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Do Female Directors Limit CEOs' Irrational Decisions?

A quantitative study from a behavioral point of view

Olivia Wasniewski *
Major in Finance
Stockholm School of Economics

ABSTRACT

Previous studies in behavioral corporate finance have shown that various decisions on company level are affected by different psychological biases of those running the businesses, resulting in irrational corporate behavior. One commonly studied bias is managerial overconfidence, and one effect that it has shown to have is to increase the cash flow sensitivity of investment. CEOs with distorted views of their companies' value, risk and future return judge investment opportunities too favorably and view external financing as excessively expensive and therefore overinvest when cash flow is avaliable, and underinvest otherwise.

This study classifies CEOs as overconfident by two different overconfidence proxies and investigates whether companies with overconfident CEOs have an increased cash flow sensitivity of investment. In contrast to previos research it tries to focus on the real economic value of the CEOs' decisions when defining them as overconfident. In the second part of the thesis, a split sample test is performed to see if more female directors create a more rational board that limits the effects of the CEO's personal overconfidence on corporate investmens.

By looking at the S&P 1500 companies during 1997-2006, it is found that the proxy based on options captures the effect of overconfidence and increases the cash flow sensitivity of investment. Further, it is found that the effect dissapears if there are two or more female directors on the board.

Tutor: Ulf von Lilienfeld-Toal
Discussants: Martin Theimer and Misha Wolynski
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1. Introduction

Behavioral finance has received growing interest during the last two decades; in fact, the speculations around the candidates for the 2010 Nobel Prize were focused on researchers within the field. The behavioral views on finance started out within asset pricing but have also spread to research on corporate finance, where much of the focus has been on the decisions taken by irrational CEOs.

Simultaneously, there is an ongoing debate that is particularly hot in Europe: the disproportionate male representations on boards of directors and the question of quotation of female board members. The discussed quotations are partly meant to serve the public good by breaking up rigid structures that hinder gender equality, but the main claim of the defenders of quotation is that it is beneficial for the company value. One of the possible ways in which female representatives on the board could add value is by creating a diverse group that more carefully questions the ideas of the CEO. Furthermore, previous research has shown that women are more careful and less overconfident in their decision making, which gives reasons to believe that more female directors could counteract faulty decisions taken by irrationally overconfident CEOs.

This thesis aims to, on the grounds of behavioral corporate finance, investigate whether having female representation on the board helps to alleviate the effect of CEOs' irrationally overconfident beliefs being transferred onto decisions taken on company level. To do so, it first aims at finding a measure that captures CEO overconfidence, and show that it actually has an effect on corporate investment decisions. Then, the goal is to investigate whether the presence of a more gender balanced board has any affect on the ability of the CEOs to transfer their personal overconfidence onto company level decisions.

The specific irrational behavior on company level that will be investigated is the cash flow sensitivity of investment. To introduce this topic and make the ideas that have led to the formation of the hypotheses clear, the thesis starts out with a broad literature review, where theories and research to date are presented. Subsequently, the hypotheses of this thesis will be formulated to fill in where the literature leaves a gap. Then, after a quick presentation of the data set used, the model to answer the hypotheses, including the variables used, is presented. Finally, the results of the investigation are presented, discussed and analyzed, before the thesis is concluded with suggestions for further research.

CONTRIBUTION

The first part of this thesis investigates an issue that has been explored by previous research, but this study introduces a new focus regarding the way of defining and measuring the key factor of interest – overconfidence. Thus, it is partly meant to investigate whether the previously found effects are robust to change of sample and method, but also to introduce a new way of thinking that I believe previously has been overlooked, which is the focus on economic significant value to the CEO in the creation of the overconfidence proxies.

The second part of the thesis contributes with a new view, as remarkably few papers have been written on the issue of gender differences within behavioral corporate finance.

2. Theory

As the subtitle indicates, the aim of this thesis is to highlight the behavioral forces that affect the decisions taken by CEOs, but also those that can justify reasons for changed decision implementation following female board inclusion.

In this section the main theories that the analysis builds upon are presented, including a review of the most influential papers on the subjects of interest.

BEHAVIORAL FINANCE

Despite of often being simplified into rational models, economics and finance ultimately are products of human actions and expectations, which is why it is hard to debate for the absence of psychological, behavioral, impact on the subjects. Even the rational founder of the classic school of economics, Adam Smith, in his *The Wealth of the Nations* (1776, Book I, Chapter X), as cited by Englmaier (2005), said that "the chance of gain is by every man more or less overvalued, and the chance of loss is by most men undervalued" – an indication of that the dynamics of economics do not have to be completely rational. Still, due to the difficulties to find hard evidence on the behavioral factors within finance, the prevailing school of thought is the rational one. The fact that many psychological effects do not seem to persist once detected further strengthens the position of the rational view on finance. Nonetheless, during the last decades an increasing amount of voices have been raised in favour of the irrational view on finance. Here follows a synopsis of the most cited and interesting studies publicised.

The rational versus behavioral debate within finance was originally mostly focused on asset pricing, with the questioning of the efficient market hypothesis, initiated by Jensen (1978). The most cited authors against the efficient market hypothesis may be Fama and French who among other interesting findings in their (1993) article determine five common risk factors that help determining the returns of stocks and bonds. Since the beginning of the debate, financial bubbles have been good examples of the irrationality of capital markets; Lee (2001) has shown how the purely cosmetic change of adding a ".com" suffix to the company name during the IT-bubble of the 2000s actually increased stock price and trading activity, controlling for any real changes that may have occurred. Although the name change obviously did not add any operational value one might still argue that there was signalling effects that other investors would be more interested in the stock, which is why it could be rational for investors to buy them as long as they believed that other irrational investors would in turn buy it from them. Still, there are pieces of evidence of irrationalities in the capital markets for which it is much harder to find any rational explanations: French (1980) was the first to mention the so called "weekday effect" by proving that stock returns on average had been significantly lower on Mondays during the period of 1953-1977, and Hirshleifer and Shumway (2003) have used data from 26 stock exchanges internationally during 1982-1997 to show that stock returns are higher during days with morning sun. Whilst it is hard to find a rational reason for companies to consistently be worth less on a gloomy Monday, just to bounce back to the previous market value on the sunny Tuesday that follows, an explanation relating the effect of the psychological well-being of the investors to their actions on the stock market lies close at hand.

Even though the behavioral pitfalls in asset pricing may be more visible and gain more attention when they are detected, there are reasons to believe that behavioral mistakes should be far more common in corporate finance. To correct for a mispricing or irrational beliefs in the capital market, all that is needed is one arbitrageur who finds the mispricing and takes advantage of it, restoring the efficiency of the market. For the equivalence of this mechanism in corporate finance to take place far more complicated actions are needed – to restore the bias of one irrational agent the dismissal of a manager or even a corporate takeover may be required. Furthermore, as Heaton (2002) explains, the "learning" objection that irrationalities in the market disappear as the irrational agents learn that they have been irrational and correct their future actions accordingly is weaker in corporate finance than in asset pricing because of the financial decisions being less frequent and give noisier feedback than trading.

The various psychological effects that cause behavioral pitfalls are often closely related, and one tendency can lead to another. According to Mullainathana and Thaler (2001) human beings behaviorally depart from the homo economicus in three ways: limited rationality, when the individual fails to pursue the best action due to cognitive constraints; limited willpower, when the individual lacks motivation or strength to carry out the optimal decisions; and limited self-interest, when the individual includes the interests of

others in the decision making. The focus of most research has been the first of these bounds, as it is the most relevant one in a managerial setting; the other ones can be corrected for with contracts and incentives. Following the example of Shefrin (2007) the behavioral pitfalls stemming from limited rationality in corporate finance can be divided according to the three main psychological phenomena that cause them: framing effects, heuristics and biases.

Framing effects arise when different outcomes are preferred depending on how they are framed and presented. A common psychological characteristic of human beings is that we are not only risk averse, but also often specifically averse towards a sure loss. In corporate finance, this may lead to irrational decisions being made for example as managers are reluctant to terminate a project with an expected negative return, because terminating it would imply a sure loss on the project. Therefore, the irrational managers may be prone to keep on investing in the project, although they would never do so if it were framed as a new investment occasion. Mental accounting is another form of framing; when different types of decision are taken separately when they should be considered together, which could happen for example if a manager decided on reducing capital expenditure by drastically reviewing the outlays of the factory, without considering the costs of office supplies that are considered to belong to another "bracket". See Thaler (1999) for detailed theories behind mental accounting.

Heuristics arise when managers use mental shortcuts and rules-of-thumb in their decision making. Heuristics can take various forms, for example, anchoring can make managers overly fixated at forecasts so that they fail to adjust appropriately when given new information, and availability can induce managers to choose the most visible projects over one with a higher pay-off, or only focus on the risks that seem obvious at that point of time.

Finally, biases are predispositions towards error and that to some extent affect all of the decisions taken; confirmation bias, illusion of control, excessive optimism and overconfidence fall into this category. The confirmation bias leads us to pay too much attention to information that supports the views that we are already holding, hindering a rational analysis of all available information. The illusion of control is the human tendency to overestimate the extent to which they can control events. A classical proof of this is when the winners of the highest prize describe the process that led them to select the right – winning – lottery ticket. Related to this is the self-serving bias – that people tend to attribute positive outcomes to skill rather than luck. On the other hand, the same persons will assign failure to bad luck. The most striking everyday example of this effect are the reactions of fans after sports games; as documented by Mann (1974), following a football game there is a large discrepancy between the fans of the opposing teams in the perceptions of the game. Whilst the winning fans see evidence of the skill of their team, the losing fans attribute the loss to bad luck, unfair play by the other team and point at other external factors. In the business world, the same bias may cause managers to take on to many assignments in-house when they rationally would be better performed by someone else. The behavioral bias that is the focus of this thesis is one with widespread effects in asset pricing as well as in corporate finance– overconfidence – and the research related to it is described next.

OVERCONFIDENCE

The behavioral bias overconfidence is related to optimism. Sometimes the terms have been used interchangeably; for example, when Heaton (2002) studies managerial optimism, he refers to overconfidence. Generally, though, the difference is that whilst optimism refers to a positive view on the overall surroundings and the future outlook, overconfidence denotes the individuals' irrationally large beliefs in themselves and their own abilities and prospects, including the prospects of their company.

Although having been a well-established concept in the field of psychology for a long time, the concept of overconfidence in practice was first cast public light on by Svenson (1981), who showed that the majority

of the Swedish drivers saw themselves as less risky and more skilful than the average driver. Since then, many psychological studies have revealed ways in which overconfidence appears: most people consider themselves better than the average, they overestimate the precision of their predictions of uncertain events, selectively chose what outcomes to attribute to their own effort, and consistently overestimate the probability of the most desirable outcome. See Englmaier (2005) for a good introduction to the psychological phenomenon of overconfidence.

The interaction of the behavioral mechanisms increases the probability of a CEO being relatively more overconfident than the rest of the population. To begin with, Goel and Thakor (2008) show that being overconfident actually increases the likelihood of being promoted to CEO. Then, when CEOs have reached their positions they have had a lot of experiences, out of which they selectively have used the successful ones to inflate their view of their own skill, through the self-serving bias. Furthermore, CEOs have made a lot of decisions in the company and have committed – both personally and professionally – to the path of the company as well as their career. Thus, the illusion of control plays in and they feel committed to their position and company, which further increases overconfidence, as early shown by Weinstein (1980). According to March and Shapira (1987) the illusion of control particularly applies to CEOs, who tend to overestimate their own control over the company. In addition, once they have reached the position, as they are labelled as the CEO – a label with connotations such as leader, confident, sharp and intellectual – they will relate to that label and act accordingly. This labelling effect can work rather quickly; Dijksterhuis and van Knippenberg (1998) showed it sufficient to divide their test subjects into two groups labelled "professors" and "hooligans" to get a significantly higher frequency of correct answers in Trivial Pursuit questions from the first group.

This increased expected level of overconfidence in CEOs, together with their role that de facto expects rational value maximizing behavior, has created an interesting research environment and I will now summarize the main effects of CEO overconfidence that researchers have detected.

It has been shown that overconfident CEOs are more prone to engage in mergers and acquisitions, for example by Malmendier and Tate (2008), who study 477 large publicly traded companies in 1980 through 1994. Brown and Sarma (2007) draw the same conclusions from a sample of Australian firms during 1994-2003. That the acquisitions are initiated by the CEOs' irrational beliefs in their capability to create value in the merger is revealed as Malmendier and Tate (2008) show that the mergers of overconfident CEOs get significantly worse stock reactions on their announcement than those of their peers who are not classified as overconfident, indicating that the relatively more rational capital market sees through the irrationality of the overconfident CEOs. The hubris hypothesis of value destroying mergers was first brought up by Roll (1986) the concept of "the winners' curse" – the fact that the winning bid in a corporate auction is likely to be the most overconfident and overpaying one.

Ben-David et.al. (2007) have shown having overconfident managers affects company policies in several ways: lower discount rates to are used to value cash flows, more investment is made all else equal, dividends are less likely to be paid out and share repurchases more likely to be pursued, more debt financing is used and proportionally more long-term, as opposed to short-term, debt is chosen. Among the many researchers who have focused on behavioral finance recently, Malmendier and Tate, who have performed most of their studies on the above mentioned sample of 477 publicly traded US firms, belong to the mostly cited in the field. In their Malmendier and Tate (2010) article they show that the overconfidence of CEOs affects financing decisions; they tend to use less external finance and, conditional on accessing risky capital, issue less equity than their peers. This is because their perceived risk and return of the company stock diverges from the external markets. For the same reason, overconfident CEOs, as shown by for example Malmendier and Tate (2005b), also have a higher cash flow sensitivity of

investment. Lina et.al. (2005) have reached the same conclusions regarding the cash flow sensitivity of investment when studying Taiwanese data. As this last consequence of CEO overconfidence is the focus of this thesis, the next section explains the theory underlying the relation of cash flow and investments. Before this, however, a summary of different types of measures for overconfidence is presented.

Overconfidence Proxies

As overconfidence is an intangible characteristic for which no obvious measure exists, previous research has provided a wide spectrum of methods to proxy for executive overconfidence. For a convenient overview of the proxies used, I would like to divide them into two groups: external and internal overconfidence proxies. The first group is those that try to capture overconfidence by looking at how outsiders perceive the executives; a common approach is to scan the press looking for various specific words that are used to describe the CEO as overconfident, such as "confident" and "optimistic", as opposed to "'reliable,'' ''cautious,'' ''conservative,'' ''practical,'' ''frugal,'' or ''steady.'' This approach was coined by Malmendier and Tate (2005a) and has later been used by among others Brown and Sarma (2007). Lina et.al. (2005) define overconfidence as the tendency of CEOs to habitually overestimate earnings. The miscalibration of beliefs is also used to determine overconfidence by Ben-David et.al. (2007), who have data on the expected confidence intervals given by managers compared to the actual outcomes. I would like to classify the miscalibration overconfidence proxies as external overconfidence proxies as well; the CEOs are well aware of that their forecasts will be observed by others.

Internal overconfidence proxies are determined by the personal portfolio decisions of the executive and thus reveal not only the confidence that the CEOs communicate externally but also the beliefs for which they are willing to assume personal risk. As internal overconfidence proxies will be the measures of choice in this paper, a closer explanation follows in the next paragraphs. Apart from external and internal overconfidence proxies, direct personal characteristics have also been found to be significant for overconfident behavior: Malmendier and Tate (2005b) have found that age and having a technical university degree increase overconfidence, and Barros and da Silveira (2007) have proxied overconfidence with the status of the CEO as an entrepreneur. Finally, studies such as Sudarsam and Huang (2006) have tackled the problem of finding the right overconfidence measure by creating an index of various factors.

