(0.293)	(0.106)	(0.108)
CEO compensation	1.80e-07*	1.36e-07	-7.79e-06	-9.99e-06***	-1.16e-05***
	(1.09e-07)	(1.23e-06)	(1.06e-05)	(3.18e-06)	(3.26e-06)
RD Intensity	-0.0923	4.069***	-4.471	10.09***	9.750***
	(0.0919)	(1.036)	(8.922)	(2.681)	(2.747)
Intercept	-0.124	0.398	-7.038	-1.254	-1.588
	(0.117)	(1.320)	(11.36)	(3.415)	(3.500)
Time FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES

R-squared	0.923	0.617	0.222	0.923	0.923
N	801	794	801	794	794

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Looking at the results of table 11, this paper has not found a significant negative effect of overconfidence on firm performance. For this reason, this paper rejects hypothesis 5a. In table 13, only regression 4 seems to have a significant negative effect, while regression 2 shows the opposite outcome and the rest of the DiD estimators are all insignificant. This paper rejects hypothesis 5b. Neither low confidence nor highly overconfidence CEOs have a negative impact on the firm performance. These results are not in line with the academic literature. Lastly, these results suggests that firms tend to have better performances when cashflow and R&D intensity are high.

5. Conclusion

Confidence is one of the main criteria boards look for when hiring CEOs. According to literature firms want a CEO that is bold, decisive and communicates his confidence to his subordinates. A known issue in corporate governance is that CEOs and managers tend to be more risk-averse while shareholders are risk-neutral at the firm level. This is because shareholders will diversify their risk by investing in a larger portfolio, while CEOs are incapable of diversifying their human capital. However, overconfidence will distort a CEO's perception of risk, making them underestimate the risk and overestimate their return on investments. This means that a CEO who is risk-averse will unknowingly increase their risk level. A value-maximizing board of directors would ideally want a risk-neutral CEO that matches the risk preferences of the shareholders. But since most CEOs are risk-averse, board members will often appoint an overconfident agent to the CEO position. A large amount of literature in behavioral economics suggests that overconfident CEO will significantly increase investing and M&A activities. According to the literature being a moderate overconfident CEO will increase investments of the risk-averse CEO to the first best level and maximize firm value. Having excessive or too little confidence will cause overinvesting or underinvesting causing firm value to drop. The goal of this paper is to measure the effect of confidence level on firm performance. While most research focused on excessive overconfidence, this paper will compare both highly overconfident and low confident relative to the moderately confident CEOs. To properly measure the effect of the different levels of confidence on the firm, this paper examined the within-firm changes after hiring a low-, moderate or highly overconfident CEO. This paper stands out from others as it also examined how the distorted risk perception of low confidence and highly overconfident affect the firm risk.

One of the most important parts of this paper was the classification of CEOs as either low confident, moderate confident or high overconfident. This was done by studying CEOs' option exercise/hold behavior. CEOs are as employees already overinvested in their company as they have most of their wealth attached to the firm in which they work. CEOs who are risk-averse are expected to exercise their options as soon as they are at an acceptable level. When options are 67% in the money CEO should be indifferent between exercise and holding an option. Overconfident CEO however will overinvest in their own company by not diversifying their risk. This paper classified CEO as overconfident if twice their stock options were above 100% in the money, but they did not exercise their options. CEOs are labeled as low confident CEO if twice they exercise options at below 30% in the money. The rest of the CEOs who were

no classified as overconfident or low confident were labeled as having moderate confidence level, as long as they have option data available. A DiD approach was used the examine the effect of overconfident and low confident CEO hire on the firm, with moderate confidence level CEO hire as the control group. Three years before the hiring of the CEO was used as the pre- treatment period. The post-treatment period was three years after hiring or until the CEO left office. To measure the M&A activities and value creation a cross-sectional OLS regression was performed with a categorical variable of confidence level as the independent variable. To measure the value creation of the M&A, this paper used an event study to examine the market reaction.

The findings of this paper showed that overconfident CEOs significantly increase the firm risk in a company. But contrary to expectations this paper did not find any evidence supporting an increase in investment intensity and M&A activities and that overconfident CEOs create less value with M&A. Nor did this paper find evidence that highly overconfident CEOs negatively affect firm performance. Low confident CEOs on the other hand, did not decrease firm risk as the literature predicted. This paper did however find that they significantly decrease investment intensity and engage in smaller M&A deals. But low confidence CEOs did not appear to lower business performance, relative to the moderate CEO group.

 One of the limitations of this paper was its small sample size, only about 5% of the CEO observations came from the overconfident group. This small observation of overconfident CEO could cause larger standard errors making it difficult to get a precise estimate of the effect. Another limitation is that DiD analysis requires a parallel trend between the treatment and control groups before the treatment was given. This means that in the pre-treatment period all the CEOs were assumed to have a moderate confidence level. In the available dataset, it was impossible to verify whether the parallel assumption holds. The result of this is that if a company replaces an overconfident CEO with another overconfident CEO the effect of an overconfident hire would wrongly decrease. The third limitations relate to the confidence measure. There may be alternative reasons to explain the CEO option hold/exercise behavior. Such reasons would be that they possess inside information, that the CEO is sending signals to the capital market, to delay payments of tax or simply due to CEO procrastination.

For future recommendations, this paper would suggest analyzing different industries apart. Literature suggests that overconfidence would be more valued in industries that require a higher level of innovation. Although this paper has not found evidence of confidence level affecting firm performance, it did find that

R&D significantly increases firm performance. Doing a DiD analysis on industries that relies on high innovation levels, may potentially give very different results. Another recommendation is to analyze the differences between male and female CEOs in terms of confidence levels. There is a lot of literature in the psychological field suggesting differences between male and female confidence levels and behavior. Originally this paper was interested in the gender differences but due to time and sample size constraints, this part of the research was ultimately dropped.

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