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# Risk taking and Performance
## A Question of Gender?

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### ABSTRACT

This thesis investigates the effect that female directors and top managers have on the risk levels of a company, and the effect that gender diversity brings to firm performance. We perform cross-sectional regression analyses on a dataset consisting of 83 companies included in the OMX Large Cap and Mid Cap between 2004 and 2008, using the fraction of female directors on the board (FFD) and management dummies as regressors. Our first part of the thesis tests whether female directors and managers are more risk averse than men. We use risk measures such as the Debt-to-Equity ratio, Cash-to-Total Assets ratio and the Stock Price Volatility. In the second part of the thesis, where we investigate the effect that gender diversity has on firm performance, performance is defined as Excess Return, Tobin's Q, Return on Assets and Return on Equity. Two of our risk measures generate significant results, proving women to be more risk averse than men. However, these results do not remain when tackling problems with omitted variables. Furthermore, one of our performance measures, Tobin's Q, clearly shows that gender diversity enhances firm performance. This result is robust for heteroscedasticity and remains even after addressing endogeneity problems due to omitted variables. The thesis discusses methodological and sociological explanations to these results.

**Key words:** Gender diversity, Risk taking, Performance.

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# 1. Introduction

Global stock markets collapsed during 2008 and worldwide indices fell as much as 40 percent (Rooney 2008). In Sweden, nearly all listed companies at the Stockholm Stock Exchange had a negative return in 2008, and the global downturn resulted in a widespread economic crisis. The debate with regard to the crisis has to a large extent focused on attempts to find factors that can explain the overall market collapse. One factor that has been especially emphasized, and questioned, is the high degree of risk taking among board members and top managers (Ferrary 2009).

The risk propensity however, may, to one part, be a question of gender. In a number of studies women have been proven to be more risk averse than men with regard to investments and other financial decisions (e.g. Goetze and Meier-Pesti 2006, Niessen and Ruenzi 2007, Bernasek and Shwiff 2001, Ansic and Powell 1997). Given their lower appetite for risk, women could have the potential to add new features to the business environment, which today is highly male-dominated, and thereby outweigh the risk taking behavior of their male counterparts. Following these findings, some researchers have taken it one step further, claiming that companies would not have been as badly hit by the recent crisis if the fraction of women in leading positions would have been higher, since gender diversity creates a more balanced level of risk (Jordan and Sullivan 2009). In a broader perspective, we believe that this statement highlights two interrelated, and highly relevant aspects of gender diversity; risk taking and firm performance. Since women are in general underrepresented on company boards and in top management positions, this subject is both interesting and delicate.

In the United States, women account for 17 percent of corporate directorships, and in Great Britain the number is even less, where women account for just 12 percent of corporate directorship in companies on the FTSE 100 stock exchange (Jordan and Sullivan 2009, Kristof 2009, Thornhill 2009). In Sweden, the majority of the companies on the Stockholm Stock Exchange have less than 20 percent women on their boards. Further, in one out of five of these listed companies, women hold no corporate directorship at all (Dagens Nyheter 2009). The uncertainty prevailing with regard to women's contribution to business, both in the form of personal characteristics and competence, and how these "female features" finally translate into firm outcome, may be one reason why the above numbers are so low. Given this, we believe that well documented empirical research in the area is necessary.

One study that particularly highlights both the risk and the performance aspects of gender diversity is the recent study conducted on the French CAC 40 stock exchange index, by the French professor Michel Ferrary (2009). He shows that companies with a higher proportion of female managers performed better in 2008 than companies with a lower proportion, all else equal. Ferrary (2009) argues that female managers create a more diverse culture and appear to balance the risk taking behavior of their male colleagues, thereby affecting the firm performance in a positive way (Jordan and Sullivan 2009). Similar effects have been identified in the Icelandic market. Audur Capital, founded and led by women, is one of the few financial companies in Iceland to have survived the crisis. The founder, Halla Tomasdottir, is certain that if women had led the country's major banks, Iceland would not have been as hurt by the crisis, with the collapse and subsequent nationalization of the country's financial institutions as a consequence (Thornhill 2009).

The above reasoning and findings caught our interest to further investigate the risk and firm performance aspects of gender diversity. If we can prove women to be more risk averse than men, thereby showing that they contribute to a more balanced and healthy risk taking atmosphere, and if gender diversity on a general level can be proven to positively affect firm performance, then it really could pay off for firms to hire more women. Given this, we have formulated the following purpose for our thesis:

The purpose of this thesis is twofold. First, we intend to test whether women in leading positions are more risk averse than men, as measured by their impact on the corporation's financial and accounting based risk measures. Second, we intend to test whether firms with more gender-balanced boards of directors show better performance, as measured by stock return and accounting based key ratios.

Our intention is not to empirically test the relationship between risk taking and firm performance per se, rather to analyze these two dimensions separately, each in a gender set-up, and then discuss common grounds and potential crossovers.

To fulfill our purpose we will use a dual approach. In order to test the relationship between gender and risk taking we begin our thesis by performing a cross-sectional analysis on a panel dataset consisting of 83 companies included in the OMX Large Cap and Mid Cap between January 1 2004 and December 31 2008 regressing six risk measures on the fraction of female board members and management gender dummies. These risk measures are the *Debt-to-Equity ratio*, the *Debt-to-Market Equity ratio*, the *Degree of Operating Leverage*, the *Fixed-to-Total Assets ratio*, the *Cash-to-Total Assets ratio* and the *Stock Price Volatility*. Secondly, we will conduct an analysis where we investigate the same companies and test the relationship between four performance measures and the gender composition of the company boards during the same time period. A proxy for *Tobin's Q* (further described in Section 4), the *Excess Return*, *Return on Assets* and *Return on Equity* are used as performance regressands.

What we find is that two risk measures, the *Debt-to-Equity ratio* and the *Cash-to-Total Assets ratio* generate significant results, proving women to be more risk averse than men. These effects are robust for heteroscedasticity but disappear when addressing unobservable firm characteristics in a fixed effects framework. One performance regression, *Tobin's Q*, indicates clear evidence that a gender diverse board enhances firm performance. This result is robust for heteroscedasticity and remains significant even after tackling problems related to omitted variables. None of our regressions shows robust evidence of women being more risk loving or that firm performance decreases when the fraction of women increases. However, some of our regressions generate insignificant results, hence disproving any differences in risk taking or performance with regard to gender. We discuss possible explanations to the above results and try to find reasons to our findings. To one part we conclude that the employment of a certain risk or performance measure is of great importance for the results obtained, and that the sample size and model specifications matter. In addition, we discuss possible sociological explanations for our results, such as issues related to sex identification and board dynamics, e.g. the choice between heterogeneous or homogenous boards.

The structure of the thesis will continue as follows. In Section 2 we start by presenting previous research on the subject, as well as our own contribution. We then move on to background theory and hypotheses formulation in Section 3, followed by an introduction to our dataset and the construction of regression variables in Section 4. In Section 5, we present the methodology we use to test our hypotheses, as well as analyze our findings. Section 6 concludes the results and makes suggestions for future research.

# 2. Previous Research and Contribution

Gender diversity in business has for long been discussed, often resulting in debates revolving around the existence, or non-existence of women in top management positions and boardrooms. A recent study by McKinsey & Company sheds light on the fact that there are too few women in business. Women are particularly underrepresented in management and decision-making positions, such as the board. In Sweden, only 10 percent of all listed companies reach the level of gender equality on the board. Furthermore, there are on average only 15 percent women in executive management (McKinsey & Company Inc. 2007, Dagens Nyheter 2009). Since the board of directors and executive management include people with the power and duty to oversee the organization’s activities and make formal decisions with regard to strategy and operations, the gender composition of these top executives and boards of directors has for a long time received the attention from researchers (Burke and Mattis 2000).

Several studies point out that female executives adopt a different management style than male executives and that female directors act differently than male directors (Adams and Ferreira 2008, Ferrary 2009). Men and women are for example likely to show different behavior when it comes to governance, financial decisions and risk taking. The risk taking dimension is particularly interesting in times of instability and market downturn. The high profits that an aggressive and risk-loving behavior may generate in bull markets could result in devastating consequences when times are less stable and favorable. If women could possibly balance this behavior over time, by being more precautious, this could add vital benefits to decision-making processes and potentially affect the company’s performance positively (Jordan and Sullivan 2009, Stephenson 2004).

In the below section we highlight previous studies that examine the relationship between gender and risk taking, both in a general and in a corporate setting. Next, we discuss previous research with regard to gender composition and firm performance and present our own contribution on the subject.

## *2.1. Women and risk taking*

One study that clearly supports the idea that men are more likely to take risks than women is the physiological study conducted by Bymes, Miller and Schafer (1999). They conduct a meta-analysis of 150 studies where they analyze male and female participants' risk aversion with regard to factors such as smoking, sexual activities and driving behavior. Their findings indicate that, at a general level, there are considerable gender differences, even though a more qualified interpretation shows that the amplitude of these differences fluctuate with regard to context, age and definition of risk.

Gender differences in risk taking do however also apply to financial decisions. Using data from the US mutual fund industry, Niessen and Ruenzi (2007) show that women are more risk averse with regard to investment and trading. Female managers trade less than their male colleagues, and receive significantly lower inflows due to their trading behavior (Niessen and Ruenzi 2007). Studies by Bernasek and Shwiff (2001) and Ansic and Powell (1997) also prove that women are more risk averse than men by analyzing investment decisions. The former study reinforces that women are more cautious when it comes to pension investments in asset portfolios, while the results from the latter study indicate that males and females adopt different strategies in financial decision environments due to their shifting risk preferences. However, all these studies are dependent on their specific setting and the definition of risk. Powell and Ansic find that gender differences appear to be more pronounced when the decision is framed in terms of losses rather than in terms of gains. Any gender difference in risk taking behavior can also vary with the type of risk, measured by the level of uncertainty and costs associated with the decision (Ansic and Powell 1997).

Ammon, Jianakoplos and Bernasek (1998) examine the role of gender with regard to household wealth and holdings of risky assets by conducting a study of US households. They find that single women exhibit relatively more risk aversion in financial decision-making than single men. 63 percent of single women were not willing to take any financial risk with their investments, versus 43 percent for single men (Ammon, Jianakoplos and Bernasek 1998).

The observed differences in financial risk taking between men and women can partly be explained by biological and social factors, as showed in a study by Goetze and Pesti-Meier (2006). Masculinity as a biological attribute is assumed to affect risk taking positively while femininity affects it negatively. However, the tendency to take financial risks seems to be based on different levels of identification with masculine versus feminine attributes. If women act in a more masculine way, because their social environment is highly male dominated, their propensity to take on risk is likely to increase. The implication is that differences in risk taking between men and women increase in environments where sex stereotypes are highlighted.