As explained by Hall and Murphy (2000), executives do not only often have unhedgeable positions in their companies but also their human capital and reputation invested in the company, which is why the company stock and options are worth less to the executives than to the market due to lack of diversification possibilities. Thus, upon vesting, executives should be willing to exercise their options and sell their shares at lower prices than outsiders, if they do not have stronger beliefs in the company than the outsiders do. Internal overconfidence proxies rest on finding executives that fail to diversify according to the reasoning above.

There are several reasons for why CEOs could overexpose themselves to company specific risk and thus trigger the internal overconfidence proxy, which it is important to account for when investigating overconfidence. Firstly, CEOs are insiders who may have some private information that makes them know more about the valuation of the stock than the market does, and in the case that this information is positive, they may take advantage of it and buy underpriced stock from the market, alternatively wait with the option exercise until the market has learned about the good news and incorporated it in the stock price. Insider information would also imply increased cash flow sensitivity of investment, especially as long as the positive insider information is about the investment to be made. According to Malmendier and Tate (2005b) there are two main ways to distinguish between overconfidence and insider information: persistence and performance. Whilst insider information is expected to be randomly positive and negative, overconfidence is likely to persist over years, and whilst portfolio decisions made on insider information

are expected to earn positive abnormal returns, overconfidence should not predict better performance. Therefore, creating CEO-specific dummies that define them as overconfident or not according to their repeated behavior is advantageous. Secondly, signalling considerations could induce CEO overexposure to company stock, to signal to the market that the company faces an upswing. On one hand, signalling may be more important for companies facing investment, thus correlate with investment. On the other hand, if signalling works it should diminish the need of cash flow sensitivity of investment, as external investors see that the CEO commits and provide capital more willingly. This would rather imply a negative relation between the internal proxies and cash flow sensitivity of investment, as opposed to the positive relation predicted by the overconfidence hypothesis. Still, this agreement does only hold for the proxies based on stock, as Malmendier and Tate (2005b) note, most financial advisory firms track insider stock sales and not option exercise, because exercising vested options is not considered to transmit any information. For the option proxy, it is also possible that CEOs hold their options for too long due to procrastination. However, as Malmendier and Tate (2008) and other studies show, the same managers that are classified as overconfident pursue more M&A activity – hardly a sign of a procrastinating nature. Other reasons for the internal overconfidence proxies to be triggered by CEO overexposure to company risk have been stated by Malmendier and Tate (2005b), such as possible tax planning or an increased risk appetite, but none of these are expected to increase the cash flow sensitivity of investment. Lastly, the CEOs can overexpose themselves to company specific risk because they are overconfident – which is equivalent to thinking that they have positive private information, only that the positive private information will never materialize.

Internal overconfidence proxies can be created based on the executive's personal portfolio decisions with respect to stocks or options. Malmendier and Tate (2005b) use three different measures: *NetBuyer*, *Holder*, and *Longholder*. The first one of these defines CEOs as overconfident if they during the first five of at least 10 years tenure were net buyers of company stock. The remaining two are based on option exercise: *Holder* classifies those who have had options that were at least 67% in-the-money at least twice during the sample in the fifth year of the option's life (which corresponded to when the typical option in the sample was fully vested), and *Longholder* looks for those who hold options to the end of the expiration. To create these proxies, rather detailed data on the single options is needed.

Despite the various ways of measuring overconfidence, the hypotheses of it having an effect on managerial behavior is confirmed in most studies. The focus area of this thesis, the effect of overconfidence on the cash flow sensitivity of investment, is an area where authors have found significant results using various overconfidence proxies: Malmendier and Tate (2005b) find significant results using as well the three internal overconfidence proxies described above as the external media coverage overconfidence proxy. The previously mentioned study by Lina et.al. (2005), who find significance using the external proxy based on managers' forecasts, reaches the same conclusions.

CASH FLOW SENSITIVITY OF INVESTMENT

In a completely rational and perfect setting, as in the one assumed by classical economists, businesses invest when there is a profitability reason for it – the only ultimate criteria is that the gains from investing exceed the costs from doing so. Thus, as current investment opportunities should be the only explicable factor of investment, current cash flow should have no explicable value when determining investments. Still, most studies point at that cash flow in fact does affect the amount of investment pursued. As explained by Broussard (2004), many researchers have found that current period cash flow affects investment. The two main rational explanations used to explain the observed relation are the agency theory outlaid by Jensen (1986) and the asymmetric information explanation first presented by Myers and Majluf (1984).

According to neoclassical economists such as Jensen (1986), the cash flow sensitivity of investment stems from agency problems between managers and shareholders. Agency theory predicts a conflict when shareholders want the value of the firm to be maximized and managers maximize the value of their own benefits, to which firm value is an important but not the only contributing parameter. Agency can lead to managers enjoying excessive perquisites, not exerting the sufficient amount of effort or taking decisions on company level that benefit them personally. As noted by Hart (1995) managers have the incentives to grow their companies and "empire build" because they reap personal benefits from managing larger firms: higher salaries, more perquisites, more power and higher status. If the CEO has to turn to external sources of capital to fund these investments, the potential debtors and shareholders will scrutinize the investment plans and not provide capital if the investment itself is not considered valuable. If using internal funds, the CEO avoids this monitoring. Therefore investments for which funding is expected to be hard to get are likely to follow inflow of cash to the business.

Hence, according to Jensen (1986) free cash flow is costly. This stands in contrast to the conclusions drawn by another classical paper – Myers and Majluf (1984) – that introduced the asymmetric information and pecking order theory. In this approach, it is highlighted that managers have more information than the providers of the external financing, and that the external sources of financing therefore have to charge a higher return on the capital provided in order to account for the uncertainty around the type of project that it is to found. According to Myers and Majluf a financial slack is desirable as it allows funding of those positive NPV projects where information asymmetry is high and it is hard to signal the soundness of the project to external investors. When cash is limited, these positive NPV projects may be foregone as the managers will have to turn to overly expensive sourced of external funding.

Agency problems and asymmetric information are the two main rational explanations for the cash flow sensitivity of investment. The first one will lead to overinvestment whenever there is cash flow available, and the second one predicts underinvestment when cash is limited. Apart from the two rational reasons for why investments would vary with cash flow, behavioral economists have come up with psychological causes for the cash flow sensitivity of investment.

The overconfidence of CEOs will have a twofold effect on the investment decisions. (Heaton 2002, Malmendier and Tate 2005b) Firstly, the overconfident CEOs are overly positive about the amount of cash flow that they will be able to extract from each project. Therefore, they will want to pursue more investment than is rationally optimal; rational judgement would see that some of the projects have negative NPV without the upward overconfidence bias in the expected cash flow. Thus, given cash availability the overconfident CEOs will overinvest. If, however, the internal sources of cash are limited, and there is a need to turn to external sources, the CEOs will perceive external financing as more costly than it rationally is. Their inflated expectations of the risk adjusted return of the project will not correspond to the expectations of external investors, which is why they will see their equity as underpriced and the terms given by debt financing as unfavorable. From the discussion above it follows that the behavioral distortions on investment are potentially more severe than those originating from pecking order or agency – they are likely to lead to both overinvestment and underinvestment, depending on whether cash flow is available, complicating the implementation of effective corporate governance mechanisms.

BEHAVIORAL REASONS FOR FEMALE INCLUSION ON BOARDS

During the last few years, the issue of the underrepresentation of women in board of directors – with the following question of whether gender affirmative action quotas is a desirable step towards equality – has spread through the Western world arising many engaged voices. The numbers point at large discrepancies; the female board representation worldwide ranges from 0% in Morocco to 40% in Norway, but for most

countries the percentage of female board members lies somewhere in between. 15.7% of the US Fortune 500 companies' directors were female, and in Europe, only the Nordic countries, the Netherlands and Germany have more than 10% women at the boards of directors. According to the European Commission's findings, the average proportion of women on the boards of listed companies in the EU is currently 12%. Authorities are looking to change these numbers. The question of gender quotas was discussed at the World Economic Forum of Davos in 2011 and the European Commission has said that if the gap between men and women in European boards will not decrease, they will have to consider legislation. According to the European Commission's recent Green Paper on corporate governance, their *Strategy for equality between women and men* (2011) stresses that over the next five years, the Commission will "consider targeted initiatives to improve the gender balance in decision making".

In Europe, several countries already have introduced quotas. Norway, which always has been a gender equality leader in international comparisons, had its female board representation average increase to 40% when they introduced gender quotas for state-owned companies in 2006 and public companies in 2008. Spain passed a law in 2007 that imposes companies with at least 250 employees to have at least 40% female board members by 2015, in France a law was passed in early 2011 giving the companies six years to reach the 40% level held by their Norwegian peers, and Germany is in the process of establishing a voluntary quotation system right now, where the largest companies commit to raising the proportion of women on boards and executive positions. Also other parts of the world have considered the question: Quebec state-owned companies have until the end of 2011 to reach a balance between men and women on the boards. If not direct gender quotas, many countries have corporate governance codes that compel them to strive towards gender equality, and regulation that requires the disclosure of the gender representation. See Women on Boards: A Statistical Review by Country, Sector, and Supersector (2010) and Catalyst (2010) for the current statistics and legislation concerning female board membership worldwide.

Although the gender inequality often provokes moral discussions, what matters in this context is whether the inclusion of more women creates additional shareholder value. According to Lord Davies (2011), who made a report on women on boards for the British Government, there are four main factors contributing to making inclusive and diverse boards more effective: performance improvement, access to the widest talent pool, better responsiveness to the market and improved corporate governance. In their report *Women Matter: gender diversity, a corporate performance driver* (2007), McKinsey has found that having women on executive positions as well as having female representation on the board of directors has a positive impact on corporate performance, and the performance is likely to follow the other three factors stated by Lord Davies. Here, the focus is on the effect that female directors may have on corporate governance, as it is an effective corporate governance mechanism that guarantees that the path the company takes is in the best interest of the shareholder, regardless of the level of irrationality or overconfidence of the CEO.

There are several behavioral theories according to which a higher degree of female board member inclusion could benefit the company through better corporate governance, and thus reduce the effects on company level decisions of managerial overconfidence. To begin with, the rationality of any group benefits from diversity as it limits the behavioral bias "group think" that Shefrin (2007) explains as the overlooking of alternatives and accuracy and a too quick acceptance of decisions due to a strive for consensus. Furthermore, the above mentioned McKinsey study and others point at leadership differences between men and women, for example that women tend to be more self-critical and question the status-quo more often than men. When it comes to boards, Adams and Ferreira (2009) show that female directors have a higher attendance rate and more often take on a monitoring role. Consequently, more female directors could lead to a better board group process and more effective corporate governance.

Additionally, there are particular reasons to believe that an increased female board representation will have an effect when it comes to overconfidence: several studies point at that women are less overconfident and prone to hubris than men. Although the gender differences in overconfidence are not well-documented when it comes to corporate finance, for example Barber and Odean (2001) have found that men display more overconfidence than women when it comes to trading.

3. Hypotheses

The theoretical discussions presented above have led to the formulation of the following hypotheses:

1. CEO overconfidence, as measured by habitually increased exposure to company specific risk by
    a. habitually having large holdings of vested in-the-money options in relation to total compensation or
    b. habitually increasing share ownership by a large proportion to total compensation

    affects decisions on company level by increasing the cash flow sensitivity of investment.

2. The transferability of the CEOs' personal overconfidence onto decisions on company level is limited by having at least two female directors on the board of directors.

Hypothesis (1) is mainly a test to see if the proxies are capable of capturing the overconfidence effect in the first place. Nonetheless, the implications of Hypothesis (1) have been previously proved, even though the way of defining the proxies and choosing the data is partially novel. Therefore, if accepted, Hypothesis (1) will confirm the conclusions of previous studies by showing that their results are robust to changes in the sample and the model. Hypothesis (2) is, as explained in the introduction, a new approach that is tested through a split sample study. After section 4 has explained the data that goes into it, the model used to test both hypotheses is presented in section 5. The results from testing Hypothesis (1) and (2) are presented in section 6 and 8 respectively; both result sections are followed by discussions of the findings in sections 7 and 9. Lastly, the implications of the two hypotheses jointly are analyzed in section 10 and the when the final conclusions have been drawn section 11 discusses the limitations of the model and gives suggestions for further research.

4. Data

This section will introduce the data that is used to test the above stated hypotheses, before the detailed methodology is outlined in section 5.

The choice of the sample population follows data availability. The time span investigated is 1997-2006, as the Directors database started collecting data in 1997 and the RiskMetrics database has the corporate governance control available up to 2006. That the data spans over the IT-bubble and the corresponding crisis of the early 2000's could affect the data, as these were times of as well increased irrationality as distorted investment – two of the main factor if this paper. Nonetheless, this does not have to be a drawback of the period as the changing circumstances may provide more opportunities to identify the overconfident CEOs.

The population of companies is those that were included in the S&P 1500 index during the specified time frame. The reason for choosing the companies that make part of this index is the aim to create an as large data set possible, given data availability. The S&P 1500 is covered by all of the databases that are used as sources for this thesis.

Banks and financial services, as classified by having a Standard Industry Code (SIC) of 6000-6799, are excluded from the sample, as their use of options as well as notions of cash flow and investment diverge from other businesses. Nevertheless, it can be mentioned that the tests performed below yield the same results if, instead of excluding the financial services companies, they are included and controlled for by industry dummies as the other industries. In addition, some observations have been eliminated due to missing data on key variables of interest, or due to fault in the original data set such as double entries. An exclusion of observations that are not completely randomly associated with the variables of interest would bias the regressions. For example, firms that have reported missing or faulty data may have a lower quality when it comes to other aspects of management as well. The amount of the dropped observations is limited, though, and there is no reason to suspect that their exclusion affects the regressions in any specific way.

The final data set is summarized in the tables below. Table 1 and Table 2 show the summary statistics and correlations for the entire data set, whilst Table 3 and Table 4 contain the summary statistics of the two subsamples that are used to analyze Hypothesis (2).

