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Does Enterprise Risk Management Matter?

A study of Swedish listed firms during the 2007-2008 Financial Crisis



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ABSTRACT

Empirical findings on Enterprise Risk Management suggests that it can have a positive impact on firm performance, since it focuses on an integrated risk management framework which provides the firm with a better resource allocation. Other findings indicate the opposite, that Enterprise Risk Management should not have an impact on firm performance since shareholders should diversify firm-specific risks themselves and not be compensated for bearing such risk. This study examines the effect of Enterprise Risk Management on non-financial firms that were listed on the Stockholm Stock Exchange during the 2007-2008 financial crisis. More precisely, we analyse the relationship of Enterprise Risk Management with firm performance measured as buy-and-hold stock returns, together with a set of control variables. Major findings from this study suggest that Enterprise Risk Management does not have an impact on firm performance during times of crisis.

Keywords: Enterprise Risk Management, Integrated Risk Management, Risk Governance, Strategic Risk Management, Holistic Risk Management, Financial Crisis

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TABLE OF CONTENTS

1. Introduction	1
2. Literature review	5
2.1. Theoretical framework.....	5
2.2. Previous literature on ERM and firm value.....	7
2.3. Previous literature on ERM and the 2007-2008 financial crisis.....	10
3. Data and variables	13
3.1. Sample selection.....	13
3.2. Measuring firm performance.....	14
3.3. Measuring Enterprise Risk Management.....	14
3.4. Control variables.....	15
4. Research design	18
4.1. Estimation of the model.....	18
4.2. Endogeneity.....	19
5. Empirical results and analysis	20
5.1. Descriptive statistics.....	20
5.2. Multivariate analysis.....	23
6. Additional analysis	27
6.1. Alternative measures of firm performance.....	27
6.2. Alternative definition of crisis period.....	28
6.3. Three time-period analysis.....	28
7. Conclusions	30
References	32
Appendices	37

LIST OF TABLES

Table 1 – Sample information.....	17
Table 2 – Descriptive statistics.....	21
Table 3 – Comparison of ERM and non-ERM firms.....	22
Table 4 – Regression analysis.....	26
Table 5 – Three time-period analysis.....	29

LIST OF APPENDICES

Appendix A – Stock price movements	37
Appendix B – Examples of ERM search word hits	38
Appendix C – Correlation analysis.....	39
Appendix D – Robustness tests.....	40

LIST OF ABBREVIATIONS

COSO	Committee of Sponsoring Organizations of the Treadway Commission
CEO	Chief Executive Officer
CRO	Chief Risk Officer
ERM	Enterprise Risk Management
ICB	Industry Classification Benchmark
ROA	Return On Assets
ROE	Return On Equity
TRM	Traditional Risk Management
U.S.	United States

1. Introduction

In recent years companies have moved from a Traditional Risk Management (TRM) approach towards implementing Enterprise Risk Management (ERM), which has developed to meet the needs of a more practical and integrated risk management process (Simkins & Ramirez, 2007). In TRM, risks are usually managed in silos, meaning that a single risk is being isolated and handled individually. This approach has its limitations as it uses different treatments for similar risks and does not take into account the interrelation between them, making it difficult to understand the risk in-depth as well as the consequences of it (Bowling & Rieger, 2005). Firms began to abandon the silo-based approach for integrated risk management as they started to face a broader scope of risks from factors such as globalization and deregulations (Liebenberg & Hoyt, 2003). Even though there are a few definitions of ERM in the literature, there are some agreements regarding what the goal of it is. Firms see the risks as a portfolio, where the focus is not only on the downside of risks but also the opportunities (Bromiley, McShane, Nair, & Rustambekov, 2014). Academics argue that ERM gives a better understanding of the various risks in the company, including more strategic and qualitative types of risks as well as making it possible to reduce risks through natural hedges (Hoyt & Liebenberg, 2011).