Even though all of the above studies find women to be more risk averse than men, none of them are conducted in an actual corporate setting. Given this, Elsaid and Ursel (2009) conducted a study in which they investigated whether personal risk attitudes carry over in a corporate setting. They used traditional measures of corporate riskiness such as financial leverage, cash holdings and operating leverage, in order to test whether these measures were changing in relation to changes in CEO gender. Their findings show that, for all measures of risk, the change to a female CEO leads to less risk in the company, which confirms the essence of previous research. This decrease in risk taking is observed despite inclusion of various control variables such as incentive compensation strategies (Elsaid and Ursel 2009).

## *2.2. Female representation and firm performance*

An interesting question in relation to gender diversity is whether an increased proportion of women in corporate top positions actually lead to greater firm performance. In past studies on gender diversity and its influence on performance, most of the researchers have found that female directors and managers have a positive influence on firm performance. A study conducted by Catalyst (1995) gives support to these theories. By analyzing companies on the Fortune 500 list, the study concludes that the top ten companies, measured by profit, all have at least one woman on their board. The top eight companies have boards with two or more female directors (Burke and Mattis 2000, Adler 1998).

Contrary to the findings that women enhance firm performance, Adams and Ferreira (2008) show, in their recent study, that gender diversity on boards have a significant negative impact on firm performance, as measured by Tobin’s Q. By studying US firms from S&P 500, S&P Midcap and S&P Small Cap, they find that a more gender diverse board leads to worse firm performance even after addressing endogeneity problems. Their study is conducted in a corporate governance setting, and the intuition is that gender diverse boards allocate more time to monitoring their managers in decision-making processes, and that well-governed firms suffer from this kind of excessive inference and over-monitoring. The general implication however, should be that increased monitoring, as indicated by a more gender diverse board, could affect firm performance both positively and negatively. The final effect is dependent upon the initial board composition and the directors’ characteristics, as well as the existing level of monitoring (Adams and Ferreira 2008).

A similar study has been conducted in Denmark. Smith, Smith and Verner (2005) use data for the 2500 largest Danish firms and find that a larger proportion of women in top management (CEOs and board of directors) lead to greater firm performance. The largest firms are defined by gross turnover and in order to measure performance they use measures such as mark-up and net results/assets. The results are however ambiguous, just as previous research show. Any effect on performance is highly dependent both on the performance measure being used and on the particular composition of the board. When, for example, mark-up is used as a performance measure they observe more significant results than for other performance measures, and the positive performance effect is even stronger when female managers hold a university degree (Smith, Smith and Verner 2005).

In Sweden, an executive MBA paper highlights that companies with a larger percentage of females on the board are more profitable than companies with no female representation during the years 2002, 2004-2005 (Lönnqvist, Mäkinen-Salmi and Niska 2006). Performance is measured as earnings before taxes, and the results are significant also for future earnings growth. These findings should, according to the authors, lead to a more positive market valuation for companies with female board members, as opposed to companies with no female board members at all. Therefore it should lie in the companies' own interest to appoint more women to their boards (Lönnqvist, Mäkinen-Salmi and Niska 2006).

Also the study by Michel Ferrary, the French professor at Ceram, brings forward insights for our thesis. Ferrary analyzes companies included in the French CAC 40 index and concludes that companies with the greatest percentage of women in management have performed the best during the stock market collapse in 2008, as measured by stock price development (Ceram Business School 2009). As an example from the financial sector, BNP Paribas Bank, whose management team is nearly 39 percent female, has handled the crisis far better than rival bank Crédit Agricole, where management consists of only 16 percent females. BNP Paribas saw its shares fall in value by 20 percent while Crédit Agricole suffered a 50 percent stock price fall. His conclusion is that female managers take on less risk, thereby reducing the volatility of a business's share price However, he concludes, that it is the mix of women and men, i.e. the gender balance that gives the optimal level of risk, indicating that a company with only female executives and board members would create a too cautious environment (Jordan and Sullivan 2009, Thornhill 2009).

Despite the fact that many studies confirm that there is a positive relationship between gender diversity and financial success, it is still not definitely determined if increased gender diversity enhance overall firm performance. In addition, the relationship between firm performance and gender composition may be subject to reverse causality, meaning that well established more profitable firms have a stronger focus on hiring women in top positions (Niessen and Ruenzi 2007).

## *2.3. Our contribution*

The above-cited studies show that there is a genuine interest in trying to understand the relationship between gender diversity and firm performance. Also the risk propensity of men versus women has been analyzed in various settings, trying to draw conclusions about whether women really have a more precautious and risk-averse management style. This being said, we have however encountered few studies that bring these two dimensions of gender diversity together in the same setup.

In addition, to our best knowledge, no previous study on Swedish data empirically examines risk propensity in a corporate setting, as measured by both accounting based and market based risk ratios. Furthermore, we have not encountered a Swedish research paper that analyzes the relationship between gender diversity and firm performance, by testing a broad set of various firms in different industries using the same performance measures as we do.

In the light of this, we believe that our study could add valuable insights to the gender related debate about risk taking and firm performance. Our intention is to test whether differences in risk taking between men and women exist not only outside the corporate doors, but also in the boardroom and in management decision-making processes. Likewise, we intend to test which effect gender diversity has on both market and accounting related firm performance measures. By doing so, we hope to add new features to previous findings and open up for interesting discussions and potential conclusions with regard to gender composition, risk and firm outcome. In the following section we will present some background theory and our hypotheses.

# 3. Theory and Hypotheses

Since this thesis, to one part, seeks to investigate differences in risk taking among men and women, our next section will focus on describing theories behind the concept of risk. These concepts will be the basis for the comprehension of the risk measures that we use in our regressions analyses. In order to motivate the usage of certain performance measures, we will dedicate the subsequent section to theories related to firm performance.

## *3.1. Risk*

In classic theory, risk is associated with the variation in the distribution of possible outcomes, where each outcome is assessed a certain probability to arrive at a mean value (Graham 2004). A risky alternative is one for which the variance, and hence the risk of losses (and gains), is large.

Total risk of a company is, in finance, divided into two components: firm specific and market risk. The former is unique to a company whereas the latter is common to all market participants (Cho 1997). Firm specific risk is traditionally categorized either as financial or operating risk. Operating risk refers to business decisions and the business environment while financial risk is related to the way the business is financed (Kallenberg 2008). Systematic risk, the market-wide risk concept mentioned above, stems from the capital asset pricing model CAPM, developed by Sharpe and Lintner. Since firm-specific risk can be diversified away by investors, CAPM is usually the main framework for analyzing the relationship between the risk of an asset and its expected return. The risk developed in this framework, the systematic risk (market-beta), indicates how a particular asset varies with the market portfolio, assuming markets are efficient. Given that CAPM contends that market-beta is the sole measure of risk, critique has been brought forward to this model (Bodie, Kane and Marcus 2008). Particularly, attempts to expand the concept of market-wide risk factors have been taken. Fama and French expand the systematic risk premiums and develop a three-factor model in which they, in addition to market-beta, include corporate capitalization and book-to-market ratio. In doing so, they hope to capture other relevant systematic risk factors that can explain risks in financial markets, and thereby variations in stock return.

A number of other studies have, instead of betas, focused on the relationship between accounting based risk measures and risk in financial markets (e.g. Beaver, Kettler and Scholes, 1970, Beaver and Manegold 1975, Hill and Stone 1980, Runsten 1998) (Hamberg 2000). Several accounting based measures, such as P/E ratios and leverage have been suggested as relevant risk proxies. Research studies indicate that such accounting based measures have strong explanatory power and serve as relevant alternatives for the risk factors described above (White, Sondhi and Fried 2003). This has lead to a vast array of modified risk conceptions, where researchers try to find relevant variables that can serve to measure risk at a corporate level (Graham 2004).

Bromiley and Miller (1990) identify nine different numeric risk measures that are used in strategic management research, some of which are accounting based and some of which are related to systematic risk. These measures are then grouped into three main categories; stock returns, financial ratios and income stream volatility, and include measures such as systematic risk (market-beta), unsystematic risk (firm specific risk), the debt-to-equity ratio and capital intensity. Each of these measures target different aspects of risk, and by combining these measures, an analysis applicable to the firm as a whole can be created (Bromiley and Miller 1990, Graham 2004).

The systematic and unsystematic risk together, translates into what is commonly known as the standard deviation of a stock, or the stock's volatility, σ. A stock with higher return is accompanied by higher standard deviation and therefore has the potential to generate more gains, but also more losses than a less risky and more stable stock (Bodie, Kane and Marcus 2008). For the company, the volatility or riskiness that is being priced by investors is largely due to the actions and decisions taken by the company. In the light of this, decision makers, such as the board of directors or the management team, are able to affect the stock volatility and its return.

We will describe our adaptation of the risk concept in Section 4.1.2 where we present the variables that we use in our regressions.

## *3.2. Firm performance*

It is difficult to determine only one proper measure of firm performance, since companies act in very different type of industries, have alternative ways of conducting business and also focus on dissimilar key ratios. There are, however, two popular approaches when it comes to measure firm performance, the first one being historical market prices, an approach that is not feasible in privately owned firms. The second approach is measures based on accounting ratios, which assumes that the company operates in a country where the financial reports are transparent enough. What measures one chooses to adopt from these two broad categories varies (Batra 1999).

One frequently used measure that assesses firm performance with the help of market prices is excess return, as developed in the CAPM framework or in the more extensive model of Fama and French. The concept of excess return is built on the idea that the return of a unique stock fluctuates with the market to a magnitude that stands in relation to the risk level of the company. The risk level is supposed to decide whether the unique stock price will fluctuate to a higher or lower extent than the market and if this relation is positive or negative. In the Fama-French framework the risk level is measured by three risk factors, as compared to CAPM, where only one risk measure, market-beta, is used (Brealey, Myers and Allen 2006).

Another measure that uses the market value approach is Tobin's Q, developed by the Nobel prize-winning economist James Tobin (White, Sondhi and Fried 2003). Tobin's Q measures the relationship between a company's market and book values (Barbu and Bocean 2007). A firm that has a Q value below one is called a "poor performer", because one dollar invested in those firms today results in a future return with a present value of less than a dollar (White, Sondhi and Fried 2003). Critique has been brought forward against Tobin's Q, claiming it should not be applicable in predicting stock returns (Henwood 2005). Still, it is however a popular and frequently used measure when it comes to comparing historical performance.

Looking at firm performance from an accounting perspective, Return on Assets (ROA), and Return on Equity (ROE) are popular measures. ROA targets the relationship between profits and the firms' assets, i.e. it measures the management's ability and efficiency in using the firm's assets to generate profits to all the providers of capital. ROE on the other hand measures the return to the firm's shareholders by presenting the relationship between net income and stockholder equity (White, Sondhi and Fried 2003).