Table 1: Summary Statistics

	Observations	Mean	Std. Dev.	Min	Max
Company Information					
Assets ($M)	12281	6063.322	22286.2	11.727	750507
LnAssets	12281	7.388042	1.502697	2.461894	13.5285
Revenue ($M)	12280	5008.382	14458.46	0	345977
Book Value Equity ($M)	12281	2083.862	6274.767	-11374	152027
Market Value Equity ($M)	12261	7436752	2.53E+07	0	6.02E+08
Q	12261	2.078956	1.778605	0.153696	77.63474
G-index	12281	9.151128	2.601952	2	19
Long Term Credit Rating	6751	11.26766	3.247274	2	29
Capital Expenditure ($M)	12185	326.2255	1033.712	0	17633
Capex Normalized by Assets	12185	0.058924	0.0537543	0	0.8152665
Cash Flow before Extraordinary Items ($M)	12278	266.2117	1403.375	-56121.9	39500
Cash Flow Extraordinary Items and Discontinued Operations ($M)	12268	3.941416	139.917	-5679	6236
Net Interest Paid ($M)	11429	108.7041	486.6799	-2	18254
Cash Flow (avaliable) ($M)	11419	0.016725	0.1639949	-5.882712	0.7438996
Female2	11728	0.227063	0.4189518	0	1
EBITDA ($M)	12246	805.4516	2559.745	-5743	68355
Industry Dummies					
Agric	12281	0.003013	0.0548083	0	1
Food	12281	0.023369	0.15108	0	1
Soda	12281	0.002769	0.0525458	0	1
Beer	12281	0.004479	0.066774	0	1
Smoke	12281	0.002199	0.0468387	0	1
Toys	12281	0.00513	0.0714421	0	1
Fun	12281	0.010586	0.1023438	0	1
Books	12281	0.013191	0.1140972	0	1
Hshld	12281	0.021578	0.1453071	0	1
Clths	12281	0.01767	0.1317527	0	1
Hlth	12281	0.018077	0.1332343	0	1
MedEq	12281	0.027522	0.1636059	0	1
Drugs	12281	0.043156	0.2032167	0	1
Chems	12281	0.032734	0.1779455	0	1
Rubbr	12281	0.005781	0.0758178	0	1
Txtls	12281	0.007247	0.0848235	0	1
BldMt	12281	0.021985	0.146641	0	1
Cnstr	12281	0.013435	0.1151345	0	1
Steel	12281	0.020438	0.1414991	0	1
FabPr	12281	0.002769	0.0525458	0	1
Mach	12281	0.042423	0.201561	0	1
ElcEq	12281	0.010748	0.1031196	0	1
Autos	12281	0.01995	0.1398325	0	1
Aero	12281	0.007491	0.0862307	0	1
Ships	12281	0.002443	0.0493663	0	1
Guns	12281	0.004723	0.0685625	0	1
Gold	12281	0.001954	0.0441653	0	1
Mines	12281	0.004234	0.0649353	0	1
Coal	12281	0.001303	0.0360726	0	1
Oil	12281	0.0434	0.203765	0	1
Util	12281	0.071574	0.2577917	0	1
Telcm	12281	0.02223	0.147435	0	1
PerSv	12281	0.110659	0.3137218	0	1
BusSv	12281	0.047227	0.2121336	0	1
Hardw	12281	0.117499	0.3220266	0	1
Softw	12281	0.065711	0.2477868	0	1
Chips	12281	0.070108	0.2553398	0	1
LabEq	12281	0.023044	0.1500485	0	1
Paper	12281	0.023695	0.1521038	0	1
Boxes	12281	0.005293	0.0725613	0	1
Trans	12281	0.031105	0.1736085	0	1
Whlsl	12281	0.035991	0.1862742	0	1
Rtail	12281	0.080368	0.2718732	0	1
Meals	12281	0.024591	0.1548808	0	1
Othr	12281	0.001791	0.0422886	0	1
Year Dummies					
y97	12281	0.091198	0.2879019	0	1
y98	12281	0.103005	0.3039773	0	1
y99	12281	0.09934	0.2991308	0	1
y00	12281	0.10162	0.3021608	0	1
y01	12281	0.098933	0.2985846	0	1
y02	12281	0.107565	0.3098422	0	1
y03	12281	0.095758	0.2942706	0	1
y04	12281	0.10846	0.3109734	0	1
y05	12281	0.092338	0.2895139	0	1
y06	12281	0.101783	0.3023754	0	1
CEO Information					
Age	12185	55.76742	7.486774	33	91
Tenure -total	11927	6.932003	7.36495	0	55
Tenure -in sample	12281	5.532856	2.731482	1	10
CEO Stake in Company, %	11550	0.026294	0.0686504	0	1.305033
Total Compensation ($K)	12193	5137.217	12408.73	0	655448
Shares Owned, Excl. Options	11590	3048.36	33563.7	0	1321271
Unexercised Exercisable Options ($K)	12276	10986.32	44102.08	0	1959915
Nr. of Shares Acquired on Option Exercise	12260	117.1031	1450.914	0	150000
Nr. of Shares Acquired on Vesting	12281	3.672651	39.505	0	1920.676
Vested In-the-Money Options per Total Compensation	12172	8928.337	837711.7	0	9.18E+07
Share Performance Next Year (created)					
Sell in One Year	10039	0.07333	0.7371645	-1	46.72881
Sell at Highest Price	10039	0.312015	0.7257029	-0.757692	46.72881

Table 2: Correlations

	Assets	LN Assets	Revenue	Q	G-index	Credit Rating	CAPX	Invest. Norm.	Net Intrst Paid	Extraord CF	Ord. CF	CF	EBITDA	Age	Tenure tot	Tenure sple	Own, %	Total Comp.	Shares Own	In-the-Money, vested	Shares Gained on Opt Ex	Shares Gained on Vesting	Vested Opt. / Inc.	Sell 1 year	Sell at max
Assets	1																								
LN Assets	0.5623	1																							
Revenue	0.671	0.5815	1																						
Q	0.0073	0.0517	0.0711	1																					
G-index	-0.0801	0.0301	-0.1033	-0.0734	1																				
Credit Rating	-0.3028	-0.5065	-0.3478	-0.2236	-0.1099	1																			
CAPX	0.7678	0.5947	0.7554	0.0404	-0.0721	-0.323	1																		
Invest. Norm.	-0.0241	-0.0351	0.0109	0.0467	-0.0654	-0.0226	0.2035	1																	
Net Intrst Paid	0.9017	0.4661	0.4778	-0.0437	-0.0528	-0.1861	0.628	-0.0316	1																
Extraord CF	0.1595	0.0648	0.0633	0.0065	-0.0224	-0.0473	0.1067	0.0001	0.1957	1															
Ord. CF	0.5933	0.4155	0.6899	0.1615	-0.0601	-0.3808	0.6072	0.018	0.4055	0.0173	1														
CF	0.0347	0.1365	0.1077	0.2791	0.0504	-0.4168	0.0652	0.0114	-0.033	0.0714	0.3029	1													
EBITDA	0.8482	0.6145	0.8165	0.1119	-0.0719	-0.405	0.8743	0.0365	0.682	0.1139	0.7919	0.1465	1												
Age	0.0559	0.0833	0.043	-0.0755	0.0086	-0.1012	0.0701	-0.0051	0.0454	-0.0131	0.0591	0.0529	0.0675	1											
Tenure tot	-0.0105	-0.0814	-0.0487	0.027	-0.0976	0.084	-0.0308	0.0362	-0.0179	-0.0144	0.0013	0.0164	-0.033	0.3908	1										
Tenure sple	-0.0132	-0.0007	0.0058	0.016	-0.001	-0.0774	-0.0084	-0.0258	-0.0349	0.0049	0.0366	0.1083	0.0029	-0.0473	0.2216	1									
Own, %	-0.0373	-0.101	-0.0571	0.0242	-0.1619	0.1029	-0.0795	-0.0191	-0.0523	-0.0109	-0.0298	-0.0089	-0.0645	0.1036	0.3295	0.1134	1								
Total Comp.	0.2045	0.2713	0.2273	0.1656	-0.0425	-0.1109	0.2351	-0.0038	0.1611	0.0273	0.1962	0.0981	0.2516	-0.024	0.0222	0.0322	-0.0066	1							
Shares Own	0.0088	0.0487	0.0195	0.1999	-0.0503	-0.0222	-0.0044	-0.0278	-0.0084	-0.0024	0.0587	0.0817	0.0365	-0.0079	0.1459	0.0756	0.2711	0.0632	1						
In-the-Money, vested	0.1327	0.1894	0.1456	0.3958	-0.0695	-0.1004	0.1437	-0.004	0.0984	0.0073	0.1948	0.1594	0.179	0.0493	0.1503	0.0897	0.1469	0.3223	0.4292	1					
Shares Gained on Opt Ex	0.0564	0.1051	0.0679	0.1903	-0.0304	-0.0376	0.0765	0.0101	0.0279	-0.0098	0.0915	0.0848	0.0929	0.0219	0.1273	0.067	0.0605	0.1584	0.4033	0.2781	1				
Shares Gained on Vesting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1			
Vested Opt. / Inc.	-0.0035	-0.0026	-0.0051	-0.003	-0.0152	0.0135	-0.0051	-0.0103	-0.004	-0.0006	-0.0041	-0.0054	-0.0045	-0.013	0.0054	-0.0108	0.017	-0.0069	0.0114	0.0222	0.0188	0	1		
Sell 1 year	-0.0164	-0.0366	-0.0191	-0.0908	-0.0155	0.0668	-0.0309	-0.0371	-0.0104	-0.0017	-0.0258	-0.0575	-0.0253	-0.0115	-0.0183	0.0385	-0.0113	-0.0278	-0.0088	-0.0541	-0.019	0	0.0138	1	
Sell at max	-0.0347	-0.0876	-0.0367	-0.0617	-0.0487	0.1466	-0.0379	-0.0027	-0.024	-0.0023	-0.0455	-0.1132	-0.046	-0.031	0.0014	0.0019	0.0003	-0.012	-0.0059	-0.0311	-0.013	0	0.0105	0.938	1

Table 3: Summary Statistics - At Least Two Female Directors

	Observations	Mean	Std. Dev.	Min	Max
Company Information					
Assets ($M)	2663	13951.76	41680.38	50.46	750507
LnAssets	2663	8.354273	1.510042	3.921181	13.5285
Revenue ($M)	2663	11607.47	26031.5	13.151	345977
Book Value Equity ($M)	2663	4275.356	9733.397	-4734	115540
Market Value Equity ($M)	2656	1.73E+07	4.25E+07	0	5.07E+08
Q	2656	2.051118	1.515608	0.509928	25.93238
G-index	2663	9.865565	2.519784	3	16
Long Term Credit Rating	2101	10.12851	3.209013	2	27
Capital Expenditure ($M)	2645	708.5737	1715.774	0.873	17633
Capex Normalized by Assets	2645	0.0548065	0.039017	0.002441	0.3353314
Cash Flow before Extraordinary Items ($M)	2662	712.6304	2243.305	-17625	39500
Cash Flow Extraordinary Items and Discontinued Operations ($M)	2659	3.254228	199.0804	-5679	4475
Net Interest Paid ($M)	2576	250.8618	942.7579	-1.754	18254
Cash Flow (avaliable) ($M)	2573	0.0331829	0.0917611	-1.737667	0.4831482
EBITDA ($M)	2663	1910.191	4564.843	-5743	68355
Industry Dummies					
Agric	2663	0.0018776	0.0432985	0	1
Food	2663	0.045062	0.207479	0	1
Soda	2663	0.0041307	0.0641495	0	1
Beer	2663	0.0120165	0.1089797	0	1
Smoke	2663	0.0060083	0.0772943	0	1
Toys	2663	0.0093879	0.0964535	0	1
Fun	2663	0.0048817	0.0697116	0	1
Books	2663	0.0431844	0.2033101	0	1
Hshld	2663	0.0368006	0.1883073	0	1
Clths	2663	0.0300413	0.170733	0	1
Hlth	2663	0.0157717	0.1246145	0	1
MedEq	2663	0.0202779	0.1409757	0	1
Drugs	2663	0.0510702	0.2201823	0	1
Chems	2663	0.034923	0.1836193	0	1
Rubbr	2663	0.0045062	0.0669894	0	1
Txtls	2663	0.0131431	0.1139088	0	1
BldMt	2663	0.0153962	0.1231455	0	1
Cnstr	2663	0.0146451	0.1201502	0	1
Steel	2663	0.012392	0.1106484	0	1
FabPr	2663	0	0	0	0
Mach	2663	0.0202779	0.1409757	0	1
ElcEq	2663	0.0033796	0.0580473	0	1
Autos	2663	0.0105145	0.1020187	0	1
Aero	2663	0.0067593	0.081952	0	1
Ships	2663	0	0	0	0
Guns	2663	0.0033796	0.0580473	0	1
Gold	2663	0.0003755	0.0193782	0	1
Mines	2663	0.0015021	0.0387346	0	1
Coal	2663	0.0015021	0.0387346	0	1
Oil	2663	0.0277882	0.1643964	0	1
Util	2663	0.1273	0.3333714	0	1
Telcm	2663	0.0300413	0.170733	0	1
PerSv	2663	0.0642133	0.2451785	0	1
BusSv	2663	0.0394292	0.1946504	0	1
Hardw	2663	0.0570785	0.2320361	0	1
Softw	2663	0.0304168	0.1717636	0	1
Chips	2663	0.0236575	0.1520083	0	1
LabEq	2663	0.0153962	0.1231455	0	1
Paper	2663	0.0259106	0.1588985	0	1
Boxes	2663	0.0037552	0.0611757	0	1
Trans	2663	0.0180248	0.1330659	0	1
Whlsl	2663	0.0326699	0.1778046	0	1
Rtail	2663	0.1333083	0.3399715	0	1
Meals	2663	0.0289148	0.1675985	0	1
Othr	2663	0.0056327	0.074854	0	1
Year Dummies					
y97	2663	0.0754788	0.2642119	0	1
y98	2663	0.0717236	0.2580782	0	1
y99	2663	0.0942546	0.2922375	0	1
y00	2663	0.091626	0.2885514	0	1
y01	2663	0.0942546	0.2922375	0	1
y02	2663	0.0995118	0.2994042	0	1
y03	2663	0.1055201	0.3072801	0	1
y04	2663	0.1186632	0.3234525	0	1
y05	2663	0.1216673	0.3269625	0	1
y06	2663	0.1273	0.3333714	0	1
CEO Information					
Age	2650	56.22943	6.822356	34	91
Tenure -total	2642	5.547691	6.252375	0	51
Tenure -in sample	2663	5.705971	2.616251	1	10
CEO Stake in Company, %	2496	0.0134864	0.047119	0	0.5704105
Total Compensation ($K)	2651	6941.613	9161.43	0	159309.3
Shares Owned, Excl. Options	2503	2677.175	27418.94	0	1216571
Estimated Value of In-the-Money Unexercised Exercisable Options ($K)	2663	14892.86	46734.12	0	956110.6
Nr. of Shares Acquired on Option Exercise	2663	141.8338	567.3016	0	14520.94
Nr. of Shares Acquired on Vesting	2663	5.393133	44.47793	0	1043.162
Vested In-the-Money Options per Total Compensation	2650	2.522662	20.58571	0	991.5907
Share Performance Next Year (created)					
Sell in One Year	2198	0.0489626	0.4249292	-1	8.329966
Sell at Highest Price	2198	0.2315663	0.3628322	-0.757692	8.329966