A number of frameworks have been developed to guide firms in their implementation of ERM. One of these are the Casualty Actuarial Society (CAS) framework, which in 2003 defined ERM as “the discipline by which an organization assesses, controls, exploits, finances and monitors risk from all sources for the purpose of increasing the short and long-term value to its stakeholders”. However, the most popular definition of ERM in literature is the one presented by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) (2004) ERM framework (Lundqvist, 2014).

“ERM is a process, affected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.”

Since its release in 2004, COSO’s *Enterprise Risk Management - Integrated Framework* has been widely used and has come to play a central role in the definition of ERM. The COSO framework consist of eight components of ERM, where (1) *Internal environment* sets the foundation for how risk and control are addressed by the company, including the amount of risk it is willing to take and the environment in which they want to operate. (2) *Objective setting*

puts a process in place for deciding the objectives and making sure that they align with the company's mission. (3) *Event identification* identifies potential events, both internally and externally, which may affect the achievement of the company's objectives. (4) *Risk assessment* are identifying and analyzing different types of risk, on a basic and advanced level, to determine the likelihood of it happening as well as its impact. (5) *Risk response* is identifying and evaluating possible actions and responses to risks. This includes avoiding, accepting, reducing and sharing risks. (6) *Control activities* is making sure policies and procedures are in place to ensure that the risk responses are effectively accomplished. (7) *Information and communication* is making sure relevant information is identified and communicated throughout all levels of the company. (8) *Monitoring* is necessary to make sure that ERM is working effectively on a regular basis. The COSO framework defines the strength of ERM based on an assessment of whether the eight components are existing and functioning well in the company (COSO, 2004).

In theory, ERM is believed to have a positive impact on firm performance, but empirical evidence on its impact is still considered scarce (Tahir and Razali, 2011). There are those who argue that ERM can create value for the firm as it focuses on an integrated risk management framework, where the collective risk of the firm is identified, assessed and managed. This provides the firm with a better resource allocation and improves the return on equity (ROE) and the capital efficiency (Meulbroek, 2002). As companies are operating in environments where globalization, technology and competition are great factors that create uncertainties and increases the risk of the firm, ERM allows companies to manage the amount of risk it is willing to accept, as it tries to achieve its goals and provide value to its stakeholders (COSO, 2004).

The large implementation of ERM in both financial and non-financial firms aims to ensure quality and to create value for the firm (Hoyt & Liebenberg, 2011). However, empirically there is no consistent evidence supporting this assumption while there are a number of studies that have investigated the impact of ERM on firm performance. The majority of the studies focus on how ERM creates value for a company, where performance is measured in different ways such as Tobin's Q (Hoyt & Liebenberg, 2011), buy-and-hold stock returns (Aebi, Sabato, & Schmid, 2012) and return on assets (ROA) (Baxter, Bedard, Hoitash, & Yezegel, 2013). Some of the studies provide evidence that ERM is value creating to shareholders, but the inconsistent evidence of the benefits of ERM may also advise that it does not ensure quality as intended, and therefore not value creating. It could be that the costs of implementing ERM outweighs the benefits, or that agency costs can result from disagreements between managers and shareholders as to what actions are preferable. Pagach and Warr (2010) argue that it could simply be that the

previous variables used in literature are the source of variation in the results, since different ways have been used to measure both the firm performance and ERM variable.

The point of departure for this thesis is that ERM programs could help firms avoid big losses and falling market value. Therefore, the results of such a program are better observed during times of crisis when the company's risks are put more in focus. The advantage of focusing on a crisis period is that it will avoid endogeneity problems that can make it harder to identify the real relationship between ERM and firm performance (Baek, Kang, & Suh Park, 2004). The financial crisis of 2007-2008 is a good time frame to measure the effects of ERM as it is viewed as the worst crisis since the Great depression in the 1930s. This is due to the fact that it caused a global recession and led to a large number of financial institutions collapsing or bailed out by governments (Isyuk, 2013). While macroeconomic factors such as loose monetary policies were the roots of the global crisis, there were some firms that were affected more than others. Therefore, it is important to examine how firm-level policies may have affected the firm's performance. One policy that had a significant impact on the degree of shareholder losses during the financial crisis, which received large attention from investors and academics, is the risk management before the crisis (Erkens, Hung, & Matos, 2012).