### *3.2. Presentation of hypotheses*

Having outlined the most important theories for our subject and presented previous research in the field of gender diversity with regard to risk taking and firm performance, we have chosen to formulate the following two hypotheses:

> *H1: Female managers and board members show less risk propensity than their male counterparts, as measured by their impact on accounting and market based risk ratios in the company.*

*H2: Companies with more gender diverse boards of directors show better performance than their competitors, as measured by stock return and accounting based performance ratios.*

# 4. Data and Empirical Design

## *4.1. Dataset*

In the following section we will start by describing our dataset and the reasons for inclusion of certain companies. Next we move on to explaining our methods for obtaining this data.

### *4.1.1. Presentation of dataset*

The dual goal of this thesis is to test whether women are more risk averse than men and to determine whether more gender diverse boards improve firm performance. To fulfill this purpose, we use a dataset based on Swedish companies listed on the OMX Large Cap and Mid Cap during the period January 1 2004-December 31 2008. The chosen time period was largely a result of the tradeoff between a longer time period and a larger cross-sectional sample. Three requirements for the inclusion was that the company should present full worthy annual reports from which we could extract relevant data, be presented in our chosen databases, and that the company had been listed during the whole time period, since we partly look at stock price evolution as one performance measure. Companies for which our databases did not present information in the comparable manner have hence been excluded. This means for example that the four major Swedish banks have been left out in our dataset.

From an original sample of 129 observations (56 large cap and 73 mid cap), we ended up with 83 companies after these corrections. For 83 companies over five years, this gave us a total of 415 data points.

### *4.1.2. Approach for obtaining information*

We will now continue by presenting our approach for obtaining the information included in our dataset. Daily and monthly stock prices (in SEK) for each company have been extracted from Thomson Datastream, for the period January 1 2004-December 31 2008. The Fama-French factors; size factor (SMB), book-to-market factor (HML), market risk premium (Mktrf) as well as the risk-free rate (Rf) have been extracted from a dataset created by Philip Emtemark and Danny Liu, fellow grad students at SSE. They constructed this dataset, based on Swedish market data, while writing their thesis "Performance Persistence, Fund characteristics and Initial Fund Performance in Swedish Mutual

Funds". The factors are composed in a similar way as the normally used factors that can be obtained from Kenneth French homepage for the American market.[1]

To gain company specific information about the board and the management structure, 415 annual reports have been analyzed and data points for 12 categories have been extracted. In the annual reports, we have mainly found information in the corporate governance sections where the board members and management teams are presented. The managers considered for our thesis are the CEOs and the CFOs. For those categories where we neither found relevant information in the annual reports, nor in any other database nor web page, we registered missing values in our dataset. The number of missing values is however not numerous, and we do not believe it to influence our empirical findings in a negative way.

In order to extract accounting based information we have used two databases: Market Manager (Soliditet), and Thomson Datastream. Market Manager has been our primary source of information because it is a Swedish database where the information is presented according to IFRS. However, since some information could only be extracted from Datastream, we have chosen to consult both databases to get as complete information as possible. If the information presented in the databases seemed odd or not in line with expectations, we consulted annual reports. Whenever this has been done, we have followed the same calculation methods as Market Manager.

## *4.2. Variables*

In this section we present the construction of the variables that we use in our regressions. First we will describe the risk and performance measures that we believe are relevant to test for in order to draw reasonable empirical conclusions. Secondly, the variables that are the main focus of this thesis, i.e. fraction of female board directors and the management dummies will be presented. Last we present the motivation for inclusion of certain control variables.

### *4.2.1. Risk variables*

Six risk measures are used as dependent variables in our regression analyses to assess the relationship between risk propensity and gender.

- **The Debt-to-Equity (DE) ratio** can, used in conjunction with other measures, help investors determine a company's level of risk. Companies that are highly leveraged may be at risk of bankruptcy if they are unable to make interest and principal repayments on their debt and they may also be unable to find new lenders in the future (Bodie, Kane and Marcus 2008).

[1] www.kenfrench.com

$$\textbf{Debt} - \textbf{to} - \textbf{Equity ratio}_{it} = \frac{\textbf{Total Debt}_{it}}{\textbf{Common Equity}_{it}} \tag{1}$$

The book value of debt has been calculated as total assets minus common equity.

- **The Debt-to-Market-Equity (DME) ratio** has been used to complement the above accounting based measure, as is routinely done.

$$\textbf{Debt} - \textbf{to} - \textbf{Market Equity ratio}_{it} = \frac{\textbf{Total Debt}_{it}}{\textbf{Market Equity}_{it}} \tag{2}$$

Market equity is the share price multiplied by the number of ordinary shares in issue.

- **Degree of Operating Leverage (DOL)** measures the percentage of fixed operating costs in a company's cost structure. Companies with lower fixed costs and higher variable costs are said to employ less operating leverage. The operating leverage targets how revenue growth translates into growth in operating income, and is therefore a measure of how risky (volatile) a company's operating income is. A high degree of operating leverage means a higher risk of variations in operating income (White, Sondhi and Fried 2003).

$$\textbf{Degree of Operating Leverage}_{it} = \frac{\textbf{Percent. Change in Operating Income}_{it}}{\textbf{Percent. Change in Sales}_{it}} \tag{3}$$

The percentage change in net sales is calculated as net sales divided by one-period lagged net sales, and the percentage change in operating income, as approximated by Earnings Before Interest and Taxes (EBIT), is calculated EBIT divided by one-period lagged EBIT.

- **The Fixed Assets-to-Total Assets ratio** is a proxy for operating leverage, used to complement DOL since fixed assets are mostly associated with fixed costs. A high ratio indicates an inefficient use of working capital, and usually means a low cash reserve. This will often limit the company's ability to respond to increased demand for their products or services, which naturally translates into higher risk with regard to profits. Fixed assets therefore have high profit potential but embody high risk (White, Sondhi and Fried 2003).

$$\boldsymbol{Fixed\ Assets - to - Total\ Assets\ ratio_{it}} = \frac{\boldsymbol{Total\ Fixed\ Assets_{it}}}{\boldsymbol{Total\ Assets(fixed\ and\ current)_{it}}} \tag{4}$$

Fixed assets include both tangible and intangible fixed assets. Total assets are equivalent to the sum of debt and equity.

- **The Cash-to-Total Assets ratio** determines how much of a firm's assets that is held in cash. More holdings of cash indicate risk aversion. Firms with lower risk preferences tend to have more corporate cash holdings, which often generate benefits in minimizing the need for costly external financing.

$$\boldsymbol{Cash - to - Total\ Assets\ ratio_{it}} = \frac{\boldsymbol{Cash\ and\ Cash\ Equivalents_{it}}}{\boldsymbol{Total\ Assets_{it}}} \tag{5}$$

Cash is measured as "cash and cash equivalents" (short term investments).

- **Stock Price Volatility** refers to the standard deviation of returns of a stock with a specific time horizon. It is used to quantify the riskiness inherent in a stock over that certain time period. Any action that the company's decision makers take will affect how the market reacts, and hence the movements in the stock price. Assuming that the market is efficient, all information will be reflected in the stock price (Brealey, Myers and Allen 2006). By using this measure we would like to capture other aspects of risks that are not captured by the accounting based measures above.

$$\boldsymbol{Stock\ Price\ Volatility_{it}} = \sqrt{\left(\sum \boldsymbol{p(r_{id})\ [r_{id} - E(r_{id})]^2}\right)} \tag{6}$$

Annual Volatility has been calculated in Stata, using daily stock prices (d) over the period January 1 2004-December 31 2008.

### *4.2.2. Firm performance variables*

For the purpose of this thesis, four different firm performance measures are used. We start by describing the two market based performance measures, and then move on to our accounting based ratios.

- **Excess return** is the performance measure we use to assess stock price evolution. We have constructed yearly excess returns for each company over a five-year period, 2004-2008, by obtaining annual returns and then subtracting the risk free rate (STIBOR). The excess returns are calculated as:

$$\boldsymbol{Excess\ Return_{it}} = \left(\frac{\boldsymbol{Stock\ Price\ (SEK)Dec\ 31_{it} - Stock\ Price\ (SEK)Jan\ 1_{it}}}{\boldsymbol{Stock\ Price\ (SEK)Jan\ 1_{it}}}\right) - \boldsymbol{STIBOR_t} \qquad (7)$$

- **Tobin's Q** is a routinely used market based measure of corporate performance. In accordance with Adams Ferreira (2008), we use a proxy for Tobin's Q in this thesis. Dividing the market value of the firm by its net book value of tangible assets, as follows, generates this proxy:

$$\boldsymbol{Tobin's\ Q_{it}} = \frac{\boldsymbol{Market\ Value_{it}}}{\boldsymbol{Net\ Tangible\ Assets_{it}}} \qquad (8)$$

  Market value is the total number of shares outstanding (ordinary shares in issue) multiplied by the value (price) of each share. Net tangible assets (or net book value), is defined as ordinary shareholder’s equity less tangible assets.

- **Return on Equity (ROE)** is an accounting based measure used to compare profitability across firms in the same business or industry. When controlling for the industry, ROE becomes a relevant performance measure. It targets how much money the firm generates with the shareholders' invested money. ROE is calculated as follows:

$$\boldsymbol{Return\ on\ Assets_{it}} = \frac{\boldsymbol{EBIT_{it}}}{\boldsymbol{Common\ Equity_{it-1}}} \qquad (9)$$

  Where EBIT is Earnings Before Interest and Taxes for year *t* and equity is the opening balance of common equity for the same year.

- **Return on Assets (ROA)** is our second accounting based measure used to assess profitability. It is comparable with ROE but targets how profitable a firm is relative to its total assets, rather than shareholders’ equity. ROE is measured as:

$$\boldsymbol{Return\ on\ Assets_{it}} = \frac{\boldsymbol{Net\ Income_{it}}}{\boldsymbol{Total\ Assets_{it-1}}} \tag{10}$$

Net income is the net income used to calculate basic earnings per share in year *t*, and assets are the opening balance of total assets for year *t*.

### *4.2.3. Independent variables*

**The Fraction of Female Directors (*FFD*)** gives us the gender composition of the board (percentage of female board directors), for each company, each year. Since our thesis, for both hypothesis 1 and 2, seeks to investigate issues related to the board composition, this variable is our main independent variable. For the risk-gender regressions, the purpose is to test whether female board directors are more risk averse than their male colleagues, and consequently a company with higher FFD is expected to show lower risk levels than a company with a lower FFD, all else equal. When it comes to the performance regressions, the FFD variable plays a different role. In our second hypothesis, a *balanced* board is assumed to be a board with equal fractions of men and women. We do not for example expect a company with only women on their board to perform better than a company with a board consisting only of men. This consequently means that the relationship between FFD and firm performance may not be linear, rather parabolic with a peak at 50 percent. Despite this, we will employ a linear regression setup when testing our second hypothesis. One reason is that we cannot observe any clear indication of a second degree relationship in our scatter plots. Another reason is that our dataset only contains companies with a fraction of women on their boards between 0 and 50 percent.[2] We therefore believe that a linear relationship setup may work as a good proxy.