Table 4: Summary Statistics - Less Than Two Female Directors

	Observations	Mean	Std. Dev.	Min	Max
Company Information					
Assets ($M)	9065	3828.848	11005.38	16.767	355935
LnAssets	9065	7.132544	1.368893	2.819413	12.7825
Revenue ($M)	9064	3187.524	8034.829	0	218529
Book Value Equity ($M)	9065	1463.725	4456.912	-5796	152027
Market Value Equity ($M)	9064	4776982	1.71E+07	0	6.02E+08
Q	9064	2.103197	1.871644	0.452407	77.63474
G-index	9065	8.978709	2.603906	2	19
Long Term Credit Rating	4378	11.63796	3.026845	2	29
Capital Expenditure ($M)	8991	223.526	717.9771	0	17101
Capex Normalized by Assets	8991	0.060799	0.0574838	0	0.8152665
Cash Flow before Extraordinary Items ($M)	9063	147.365	1026.377	-56121.9	17138
Cash Flow Extraordinary Items and Discontinued Operations ($M)	9056	4.168429	120.6171	-1196	6236
Net Interest Paid ($M)	8345	66.56605	200.3153	-2	9297
Cash Flow (avaliable) ($M)	8338	0.017344	0.164099	-5.882712	0.7438996
EBITDA ($M)	9031	501.5024	1470.695	-1317	35077
Industry Dummies					
Agric	9065	0.002979	0.0544972	0	1
Food	9065	0.01754	0.1312792	0	1
Soda	9065	0.002427	0.0492066	0	1
Beer	9065	0.002096	0.0457363	0	1
Smoke	9065	0.001103	0.0331971	0	1
Toys	9065	0.003861	0.0620203	0	1
Fun	9065	0.011583	0.1070052	0	1
Books	9065	0.004964	0.0702855	0	1
Hshld	9065	0.01754	0.1312792	0	1
Clths	9065	0.014562	0.1197959	0	1
Hlth	9065	0.017871	0.1324896	0	1
MedEq	9065	0.030447	0.1718227	0	1
Drugs	9065	0.040816	0.1978754	0	1
Chems	9065	0.033205	0.1791804	0	1
Rubbr	9065	0.006398	0.0797371	0	1
Txtls	9065	0.005405	0.0733265	0	1
BldMt	9065	0.02449	0.1545726	0	1
Cnstr	9065	0.013569	0.115698	0	1
Steel	9065	0.022394	0.1479688	0	1
FabPr	9065	0.00364	0.0602289	0	1
Mach	9065	0.050193	0.2183551	0	1
ElcEq	9065	0.013238	0.1142976	0	1
Autos	9065	0.022725	0.1490329	0	1
Aero	9065	0.008163	0.0899862	0	1
Ships	9065	0.003089	0.0554942	0	1
Guns	9065	0.004964	0.0702855	0	1
Gold	9065	0.002317	0.048078	0	1
Mines	9065	0.005075	0.0710582	0	1
Coal	9065	0.001214	0.0348155	0	1
Oil	9065	0.047546	0.2128143	0	1
Util	9065	0.058687	0.2350514	0	1
Telcm	9065	0.018312	0.1340852	0	1
PerSv	9065	0.120132	0.3251342	0	1
BusSv	9065	0.049642	0.2172151	0	1
Hardw	9065	0.135135	0.3418867	0	1
Softw	9065	0.072366	0.2591077	0	1
Chips	9065	0.084722	0.2784821	0	1
LabEq	9065	0.024931	0.1559236	0	1
Paper	9065	0.023387	0.1511365	0	1
Boxes	9065	0.005405	0.0733265	0	1
Trans	9065	0.033646	0.1803259	0	1
Whlsl	9065	0.037397	0.1897421	0	1
Rtail	9065	0.065747	0.2478537	0	1
Meals	9065	0.023828	0.1525212	0	1
Othr	9065	0.000772	0.0277793	0	1
Year Dummies					
y97	9065	0.101379	0.3018465	0	1
y98	9065	0.113955	0.3177739	0	1
y99	9065	0.106895	0.3089963	0	1
y00	9065	0.105571	0.3073045	0	1
y01	9065	0.106343	0.3082932	0	1
y02	9065	0.100827	0.3011166	0	1
y03	9065	0.098731	0.2983175	0	1
y04	9065	0.094981	0.2932044	0	1
y05	9065	0.089355	0.2852707	0	1
y06	9065	0.081964	0.2743244	0	1
CEO Information					
Age	8994	55.70113	7.614902	33	91
Tenure -total	8745	7.389022	7.591441	0	55
Tenure -in sample	9065	5.618974	2.733692	1	10
CEO Stake in Company, %	8575	0.029849	0.0723912	0	1.305033
Total Compensation ($K)	9002	4536.46	11397.98	0	600347.4
Shares Owned, Excl. Options	8583	3118.155	35790.46	0	1321271
Estimated Value of In-the-Money Unexercised Exercisable Options ($K)	9061	9898.517	43124.84	0	1959915
Nr. of Shares Acquired on Option Exercise	9051	110.1985	1655.466	0	150000
Nr. of Shares Acquired on Vesting	9065	2.487387	32.01419	0	1920.676
Vested In-the-Money Options per Total Compensation	8983	12097.05	975129.9	0	9.18E+07
Share Performance Next Year (created)					
Sell in One Year	7794	0.079535	0.8047308	-1	46.72881
Sell at Highest Price	7794	0.334371	0.7987273	-0.629146	46.72881

The data for this thesis has been collected from various sources, out of which each is briefly described below.

DATA OBTAINED FROM COMPUSTAT

The information related to the company annual accounts has been provided by Compustat North America from Standard & Poor. Compustat has gathered fundamental and market information on active and inactive publicly held companies since 1950. All balance sheet and profit and loss account data is retrieved from Compustat. Compustat has also provided the S&P Long Term Credit Rating.

The information related to the CEOs, including personal characteristics such as age, tenure and position as well as ownership data on shares and options, has been provided by Compustat Execucomp. A caveat of this data source is that it does not provide information on specific option programs or on when and in what quantities CEOs have bought or sold their holdings or exercised their options. Having this information would open up for closer investigation of CEO beliefs and the creation of accurate overconfidence proxies. Malmendier and Tate (2005b) have had access to this type of deeper information – including option exercise prices, duration and number of underlying shares – in their studies. As of the year 2006, Execucomp collects more detailed information of managerial stock and option grants and holdings. Unfortunately, this information does not overlap well with my period of investigation and is thus excluded from this thesis. Nonetheless, it opens up for interesting follow-up studies.

DATA OBTAINED FROM CRSP

The CRSP US Stock Database, provided by the Center for Research in Security Prices, is the largest and most commonly used source for prices on marketable securities. It provides data on all listed NYSE, Amex, and NASDAQ common stocks along with basic market indices. CRSP has been used to complement the company information mentioned above in creating reliable measures of stock prices, market values and share price growth.

DATA OBTAINED FROM RISK MERTICS

RiskMetrics, that provides statistics on corporate governance and boards, was formerly owned by IRRC. After the acquisition of IRRC by ISS in 2005 the data provided changed to some extent, which is why the legacy databases, with data up to year 2007, were used in this thesis. The data from RiskMetrics has been accessed through two databases: Governance Legacy and Directors Legacy.

Governance Legacy provides data on all companies in the S&P 1500 index, together other companies of similar market capitalization. The main reason to use this data source is that it provides the so called G-index created by Gompers et. al. (2003). I consider the G-index as the best single control for corporate governance, something that is very important to control for to diminish endogenity issues when splitting the sample on board characteristics (here: extent of female representation). A further explanation of the G-index follows in section 5. Model/Control Variables.

Directors Legacy provides data on all single directors in the S&P 1500 index. The data provided is personal information, titles, roles in and affiliations to the company as well as other companies. Directors Legacy has been used to create the variables defining female representation on the boards.

5. Model

The model that is employed by this thesis is similar to the one presented in Malmendier and Tate (2005b) and others. It assumes that CEOs are risk averse and want to value-maximize primarily their own pay-off, but also the one of the company. Then, it investigates how the presence of an overconfident CEO, represented by a dummy variable, affects the cash flow sensitivity of investment of the company. Thus,

the dependent variable is investment, and the variable with the effect to be analyzed is the one that shows how investments are more or less sensitive to cash flow in the presence of an overconfident CEO – the interaction term of cash flow and the overconfidence proxy. The general regression of the model looks like this:

$$Investment_{it} = \beta_1 + \beta_2 CF_{it} + \beta_3 overconfidence_{it} + \beta_4 overconfidence_{it} * CF_{it} + \beta_k controls_{it} + \beta_j controls_{it} * CF_{it} + \varepsilon_{it}$$

The model above has *k* control variables. As the primary variable of interest in the regression is the interaction term between the overconfidence proxies and cash flow, here with the coefficient β_4, all other variables in the regressions have their respective cash flow interaction variable added into the regressions. Thus, not only the effect of the control variable itself on investment is controlled for, but also its effect jointly with cash flow, resulting in a more accurate model.

There are studies, such as Ben-David et.al. (2007), that look at the effect of overconfident CFOs rather than CEOs on corporate financial policies. Indeed, a possible limitation of this model could be that whilst most organizations have CFOs that are deeply involved in and many times responsible for the investments decisions, this model rests only on data concerning CEOs. Although it would be interesting to investigate the affects of various officers' personal beliefs on corporate finance decisions this cannot be done to the same extent due to lack of data – information on CEOs is more widespread than on CFOs. Furthermore, following the argument of Malmendier and Tate (2010), there are strong reasons to believe that the overconfidence of the CEO will have impact on financial decisions, partly because the CEO is superior to the CFO but also because the beliefs of CEOs and CFOs are likely to be highly correlated. Ben-David et.al. (2007) in fact look at CFOs, after having performed quarterly surveys of US CFOs from 2001 to 2007. This further points at the firstly mentioned reason to focus on CEOs – unless primary research is done, the detailed information on CFOs is rather limited as compared to CEOs.

As the analysis is to be performed on panel data, with information on CEOs in companies that are followed during a ten year period, random effects generalized least squares regressions are run on the data. To control for heteroskedasticity, robust standard errors are used. Firm fixed effects regression are not appropriate for this sample, as during the ten years investigated there are many cases where the same CEOs maintain their position throughout the sample, thus eliminating the fixed effects for the company. The specific year and industry effects are controlled for by dummy variables.

However, as explained by Wooldridge (2003), if there are intra-group unobservable effects, which each firm is likely to have in this analysis, it is important to account for this by clustering the standard error, otherwise there will be a downward bias in the ordinary OLS standard errors. In this theses the standard errors are clustered by firm, as this is the smallest group with common effects and thus the most prudent level of clustering. Still, in non-reported regressions it has been found that the key results are similar if the clustering takes place at industry level, apart from the higher significance because of the lower standard deviation that follows the choice of larger clustering groups.

To test Hypothesis (2), a split sample analysis is performed. A dummy variable is created that distinguishes between companies that have at least two female directors on the board from companies that have less than two female directors. The reason to look at firms having two or more directors is that, as the McKinsey (2007) report explains, having at least two board members should intensify the effect of the diverse board. The split sample test could compare at least two female board members versus no female board members to provide a sharper distinction, but as this test has been performed with similar results to the method chosen here, the former sample split is chosen in order to keep as many observations as

possible. An alternative way of splitting on the amount of women on the boards would be to look at the percentage female representation. This, however, would have a disproportionate effect depending on board size, and setting the cut-off limit would be rather ambiguous.

Below follows an explanation of all of the variables used in the model, together with motivations for why the variables have been chosen and defined the way they are.

OVERCONFIDENCE MEASURES

As described in the literature review, previous researchers on the subject have employed both so called internal and external overconfidence proxies. This study relies completely on internal overconfidence proxies. In this subchapter, I argue for the internal overconfidence proxies being more appropriate than the external ones, I describe the motivation behind my way of proxying for managerial overconfidence, and finally present the two proxy variables used in this paper: *Habitual Vester* and *Habitual Buyer*.

As for the external overconfidence proxies, I believe that they bear the risk of being too noisy and prone to endogenity. For example, although the press coverage proxy has been found to significantly determine various phenomena that could follow overconfidence, I believe that the press may describe the CEO as overconfident precisely because of the actions that are a result of overconfidence, rather than because of the overconfidence itself. Thus, those CEOs that are overconfident but hindered to transform their beliefs into policies on company level, for example by a strong board, would be left out by such a proxy. Furthermore, the fact that a CEO is described as overconfident in the press could induce overconfident behavior later on because of representativeness and labelling the CEO as an overconfident type; thus the overconfidence press coverage measure could suffer from endogenity. Furthermore, the CEO may consciously express confidence, to bias the expectations of the public. This argument speaks against the overestimated predictions overconfidence proxy used by Lina et.al. (2005) as well. The authors argue the fact that the market would notice if the CEO would manipulate the expectations by signalling exaggerated faith in the company regularly should eliminate the incentives to do so. Still, the fact that the prediction statements are highly public induces noise; at some occasions (for example prior to capital raising or restructuring) the benefits for CEOs to overstate their beliefs in their company can outweigh the costs. For example Efendi et.al. (2007) point at several occasions when CEOs have been found to overstate earnings due to agency issues. Thus, I will refrain from focusing on these measures and focus only on internal overconfidence proxies, based on the personal portfolio decisions of the CEOs.

Similarly to Malmendier and Tate (2005b), I look at habitual behavior of the CEOs with respect to their personal portfolios. As well buying company stock as keeping vested options could be a sign of positive inside information. However, a CEO is likely to have positive inside information just about as often as negative inside information. Therefore, habitual behavior is a good way to distinguish between buying stock and keeping vested options because of inside information or because of overconfidence – in an efficient market the market should over- and undervalue the company stock with equal probabilities, regardless of CEO inside information.

I have chosen to include a new view when making the overconfidence proxies – in contrast to other authors I try to account for the economic significance of the personal portfolio decisions taken by the CEO. I believe it to be crucial to control for the economic significance to the CEOs when evaluating their overconfidence; if the portfolio decision is to show that they believe in a strong share price development, it has to involve a real bet that is felt by the one taking it. Furthermore, the argument that options may be held unexercised not because of confidence in the stock but because of procrastination is weakened if the focus is on amounts of real economic significance to the CEOs. If there is a lot to gain or lose, the probability that the CEO evaluates and tries to make the right decision increases.

To test the hypotheses of this thesis, two overconfidence proxies are created: one based on the CEOs personal portfolio option decisions and the other one on their changes in company share holdings.

The overconfidence proxy based on options, *Habitual Vester*, is defined as the value of exercisable unexercised in-the-money options held by the CEO, relative to the CEOs total annual compensation. The CEO is defined as overconfident in a specific year according to this criterion when holding more than the median amount of vested options relative wage, as compared to the whole sample. Each CEO that satisfies this in a given year is a *Vester*. To be classified as a *Habitual Vester*, the CEO has to qualify for being a *Vester* more than 60% of the years. This limit is chosen as I am looking for a consistent confidence display, more than the positive information half of the time and negative information half of the time predicted by the theory of insider information and efficient markets. The regressions are run for tenures from three years and up, so the first time a CEO can classify as a *Habitual Vester* is when after three years having behaved in the specified way during at least two years. Hence, whilst *Vester* is a year-CEO-specific variable, *Habitual Vester* is a CEO-specific variable that remains constant over time for each particular CEO.

The overconfidence proxy created of the CEOs' changes in their companies' holdings, *Habitual Buyer*, rests on the same philosophy as *Habitual Vester*: to be classified as a *Buyer* in a particular year, net shares bought, defined as change in shares owned less shares acquired on vesting or option exercise, have to correspond to over 40% of the total annual compensation of the CEO. The limit of 40% is again chosen so that the amount should have economic significance to the CEO. In non-reported regressions, limits of between 10-50% are set with very similar results – the same CEOs appear to be identified. Thus the seemingly arbitrarily process of choosing the limit of 40% is not a fault of the proxy. In the same way as when defining the *Habitual Vester*, the CEOs that qualify for being a *Buyer* more than 60% of the years are defined as *Habitual Buyers*.

A limitation of the data is that I only see if the option is exercisable and in the money or not – in contrast to Malmendier and Tate (2005b) I have no information neither on by how much nor when the option became in the money. Thus, there may be situations where the shares recently vested or the option either recently became exercisable or went in-the-money and the managers have not yet had time to sell or exercise their holdings, or where the option is not sufficiently in-the-money to offset the trading costs of exercising it. Still, this problem should be partially alleviated by the focus on economic value for the CEO – for example, options that are less in-the-money will have a lower economical value to the CEO.

If the proxies catch the effect of overconfidence on investment, the cash flow interaction terms of the proxies should be positive; overconfident CEOs will let their pursued investment depend on the cash flow to avoid accessing external sources of finance that are perceived as overly expensive.

PRMARY VARIABLES

The dependent variable, *investment*, is measured as capital expenditure, in line with other papers looking at the cash flow sensitivity of investment, for example Malmendier and Tate (2005b). For comparability, investments are normalized by total assets.

In the previous literature, various ways of measuring the *cash flow* can be found. Broussard et. al. (2004) use cash flow net of dividends, Lina et.al. (2005) use cash flow from operations and Malmendier and Tate (2005b) use earnings before extraordinary items plus depreciation. I have chosen to explicitly focus on the cash flow that the CEO has at hand when the investment decisions are made, therefore I believe that it is appropriate to include the cash flow from extraordinary items as well. Accordingly, I have defined cash flow as cash flow income before extraordinary items plus extraordinary items and discontinued operations, less interest paid. Similarly to investments, the cash flow is normalized by total assets. As

mentioned above, this variable is interacted which every other variable in the model, and its interaction with the overconfidence proxies will confirm or reject the hypotheses of this thesis.

CONTROL VARIABLES

As is further explained in the next section on results below, three regressions are run with varying numbers of control variables: Regression A, B, and C. Regression A does not include any control variables. Regression B and C, though, include *year* and *industry* dummy variables to control for time fixed effects, such as the state of the economy, and industry fixed effects, for example various industry related investment needs, organization and compensation structures, and the degree of information asymmetry in the industry. The year is the fiscal year of the data, and the industry dummies are created according to Fama and French 49 industry codes, reduced to 45 industries after the exclusion of financial services. In addition, Regression C includes the controls described below.