Almost every developed country in the world was severely hit by the financial crisis, which caused their economies and predications for the future to crash. Then there was Sweden which was referred to as the "expert" of the recovery, since their percentage growth rate was almost twice as large as in the United States (U.S.) and stronger than any other developed nation in Europe (Irwin, 2011). To our knowledge, no previous studies exist on the impact of ERM on firm performance for the Swedish market during the financial crisis. Therefore, we will examine this matter in the Swedish context. The advantage of focusing on a single country is that it allows us to analyze risk governance at a level of detail that would be hard to aggregate across countries (Baek et al., 2004). However, the downside is that it will limit our sample and only give us results about the relationship between ERM and firm performance for a single nation.

While there exists some lack of consensus regarding ERM and its ability to create value, the aim of this thesis is to investigate if ERM has an impact on firm performance during times of crisis.

The following research question was created:

- Does Enterprise Risk Management have an impact on firm performance during times of crisis?

To answer the research question we will be looking at non-financial firms listed on the Stockholm Stock Exchange during the 2007-2008 financial crisis. Similar to Aebi et al. (2012), Erkens et al. (2012) and Baxter et al. (2013), we test how risk management and corporate governance variables affect stock returns during times of crisis. However, since most of the previous studies have looked at ERM and firm performance by studying financial firms during the crisis, we will investigate this matter for non-financial firms. One important difference between non-financial firms and financial firms is the role of risk management, where non-financial firms view risks as a secondary activity compared to banks and insurance companies that have risk as a main focus (Aebi et al., 2012). To our knowledge, there is only one study that examines the role of ERM for non-financial firms during the 2007-2008 financial crisis, and this is made for the Canadian market. However, the results are not complete and there is no clear structure as to which methodology and variables that were used in their study (Quon, Zeghal, & Maingot, 2012).

We believe that this thesis contributes to a better understanding of the effect of ERM on firm performance and the effect that ERM has on Swedish listed non-financial firms. Our paper sheds new light on the role of ERM in influencing firm performance and contributes to the risk management, corporate governance and financial crisis literature. Moreover, our findings are useful to companies that are listed on the Swedish stock market, that are interested in the implementation of ERM in their corporations.

As in the research conducted by Aebi et al. (2012), we collect the measures for risk management and control variables at the end of year 2006, since this is the last complete year before the financial crisis. We use both hand-collected data from the firms' annual reports and from the Bloomberg database. We investigate if the ERM is significantly related to the firm's crisis performance, defined as buy-and-hold stock returns from July 2007 to December 2008 (Fahlenbrach & Stulz, 2011; Beltratti & Stulz, 2012). Our results find no support that ERM is value creating for Swedish listed non-financial firms during the 2007-2008 financial crisis.

The remainder of this paper is organized as following: Section 2 is used for presenting earlier research and theories as well as to deduce the hypothesis. In Section 3 we describe our data and variables, and in Section 4 we explain the research design for testing the hypothesis. Section 5 contains empirical results and analysis from testing our data. In Section 6, we perform additional analysis and assess the robustness of our results, and finally Section 7 concludes the results and suggests inspirations for future research.