**The Chief Executive Officer (*CEO-dummy*)** and **The Chief Financial Officer (*CFO-dummy*)** are two other relevant independent variables for our regression analyses. The dummies will take on the value 1 if the CEO or CFO is a woman, zero otherwise. For our first hypothesis, our purpose is to observe whether women in top management are more risk averse than men, and since both the CEO and the CFO are highly involved in operational decisions, including decisions concerning risk taking, we find it relevant to include these variables. The reason for not including additional top managers is that we want our collected data to be consistent. The CEOs and CFOs are always included in the annual reports and denoted in a similar way, which makes these variables fairly easy to use across companies.

The CEO- and CFO-dummies will only be in focus for hypotheses 1. The reason for this is that, for the second hypothesis, our objective is to analyze whether gender balance is positive for

[2] Note that, from our initial sample, we have excluded the 4 observations that reported a fraction above 50 percent (however below 60 percent) when regressing the performance measures.

performance, not if any particular gender is more suited for its role and therefore enhances firm performance. We intend however to keep the dummies in the performance regressions, in the role of control variables, since they potentially could have a small impact on our results.

### *4.2.4. Control Variables*

In order to avoid biased effects from variables that are left out of our regressions, and consequently get as meaningful and correct results as possible, we have chosen to include control variables. The variables chosen for this purpose are the ones that we believe will have the greatest impact on the data but at the same time are realistically measurable. All control variables are presented below, and the names used in our regressions are expressed as italics in parenthesis. Note that some variables are solely used in the risk regressions, while others are only applied in the performance setup.

For categorization of various industries we use four-digit GICS-codes, obtained from OMX web page (Nasdaq Omx 2009). Since we believe that the industry a given company operates in will have an effect on the risk level taken, as well as on the company's stock performance, we will use the GICS-codes to generate industry dummies *(Gics-dummy1, Gics-dummy2…Gics-dummy28)* and control for time-invariant industry characteristics, or industry effects. If necessary, we also want to control for firm fixed effects. For this purpose the Swedish *Company ID* will be used.

Since our thesis has a strong focus on the board of directors it is important to include all possible characteristics of a board, in addition to gender composition, as control variables, since those characteristics, naturally, will affect our data to a large extent. The board size, i.e. the number of members on the board ($Boardmembers_{it}$) will play the role as one of these control variables since the dynamics of the board, and hence the decision making process, probably is influenced by its size. We also believe that the board members' particular relations towards the company affect any decisions made by the board, and due to this fact an important factor to control for in our regressions is the fraction of independent[3] board members ($FractionIndWomen_{it}$ and $FractionIndMen_{it}$). Furthermore, the gender of the chairman ($Chairmandummy_{it}$) is also included as a control variable since the chairman has an important role in influencing the decisions being taken by the board when it comes to voting processes, as one example. Also, we believe that risk propensity and firm performance is dependent on the age of the decision makers, since age is closely linked to experience and preferences. Given this, it seems reasonable to control for the average age of the board members ($AverageBoardage_{it}$). The average age of the board is calculated as the geometric average of the board members' ages in company *i* at year *t*.

Moving on, we have chosen to control for the fraction of variable salary that the CEO receives ($PercentageVarRemCEO_{it}$) when testing our risk measures. We imagine that the willingness

[3] Independent in relation to the company, according to *Svensk kod för bolagsstyrning*. (Before the Code was implemented in 2005, according to OMX börsregler). The fraction is obtained by dividing the number of independent female or male board members, by the total number of female or male board members.

for decision makers to take on different types of risk will depend upon how their compensation schemes are designed. We assume the variable salary for the CEO to be a good proxy for the overall variable remuneration policy of the company, and hence this policy will affect overall risk levels.

The last variable that we will control for in all our regression analyses is firm size, which will be included since the size of the company has a probable impact on any actions being taken by the company board and its executive managers. In accordance with Adams and Ferreira (2008), a proxy for firm size is obtained by taking the natural logarithm of sales for each year *($CompanySize_{it}$)*.

Regarding the regressions of excess return, we will include additional control variables, obtained from the Fama-French model. The Fama-French risk factors are routinely used in explaining excess returns, so we will include them in this regression solely since we want to avoid effects on the excess return that stems from something else than firm specific decisions and events. The Fama-French Market risk premium *(Mktrf)* is expressed as return on market index minus the risk free rate. The Size factor *(SMB)* is calculated as return on small-firm stocks less return on large-firm stocks. The third factor, the Book-to-market factor *(HML)* is expressed as return on high book-to-market stocks less return on low book-to-market stocks.

### *4.3. Data and Summary Statistics*

To get an overview of our data, before we run our regressions, we present summary statistics below. The mean percentage of female directors is approximately 20 percent, far from the level of gender equality but fairly in line with expectations given by previous findings. Some companies have no females on their boards, whereas in a few, women represent the majority of all board members, 60 percent.[4] What concerns female CEOs, the numbers are much lower than for directors, with only one company out of 83 having a female CEO in two of the five years observed (2 out of 415 observations). The number of female CFOs is a bit higher, with 55 out of 415 observations indicating a female CFO. Given that the total number of female CEOs is incredibly low, we do not consider this factor a functional variable, and will henceforth exclude it from our regressions and analyses.

**Table 1: Descriptives for FFD (exclusion of FFD>50%), CEOs and CFOs**
The table is constructed from data collected from annual reports. FFD has been calculated as the number of female board members, divided by the total number of board members. Average FFD is calculated as a geometric average. The number of female CEOs and CFOs has been obtained from dummy variables in our dataset.

| Variable of interest | Result |
|---|---|
| Total number of female CEOs, 2004-2008 | 2 |
| Total number of female CFOs, 2004-2008 | 55 |
| Average FFD, 2004-2008 | 0.196 |
| | (0; 0.5)[5] |

[4] Note that these have been excluded in the dataset we use for our performance regressions.
[5] 0 indicates minimum fraction and 0.5 indicates maximum fraction in our sample.

# 5. Empirical Findings

## *5.1. Regression Analyses*

The twofold goal of this study; to test whether there is a difference in risk taking between men and women, and to test the relationship between gender diversity and stock performance, will be reached by testing our two hypotheses. For the first hypothesis, which targets differences in risk propensity between men and women, we will run six different standard OLS regressions, based on the risk measures explained in Section 4.4.

Regression A below is our fundamental regression analysis for answering hypothesis 1, and will been run for each of our six risk measures. Given that the number of observations for each year is fairly low, we perform a pooled OLS where we pool all five years together. Instead we include year dummies to control for year fixed effects. Regression A looks as follows:

$$\begin{aligned} y_{it} &= \alpha + \beta_1 * FFD_{it} + \delta_1 * CFOdummy_{it} + \delta_2 * Chairmandummy_{it} + \beta_2 * Boardmembers_{it} \\ &+ \beta_3 * AverageBoardage_{it} + \beta_4 * FractionIndWomen_{it} + \beta_5 * FractionIndMen_{it} \\ &+ \beta_6 * CompanySize_{it} + \beta_7 * PercentageVarRemCEO_{it} + \delta_3 * 2004dummy + \delta_4 * 2005dummy \\ &+ \delta_5 * 2006dummy + \delta_6 * 2007dummy + \delta_7 * 2008dummy + \delta_8 * gics\_dummy_1 \\ &+ \cdots + \delta_{35} * gics\_dummy_{28} + u_{it} \end{aligned} \tag{11}$$

In answering the second hypothesis, which targets the relation between performance and gender diversity, we employ partly the same framework as Adams and Ferreira (2008). We run four different OLS regressions, using industry and time dummies in addition to the other firm and board related control variables. Regression B is expressed as:

$$\begin{aligned} r_{it} &= \alpha + \beta_1 * FFD_{it} + \delta_1 * CFOdummy_{it} + \delta_2 * Chairmandummy_{it} + \beta_2 * Bordmembers_{it} \\ &+ \beta_3 * AverageBoardage_{it} + \beta_4 * FractionIndWomen_{it} + \beta_5 * FractionIndMen_{it} \\ &+ \beta_6 * CompanySize_{it} + \delta_3 * 2004dummy + \delta_4 * 2005dummy + \delta_5 * 2006dummy \\ &+ \delta_6 * 2007dummy + \delta_7 * 2008dummy + \delta_8 * gics\_dummy1 + \cdots + \delta_{35} * gics\_dummy28 + u_{it} \end{aligned} \tag{12}$$

Where:

- *$y_{it}$ = risk measure for company i at year t, for i = 1,2…83 and t=1,2…5*
- *$r_{it}$ = performance measure for company i at year t, for i = 1,2…83 and t=1,2…5*
- *200Xdummy takes on value 1 if the current year is X, 0 otherwise*

In addition, we have included *Mktrf*, *SMB* and *HML* in the regressions for *Excess Returns*. All descriptions of the variables included in the regressions are found in Section 4.2.

## *5.2. Results and economic interpretations*

In the following subsections we will present our results from the regression analyses. Foremost, we will comment on the variables that are used to test our hypotheses. Our control variables will be commented whenever the coefficients appear to be significant and further discussed whenever they give rise to insights that may complement our initial thoughts about what is driving risk levels and firm performance.