To control for *size*, the logarithm of total assets measured in millions of dollars is included. Size is an important factor to control for as it can affect the investment behavior as well as the compensation structure of the companies. Furthermore, the size of a company can affect the amount of information asymmetry and agency issues – the public is more likely to have better insight into larger companies, reducing the need of cash flow sensitivity of investment. Large companies are also expected to be better governed, which further reduces the cash flow sensitivity of investment. Thus the interaction term of size and cash flow is expected to be negative.

Another obvious way of controlling for agency is to control for the *percentage of the companies' shares owned by the CEOs*. According to the rational agency theory managers may not induce complete effort in general but overinvest cash flow on perks and empire building when given the chance in form of free cash flow. An increase in CEO ownership should align CEO incentives with those of shareholders. Thus, whilst the agency theory could predict an increase in investments with higher CEO ownership, the cash flow sensitivity of investment should decrease with a significant CEO ownership. Broussard et. al. (2004) indeed show that aligning managers' and shareholders' interests increases investment because of less managerial shrinking, but decreases the cash flow sensitivity of investment as less free cash flow is misspent. Hadlock (1998) has found that CEO ownership increases cash flow sensitivities of investment up to a certain point, below which they decrease the sensitivities. Although this finding speaks for including a square term of CEO ownership in the model, I chose not to do so because of parsimony considerations.

An important control variable is *Tobin's Q*, the ratio of the market value of assets to the book value of assets. Q can be seen as a proxy for current investment opportunities (more perceived opportunities would increase market to book value of equity) as well as for the perceived over-/undervaluation of equity, which would in turn affect the CEOs willingness to time the market and could induce more investment. The effect of Q on investment should be positive. Furthermore, Q is an important control in one of the check regressions, where the capital gain of those qualifying for overconfidence is checked, as it has been proved that Q has predictable value on future stock returns. The book value of assets is taken from Compustat, whilst the market value of assets is created by adjusting for the difference between Compustat book value of equity and the market value of equity derived from CRSP. In the regressions that evaluate Hypothesis (1) and (2) it would make sense to use the beginning of the year Q or the mean value of Q over the year, as it is to represent the information available during the year when the investment decision have been taken. However, as it is crucial to use the end of the year Q in the forward looking check regressions where performance of the CEOs personal portfolio decisions is evaluated, and because the use of the same controls in the complete model is desired, the end of the year Q is used to proxy for what had been during the year in the main regressions as well.

Standard & Poor's *long term credit rating* is included as a control variable in the Full Regression. Corresponding controls have not been done by previous studies; however as Malmendier and Tate (2005b) highlight the effect of credit availability on the cash flow sensitivity of investment by a split sample test, I believe the credit rating to be an important control. The interaction of the long term credit rating with cash flow is expected to have a significantly negative effect on investment – CEOs of firms that can borrow easier and cheaper have less need to take advantage of the cash flow when it comes.

It is crucial to control for *corporate governance* when investigating any relationships in how the company is managed. To have a good corporate governance control is especially important when testing for Hypothesis (2), as the amount of female directors may be correlated with the appropriateness of corporate governance systems, which would cause an endogenity problem. There are various ways to proxy for corporate governance; one common way, among others used by Malmendier and Tate (2005b), is to use the number of directors that also serve on other companies' boards. Because of the importance of a good control for corporate governance, I chose to control for it with one of the most sophisticated measures for corporate governance – the G-index, a composite measure created by Gompers et. al. (2003). These authors have found that better corporate governance gives higher returns, higher firm value, higher profits, higher sales growth, lower capital expenditure and fewer acquisitions. The authors claim that it comes from reduced agency costs that are hindered by better governance, and although agency surely explains some of the results, it might as well partially be the effects of overconfidence that are made less pronounced by better corporate governance. The G-index can assume values of 1-100, with a higher value representing more restrictions on shareholders' rights. In the initial sample of Gompers et. al. (2003), the G-index assumes values of 2-18, and companies with a G-index of 5 or less are classified as "democracies" and with an G-index score of 16 or above as "dictatorships". In the sample of this thesis the index assumes values in the range of 1-19. As a higher G-index implies a worse corporate governance, it is expected to increase the cash flow sensitivity of investment.

Finally, two personal characteristics are included as controls: *age* and *tenure*. There are several reasons to include these characteristics as control variables. Both age and tenure in the company are likely to affect CEO personal portfolio decisions, as the CEOs may have varying preferences in their life cycle, as well as be differently compensated depending on their stage of employment. The factors can also affect their decisions through variation in the knowledge of the business and the firm. Some studies have pointed out that age and tenure can create or even proxy for overconfidence. For example, Sudarsanam and Huang (2006) include the factors in their overconfidence index. Thus, one could argue that including these factors as control variables will carry some of the overconfidence effect of the overconfidence proxies, understating their importance in explaining the dependent variable. Still, as other effects as mentioned also can be attributed to age and tenure I believe that it is correct and prudent to include them as controls. There are reasons to suspect a non-linear effect of these variables, why including the square terms would be appropriate. Nonetheless this is not done to avoid model overspecification. If these variables partially proxy for overconfidence, they are expected to behave as the overconfidence proxies and have a positive cash flow interaction term.

SPLIT VARIABLE

The split sample test used to analyze Hypothesis (2) as previously mentioned rests on the division of the sample according to the companies' female board representation. A dummy variable, *Female2*, that is equal to one if the company has at least two female directors in a given year is used to divide the sample into two subsamples.

6. Results Hypothesis (1)

The regressions that have been run are: A – Base Regression (includes only the key variables of interests), B – Industry and Year Fixed Effects Regression (A + year and industry fixed effect dummies), and C – Full Regression (B + all control variables).

$$A: \quad Investment_{it} = \beta_1 + \beta_2 CF_{it} + \beta_3 overconfidence_{it} + \beta_4 overconfidence_{it} * CF_{it} + \varepsilon_{it}$$

Where $Investment_{it}$ and CF_{it} are investment and cash flow respectively, as defined in the section above, and $overconfidence_{it}$ is the overconfidence measure.

$$B: \quad Investment_{it} = \beta_1 + \beta_2 CF_{it} + \beta_3 overconfidence_{it} + \beta_4 overconfidence_{it} * CF_{it} + \beta_5 industry_{it} + \beta_6 industry_{it} * CF_{it} + \beta_7 year_i + \beta_8 year_i * CF_{it} + \varepsilon_{it}$$

Where $industry_{it}$ are the industry dummies and $year_i$ are the year dummies.

$$C: \quad Investment_{it} = \beta_1 + \beta_2 CF_{it} + \beta_3 overconfidence_{it} + \beta_4 overconfidence_{it} * CF_{it} + \beta_5 Industry_{it} + \beta_6 Industry_{it} * CF_{it} + \beta_7 year_i + \beta_8 year_i * CF_{it} + \beta_k controls_{it} + \beta_j controls_{it} * CF_{it} + \varepsilon_{it}$$

Where the *k* controls are: size measured by the logarithms of assets, Tobin's Q, the G-index, S&P long term credit rating, and the CEOs age, tenure and personal ownership in the company.

The set of regressions has been run for both of the two overconfidence proxies, with the results below. In the tables below the coefficients for the industry and year fixed effects variables have been excluded. For the complete regressions, please see the appendix.

Table 5: Regression Results for Habitual Vester

	Model A			*Model B*			*Model C*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.0583	0.0015	38.53***	0.0713	0.0060	11.91***	0.1291	0.0175	7.37***
Cash flow (CF)	0.0118	0.0064	1.84*	-0.0389	0.0456	-0.85	0.1086	0.1018	1.07
Industry dummies				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Industry dummies * CF				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Year dummies				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Year dummies * CF				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Size							-0.0062	0.0011	-5.55***
Size * CF							-0.0075	0.0052	-1.45
Q							0.0019	0.0009	2.07**
Q * CF							-0.0028	0.0050	-0.56
G-index							0.0003	0.0005	0.64
G-index * CF							0.0042	0.0036	1.18
Credit rating							-0.0017	0.0004	-3.84***
Credit rating * CF							-0.0081	0.0020	-4.02***
Ownership							-0.0032	0.0243	-0.13
Ownership * CF							-0.0866	0.1163	-0.74
Age							-0.0001	0.0002	-0.67
Age * CF							0.0017	0.0013	1.30
Tenure							0.0002	0.0002	1.02
Tenure * CF							-0.0002	0.0013	-0.19
Overconfidence	0.0023	0.0024	0.99	0.0027	0.0019	1.40	-0.0006	0.0023	-0.26
Overconfidence * CF	0.0167	0.0143	1.17	0.0527	0.0109	4.82***	0.0588	0.0193	3.04***
Observations	9534			9534			5311		
Adjusted R2	0.0048			0.335			0.3843		

* Significant at 10% ** Significant at 5% *** Significant at 1%

Table 6: Regression Results for Habitual Buyer

	Model A			*Model B*			*Model C*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.0594	0.0013	46.01***	0.0731	0.0060	12.26***	0.1309	0.0176	7.46***
Cash flow (CF)	0.0153	0.0062	2.46*	-0.0283	0.0463	-0.61	0.1169	0.1033	1.13
Industry dummies				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Industry dummies * CF				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Year dummies				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Year dummies * CF				see appendix	see appendix	see appendix	see appendix	see appendix	see appendix
Size							-0.0063	0.0011	-5.60***
Size * CF							-0.0103	0.0059	-1.73*
Q							0.0020	0.0009	2.09**
Q * CF							-0.0015	0.0050	-0.31
G-index							0.0003	0.0005	0.70
G-index * CF							0.0035	0.0037	0.94
Credit rating							-0.0017	0.0005	-3.78***
Credit rating * CF							-0.0100	0.0020	-4.87***
Ownership							0.0008	0.0256	0.03
Ownership * CF							-0.0965	0.1225	-0.79
Age							-0.0001	0.0002	-0.76
Age * CF							0.0026	0.0014	1.88*
Tenure							0.0002	0.0002	0.88
Tenure * CF							0.0000	0.0013	-0.01
Overconfidence	0.0008	0.0037	0.22	-0.0008	0.0032	-0.26	-0.0067	0.0038	-1.73*
Overconfidence * CF	0.0123	0.0131	0.94	0.0026	0.0125	0.21	-0.0075	0.0335	-0.22
Observations	9534			9534			5311		
Adjusted R2	0.0035			0.3303			0.3826		

* Significant at 10% ** Significant at 5% *** Significant at 1%

CHECK REGRESSIONS

Before drawing conclusions of any model it is crucial to be aware of the suitability of the chosen model specification. Firstly, the residuals over their squared counterparts in order to test if the right functional form is used; nonlinear specifications will give significant effects of the squared residual on the residual itself. The results from these regressions for the Model A regressions with the two different overconfidence proxies are presented in Table 7 and Table 8 below.

Table 7: Specification Test - Habitual Vester

	Coefficient	Standard Deviation	t-statistic
Constant	0.0366	0.0017	21.80
Squared *û(vest)*	5.0333	0.3676	13.69
Observations	6104		
Adjusted R2	0.8990		

* Significant at 10% ** Significant at 5% *** Significant at 1%

Table 8: Specification Test - Habitual Buyer

	Coefficient	Standard Deviation	t-statistic
Constant	0.0359	0.0015	23.83
Squared *û(buy)*	5.1148	0.3377	15.15
Observations	6104		
Adjusted R2	0.8997		

* Significant at 10% ** Significant at 5% *** Significant at 1%

Another type of specification error, to omit important variables from the model, is also tested for by analyzing the residuals. If a variable is omitted and therefore included in the residual, and an exogenous variable in the model is correlated with the omitted model, the results, although they may be consistent, will be biased. The variables of focus of this study are the overconfidence proxies and mainly their cash flow interactions. Their correlations with the error terms are presented in the tables below.

Table 9: Error Term Correlation Habitual Vester

	û(vest)
û(vest)	1
Overconfidence	0.0183
p-value	0.1539
Overconfidence * CF	0.0739
p-value	0.0000

Table 10: Error Term Correlation Habitual Buyer

	û(buy)
û(buy)	1
Overconfidence	-0.0022
p-value	0.8656
Overconfidence * CF	0.0096
p-value	0.4553

As the two overconfidence proxies employed by this thesis, *Habitual Vester* and *Habitual Buyer*, aim to capture the same effect, an obvious point of interest is the correlation between the variables. The table below presents these correlations, where *Vester* and *Buyer* are the year and CEO specific overconfidence variables whilst *Habitual Vester* and *Habitual Buyer* are the CEO specific variables that do not change across years, as explained in the Model section 4.

Table 11: Correlations of Overconfidence Proxies

	Vester	Buyer	Habitual Vester	Habitual Buyer
Vester	1			
Buyer	-0.0861*	1		
Habitual Vester	0.6678*	-0.0500*	1	
Habitual Buyer	-0.0886*	0.4790*	-0.0663*	1

* Significant at 1%

To ensure that the effects captured by my model are in fact overconfidence and not any other effect, a number of check regressions have been run. As the literature review mentions, there are two ways to distinguish overconfidence from insider information: persistence and performance. The first one, that overconfidence results in persistent behavior, is partly accounted for by the usage of dummy variables as overconfidence proxies. To further check if the behavior that triggers the overconfidence proxies each year in fact tends to be caused by overconfidence rather than insider information, the year and CEO specific overconfidence variables *Vester* and *Buyer* are regressed over their lagged counterparts. The results of the regressions are presented in Tables 12 and 13 below.

Table 12: Persistance in Vesting

	Coefficient	Standard Deviation	t-statistic
Constant	0.2371	0.0060	39.36***
Lagged Vester	0.5623	0.0082	68.47***
Observations	10088		
Adjusted R2	0.3654		

* Significant at 10% ** Significant at 5% *** Significant at 1%

Table 13: Persistance in Buying

	Coefficient	Standard Deviation	t-statistic
Constant	0.0905	0.0049	18.32***
Lagged Buyer	0.0342	0.0058	5.86***
Observations	10088		
Adjusted R2	0.0278		

* Significant at 10% ** Significant at 5% *** Significant at 1%

The overconfidence proxies are based on the holdings of CEOs at the end of each year. Therefore, to test for performance, two variables are created that show the companies' share price development from that day and onwards. The first one represents the holding period of one year, that is, it shows if the share price of a company will develop better during the coming year if it has a CEO that is classified as a *Vester* or *Buyer* at the end of that the preceding year. The second one represents a holding period from the year end to the point of the highest monthly share price the coming year. If the CEOs are vesters and buyers

because they successfully use their insider information, the *Vester* and *Buyer* variables should particularly predict an abnormally higher peak share price the next year, as this is when they should expect their payoff. Table 14 below shows CEOs personal portfolio decisions predictability of the next years share price returns.