2. Literature review

2.1. Theoretical framework

There have been two main theoretical explanations for why firms adopt ERM, related to traditional capital market imperfections and corporate governance. Traditional capital market imperfections are the most commonly used explanation in the ERM literature (Liebenberg & Hoyt, 2003; Beasley, Pagach, & Warr, 2008; Pagach & Warr, 2011; Hoyt & Liebenberg, 2011; McShane, Nair, & Rustambekov, 2011; Altuntas, Berry-Stölzle, & Hoyt, 2011; Gates, Nicolas, & Walker, 2012; Eckles, Hoyt, & Miller, 2014; Bromiley et al., 2014; Grace, Leverty, Philips, & Shimpi, 2015). This literature argues that the implementation of risk management stems from its ability to increase firm value and reduce costs, resulting from asymmetric information that occur whenever one party has greater material knowledge than the other party. More specifically, Liebenberg and Hoyt (2003) refers to motives for risk management activities such as corporate insurance and hedging. Firms should purchase insurance because it can potentially increase firm value through its effect on investment policies, contracting costs and firm's tax liabilities. While it can also reduce the costs associated with conflicts of interest between owners and managers, the firm's tax burden, and expected bankruptcy costs. As with insurance, corporate hedging can reduce expected bankruptcy costs by lowering the probability of financial distress. Further, previous literature on hedging also suggested that risk management can potentially reduce conflicts and expected taxes as well as improve the firm's power to benefit from investment opportunities (Froot, Scharfstein, & Stein, 1993; Jankensgård, 2016).

However, these arguments do not distinguish between a firms choice to implement TRM or ERM, where both most likely would be influenced by such advantages. The arguments made specifically for ERM is that firms should seek to implement these programs only if it increases the expected shareholder value. Academics argue that ERM can benefit the firms by reducing external capital costs, decreasing earnings and stock price volatility, increasing capital efficiency, and creating synergies between different risk management activities. With ERM, firms with a broad range of investment opportunities are likely to benefit from selecting investments based on a more risk-adjusted rate than was available under the TRM approach (Meulbroek, 2002; Beasley et al., 2008). Overall, ERM is said to create more risk awareness that leads to better operational and strategic decision making in the company, which in turn can increase the firm value (Hoyt & Liebenberg, 2011).

ERM also has a strong connection to corporate governance, since it integrates standard aspects of risk management with governance (COSO, 2004). Often, links are made between ERM and theories of corporate governance in the literature (Beasley, Clune, & Hermanson, 2005a; Desender, 2011; Altuntas et al. 2011; Aebi et al., 2012; Baxter et al., 2013), where Altuntas et al. (2011) found that firms that engage in ERM generally have better corporate governance and organizational structure. Beasley et al. (2005) shows that the presence of a Chief Risk Officer (CRO), managerial involvement and board independence are all associated with a greater level of ERM adoption. More specifically, Desender (2011) finds that the position of the Chief Executive Officer (CEO) in the board has an important influence on the level of ERM in the firm. They also find that board independence is significantly related to ERM when there is a separation of the role as CEO and chairman. They argue that CEOs do not favor ERM implementation and are able to endure the pressure from the board when they are the chairman.

Researches have also aimed to build theoretical frameworks for ERM (Nocco & Stulz, 2006; Ai, Brockett, Cooper, & Golden, 2011). Nocco and Stulz (2006) discuss the value creation of ERM in terms of macro and micro advantages. They argue that ERM can create a competitive advantage for a firm in the long-run by helping them maintain access to the capital markets, and by creating a process for managers and employees in the organization. By having an ERM program in place one should also reduce the possibility of financial distress, as managing risk should be less costly than holding more equity. Ai et al. (2011) apply a risk-constrained optimization approach to study the capital allocation decisions when ERM is implemented. Their mathematical framework measures the concepts of risk appetite from the COSO framework, which is the amount of risk the firm is willing to take to achieve its objectives, while also considering the avoidance of the firm's default and financial distress costs.

But there are also those who question whether risk management can add value to the firm. The argument that ERM is value creating runs counter to the portfolio theory by Markowitz (1952). Portfolio theory assumes that under certain assumptions, shareholders can eliminate firm-specific risks in a basically costless way through portfolio diversification. The classical finance theory distinguishes between systematic (market) risk and idiosyncratic (firm-specific) risk, which together constitute a firm's total risk. Investors can reduce the amount of total risk by two main risk management approaches, diversification and asset allocation. The systematic risk is the risk that remains after diversification, but investors can also control their exposures to this risk by adjusting their ownership of risky assets or by using derivative products such as forwards, futures or swap contracts (Woon, Azizan, & Samad, 2010; McShane et al., 2011).