### *5.2.1. Relationship between gender and risk propensity*

**Table 2: Regressions of risk measures on FFD and CFOdummy variables**
OLS regressions run for five risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Fixed-to-Total Assets ratio* (A4), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), not correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In all regressions, industry and year dummies are included.

| | **Regression number:** | | | | |
|---|---|---|---|---|---|
| **Independent variable:** | **(A1)** | **(A2)** | **(A4)** | **(A5)** | **(A6)** |
| FFD | -5.1312*** | 3.6418** | -0.1852 | 0.2607** | 0.0274** |
| | [1.8229] | [1.8197] | [0.1762] | [0.1137] | [0.0129] |
| CFOdummy | -0.3566 | -0.7923** | 0.0335 | -0.0121 | -0.0028 |
| | [0.3249] | [0.3501] | [0.0314] | [0.0203] | [0.0023] |
| Boardmembers | 0.0493 | 0.0493 | 0.0117 | 0.0026 | -0.0009 |
| | [0.0853] | [0.0863] | [0.0082] | [0.0053] | [0.0006] |
| AverageBoardage | -0.0915*** | -0.0832** | 0.0134*** | 0.0010 | 0.0001 |
| | [0.0331] | [0.0338] | [0.0032] | [0.0021] | [0.0002] |
| FractionIndWomen | 0.2457 | -0.6266*** | -0.0131 | -0.0058 | -0.0011 |
| | [0.2077] | [0.2260] | [0.0201] | [0.0130] | [0.0015] |
| FractionIndMen | -0.1250 | -0.0778 | 0.0148* | -0.0038 | -0.0010 |
| | [0.0919] | [0.0971] | [0.0089] | [0.0057] | [0.0006] |
| CompanySize | 0.0800 | 0.1076 | -0.0015 | -0.0189*** | -0.0016** |
| | [0.0918] | [0.1036] | [0.0089] | [0.0057] | [0.0006] |
| PercentageVarRem | 0.6259 | -0.7862 | -0.1464** | -0.0029 | 0.0141*** |
| | [0.6305] | [0.7005] | [0.0609] | [0.0393] | [0.0044] |
| Chairmandummy | -1.7620** | -0.0673 | 0.0400 | -0.0121 | -0.0121 |
| | [0.8279] | [0.9148] | [0.0800] | [0.0516] | [0.0058] |
| Observations | 356 | 259[6] | 356 | 356 | 356 |
| R-squared | 0.2867 | 0.3680 | 0.5217 | 0.3785 | 0.3009 |
| Year effects | Included | Included | Included | Included | Included |
| Industry effects | Included | Included | Included | Included | Included |
| Firm fixed effects | Not included | Not included | Not included | Not included | Not included |

***Regression A1: Debt-to-Equity (DE) ratio***

The results from regressing the *Debt-to-Equity (DE) ratio* are presented as Regression A1 in Table 2 above. As can be seen, the coefficient for FFD has a negative value of -5.1312 and is statistically significant at the 1 percent level (p-value of 0.005). The economic interpretation is that companies with a larger fraction of women on their boards have a lower degree of financial leverage, which indicates that women are more risk averse, since a high level of debt could be troublesome and risky

[6] These observations have been reduced compared to our original sample (415 observations) due to difficulties in computing the market value of equity for companies with dual listed shares. This lower sample size may impact our findings and conclusions.

for a company if it cannot afford to make interest and principal repayments. Further, a higher level of debt is risky in the sense that the company may have a harder time to find external financing when necessary. The output for the *FFD* coefficient therefore gives support to hypothesis one. On the other hand, the coefficient for the management dummy, *CFOdummy,* is not significant at reasonable levels (p-value of 0.273), rather disproving any particular difference in risk taking between men and women.

Two of our control variables, the *AverageBoardage* and the *Chairmandummy* (indicating gender), give significant results at the 1 and 5 percent levels respectively (p-values of 0.006 and 0.034). The relationships are negative for both variables, indicating that the higher the average age of the board members is, the lower the level of debt and whenever the chairman is a woman, the level of debt is lower than when the chairman is a man. A possible explanation to the result with regard to board age could be that an older board member has fewer years left in business, and therefore chooses to be more cautious when it comes to risky decisions. The debt level being lower when the chairman is a woman, can be explained by similar reasoning as what concerns *FFD,* namely that women are more risk averse than men. The effect from the chairman dummy is particularly interesting since it is directly related to gender. However, we have chosen to only include it as a control variable due to necessary limitations of our purpose. From the regression results for the *DE ratio,* we further observe that one of our year dummies, the *2008dummy,* is statistically significant at the 5 percent level with a coefficient of 0.8241, indicating that the *DE ratio* seems to be subject to yearly variations.

***Regression A2: Debt-to-Market-Equity (DME) ratio***

The regression results for the *Debt-to-Market-Equity (DME) ratio* are presented as Regression A2 in Table 2. As can be seen, the coefficient for *FFD* is now positive and significant at the 5 percent level, with a value of 3.6418. Contrary to the results when using book value of equity, this now implies that companies with a higher fraction of females on the board prove to have higher financial leverage than companies with a lower fraction, all else equal. Using the market value of equity can sometimes give a more realistic measure than book value because it takes into account current market conditions. Given this, it should be clear that the market itself plays a role in influencing the *DME ratio* of companies. This could probably explain why the results differ when using book and market values of equity as denominators. As opposed to the *DE* ratio above, the coefficient for the *CFOdummy* is significant in this regression, with a value of -0.7923. The result is consistent with the assumption that female CFOs take on a lower level of risk, as indicated by the lower *DME ratio.*

Further, we note that both the *AverageBoardage* and *FractionIndWomen* give us negative and significant results at the 5 and 1 percent levels respectively. As previously outlined, the age structure of the board can clearly influence the preferred level of risk being taken. We believe that the significant results for these variables clearly show that these variables are important to control for, and that variables other than gender diversity prove to affect the risk level of the company.

One result, which is interesting in the context and also in line with the result from Regression A1, is the positive and statistically significant coefficient for the *2008dummy*. Comparing the results from Regression A1 with the result from Regression A2, we note that the coefficient increases for the *DME ratio* (from 0.8241 to 2.0040) and that the statistical significance strengthens (now showing a p-value of 0.000 instead of 0.0330). Given that the market values drastically dropped during the turbulent months of 2008, this is not surprising. The result further proves that the *DME ratio* is sensitive to market conditions, and that any results with regard to this ratio may not only depend on internal corporate decisions, but also external conditions and perceptions that the market may hold.

***Regression A3: Degree of Operating Leverage (DOL)***

Employing the *Degree of Operating Leverage (DOL)* as dependent variable in our regressions gives no significant results at all and an overall R-squared that is lower than 1 percent. A probable reason for this could be that *DOL* is based on percentage changes in EBIT and Net Sales, and that a relatively short time period of five years makes it hard to find significant results for measures that are based on yearly fluctuations of this kind. Further, from our initial dataset we have noticed that *DOL* is highly inconsistent with regard to ratio size across companies, which probably contributes to the fact that the size of the coefficients in our regression output is hard to interpret. Given this, we will move on to analyze the results for the *Fixed-to-Total Assets ratio* instead, used as a proxy for operating leverage. The output for *DOL* can however be found in Table Appendix 1.

***Regression A4: Fixed-to-Total assets ratio***

Regressing the *Fixed-to-Total Assets ratio* on *FFD* and the *CFOdummy* instead, generates the results presented in Table 2, Regression A4. As can be seen, we get no significant results for the coefficient of *FFD* (p-value of 0.296), however the coefficient is negative. The coefficient for *CFOdummy* is also highly insignificant, not giving support to any differences in risk taking between genders. Altogether the *Fixed-to-Total Assets ratio* generates poor results, with none speaking in favor of our hypothesis.

From Table 2 we can however observe that we get significant results for one of our control variables, the *AverageBoardage*, as found when testing the *DE* and *DME ratios* as well. This time, the relationship is positive though (coefficient of 0.0134), giving support for companies with older board structures to have a higher fraction of fixed assets, hence taking on more risk.

Regarding our other control variables, two of them; *PercentageVarRem* and *FractionIndMen* give us significant results, at the 1 and 10 percent levels respectively. This further proves that there are important variables other than gender that contributes to the understanding of differences in risk levels between companies. In addition, it is noteworthy to emphasize that all year dummies are significant at the 10 percent level. Thus, the amount of fixed assets that companies hold, as a proportion of total assets, seems to vary with specific yearly conditions.

***Regression A5: Cash-to-Total Assets ratio***

Our next risk measure, the *Cash-to-Total Assets ratio*, gives significant results for *FFD* (p-value of 0.022), with a coefficient of 0.2607, as shown in Table 2, Regression A5. The positive sign of the coefficient indicates that the higher the fraction of women on the board, the higher is the fraction of cash (liquid assets) in relation to total assets held by the company. This also shows that women have a more risk-averse behavior. In this setting, the coefficient for the *CFOdummy* generates a negative but insignificant result.

From Table 2, Regression A5, it can further be seen that one of our control variables, *CompanySize*, appears to be an important factor for our results. The low p-value of 0.001 indicates a highly significant result for the coefficient of -0.0189, proving that the size of a company is negatively related to the proportion of cash that it holds.

***Regression A6: Stock Price Volatility***

The last risk measure we have been testing for is the *Stock Price Volatility*. For this measure we find statistically significant results for *FFD* at the 5 percent level (p-value of 0.034). The sign of the coefficient is however positive. This means that the volatility level increases the higher the percentage of women there are on the board. A higher volatility is, of course, a sign of higher risk, meaning that a company characterized by a board with a high fraction of women, shows higher risk level than a company with fewer women on their board, all else equal. In accordance with the *DME ratio*, this positive result may be the consequence of the role that the market plays. Even though the stock price volatility, to a certain extent is driven by a company's actions (and naturally the actions of the board), the market itself may add its own perception of these actions.

For the volatility measure, two of the control variables appear to be significant at reasonable levels; *CompanySize* and *PercentageVarRem.* As noted for previous risk measures, our results seem to be highly driven be other factors than gender. A last observation for this risk measure is that two of the year-dummies, especially the *2008dummy*, is highly significant, indicating that volatility is driven by annual variations and market conditions. The positive sign of the coefficient for the *2008dummy* (0.0182) shows that the volatility was particularly high for 2008, naturally due to the large turbulence following the credit crunch.

### *5.2.2. Relationship between gender and firm performance*

**Table 3: Regressions of performance measures on FFD variable**
OLS regressions run for four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3) and *Return on Equity* (B4), not correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In all regressions, industry and year dummies are included.

| | **Regression number:** | | | |
|---|---|---|---|---|
| **Independent variable:** | **(B1)** | **(B2)** | **(B3)** | **(B4)** |
| FFD | -0.6305 | 9.3199*** | 0.1557 | -0.1541 |
| | [0.4627] | [2.8046] | [0.1344] | [0.2832] |
| CFOdummy | 0.0257 | -0.5733 | -0.0109 | 0.0141 |
| | [0.0826] | [0.4833] | [0.0236] | [0.0497] |
| Boardmembers | -0.0326 | -0.1253 | -0.0155*** | -0.0643*** |
| | [0.0208] | [0.1338] | [0.0060] | [0.0126] |
| AverageBoardage | -0.0175** | 0.0041 | 0.0001 | -0.0012 |
| | [0.0081] | [0.0494] | [0.0023] | [0.0050] |
| FractionIndWomen | 0.0681 | -0.0516 | 0.0110 | 0.1023*** |
| | [0.0514] | [0.3066] | [0.0149] | [0.0314] |
| FractionIndMen | 0.0407* | 0.2300 | 0.0078 | 0.0180 |
| | [0.0224] | [0.1420] | [0.0064] | [0.0136] |
| CompanySize | -0.0075 | -0.5893*** | 0.0292*** | 0.0794*** |
| | [0.0221] | [0.1370] | [0.0061] | [0.0128] |
| Chairmandummy | -0.2414 | 1.4682 | 0.0852 | 0.1713 |
| | [0.2013] | [1.1275] | 0.0580 | [0.1222] |
| Mktrf | -0.1051** | | | |
| | [0.0440] | | | |
| HML | 0.0092 | | | |
| | [0.0244] | | | |
| SMB | -0.0000 | | | |
| | [0.0000] | | | |
| Observations | 354 | 293 | 355 | 354 |
| R-squared | 0.4648 | 0.4446 | 0.3278 | 0.3828 |
| Year effects | Included | Included | Included | Included |
| Industry effects | Included | Included | Included | Included |
| Firm fixed effects | Not included | Not included | Not included | Not included |

***Regression B1: Excess Return***

Using the *Excess Return* as the first performance measure generates the following results. The market return, *Mktrf,* obtained from the Fama-French factors, as well as the year dummies have very high significance levels, showing that they are important factors in explaining the *Excess Return* of a company. The *FFD* variable on the other hand, returns insignificant results (p-value of 0.201), which means that we cannot comment on the true effects that gender diversity have on the firm's *Excess Return*. However, our results reveal that female directors most likely would bring a negative effect to the *Excess Return* of a stock, as shown by the coefficient of -0.6305. For our control variables, we obtain one result that is worth mentioning; the coefficient for *AverageBoardage* is significant at the 5 percent level, indicating that the size of the board is negatively related to *Excess Return*.