Table 14: Performance of the Decisions Behind the Overconfidence Proxies

	Vester						*Buyer*					
Holding Period:	Year			To max price			Year			To max price		
		Standard			Standard			Standard			Standard	
	Coefficient	Deviation	t-statistic	Coefficient	Deviation	t-statistic	Coefficient	Deviation	t-statistic	Coefficient	Deviation	t-statistic
Constant	0.3521	0.1683	2.09**	0.5077	0.1832	2.77***	0.3057	0.1737	1.76*	0.4514	0.1852	2.44**
CF	-0.6707	0.4191	-1.6*	-1.0858	0.5827	-1.86*	-0.6963	0.4051	-1.72*	-1.1073	0.5662	-1.96*
Industry dummies	Not reported - controled for			Not reported - controled for			Not reported - controled for			Not reported - controled for		
Year dummies	Not reported - controled for			Not reported - controled for			Not reported - controled for			Not reported - controled for		
Size	-0.0294	0.0112	-2.63***	-0.0270	0.0144	-1.87*	-0.0303	0.0110	-2.76***	-0.0278	0.0141	-1.97*
Q	-0.0404	0.0102	-3.95***	-0.0156	0.0103	-1.52	-0.0432	0.0113	-3.83***	-0.0181	0.0113	-1.61
G-index	-0.0067	0.0044	-1.53	-0.0099	0.0046	-2.14**	-0.0064	0.0044	-1.44	-0.0095	0.0047	-2.04**
Credit Rating	-0.0032	0.0055	-0.58	0.0137	0.0067	2.05**	-0.0033	0.0055	-0.59	0.0134	0.0068	1.97*
Age	0.0012	0.0012	0.97	0.0000	0.0013	0.02	0.0012	0.0012	0.98	0.0001	0.0013	0.07
Tenure	-0.0018	0.0014	-1.28	-0.0011	0.0016	-0.68	-0.0019	0.0016	-1.13	-0.0009	0.0017	-0.54
Ownership	-0.1350	0.1746	-0.77	-0.2319	0.1616	-1.43	-0.1237	0.1744	-0.71	-0.2328	0.1626	-1.43
Overconfidence (yearly)	-0.0426	0.0257	-1.65*	-0.0367	0.0287	-1.28	0.0260	0.0269	0.97	0.0357	0.0283	1.26
Observations	5699			5699			5699			5699		
Adjusted R2	0.0563			0.0635			0.0558			0.0633		

* Significant at 10% ** Significant at 5% *** Significant at 1%

7. Discussion Hypothesis (1)

Before discussing the actual regressions of the model, I discuss the check regressions, as they increase the understanding of the model.

CHECK REGRESSIONS

The squared residuals have explaining power on the residuals of the full regressions when using both proxies, suggesting that the model has the wrong functional form, which could make it biased and heteroskedastic. However, robust standard errors are used and even if there is some model misspecification, the focus in corporate finance should rather be on having simple and logical models than trying to overfit the data, as there are so many forces affecting the outcome. A perfect model does not exist. Still, the indication of endogenity as the *Habitual Vester* cash flow interaction is significantly correlated with the residual is potentially serious. It is an indication of that an unobservable factor affects as well the investment as the existence of cash flow simultaneously with overconfidence, and lowers the reliability of the results. However, it should be mentioned, that previous studies have not presented any specification tests and yet drawn conclusions from the results of their models.

The lagged variables in Tables 12 and 13 are highly significant in explaining the year and CEO specific overconfidence variables. This suggests that my way of measuring overconfidence is particularly free from the effects of insider information; not only do the proxies look for the habitual display of confidence signs, the behavior that they look for itself is often reoccurring once displayed, indicating that it captures something more permanent, such as overconfidence, rather than something random, such as positive insider information.

The same effect is shown in Table 11; *Habitual Vester* and *Habitual Buyer* are significantly correlated with their year and CEO specific counterparts, *Vester* and *Buyer*, meaning that if CEOs show signs of confidence in a particular year, they are likely to show similar behavior in other years, so that they classify for the final overconfidence proxies that require habitual behavior.

The two types of overconfidence measures, *Habitual Vester* and *Habitual Buyer* (the same relation holds for *Vester* and *Buyer*) are negatively correlated. This could mean that they capture different, opposing, effects. However, although the proxies were to catch the same effect of overconfidence, they do not necessarily have to correlate – in fact, if they are two alternative ways of increasing exposure to company specific risk and therefore can work as substitutes, a negative correlation is expected. Specifically, the proxies are created so that if the share price goes up, the value of the vested options increase, increasing the probability that the CEO is classified as a *Vester*. Simultaneously, CEOs may be reluctant to increase their exposure towards company specific risk following a soaring share price – which decreases the probability that they are classified as *Buyers* – and then instead choose to delay vested options exercise. This could create a negative correlation between the proxies and is a reason for including both proxies in the analysis.

Table 14 provides some interesting results. If the overconfidence effect would be caused by insider information, then the years when CEOs classify at *Vesters* or *Buyers* would be followed by better than average stock returns as the information reached the market. Even if the yearly return can be affected by a lot of other factors than the insider information, at least the performance to the coming year's peak price – the expected peak of the CEO wanting to take advantage of the insider information – should be significantly higher following the existence of a *Vester* or a *Buyer*. What Table 14 shows is that following a *Vester* or a *Buyer*, there is no abnormal positive return that would indicate insider information. Although the coefficients for *Buyer* are positive both for a holding period of one year and for a holding period to the maximum share price the coming year, they are not significant. For *Vester*, on the contrary, the signs are negative. This implies that if a CEO shows signs of overconfidence in a given year, the share will perform worse the year that follows. For a holding period to the next year's monthly peak price, however, the result is not significant. Nonetheless, looking at the peak price is a rather bold thing to do. When looking at holding periods of one year though, *Vester* is significant. Actually, all else equal, if a CEO displays overconfidence by being a *Vester* in a given year the share price on average returns -4.26% compared to if the CEO were not to be a *Vester*. This indicates that the overconfident CEOs may undertake irrational actions on company level, other than assuming unnecessary risk in their personal portfolios.

MODEL

In Model A, where no controls are included, none of the overconfidence proxies or their cash flow interaction terms is significant. This is an expected result, as there are so many other factors influencing the dependent variable, *Investment*, that in Model A are included in the residual. In Model B, where year and industry dummies are included to control for time and industry fixed effects, *Habitual Buyer* and its cash flow interaction remain insignificant, whilst the cash flow interaction of *Habitual Vester* turns highly significant and positive – when firms have CEOs that habitually hold a large proportion of their income in vested options, all else equal they will tend to let their investment depend more on the cash flow. The same result is found when all relevant controls described in section 5 (Model): overconfidence as measured by *Habitual Buyer* does not increase the cash flow sensitivity of investment, but so does overconfidence specified by *Habitual Vester*. According to the full model, having an overconfident CEO on average leads to an extra spending of $58 800 on capital expenditure per $1 million of additional available cash flow.

Thus, whilst *Habitual Vester* acts in accordance with the overconfidence proxies of previous studies, *Habitual Buyer* does not seem to capture the effect of overconfidence; in fact it has no significant effect on the cash flow sensitivity of investment at all. This is likely due to that the information of the act of the CEO to buy shares in the company is much noisier than the act of holding vested options – whilst the second one, if disregarding the possibility of procrastination, is done for speculative reasons, CEOs can buy shares because of many other reasons than for speculation. For example, they may want to signal to the market, or the buying may be an active strategy to acquire a larger stake in the company. Because of

the special occasions when CEOs may want to acquire large stakes of their companies, occasions that could be viewed as outliers and not correlated to overconfidence, the focus on economic significance, although being appropriate for creating option based internal overconfidence proxies, may not be the right focus when creating share based internal overconfidence proxies – when it comes to shares, the largest acquisitions of company shares by CEOs may have a larger probability to have other reasons than overconfidence.

An interesting effect is that whilst *Habitual Buyer* is not significant, when *Habitual Vester* is replaced in the regression the variable Age turns significant and behaves in the way that an overconfidence proxy is expected to. This could imply that age actually captures some overconfidence in the model, even though it is taken over by the proper overconfidence proxy when it is included. Tenure does not prove to have any significance on explaining the investments or its cash flow sensitivity in this data set.

Credit rating is consistently very significant and decreases both the cash flow sensitivity of investment and investment directly, although the first effect is stronger as well as more significant. This is in line with that cash constrained firms to a larger extent let their investments depend on cash flow. Similarly, size decreases the cash flow sensitivity of investment. Larger firms generally have less information asymmetry problems and can also have had more possibilities to build up a cash buffer, both of which would decrease the need to let investment vary with cash flow. Although Q does not seem to affect the cash flow sensitivity of investment, it is worth noting that it affects the investment directly and positively, which is not surprising as firstly, the market value may be high precisely because the market expects valuable investments to be done, and secondly, because management may want to take advantage of the high market price of equity to pursue equity founded investments.

DECISION ON HYPOTHESIS (1)

CEO overconfidence, as measured by habitually increased exposure to company specific risk by habitually having large holdings of vested in-the-money options in relation to total compensation has shown highly significant in explaining the cash flow sensitivity of investment. Thus, Hypothesis (1a) is accepted, although the model suffers from some endogenity problems. Hypothesis (1b) is rejected as habitually increasing share ownership by a large proportion to total compensation has not shown to have any effect on the cash flow sensitivity of investment.

8. Results Hypothesis (2)

To test for Hypothesis (2), the Full Regression (C) is performed on the split sample. The results are presented in Tables 15 and 16 below.

Even though the year and industry dummies have been controlled for in the split sample regression in the same way as in the complete regressions, the results are not reported because of irrelevance.

Table 15: Split Sample Regressions - Full Model - Habitual Vester

	Full Sample			*At least two female directors*			*Less than two female directors*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.1291	0.0175	7.37***	0.1360	0.0266	5.1***	0.1131	0.0216	5.22***
Cash flow (CF)	0.1086	0.1018	1.07	-0.1109	0.1798	-0.62	0.0671	0.1452	0.46
Industry dummies	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Industry dummies * CF	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Year dummies	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Year dummies * CF	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Size	-0.0062	0.0011	-5.55***	-0.0055	0.0015	-3.68***	-0.0056	0.0014	-4.04***
Size * CF	-0.0075	0.0052	-1.45	-0.0042	0.0107	-0.39	-0.0100	0.0071	-1.41
Q	0.0019	0.0009	2.07**	0.0025	0.0015	1.66*	0.0023	0.0009	2.50**
Q * CF	-0.0028	0.0050	-0.56	0.0019	0.0086	0.22	-0.0061	0.0061	-1
G-index	0.0003	0.0005	0.64	0.0009	0.0006	1.49	0.0001	0.0005	0.27
G-index * CF	0.0042	0.0036	1.18	0.0055	0.0064	0.86	0.0023	0.0051	0.46
Credit rating	-0.0017	0.0004	-3.84***	-0.0034	0.0006	-5.59***	-0.0011	0.0006	-1.9*
Credit rating * CF	-0.0081	0.0020	-4.02***	0.0025	0.0067	0.38	-0.0088	0.0024	-3.62***
Ownership	-0.0032	0.0243	-0.13	0.0000	0.0003	-0.08	-0.0001	0.0002	-0.39
Ownership * CF	-0.0866	0.1163	-0.74	0.0014	0.0026	0.53	0.0025	0.0019	1.34
Age	-0.0001	0.0002	-0.67	0.0002	0.0002	1.08	0.0000	0.0002	0.15
Age * CF	0.0017	0.0013	1.30	-0.0021	0.0027	-0.78	0.0002	0.0017	0.1
Tenure	0.0002	0.0002	1.02	-0.0342	0.0193	-1.77*	-0.0058	0.0377	-0.15
Tenure * CF	-0.0002	0.0013	-0.19	-0.0262	0.2373	-0.11	-0.0792	0.1182	-0.67
Overconfidence	-0.0006	0.0023	-0.26	-0.0013	0.0029	-0.45	-0.0007	0.0029	-0.24
Overconfidence * CF	0.0588	0.0193	3.04***	0.0507	0.0348	1.46	0.0670	0.0285	2.35**
Observations	5311			1733			908		
Adjusted R2	0.3843			0.3230			0.4452		

* Significant at 10% ** Significant at 5% *** Significant at 1%

Table 16: Split Sample Regressions - Full Model - Habitual Buyer

	Full Sample			*At least two female directors*			*Less than two female directors*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.1309	0.0176	7.46***	0.1370	0.0268	5.12***	0.1139	0.0215	5.31***
Cash flow (CF)	0.1169	0.1033	1.13	-0.1265	0.1754	-0.72	0.1005	0.1499	0.67
Industry dummies	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Industry dummies * CF	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Year dummies	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Year dummies * CF	see appendix	see appendix	see appendix	Not reported - controled for			Not reported - controled for		
Size	-0.0063	0.0011	-5.60***	-0.0057	0.0015	-3.71***	-0.0057	0.0014	-4.08***
Size * CF	-0.0103	0.0059	-1.73*	-0.0033	0.0108	-0.3	-0.0137	0.0081	-1.69*
Q	0.0020	0.0009	2.09**	0.0024	0.0015	1.58	0.0024	0.0009	2.60***
Q * CF	-0.0015	0.0050	-0.31	0.0045	0.0089	0.51	-0.0040	0.0058	-0.69
G-index	0.0003	0.0005	0.70	0.0009	0.0006	1.55	0.0001	0.0005	0.21
G-index * CF	0.0035	0.0037	0.94	0.0056	0.0063	0.89	0.0027	0.0051	0.53
Credit rating	-0.0017	0.0005	-3.78***	-0.0033	0.0006	-5.51***	-0.0011	0.0006	-1.90*
Credit rating * CF	-0.0100	0.0020	-4.87***	0.0010	0.0062	0.15	-0.0106	0.0026	-4.01***
Ownership	0.0008	0.0256	0.03	0.0000	0.0003	-0.12	-0.0001	0.0002	-0.39
Ownership * CF	-0.0965	0.1225	-0.79	0.0018	0.0027	0.66	0.0029	0.0020	1.49
Age	-0.0001	0.0002	-0.76	0.0002	0.0002	1	0.0000	0.0002	0.07
Age * CF	0.0026	0.0014	1.88*	-0.0016	0.0027	-0.58	0.0004	0.0017	0.25
Tenure	0.0002	0.0002	0.88	-0.0343	0.0197	-1.74*	-0.0052	0.0380	-0.14
Tenure * CF	0.0000	0.0013	-0.01	-0.0406	0.2393	-0.17	-0.0782	0.1260	-0.62
Overconfidence	-0.0067	0.0038	-1.73*	-0.0029	0.0053	-0.54	-0.0038	0.0059	-0.65
Overconfidence * CF	-0.0075	0.0335	-0.22	0.0280	0.0460	0.61	-0.0343	0.0515	-0.67
Observations	5311			1733			908		
Adjusted R2	0.3843			0.3233			0.4431		

* Significant at 10% ** Significant at 5% *** Significant at 1%

In the section on the data, summary statistics on the two samples have already been presented. However, it is also important to look at the correlations of the *Female2*, which divides the sample in the split sample analysis, with the overconfidence measures as well as the residuals of the main regressions (*û(vest)* and *û(buy)*), which are presented in Table 17 and Table 18 below.

Table 17: Correlations, Split Variable and Proxies

	Female2
Female2	1
Vester	0.0176
Buyer	-0.0481*
Habitual Vester	0.0054
Habitual Buyer	-0.0072

* Significant at 1%

Table 18: Correlations, Split Variable and Error Term

	Female2
Female2	1
û(vest)	-0.0803*
û(buy)	-0.0807*

* Significant at 1%

9. Discussion Hypothesis (2)

A concern when performing a split sample analysis is that the subsamples differ when it comes to exogenous variables in the model, which biases the results and makes the conclusions unreliable. The summary statistics in Table 3 and Table 4 show some signs of the two samples being different. Mainly, the sample with firms having at least two female directors is smaller and consists of significantly larger firms. Accordingly, it contains some typical characteristics for larger firms: higher compensation, lower CEO tenure and lower returns. Interestingly, the sample with less than two female directors has a lower average G-index, implying better corporate governance, and a higher credit rating. Both of these sample characteristics should limit the cash flow sensitivity of investment.

Further, Table 17 shows that the *Female2* variable is not significantly correlated with the trial measures of overconfidence, except the year and CEO specific variable that is used to create the share based *Habitual Buyer* proxy – a proxy that according to the rejection of Hypothesis (1b) fails to capture overconfidence. This indicates that the presence of overconfidence amongst CEOs is independent of the whether there are at least two female directors on the board or not – which is good as the aim of Hypothesis (2) is to find out if the female representation hinders the negative effects of the overconfidence. A serious problem, however, is that *Female2* is correlated with the residual of the main regressions. This indicates that the unobservable factors, that may also be correlated with the overconfidence proxies and their cash flow interactions, are unevenly present in the two subsamples. This may cause bias in the results.