The possibility for investors to adjust their own risk exposures seems to leave no role for the firm's risk management, and since investors can diversify idiosyncratic risks they should not be compensated for bearing such risks. As a result, investors should not value costly attempts by firms to reduce idiosyncratic risk, since the expenses and distraction of the management's attention would make ERM a bad investment due to the negative net present value of the project (Meulbroek, 2002; Pagach & Warr, 2010). This view relies on the assumption that capital markets work without imperfections. Furthermore, Modigliani and Miller (1958) established that in perfect capital markets, firm value is not affected by the capital structure.

From an agency theory perspective, risk management can control for the underinvestment problem by reducing the volatility of the firm value (Myers, 1977; Morrellec & Smith, 2007). However, this motive refers to TRM and does not argue for the implementation of ERM. The adoption of ERM might instead lead to a principal-agent problem, where agency costs can result from manager and shareholders conflicts on the risk management strategy. It may not be in the interest of managers to have the additional monitoring and restriction that ERM provides while independent members of the board may favor more control and risk management (Desender, 2011). While shareholders are mostly concerned with taking actions that increases the value of the stock, managers may be more focused on growing the business in ways that increase their own wealth. These conflict of interests usually leads to value destructions (Jensen, 1986).

2.2. Previous literature on ERM and firm value

Given the rather recent development of ERM in the literature and the many ways of identifying ERM firms, empirical results are inconsistent and there is a lack of consensus regarding the impact of ERM on firm performance. There are two main approaches that researchers have taken to measure ERM in firms, either they search for publically available data or they use surveys to obtain the information directly from the firms. Earlier studies have found some evidence of the motives for implementing ERM, but one of the main questions is if ERM is value creating. In their review, Kraus and Lehner (2012), identify 25 different studies that investigate the relationship between ERM and firm value. In 78% of these studies, a positive impact between ERM and firm value could be found, 17% found nothing, and 5% even found a negative impact.

Colquitt, Hoyt, and Lee (1999) were among the first to investigate ERM and its characteristics through survey studies. They found that the role of the risk manager was in development and that they were starting to deal with a broad range of risks, which would come to affect the structure of the risk management in the companies. In order to investigate how extensively

ERM was used, Kleffner, Lee, and McGannon (2003) surveyed members of the Canadian Risk and Insurance Management Society and found that 31% had adopted ERM. These firms implemented ERM mostly because they were influenced by the risk manager or encouraged by the board of directors. Reasons for not adopting ERM were found to be organizational structure and negative attitudes towards changes. Gates et al. (2012), also surveyed firms regarding the stages of their ERM adoption. They found that an ERM framework can help companies improve their performance, since executives can manage the company's risks in a better way.

While earlier studies have investigated ERM on a survey level, one of the first studies addressing the subject using publically available data is Liebenberg and Hoyt (2003). They use the announcement of a CRO to measure ERM adoption in the firms which has continued to be a popular way to identify ERM. They find that there is a lack of difference between firms that signal the appointment of a CRO, and other firms with comparable size and industry. Similar researches were made by Beasley et al. (2008) and Pagach and Warr (2010), where they study the market reactions of firms when they announce the appointment of a CRO, which they consider a proxy for ERM adoption. Both studies find little evidence of any firm effects from an ERM adoption. In addition, it may be that firms who have implemented ERM have not hired a CRO. This is supported by Lundqvist (2014), where evidence from her survey study show that some of the firms with ERM does not have a CRO in place. COSO (2004) also states that some firms choose to assign the role of the risk manager to another role in the company, even though they have an ERM program. This makes the hiring of a CRO unnecessary for the implementation of ERM, and therefore does not show the real effect of ERM on firm value.