***Regression B2: Tobin's Q***

In the next regression, *Tobin's Q* was used as the performance measure. After removing apparent outliers in the dataset, the regression returned a significant *FFD* coefficient at the 1 percent level, with a value of 9.3199. The economic interpretation is that there is a strong positive relationship between a higher fraction of women on the board and the firm's *Tobin's Q*, hence, the more gender diverse board, the better firm performance.

All control variables, except for C*ompanySize* and the *2008dummy*, showed no significance. It is not surprising that the *2008dummy* turned out to have a strong effect on *Tobin's Q* since the computed *Q* consists of market values that most probably were negatively affected by the economic downturn in 2008. It is harder to decide the reason for the negative connection between company size and *Tobin's Q,* and since it does not provide us with any usable insights for our purpose, we will not discuss it further.

***Regression B3: Return on Assets (ROA)***

The regression for the first accounting based ratio, *ROA*, did not return as distinct results as *Tobin's Q*. Using *ROA* as the performance measure resulted in a positive but insignificant *FFD* coefficient, with a p-value of 0.395 (see Regression B3 in Table 3). However, we could notice some significant effects in this regression; a higher number of *Boardmembers* would, for example, have a negative effect on a firm's return on assets. What concerns this relationship, it may be possible to adopt the theories that speak in favor of a homogenous board composition, since a smaller board probably is less subject to conflicting views. Hence, the observed negative effect can provide interesting and important knowledge with regard to the discussion related to homogenous or diversified boards. Finally, in this regression we note that *CompanySize* has a small but highly significant explanatory power to *ROA*, with a positive coefficient of 0.0292. This could be the result of our choice to use the log of sales as a proxy for firm size, since sales and net income, the numerator in this performance measure, most likely are correlated.

***Regression B4: Return on Equity (ROE)***

For *ROE* we can see the opposite effect as for *ROA*, namely a negative but insignificant coefficient for *FFD* (p-value of 0.396). However, this regression supports the effect in the *ROA* regression, proving that the number of *Boardmembers* negatively affects firm performance. The *ROE* regression returned a coefficient for the number of *Boardmembers* with a negative value of -0.0643 and a p-value of 0.0000, indicating high statistical significance. The last significant results in this regression can be observed for *FractionIndWomen* and *CompanySize,* which emphasizes the fact that there are other variables, apart from gender diversity that affect firm performance.

## 5.3. Model specification and reverse causality

Throughout our regressions we encountered problems with insignificant coefficients. There are several reasons to why a model generates insignificant results. To begin with, the number of observations is, of course, a severe problem in our model since it becomes more difficult to capture any significant trends the smaller sample you got. Having 415 observations may not be enough to capture the effects we would like to test for. In addition, we could have a problem with misspecification of the models. In order to detect misspecification problems, one would have to find a rationale to why some of the variables included in the model should be removed, or replaced. One way would be to remove the variables that most likely do not fit in, and then perform the regression with the re-specified version, and compare the results.

For a correctly specified model, on the other hand, a reason for insignificance could be multicollinearity among the variables. If a model is subject to multicollinearity problems we would observe a high R-squared while receiving few significant coefficients. In our results we can observe that the R-squared spans between 0.29 and 0.52, which we do not regard as particularly high values and therefore draw the conclusion that multicollinearity does not seem to be the main explanation to the significance problem. Due to necessary limitations and economization on space, we have not expanded our dataset nor have we attempted to re-specify the model. Instead we see this discussion as a sufficient remedy.

Reverse causality may also be a concern in this type of model estimation, especially in the performance setup. The independent variable we test for (*FFD)* may be endogenous in the sense that more profitable firms also recruit more women, obtaining a greater gender balance. These firms may be subject to hard media coverage, feeling a pressure to be in the front line of promoting gender diversity. This kind of endogeneity can result in biased estimations, and hence incorrect conclusions. One procedure to tackle this problem is to re-estimate the models, using IV-techniques, or instrumental variables. In that case it is important to find good instruments that are correlated with the independent variable *(FFD)*, but uncorrelated with the performance measures. Given that our dataset does not include any valid instruments that meet these requirements, we cannot fully address the endogeneity problems that may arise due to reverse causality. However, we mention the issue, because if we had access to good instruments, we could probably have gotten rid of some biases, making our results even more trustworthy and significant.

## 5.4. Tests

Apart from the issues mentioned in the preceding section, there are some tests that we can perform to assess the robustness of our results. We will in this section address concerns with regard to heteroscedasticity and omitted variable bias. Performing additional tests, whenever possible, will help us come up with better and more valid conclusions regarding our results.

### *5.4.1. Heteroscedasticity*

A test for heteroscedasticity is usually done in statistical analyses to find out if the models are heteroscedastic or homoscedastic in the error term. Homoscedasticity, or equal variance of $u_i$, is an underlying assumption of the OLS method. When heteroscedasticity is present we cannot rely on conventionally computed confidence intervals or significance levels because of inefficient estimators. Consequently, running standard OLS regressions and ignoring the presence of heteroscedasticity can create misleading results and lead to incorrect inferences or conclusions (Gujarati 2003). Heteroscedasticity is a common problem that can arise even in correctly specified models.

We have performed a test in the Breusch-Pagan-Godfrey setup in order to detect heteroscedasticity. Whenever the computed chi2 value exceeds the critical chi2 value, at the chosen level of significance, presence of heteroscedasticity can be confirmed (Gujarati 2003). Below we present a summary of these tests:

**Table 4: Tests for heteroscedasticity for risk and performance regressions**
Breusch-Pagan-Godfrey test for heteroscedasticity. The test is run for five risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Fixed-to-Total Assets ratio* (A4), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), and for four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3), and *Return on Equity* (B4). The values in parenthesis are the reported p-values. A low p-value indicates presence of heteroscedasticity.

| **Risk/Performance measure** | **Heteroscedasticity (p-value)** |
|---|---|
| Regression A1 *(DE)* | Yes (0.000) |
| Regression A2 *(DME)* | Yes (0.000) |
| Regression A4 *(Fixed-to-Total Assets)* | No (0.718) |
| Regression A5 *(Cash-to-Total Assets)* | Yes (0.000) |
| Regression A6 *(Stock Price Volatility)* | Yes (0.000) |
| Regression B1 *(Excess Return)* | Yes (0.000) |
| Regression B2 *(Tobin's Q)* | Yes (0.011) |
| Regression B3 *(ROA)* | Yes (0.000) |
| Regression B4 *(ROE)* | Yes (0.000) |

As can be clearly seen from the low p-values, all our results, except Regression A4, suffer from a heteroscedastic distribution. It is therefore necessary to re-estimate our models and correct the standard errors for heteroscedasticity, using White's correction method. The complete output for our robust re-estimated models can be found in Table Appendix 2 and 3. At the next page we will present a summary of the results.

**Table 5: Regressions of performance and risk measures, correcting for heteroscedasticity**
OLS regressions run for our risk and performance measures, using White's correction for heteroscedasticity. The test is run for five risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Fixed-to-Total Assets ratio* (A4), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), and for four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3), and *Return on Equity* (B4).

| **Regression** | **Regressor** | **Coeffient** | **p-value** |
|---|---|---|---|
| Regression A1 (*DE)* | FFD | -5.1312 | 0.0010 |
| Regression A1 (*DE)* | CFO | -0.3566 | 0.1180 |
| Regression A2 *(DME)* | FFD | 3.6418 | 0.2290 |
| Regression A2 *(DME)* | CFO | -0.7923 | 0.0670 |
| Regression A5 *(Cash-to-Total Assets)* | FFD | 0.2607 | 0.0170 |
| Regression A5 *(Cash-to-Total Assets)* | CFO | -0.0121 | 0.4070 |
| Regression A6 *(Stock Price Volatility)* | FFD | 0.0274 | 0.1280 |
| Regression A6 *(Stock Price Volatility)* | CFO | -0.0028 | 0.1430 |
| Regression B1 *(Excess return)* | FFD | -0.5659 | 0.1110 |
| Regression B2 *(Tobin's Q)* | FFD | 9.3199 | 0.0020 |
| Regression B3 *(ROA)* | FFD | 0.1557 | 0.1450 |
| Regression B4 *(ROE)* | FFD | -0.1541 | 0.4120 |

From the result summary in Table 5 we see that all of the coefficients indicate the same effect (positive or negative) as they did in the naïve setup, without correcting for heteroscedasticity. However, after correcting for heteroscedasticity, some results that were significant before are now insignificant. This is the case for the *FFD* coefficients in Regression A2 (*DME)* and Regression A6 *(Stock Price Volatility)*, which means that differences in risk taking in relation to gender cannot be confirmed for these risk measures when standard errors are corrected for heteroscedasticity. The regressors that give us insignificant results in this setting (and were significant when not correcting for heteroscedasticity) are underlined in Table 5.