As can be seen from Table 9, when using *Habitual Vester* as a proxy for overconfidence there are significant signs showing that having at least two female directors on the board limits the irrational decisions taken by overconfident CEOs, as the term of interest changes in magnitude as well as in significance across the samples. The coefficient of the overconfidence cash flow interaction term, which measures the magnitude of the increased cash flow sensitivity of investment caused by overconfidence, increases when there are less than two female directors as compared to the full sample, whilst it decreases when there are at least two women on the board. Even more importantly, in the sample with at least two female directors, the coefficient loses its significance – if there are at least two female directors the overconfidence of the CEO does not have significant effect on the investment decisions taken by the company. If there are less than two female directors, an overconfident CEO increases the investments by $76 000 per each $1 million of cash flow. The term is slightly less significant even in the sample with less than two female directors; however, it should be noted that the loss in significance to some extent is caused by the reduction in sample size.

Table 10 shows that when *Habitual Buyer* is used as an overconfidence proxy, no meaningful additional results are obtained in the split sample analysis. Thus, the conclusion from section 7 is reinforced – the way that the overconfidence proxy based on share ownership by the CEOs is employed by this thesis fails to capture the overconfidence effect.

In the sample with less than two female directors, the cash flow sensitivity of investment increases not only with the presence of overconfident CEOs, but also when the company is smaller (which could imply higher information asymmetry) and when the credit rating is worse (more restricted access to external capital). These effects could follow characteristics of the sample, but they could also imply that gender diverse boards are more active and not only limit the irrational investment decisions taken by overconfident CEOs, but also work for a more even and market driven (as opposed to cash flow driven and opportunistic) investment policy. The engaged work of the diverse boards may overcome the information asymmetry and opportunistic investment.

DECISION ON HYPOTHESIS (2)

Even though the results are not strongly significant and may be affected by serious endogenity issues, I do not reject Hypothesis (2), as I find some evidence for the claim that at least two female directors limit the transfer of CEOs personal overconfidence decisions onto corporate investment decisions.

10. Concluding Analysis

One of the main differences of this study as compared to previous ones is the focus on economic value in the creation of overconfidence proxies. Although it makes intuitive sense to evaluate the value of the overexposure that the CEOs are willing to take relative to their total annual income, it should indicate how much the confidence means to them, it has proved to not be the appropriate way to evaluate changes in CEO holdings of company shares. There can be many reasons to acquire shares in the company, especially when it comes to the largest amounts – overconfidence effects could be better captured by small but frequent adjustments in holdings, but these would still be noisy due to signalling concerns, which is not the case for option exercise.

The *Habitual Vester* is a less noisy proxy than *Habitual Buyer*, and here the focus on economic value to the CEO shows to be good. Partly, the value of the options proxies for the amount by which they are in-the-money, as options that are more in-the-money are worth more. In addition, as previously mentioned, the focus on economic value reduces the risk of delayed option exercise due to procrastination – if there is a lot to gain the probability of revising the portfolio increases. To compare the value against the total annual compensation of the CEOs is appropriate as their compensation is likely to be structured in a way so that the total amount has real value to them; moreover the CEOs are likely to use their annual compensation as a value reference. The way of measuring will inevitably overlook some overconfidence as some managers may never hold significant amounts of their total income in vested options, thus they do not have the possibility to classify as overconfident even if they are. This prudent way of classifying overconfidence will bias its importance downwards, as some overconfident CEOs remain undetected. Furthermore, as the sample consists of S&P 1500 companies, most companies employ options as an important part of their compensation package.

The two main rational theories that predict the cash flow sensitivity of investment, agency theory and insider information and pecking order, are not supported by the data that this thesis is based upon. To begin with, agency theory predicts that when the CEOs are more aligned with the interests of the shareholders, that is when they increase exposure towards company specific risk as *Habitual Vester* and *Habitual Buyer* do, they should invest in the shareholders rational interest rather than empire build when cash flow is available – the expected effect is the opposite of the one predicted by the overconfidence

theory. When it comes to insider information, the check regressions show that the decisions taken by *Vesters* are not followed by abnormal returns. Consequently, the conclusion is that the significant effect that *Habital Vester* shows is due to overconfidence.

Even though Hypothesis (1) indicates that only *Habitual Vester*, and not *Habitual Buyer*, is a suitable proxy for overconfidence, the split sample analysis is performed on both proxies. This follows the discussion about the importance of looking at various variables as there may be several ways to increase exposure towards company specific risk when feeling confident about the results. Yet another possibility is that CEOs are overconfident but still do not show it in their personal portfolio decisions, even though they let it affect decisions taken at company level. This would be a reason to complement the use of internal overconfidence proxies with external ones, despite of the drawbacks of the external proxies.

From the sample analyzed in this thesis, it seems as CEOs, although they indicate that they personally believe in the company by significantly increasing the exposure in their personal portfolio, are influenced by a more rational board if the board has at least two female directors. In the subsample with more gender balanced boards the cash flow sensitivity of investment does not increase with the existence of overconfident CEOs; in the subsample with heavy male dominance on the boards, the overconfidence of the CEOs shown by their personal portfolio decisions is reoccurring in the company-level investment decisions. Then again, the male dominated subsample on average consists of smaller firms, and it is more likely that small firms have to act in an opportunistic way and invest when cash flow is available. Still, the same subsample on average has a better credit rating, which should ease the cash constraint on rational investments.

It is important to note that although this study points at a positive aspect of companies with gender balanced boards, no conclusions regarding the value of gender quotas can be drawn from the results of this thesis. Mainly, there is always the problem of endogenitiy. The number of female directors on a board is not randomly assigned but rather a complex process that is partially determined within the model. Even when trying to control for corporate governance, it is likely that a certain type of firms promote gender balance and also perform well in other areas. For example, these firms may have better and more engaged election committees, because if a wider search for complementing board candidates is performed it is the likelihood of gender balance increases. These election committees would not only likely propose boards with a better gender balance, but also through their elaborate search find the most suitable candidates regardless of the sex. Secondly, a forcing regulation could hurt well-governed firms by limiting their freedom of action, and finally, there are at least as many moral opponents against the female quotas to boards as there are against gender imbalance on boards of directors. However, even if the results are not robust enough for policy evaluation, they could have some informational value to investors, as having at least two female directors on the board in the sample studied in this thesis signals a more rational investment decision process.

11. Limitations and Suggestion for Further Research

An obvious challenge of a study that aims to measure such an intangible effect such as overconfidence is to make sure that the model measures the effect of interest and is free of endogenity – questions that have been discussed throughout the thesis. Another limitation when dealing with a sample of firms over time is the issue of the survivorship bias. This investigation, in fact, by looking at CEOs suffers from a double survivorship bias: firstly, very badly managed firms can go bankrupt, and secondly, CEOs that show too much – or too little – confidence can be fired.

Not only can CEOs fall out of their sample depending on their degree of overconfidence, it is also possible that they enter the sample because of their overconfidence. If it is more likely that "brave" CEOs

are selected to manage companies with a need to adapt quickly and respond opportunistically to the current conditions, then overconfident CEOs may be hired in firms that are to have investments that vary with cash flow – rather than the overconfident CEO causing the cash flow sensitivity of investment. If this would be the case, the study would suffer of reverse causality.

Although attempts are made to control for the firm specific factors that could affect cash flow sensitivity of investment – partly with control variables such as industry, size, Q, credit rating, etc., but also by clustering the standard errors – firm specific factors may affect the results. To highlight the effect of the CEO's overconfidence, an event study around the change of CEOs with varying confidence could be performed. However, to do this a longer sample period than ten years would be needed, because of the time needed to determine overconfidence, and because of the noisy signals sent by the data around the appointment of a new CEO. Similarly, with a longer sample an event study around the change of female board representation could be performed, to see whether overconfident CEOs change their behavior following changes in the board composition. In the sample studied by this thesis, there are only 205 companies with overconfident CEOs that reclassify according to *Female2* during the ten years.

In the data section it is mentioned that the chosen data set, and any conclusions drawn from it, may be affected by the inclusion of the fact that it spans over the dot-com bubble and crash that took place in the late 1990s and early 2000s. In this thesis, the effect of year specific economic conditions and market sentiment is controlled for with year fixed effects dummies. Still, it would be of interest to look at a longer time span and see how primarily Hypothesis (1), the existence of CEO overconfidence and its effect on corporate investment decisions, is affected by the overall levels of confidence in the market generated by booms and busts. A long-term study corresponding to the Hypothesis (2) of this thesis could also be of interest, as the importance and effect of having a diverse group may depend on the level of perceived market anomaly.

Furthermore, if the results are to be globally generalized it is a sample selection bias to only investigate large US firms, as this study does. Many of the key factors investigated in this thesis – overconfidence, gender issues and corporate governance – vary across nations and cultures, an interesting area for further research would therefore be to make a similar investigation in an international setting to incorporate cultural issues.

Finally, I believe that the intersection of behavioral finance and gender issues can open up for many interesting research fields. As some countries have introduced rules for female quotas on boards this provides a good setting for a natural experiment – for example it would be interesting to study how the amount of female board members influences the decision making in Norwegian companied before and after the legislation in 2008.

12. References

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DATABASES AND STATISTICS

Wharton Research Data Services (WRDS) was used in preparing this thesis. This service and the data available thereon constitute valuable intellectual property and trade secrets of WRDS and/or its third-party suppliers.

Compustat Execucomp, Standard & Poor

Compustat North America, Standard & Poor

Fama-French Industries, French's Website, Dartmouth

The CRSP® US Stock Database, the Center for Research in Security Prices

RiskMetrics Directors, ISS Governance Services

RiskMetrics Governance, ISS Governance Services

10. Appendix

Table 4b: Regression Results for Habitual Buyer - Including Year and Industry Dummy Variables

	Model A			*Model B*			*Model C*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.0594	0.0013	46.01***	0.0731	0.0060	12.26***	0.1309	0.0176	7.46***
Cash flow (CF)	0.0153	0.0062	2.46*	-0.0283	0.0463	-0.61	0.1169	0.1033	1.13
Agric				-0.0178	0.0063	-2.84	-0.0081	0.0085	-0.95
Food				-0.0065	0.0065	-1.00	-0.0065	0.0076	-0.86
Soda				0.0092	0.0082	1.12	0.0154	0.0090	1.71
Beer				-0.0151	0.0092	-1.65	-0.0046	0.0104	-0.44
Smoke				-0.0322	0.0057	-5.67	-0.0181	0.0097	-1.86
Toys				-0.0144	0.0074	-1.95	-0.0111	0.0097	-1.14
Fun				0.0154	0.0133	1.16	0.0200	0.0137	1.45
Books				-0.0170	0.0082	-2.08	-0.0100	0.0098	-1.02
Hshld				-0.0078	0.0060	-1.29	-0.0088	0.0079	-1.12
Clths				-0.0130	0.0070	-1.85	-0.0153	0.0082	-1.85
Hlth				-0.0003	0.0073	-0.03	0.0070	0.0090	0.77
MedEq				-0.0114	0.0072	-1.58	-0.0211	0.0079	-2.68
Drugs				-0.0113	0.0059	-1.92	-0.0133	0.0076	-1.75
Chems				-0.0085	0.0063	-1.35	-0.0065	0.0081	-0.81
Rubbr				-0.0048	0.0080	-0.60	-0.0105	0.0073	-1.43
Txtls				-0.0078	0.0076	-1.02	0.0015	0.0113	0.14
BldMt				-0.0028	0.0102	-0.28	-0.0024	0.0168	-0.15
Cnstr				-0.0306	0.0088	-3.48	-0.0354	0.0084	-4.22
Steel				-0.0026	0.0065	-0.40	-0.0012	0.0079	-0.15
FabPr				0.0203	0.0211	0.96	0.0525	0.0167	3.15
Mach				-0.0131	0.0056	-2.31	-0.0121	0.0074	-1.63
ElcEq				-0.0083	0.0080	-1.04	-0.0167	0.0069	-2.43
Autos				-0.0016	0.0070	-0.23	0.0068	0.0088	0.77
Aero				-0.0196	0.0058	-3.38	-0.0116	0.0074	-1.58
Ships				0.0058	0.0327	0.18	0.0115	0.0319	0.36
Guns				-0.0240	0.0073	-3.30	-0.0145	0.0074	-1.95
Gold				0.0185	0.0076	2.42	0.0246	0.0095	2.59
Mines				0.0273	0.0190	1.44	0.0564	0.0334	1.69
Coal				0.0425	0.0199	2.14	0.0481	0.0193	2.49
Oil				0.1023	0.0123	8.33	0.1011	0.0136	7.43
Util				0.0082	0.0061	1.35	0.0158	0.0075	2.09
Telcm				0.0182	0.0084	2.16	0.0280	0.0101	2.76
PerSv				0.0143	0.0096	1.50	0.0137	0.0203	0.67
BusSv				-0.0148	0.0094	-1.57	-0.0279	0.0190	-1.46
Hardw				0.0001	0.0053	0.02	0.0040	0.0068	0.58
Softw				-0.0268	0.0110	-2.45	-0.0206	0.0234	-0.88
Chips				0.0018	0.0058	0.31	0.0137	0.0087	1.57
LabEq				-0.0156	0.0065	-2.41	-0.0124	0.0092	-1.34
Paper				-0.0041	0.0062	-0.66	-0.0001	0.0077	-0.01
Boxes				-0.0070	0.0074	-0.95	0.0017	0.0080	0.21
Trans				0.0434	0.0103	4.22	0.0466	0.0120	3.89
Whlsl				-0.0214	0.0063	-3.42	-0.0209	0.0077	-2.71
Rtail				0.0197	0.0064	3.10	0.0164	0.0076	2.17
Meals				0.0641	0.0094	6.83	0.0381	0.0100	3.82
Agric * CF				0.0307	0.0517	0.59	-0.0538	0.0951	-0.57
Food * CF				0.0740	0.0506	1.46	-0.0774	0.0376	-2.06
Soda * CF				-0.6054	0.2630	-2.30	-0.6839	0.2763	-2.47
Beer * CF				0.0628	0.0463	1.36	-0.0502	0.0775	-0.65
Smoke * CF				0.0054	0.0391	0.14	-0.1255	0.0329	-3.81
Toys * CF				-0.0050	0.0398	-0.13	-0.0870	0.0410	-2.12
Fun * CF				-0.0177	0.0354	-0.50	-0.0513	0.1506	-0.34
Books * CF				-0.0781	0.0428	-1.83	-0.2618	0.0527	-4.96
Hshld * CF				0.0458	0.0336	1.36	-0.0666	0.0432	-1.54
Clths * CF				0.0164	0.0309	0.53	-0.0709	0.0546	-1.30
Hlth * CF				-0.0264	0.0387	-0.68	-0.0178	0.0489	-0.36
MedEq * CF				-0.0025	0.0339	-0.08	-0.0884	0.0350	-2.52
Drugs * CF				-0.0488	0.0210	-2.32	-0.0966	0.0314	-3.08
Chems * CF				-0.0079	0.0287	-0.27	-0.0616	0.0357	-1.72
Rubbr * CF				0.1175	0.0387	3.03	-0.1128	0.0919	-1.23
Txtls * CF				0.0044	0.0537	0.08	-0.0458	0.0495	-0.92
BldMt * CF				0.0306	0.0492	0.62	-0.0651	0.0498	-1.31
Cnstr * CF				-0.0010	0.0403	-0.02	-0.0676	0.0452	-1.49
Steel * CF				0.0342	0.0391	0.87	-0.0658	0.0432	-1.52
FabPr * CF				0.3841	0.2537	1.51	0.8462	0.5159	1.64
Mach * CF				-0.0395	0.0223	-1.77	-0.0807	0.0283	-2.85
ElcEq * CF				-0.0387	0.0313	-1.24	-0.0244	0.0349	-0.70
Autos * CF				-0.0295	0.0263	-1.12	-0.1225	0.0424	-2.89
Aero * CF				-0.0253	0.0300	-0.84	-0.1506	0.0373	-4.04
Ships * CF				-0.1075	0.0449	-2.39	-0.1390	0.0475	-2.92
Guns * CF				-0.0478	0.0226	-2.12	-0.0777	0.0362	-2.15
Gold * CF				-0.0021	0.0365	-0.06	-0.0470	0.0416	-1.13
Mines * CF				0.2132	0.1363	1.56	0.1119	0.1776	0.63
Coal * CF				0.8706	0.2647	3.29	0.8767	0.2483	3.53
Oil * CF				-0.0486	0.0731	-0.67	-0.1028	0.0573	-1.79
Util * CF				0.0472	0.0990	0.48	-0.0224	0.1251	-0.18
Telcm * CF				-0.0628	0.0219	-2.87	-0.0650	0.0317	-2.05
PerSv * CF				0.0247	0.0303	0.82	-0.0332	0.0606	-0.55
BusSv * CF				-0.0611	0.0278	-2.20	-0.0962	0.0551	-1.75
Hardw * CF				-0.0276	0.0240	-1.15	-0.0772	0.0326	-2.37
Softw * CF				-0.0929	0.0342	-2.71	-0.0529	0.0657	-0.81
Chips * CF				-0.0189	0.0188	-1.01	0.0142	0.0317	0.45
LabEq * CF				-0.0294	0.0320	-0.92	-0.1088	0.0385	-2.82
Paper * CF				0.0557	0.0398	1.40	-0.0001	0.0486	0.00
Boxes * CF				-0.0878	0.1515	-0.58	-0.0425	0.0752	-0.57
Trans * CF				0.1684	0.0985	1.71	0.1642	0.1063	1.55
Whlsl * CF				-0.0161	0.0267	-0.60	-0.0378	0.0363	-1.04
Rtail * CF				0.0118	0.0341	0.35	0.0237	0.0373	0.64
Meals * CF				0.0704	0.0569	1.24	0.1584	0.0782	2.03
Year 1998				-0.0015	0.0024	-0.62	0.0019	0.0023	0.79
Year 1999				-0.0142	0.0027	-5.28	-0.0092	0.0027	-3.37
Year 2000				-0.0151	0.0027	-5.63	-0.0086	0.0027	-3.19
Year 2001				-0.0164	0.0028	-5.86	-0.0091	0.0028	-3.26
Year 2002				-0.0282	0.0028	-10.07	-0.0185	0.0028	-6.62
Year 2003				-0.0312	0.0028	-11.05	-0.0217	0.0028	-7.64
Year 2004				-0.0305	0.0028	-10.94	-0.0201	0.0029	-6.92
Year 2005				-0.0273	0.0028	-9.65	-0.0135	0.0030	-4.47
Year 2006				-0.0247	0.0028	-8.67	-0.0077	0.0033	-2.33
Year 1998 * CF				0.0231	0.0420	0.55	-0.0727	0.0421	-1.73
Year 1999 * CF				0.0865	0.0423	2.05	0.0245	0.0465	0.53
Year 2000 * CF				0.0793	0.0404	1.96	0.0146	0.0422	0.35
Year 2001 * CF				0.0812	0.0402	2.02	0.0461	0.0424	1.09
Year 2002 * CF				0.0801	0.0404	1.98	0.0191	0.0437	0.44
Year 2003 * CF				0.0908	0.0401	2.27	0.0477	0.0419	1.14
Year 2004 * CF				0.0748	0.0404	1.85	0.0198	0.0428	0.46
Year 2005 * CF				0.0780	0.0410	1.90	-0.0142	0.0452	-0.32
Year 2006 * CF				0.1173	0.0424	2.76	0.0318	0.0496	0.64
Size							-0.0063	0.0011	-5.60***
Size * CF							-0.0103	0.0059	-1.73*
Q							0.0020	0.0009	2.09
Q * CF							-0.0015	0.0050	-0.31
G-index							0.0003	0.0005	0.70
G-index * CF							0.0035	0.0037	0.94
Credit rating							-0.0017	0.0005	-3.78***
Credit rating * CF							-0.0100	0.0020	-4.87***
Ownership							0.0008	0.0256	0.03
Ownership * CF							-0.0965	0.1225	-0.79
Age							-0.0001	0.0002	-0.76
Age * CF							0.0026	0.0014	1.88*
Tenure							0.0002	0.0002	0.88
Tenure * CF							0.0000	0.0013	-0.01
Overconfidence	0.0008	0.0037	0.22	-0.0008	0.0032	-0.26	-0.0067	0.0038	-1.73*
Overconfidence * CF	0.0123	0.0131	0.94	0.0026	0.0125	0.21	-0.0075	0.0335	-0.22
Observations	9534			9534			5311		
Adjusted R2	0.0035			0.3303			0.3826		