### *5.4.2. Omitted Variable Bias*

In practice it is hard to know if your regression results truly reflect the reality. There can be variables which, at a first glance, seem to be connected to each other but in reality are linked together by time-invariant unobserved firm characteristics, left out of the procedure. As a consequence, the estimated regression coefficients may be biased (Gujarati 2003). Due to our findings in Section 5.2, there are reasons to believe that there could be other factors, excluded in the regression, that affect our results. One way to address omitted variables is to compare our regressions done so far, with regressions conducted in a firm fixed effects framework. This is routinely done with the so-called Hausman test. The summarized results from running this test can be seen on the next page:

**Table 6: Hausman test for omitted variable bias**
The test is run to detect omitted variables biases, using the Hasuman technique. Five risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Fixed-to-Total Assets ratio* (A4), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), and four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3), and *Return on Equity* (B4) have been tested.

| Risk/Performance measure | Omitted Variable Bias |
|---|---|
| Regression A1 *(DE)* | Yes |
| Regression A2 *(DME)* | Yes |
| Regression A4 *(Fixed-to-Total Assets* | No |
| Regression A5 *(Cash-to-Total Assets)* | No |
| Regression A6 *(Volatility)* | Yes |
| Regression B1 *(Excess return)* | Yes |
| Regression B2 *(Tobin's Q)* | No |
| Regression B3 *(ROA)* | No |
| Regression B4 *(ROE)* | No |

The results from the Hausman test in Table 6 show that four of the regressions suffer from omitted variable bias; Regression A1, A2, A6 and B1. This implies that it would be more accurate to perform these regressions in a firm fixed effects framework. After running the regressions again, this time adding firm fixed effects, we get somewhat different results than we got in Section 5.2. The results from the fixed effects framework are summarized in Table 7 below, and a complete output can be found in Table Appendix 4 and 5.

**Table 7: Regression of risk and performance measures on FFD and CFO, employing firm fixed effects**
The test is run to detect omitted variables biases, using the Hasuman technique. Five risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Fixed-to-Total Assets ratio* (A4), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), and four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3), and *Return on Equity* (B4) have been tested.

| Regression | Regressor | Coeffient | p-value |
|---|---|---:|---:|
| Regression A1 (*DE)* | FFD | -0.1870 | 0.9250 |
| Regression A1 (*DE)* | CFO | -0.0923 | 0.7850 |
| Regression A2 *(DME)* | FFD | 8.8184 | 0.0010 |
| Regression A2 *(DME)* | CFO | -1.5423 | 0.0020 |
| Regression A6 *(Volatility)* | FFD | 0.0042 | 0.8290 |
| Regression A6 *(Volatility)* | CFO | -0.0039 | 0.2420 |
| Regression B1 *(Excess Return)* | FFD | -2.5800 | 0.0010 |

The only risk regression that now shows significant results for the *FFD* coefficient and the *CFOdummy* is Regression A2. Also, the performance regression for *Excess Return*, Regression B1, shows significant results for *FFD*. However, the fixed effects estimation assumes constant variance for the disturbance terms. Given that we know this is not the case for the *DME* regression and the *Excess Return* regression (proved heteroscedasticity above), we chose to interpret these results carefully. What we can conclude however, is that overall there may be some misspecification in our models, that partly seems to be related to the exclusion of time-invariant firm fixed effects.

### 5.5. Summary and discussion of results

Having performed all regressions and necessary tests of robustness, we now move on to discussing and analyzing our results more in depth. Allowing ourselves to speculate we will try to come up with plausible explanations to the results obtained.

#### 5.5.1. Relationship between gender and risk taking

Regarding the results for the regressions run in the risk setup, we find it most relevant to discuss and analyze the ones that are significant and contribute to achieving our purpose. The question of interest is whether we have found statistical support for our hypothesis; namely that women are more risk averse than men, even in a corporate setting. By using different risk measures, and analyzing the impact that gender has on those measures, we have hoped to be able to complement previous research that prove women to be more risk averse.

In our regressions, we find varying support for this hypothesis, partly dependent on whether we do robustness checks or not. In two of our regressions, Regression A1 and A5, the coefficients for *FFD* are statistically significant and in support of our hypothesis, even after addressing heteroscedasticity problems. For the *DE ratio* in Regression A1, the negative coefficient proves that, the higher the fraction of women there are on the board, the lower the level of debt. And for the *Cash-to-Total Assets ratio* in Regression A5, the positive coefficient indicates that, the higher the fraction of women there are on the board, the more cash does the company hold. Given that the board has an impact on these ratios, the results clearly show that women prefer to take on less risk than men.

It does however, seem like the results obtained are highly dependent on the risk measure being used, as well as the setup in which the regression is performed. The *DE ratio* and the *Cash-to-Total Assets ratio* are two related measures that combined generates the Net Debt of the company (Net debt = Short and Long Term Debt – Cash and Cash Equivalents), which could be one plausible reason to why these results point in the same direction. Further, ratios related to financial leverage are commonly affected by other variables, such as the market-to-book ratio and the cash flow variability, which we have not included as control variables in our setup. We should keep this in mind when interpreting our findings.

The fact that our results are related to the particular risk measure employed is further shown by regression outputs for the *DME ratio* and the *Stock Price Volatility*. In the naïve setup, without correcting for heteroscedasticity or omitted variable biases, the significant coefficients for *FFD* point in an opposite direction than the *DE ratio* and the *Cash-to-Total Assets ratio* do, proving women to prefer a *higher* risk level than men. This inconsistency in our results can of course also be due to the fact that our data sample is relatively small, or not sufficient for this kind of analysis. However, we find it interesting to discuss other issues that may contribute to our contradictory results. As one example, the risk measures that prove women to be less risk averse than men, the *DME ratio* and the

*Stock Price Volatility* are related to market based ratios, and just as mentioned in Section 5.1, there may be a divergence between risk measures solely obtained from accounting data and risk measures also contingent on the market. These latter results are however not robust to heteroscedasticity corrections. In addition, none of the results discussed above, apart from the *DME ratio*, remains after addressing endogeneity problems arising from omitted variables. It may therefore be hard to draw any comprehensive analyses with regard to risk taking and gender, even though we have found some support for our hypothesis in the simplest setup. A larger data sample could probably have generated more robust and significant results for all our risk measures, making us able to draw more valid conclusions.

There could be several other explanations to why our regression results are insignificant and differ across risk measures. One plausible explanation, apart from model misspecifications, lack of sufficient data, or the usage of different risk measures, may be the following: even though women, in a number of other studies, are proven to be more risk averse when it comes to investment decisions for own wealth, or decisions related to everyday life, they may, when being the minority in a group of risk taking men, just as well behave more like these men. Due to the fact that women are highly underrepresented in leading business positions, there may be an unspoken requirement for women to behave more like men, if they wish to make career advancements. This statement partly finds support in the study by Goetze and Meier-Pesti (2006), where the authors claim that differences in risk taking between men and women are weaker in social environments where there is a strong identification with either masculinity or femininity. The business environment being highly male dominated, may then be one reason to why differences in risk taking do not show up in all our results.

All in all, given that we only find partial proof for our hypothesis, we do not feel confident in claiming that women are always more risk averse than men, or at least we cannot show it by using the setup we have used.

### *5.5.2. Relationship between gender diversity and firm performance*

Summarizing the results from the performance regressions, where we attempted to establish the relationship between firm performance and gender composition of the board, we observe weak support for our second hypothesis. In three out of four regressions we obtained insignificant results for the *FFD* coefficients. This would, in econometric terms, imply that those variables are not statistically significantly different from zero and thus, the fraction of women on the board would have no impact on the performance of a company. As mentioned before, the lack of significant results could be a consequence of a small sample size or miss-specified models.

Looking at our results, only one regression supports our hypothesis that gender diversity enhances firm performance. In the regression where we tested our proxy for *Tobin's Q*, we could observe a positive significant coefficient for *FFD*, proving that gender diverse boards creates greater firm performance. There may be several explanations to why a gender diverse board has a positive impact on firm performance, one being related to the explanations that are brought forward in traditional theories speaking in favor of heterogeneous boards, namely that it is positive whenever the board members complement each other. The mix of personalities, competences and knowledge is the key to success. Referring to the differences in risk propensity between men and women, that we discussed in the previous section, it may actually be the fact that a gender diverse board creates a more balanced risk taking environment, which, according to for example Ferrary (2009), is positive for success. In our sample, the results for *Tobin's Q* show that a gender-balanced board is more profitable than a board that has a more uneven distribution of men and women. This is in line with the previous findings showing that firms with more women on their boards of directors are more profitable than firms with no women at all, all else equal. What should be emphasized however is that we cannot say anything about the effect that a board consisting only of women (or more women than men) would have on *Tobin's Q* (since no such observations are included in our sample). Given our hypothesis regarding gender diversity, this was neither our intention.

As already mentioned, we received insignificant results in three of the performance regressions, something that weakens the arguments above and rather states that performance is not related to gender composition of boards. In the regressions for *Excess Return* and *ROE*, we can observe negative and insignificant *FFD* coefficients. Since these results cannot be statistically confirmed (p-values of 0.20 and 0.40 respectively) we cannot draw any definite conclusions with regard to potential negative effects that gender diversity might have on those performance measures. In none of our performance regressions we find robust and significant evidence proving that gender diversity should deteriorate firm performance, which at least implies that, as long as there are equivalent candidates of both genders, there are no reasons to have as male dominated boards as Swedish companies have today.

Last but not least we would like to highlight the fact that gender diversity is not the only dimension of board composition that affects performance. By including various control variables we have tried to assess all possible board and firm characteristics that may affect the performance measures we tested for. In the *ROA* and *ROE* regressions, we observe, for example, that the coefficients for the number of *Boardmembers* are negative and significant. This implies that, the smaller the board, the greater the performance, as measured by *ROA* and *ROE*. These results may show that there exists some substance in the arguments promoting homogeneous boards. A smaller number of directors create a board with, presumably, less conflicting views and a more aligned vision for the company, which, according to the theories that speak in favor of homogenous boards, should be positive for firm performance. Relating these theories to our own hypothesis, it might be the case that a less gender diverse board, i.e. a more homogenous board, could have some positive effects on performance, even though we have not found any clear signs of this being the case.

To summarize, given that we overall get so few results that are significant, we do not feel confident in claiming that a more gender diverse board is positive for performance in every sense.

However, we feel that we can confirm the existence of some, albeit vague, support for our second hypothesis, since we have one strong and robust result in favor, and no robust results disproving it.

# 6. Concluding remarks

In this final section we will provide a summary of our initial purpose and the hypotheses we have tested for in this thesis. We will then move on to our main findings and conclusions. Finally, we will present suggestions for further interesting research in this area.

## *6.1. Conclusion*

This thesis attempted to assess the effects that female directors and managers have on risk taking and performance levels in companies. The subject caught our interest since the fractions of females in both domestic and international top positions are fairly low. In addition, it is a delicate and hot topic, constantly subject to discussions. First, we wanted to investigate the relationship between, on the one side a higher fraction of women on boards and in top management, and on the other side the risk levels in a company. Our first hypothesis was that females would turn out to be more risk averse than men, which consequently would be demonstrated through the fact that a company with more women showed lower risk levels, as measured by various accounting and market based risk measures. Our second hypothesis was that a firm with a gender-balanced board would perform better over time, the intuition being that women contribute to a more diversified and cautious way of thinking with regard to risky decisions.