* Significant at 10% ** Significant at 5% *** Significant at 1%. Significance not reported for year/industry dummies.

Table 3a: Regression Results for Habitual Vester - Including Year and Industry Dummy Variables

	Model A			*Model B*			*Model C*		
	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic	Coefficient	Standard Deviation	t-statistic
Constant	0.0583	0.0015	38.53***	0.0713	0.0060	11.91***	0.1291	0.0175	7.37***
Cash flow (CF)	0.0118	0.0064	1.84*	-0.0389	0.0456	-0.85	0.1086	0.1018	1.07
Agric				-0.0184	0.0063	-2.93	-0.0095	0.0088	-1.09
Food				-0.0056	0.0065	-0.86	-0.0060	0.0077	-0.78
Soda				0.0103	0.0081	1.28	0.0138	0.0090	1.53
Beer				-0.0142	0.0086	-1.65	-0.0056	0.0100	-0.56
Smoke				-0.0327	0.0058	-5.64	-0.0169	0.0095	-1.77
Toys				-0.0143	0.0073	-1.97	-0.0105	0.0099	-1.05
Fun				0.0152	0.0134	1.14	0.0192	0.0141	1.36
Books				-0.0177	0.0082	-2.17	-0.0110	0.0098	-1.13
Hshld				-0.0071	0.0059	-1.19	-0.0087	0.0079	-1.10
Clths				-0.0126	0.0069	-1.82	-0.0150	0.0082	-1.82
Hlth				-0.0015	0.0072	-0.21	0.0068	0.0090	0.75
MedEq				-0.0115	0.0071	-1.62	-0.0199	0.0079	-2.51
Drugs				-0.0120	0.0059	-2.05	-0.0116	0.0076	-1.52
Chems				-0.0076	0.0063	-1.22	-0.0061	0.0081	-0.76
Rubbr				-0.0049	0.0079	-0.62	-0.0096	0.0073	-1.31
Txtls				-0.0067	0.0075	-0.89	0.0012	0.0110	0.11
BldMt				-0.0019	0.0101	-0.19	-0.0019	0.0168	-0.11
Cnstr				-0.0298	0.0090	-3.32	-0.0342	0.0084	-4.07
Steel				-0.0014	0.0064	-0.22	-0.0012	0.0079	-0.15
FabPr				0.0209	0.0206	1.02	0.0520	0.0181	2.87
Mach				-0.0128	0.0056	-2.29	-0.0120	0.0075	-1.60
ElcEq				-0.0094	0.0079	-1.19	-0.0160	0.0067	-2.38
Autos				-0.0008	0.0070	-0.12	0.0070	0.0089	0.79
Aero				-0.0194	0.0058	-3.33	-0.0122	0.0074	-1.65
Ships				0.0050	0.0336	0.15	0.0113	0.0321	0.35
Guns				-0.0229	0.0071	-3.20	-0.0132	0.0075	-1.75
Gold				0.0192	0.0074	2.58	0.0252	0.0093	2.71
Mines				0.0273	0.0191	1.43	0.0549	0.0329	1.67
Coal				0.0424	0.0202	2.10	0.0487	0.0190	2.56
Oil				0.1024	0.0122	8.40	0.1007	0.0136	7.41
Util				0.0095	0.0061	1.56	0.0160	0.0076	2.10
Telcm				0.0185	0.0084	2.21	0.0285	0.0101	2.82
PerSv				0.0139	0.0096	1.45	0.0130	0.0204	0.64
BusSv				-0.0148	0.0095	-1.57	-0.0272	0.0190	-1.43
Hardw				0.0003	0.0052	0.05	0.0033	0.0069	0.48
Softw				-0.0260	0.0110	-2.37	-0.0198	0.0234	-0.85
Chips				0.0019	0.0058	0.33	0.0134	0.0087	1.54
LabEq				-0.0156	0.0066	-2.34	-0.0105	0.0095	-1.10
Paper				-0.0036	0.0061	-0.58	-0.0003	0.0077	-0.03
Boxes				-0.0059	0.0074	-0.79	0.0011	0.0081	0.14
Trans				0.0442	0.0103	4.31	0.0466	0.0120	3.89
Whlsl				-0.0207	0.0062	-3.33	-0.0203	0.0078	-2.59
Rtail				0.0196	0.0063	3.11	0.0167	0.0076	2.19
Meals				0.0632	0.0091	6.94	0.0385	0.0099	3.89
Agric * CF				-0.0022	0.0578	-0.04	-0.0574	0.1030	-0.56
Food * CF				0.0623	0.0552	1.13	-0.0944	0.0457	-2.06
Soda * CF				-0.6080	0.2607	-2.33	-0.6947	0.2794	-2.49
Beer * CF				0.0320	0.0438	0.73	-0.0560	0.0637	-0.88
Smoke * CF				-0.0390	0.0412	-0.95	-0.1682	0.0405	-4.16
Toys * CF				-0.0265	0.0380	-0.70	-0.1144	0.0422	-2.71
Fun * CF				-0.0201	0.0354	-0.57	-0.0689	0.1484	-0.46
Books * CF				-0.0796	0.0382	-2.08	-0.2495	0.0480	-5.19
Hshld * CF				0.0117	0.0310	0.38	-0.0781	0.0448	-1.74
Clths * CF				0.0121	0.0305	0.40	-0.0726	0.0559	-1.30
Hlth * CF				-0.0434	0.0365	-1.19	-0.0497	0.0424	-1.17
MedEq * CF				-0.0420	0.0352	-1.19	-0.1278	0.0406	-3.15
Drugs * CF				-0.0635	0.0220	-2.88	-0.1305	0.0359	-3.64
Chems * CF				-0.0050	0.0282	-0.18	-0.0615	0.0359	-1.71
Rubbr * CF				0.0906	0.0425	2.13	-0.1147	0.1006	-1.14
Txtls * CF				0.0040	0.0521	0.08	-0.0466	0.0495	-0.94
BldMt * CF				0.0312	0.0488	0.64	-0.0637	0.0502	-1.27
Cnstr * CF				-0.0300	0.0421	-0.71	-0.1051	0.0493	-2.13
Steel * CF				0.0339	0.0381	0.89	-0.0626	0.0438	-1.43
FabPr * CF				0.3647	0.2382	1.53	0.7439	0.5378	1.38
Mach * CF				-0.0459	0.0220	-2.09	-0.0902	0.0326	-2.77
ElcEq * CF				-0.0368	0.0284	-1.29	-0.0380	0.0390	-0.97
Autos * CF				-0.0291	0.0256	-1.14	-0.1167	0.0425	-2.75
Aero * CF				-0.0406	0.0357	-1.14	-0.1481	0.0392	-3.78
Ships * CF				-0.1183	0.0501	-2.36	-0.1446	0.0539	-2.68
Guns * CF				-0.0479	0.0209	-2.29	-0.0806	0.0344	-2.34
Gold * CF				-0.0003	0.0362	-0.01	-0.0394	0.0419	-0.94
Mines * CF				0.2155	0.1345	1.60	0.1128	0.1798	0.63
Coal * CF				0.8314	0.2585	3.22	0.8355	0.2388	3.50
Oil * CF				-0.0525	0.0703	-0.75	-0.1054	0.0570	-1.85
Util * CF				0.0428	0.0965	0.44	-0.0279	0.1214	-0.23
Telcm * CF				-0.0821	0.0207	-3.97	-0.0866	0.0328	-2.64
PerSv * CF				0.0184	0.0294	0.63	-0.0383	0.0657	-0.58
BusSv * CF				-0.0707	0.0269	-2.62	-0.0937	0.0608	-1.54
Hardw * CF				-0.0254	0.0242	-1.05	-0.0869	0.0332	-2.62
Softw * CF				-0.1149	0.0344	-3.34	-0.0571	0.0708	-0.81
Chips * CF				-0.0232	0.0186	-1.25	0.0159	0.0282	0.57
LabEq * CF				-0.0546	0.0312	-1.75	-0.1325	0.0492	-2.70
Paper * CF				0.0590	0.0388	1.52	0.0073	0.0485	0.15
Boxes * CF				-0.0944	0.1469	-0.64	-0.0626	0.0740	-0.85
Trans * CF				0.1660	0.0977	1.70	0.1629	0.1093	1.49
Whlsl * CF				-0.0285	0.0255	-1.12	-0.0508	0.0375	-1.35
Rtail * CF				0.0065	0.0324	0.20	0.0045	0.0403	0.11
Meals * CF				0.0653	0.0536	1.22	0.1401	0.0776	1.80
Year 1998				-0.0014	0.0024	-0.58	0.0019	0.0024	0.81
Year 1999				-0.0143	0.0027	-5.37	-0.0092	0.0027	-3.39
Year 2000				-0.0155	0.0026	-5.85	-0.0088	0.0027	-3.24
Year 2001				-0.0166	0.0028	-6.01	-0.0092	0.0028	-3.28
Year 2002				-0.0286	0.0028	-10.31	-0.0188	0.0028	-6.72
Year 2003				-0.0316	0.0028	-11.30	-0.0218	0.0028	-7.69
Year 2004				-0.0309	0.0028	-11.20	-0.0206	0.0029	-7.02
Year 2005				-0.0274	0.0028	-9.78	-0.0137	0.0030	-4.54
Year 2006				-0.0249	0.0028	-8.85	-0.0079	0.0033	-2.41
Year 1998 * CF				0.0213	0.0418	0.51	-0.0747	0.0425	-1.76
Year 1999 * CF				0.0860	0.0413	2.08	0.0227	0.0467	0.49
Year 2000 * CF				0.0874	0.0395	2.21	0.0132	0.0425	0.31
Year 2001 * CF				0.0849	0.0391	2.17	0.0395	0.0424	0.93
Year 2002 * CF				0.0908	0.0396	2.29	0.0239	0.0439	0.54
Year 2003 * CF				0.0968	0.0392	2.47	0.0421	0.0421	1.00
Year 2004 * CF				0.0802	0.0395	2.03	0.0200	0.0432	0.46
Year 2005 * CF				0.0757	0.0400	1.89	-0.0185	0.0455	-0.41
Year 2006 * CF				0.1187	0.0415	2.86	0.0270	0.0492	0.55
Size							-0.0062	0.0011	-5.55***
Size * CF							-0.0075	0.0052	-1.45
Q							0.0019	0.0009	2.07**
Q * CF							-0.0028	0.0050	-0.56
G-index							0.0003	0.0005	0.64
G-index * CF							0.0042	0.0036	1.18
Credit rating							-0.0017	0.0004	-3.84***
Credit rating * CF							-0.0081	0.0020	-4.02***
Ownership							-0.0032	0.0243	-0.13
Ownership * CF							-0.0866	0.1163	-0.74
Age							-0.0001	0.0002	-0.67
Age * CF							0.0017	0.0013	1.30
Tenure							0.0002	0.0002	1.02
Tenure * CF							-0.0002	0.0013	-0.19
Overconfidence	0.0023	0.0024	0.99	0.0027	0.0019	1.40	-0.0006	0.0023	-0.26
Overconfidence * CF	0.0167	0.0143	1.17	0.0527	0.0109	4.82***	0.0588	0.0193	3.04***
Observations	9534			9534			5311		
Adjusted R2	0.0048			0.335			0.3843		