From our regression results it was hard to establish any consistent relationships, since many of the variables we tested for showed insignificant coefficients, especially after we checked the results for robustness. In the gender-risk setup, we received more varying results than for the gender-performance setup, and in the summary and discussion part we outlined several reasons to why this might be the case and why our results are not as significant and consistent as previous research give evidence to. When it comes to the performance measures we can however conclude that *Tobin's Q* increases when the board reaches a more balanced gender composition, as measured by *FFD*. For the other performance measures we did not observe any results that confirmed this observation, nor significantly supported the contrary.

Some general conclusions that we can draw from this thesis are that these kinds of analyses are highly dependent upon the particular risk or performance measure being used, just as previous research shows. It is also hard to fully investigate this subject by conducting a study on the Swedish market, since it is difficult to find relevant and sufficient data in such a small market. This would probably have been avoided with a larger dataset, extended over a larger geographical area and a longer time period.

## 6.2. Further research

In order to fully confirm the hypotheses presented in this paper, and also establish more robust results, more data would be necessary. It would be interesting to see if significant results could be obtained from a more extensive dataset. If performance measures based on share prices were deducted from the analyses, it would for example be possible to include non-listed Swedish companies as well, as long as these companies present full-worthy data.

Another interesting subject for further research would be to investigate the effect that a board consisting of 100 percent women would have on firm performance. Being able to make this analysis would complement the gender discussion and give additional proof of whether a heterogeneous (diverse) or a homogenous board of any kind is the ultimate choice.

Finally, in order to see if women really have a different risk taking behavior when they work as top managers or hold positions on boards, and observe to what extent their ideas affect their decisions, it would be interesting to perform a sociological study rather than using certain risk measures as proxies for their actions. It would also be possible to conduct a diff-in-diff estimation and test whether companies that have increased their fraction of women experience lower risk levels than they did before this change.

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# Appendices

**Table Appendix 1: Regressions of DOL on FFD and CFOdummy variables**
OLS regressions run for one risk measure; *Degree of Operating Leverage* (A3), not correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In the regression, industry and year dummies are included.

| **Independent variable:** | **Regression number: (A3)** |
|---|---|
| FFD | 8.2332 |
| | [55.9987] |
| CFOdummy | -4.1527 |
| | [9.9810] |
| Boardmembers | 2.6919 |
| | [2.6204] |
| AverageBoardage | 0.4708 |
| | [1.0178] |
| FractionIndWomen | 3.9265 |
| | [6.3800] |
| FractionIndMen | -0.4664 |
| | [2.8229] |
| CompanySize | -3.9784 |
| | [2.8201] |
| PercentageVarRem | 2.4489 |
| | [19.370] |
| Chairmandummy | -21.5310 |
| | [25.4313] |
| Observations | 356 |
| R-squared | 0.0583 |
| Year effects | Included |
| Industry effects | Included |
| Firm fixed effects | Not included |

**Table Appendix 2: Results for risk regressions using White's correction for heteroscedasticity**
OLS regressions run for four risk measures; the *DE ratio* (A1), the *DME ratio* (A2), the *Cash-to-Total Assets ratio* (A5) and the *Stock Price Volatility* (A6), correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In all regressions, industry and year dummies are included.

| | **Regression number:** | | | |
|---|---|---|---|---|
| **Independent variable:** | **(A1)** | **(A2)** | **(A5)** | **(A6)** |
| FFD | -5.1313*** | 3.6418 | -0.2607** | 0.0274 |
| | [1.5821] | [3.0178] | [0.1089] | [0.0180] |
| CFOdummy | -0.3566 | -0.7923* | -0.0121 | -0.0028 |
| | [0.2277] | [0.4308] | [0.0146] | [0.0019] |
| Boardmembers | 0.0493 | 0.0433 | 0.0026 | -0.0009** |
| | [0.0581] | [0.0615] | [0.0049] | [0.0004] |
| AverageBoardage | -0.0915*** | -0.0832* | 0.0010 | 0.0001 |
| | [0.0342] | [0.0430] | [0.0022] | [0.0003] |
| FractionIndWomen | 0.2457 | -0.6266** | -0.0058 | -0.0011 |
| | [0.1680] | [0.2832] | [0.0120] | [0.0012] |
| FractionIndMen | -0.1251** | -0.0778 | -0.0038 | 0.0010 |
| | [0.0558] | [0.0820] | [0.0056] | [0.0006] |
| CompanySize | 0.0800 | 0.1076 | -0.0189*** | -0.0016** |
| | [0.0597] | [0.0759] | [0.0064] | [0.0008] |
| PercentageVarRem | 0.6259 | -0.7862 | -0.0029 | 0.0141 |
| | [0.4122] | [0.5255] | [0.0309] | [0.0112] |
| Chairmandummy | -1.7620*** | -0.0673 | -0.0384 | 0.0036 |
| | [0.5506] | [0.5584] | [0.0408] | [0.0041] |
| Observations | 356 | 259 | 356 | 356 |
| R-squared | 0.2867 | 0.3680 | 0.3785 | 0.3009 |
| Year effects | Included | Included | Included | Included |
| Industry effects | Included | Included | Included | Included |
| Firm Fixed effects | Not included | Not included | Not included | Not included |

**Table Appendix 3: Results for performance regressions using White's correction for heteroscedasticity**
OLS regressions run for four performance measures; *Excess Return* (B1), *Tobin's Q* (B2), *Return on Assets* (B3) and *Return on Equity* (B4), correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In all regressions, industry and year dummies are included.

| **Independent variable:** | **Regression number:** (B1) | **(B2)** | **(B3)** | **(B4)** |
|---|---|---|---|---|
| FFD | -0.6305* | 9.3199*** | 0.1557 | -0.1541 |
| | [0.3711] | [2.9240] | [0.1066] | [0.1876] |
| CFOdummy | 0.0257 | -0.5733* | -0.0109 | 0.0141 |
| | [0.1024] | [0.3049] | [0.0266] | [0.0416] |
| Boardmembers | -0.0326 | -0.1253 | -0.0155** | -0.0643*** |
| | [0.0229] | [0.1817] | [0.0064] | [0.0199] |
| AverageBoardage | -0.0175** | 0.0041 | 0.0001 | -0.0012 |
| | [0.0432] | [0.0485] | [0.0028] | [0.0047] |
| FractionIndWomen | 0.0681 | -0.0516 | 0.0110 | 0.1023*** |
| | [0.0432] | [0.2944] | [0.0128] | [0.0304] |
| FractionIndMen | 0.0407 | 0.2300 | 0.0078 | 0.0180* |
| | [0.0261] | [0.1573] | [0.0062] | [0.0095] |
| CompanySize | -0.0075 | -0.5893*** | 0.0292*** | 0.0794*** |
| | [0.0324] | [0.1396] | [0.0074] | [0.0253] |
| Chairmandummy | -0.2414 | 1.4682* | 0.0852 | 0.1713 |
| | [0.2421] | [0.7750] | [0.1154] | [0.2045] |
| Mktrf | -0.1051 | | | |
| | [0.0902] | | | |
| HML | 0.0092 | | | |
| | [0.0383] | | | |
| SMB | -0.0000*** | | | |
| | [0.0000] | | | |
| Observations | 354 | 293 | 355 | 354 |
| R-squared | 0.4648 | 0.4446 | 0.3278 | 0.3828 |
| Year effects | Included | Included | Included | Included |
| Industry effects | Included | Included | Included | Included |
| Firm fixed effects | Not included | Not included | Not included | Not included |

**Table Appendix 4: Results for risk regressions using firm fixed effects**

OLS regressions run for three risk measures; the *DE ratio* (A1), the *DME ratio* (A2) and the *Stock Price Volatility* (A6), not correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In all regressions, year dummies are included.

| Independent variable | Regression number: (A1) | (A2) | (A6) |
|---|---|---|---|
| FFD | -0.1870 | 8.8184*** | 0.0042 |
| | [1.9793] | [2.7135] | [0.0196] |
| CFOdummy | -0.0923 | -1.5423*** | -0.0039 |
| | [0.3380] | [0.4861] | [0.0033] |
| Boardmembers | 0.2195* | 0.0024 | -0.0008 |
| | [0.1322] | [0.2038] | [0.0013] |
| AverageBoardage | -0.0798** | -0.2132*** | -0.0004 |
| | [0.0394] | [0.0534] | [0.0004] |
| FractionIndWomen | -0.1611 | -0.9387** | 0.0000 |
| | [0.2679] | [0.3632] | [0.0026] |
| FractionIndMen | -0.1123 | -0.0013 | 0.0015 |
| | [0.0956] | [0.1338] | [0.0009] |
| CompanySize | 0.0646 | -1.0010*** | -0.0023 |
| | [0.1873] | [0.3390] | [0.0019] |
| PercentageVarRem | -0.2613 | -1.1909 | 0.0224*** |
| | [0.7382] | [1.0443] | [0.0073] |
| Chairmandummy | -0.5935 | 1.1177 | 0.0018 |
| | [0.8848] | [1.6453] | [0.0088] |
| Observations | 356 | 259 | 356 |
| R-squared (overall) | 0.0278 | 0.0211 | 0.1317 |
| R-squared (within) | 0.0655 | 0.4144 | 0.2833 |
| Year effects | Included | Included | Included |
| Industry effects | Not included | Not included | Not included |
| Firm fixed effects | Included | Included | Included |

**Table Appendix 5: Results for performance regressions using firm fixed effects**
OLS regressions run for one performance measure; *Excess Return* (B1), not correcting for heteroscedasticity. The first row for each independent variable indicates the coefficient value. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. The values in parenthesis are the reported standard errors. In the regression, year dummies are included.

| **Independent variable** | **Regression number: (B1)** |
|---|---|
| FFD | -2.5800*** |
| | [0.7907] |
| CFOdummy | 0.1187 |
| | [0.1309] |
| Boardmembers | -0.0098 |
| | [0.0488] |
| AverageBoardage | -0.0382*** |
| | [0.0145] |
| FractionIndWomen | 0.0253 |
| | [0.1060] |
| FractionIndMen | 0.0420 |
| | [0.0352] |
| CompanySize | -0.3452*** |
| | [0.0814] |
| Chairmandummy | 0.1176 |
| | [0.3077] |
| Mktrf | -0.0642 |
| | [0.0438] |
| HML | 0.0192 |
| | [0.0261] |
| SMB | -0.0000 |
| | [0.0000] |
| Observations | 354 |
| R-squared (overall) | 0.1774 |
| R-squared (within) | 0.5228 |
| Year effects | Included |
| Industry effects | Not included |
| Firm fixed effects | Included |