One of the studies with the strongest support for the value creation of ERM is Hoyt and Liebenberg (2011). They identify firms with ERM programs by doing keyword searches in their annual reports for the terms "Enterprise Risk Management", "Chief Risk Officer", "Risk Committee", "Strategic Risk Management", "Consolidated Risk Management", "Holistic Risk Management" and "Integrated Risk Management". They find that insurance companies with ERM have 20 percent higher Tobin's Q than those without ERM. A similar method is used by Seik, Yu, and Li (2011) and Tahir and Razali (2011), where they use publically available data to identify firms with ERM to see if it has an effect on their firm performance. Seik et al. (2011) find that insurance companies with ERM have lower stock volatility than their non-ERM peers, while Tahir and Razali (2011) find no significant impact of ERM on firm value. The latter one investigates this matter for both financial and non-financial firms on the Malaysian market. Eckles et al. (2014) use the same search word strings as Hoyt and Liebenberg (2011), and find

evidence that insurance companies implementing ERM experience a reduction in stock return volatility. They also find that this reduction becomes stronger over time and that operating profits per unit of risk (ROA/return volatility) increases after they have implemented ERM.

McShane et al. (2011) uses publically available data and collects ERM ratings available for insurance companies at Standard & Poor. This ERM rating is constructed as a scale from 1 to 5, scoring the firms on their ERM implementation. They find that insurers show a positive relationship between ERM ratings and firm value, but only as the rating increases over the first three levels, indicating a firm's use of TRM. They find no additional value for firms achieving the higher levels of the rating, which is considered as ERM. Similarly, Farrell and Gallagher (2015) use the Risk and Insurance Management Society (RIMS) Risk Maturity Model (RMM), which scores the firms on a five-point maturity scale. Their results suggest that firms that have reached mature levels of ERM also have higher firm values.

An ERM measure that has been developed in literature is the ERM index by Gordon, Loeb, and Tseng (2009). The index is based on the COSO framework of how well firms manage their strategical, operational, reporting and compliance objectives. They construct different ways of measuring these objectives quantitatively, to be able to score the firms on their ERM usage. They find that the relationship between ERM and firm performance is contingent upon the match between ERM and five firm-specific factors which are environmental uncertainty, industry competition, firm size, firm complexity and monitoring of the board.

By implementing ERM, the firms will benefit from new understandings about the relation between different risks and decision areas, which is something that can easily be missed without a broad framework (Meulbroek, 2002). However, the ability to reduce risks does not always imply that the firm should do so, since the advantages of risk management can vary by firms the strategy must be suitable for the company affected. While there are theoretical reasons why ERM may increase shareholder value, Beasley et al. (2008) says that these reasons may depend upon the characteristics of the individual firm, suggesting that a clear statement about the benefits and costs of ERM is not possible. For some firms, targeting a level of earnings or cash flow might increase the value of the firm while for others the strategy is to target the variation in the market value. To determine the optimal risk management, the firm must begin by understanding how the uncertainties about future profits affects the current market value, and to do so the managers must understand the channels through which risk management can potentially affect firm value. According to Meulbroek (2002), this understanding leads to the support of an ERM strategy.

While most empirical results seem to be in favor of the argument that ERM is value creating, the opposing evidence must be kept into consideration. The literature review suggests that the value creation of ERM is partly dependent on the firms industry, where insurance companies seem to find a significant relationship between ERM and firm performance more often than others (Hoyt & Liebenberg, 2011; Seik et al., 2011; McShane et al., 2011; Eckles et al., 2014; Grace et al., 2015). This could be due to the fact that, for insurers the major ratings agencies such as Standard & Poor have put increasing focus on ERM as part of their financial review. This is likely to provide additional incentives for insurance companies to consider ERM programs, as it might suggest a possible value creation (Hoyt & Liebenberg, 2011).

2.3. Previous literature on ERM and the 2007-2008 financial crisis

Recent studies have shown that a firms risk management and financing policies had significant impact on the degree to which they were affected by the financial crisis. As risk management and financing policies eventually are the results of a benefit and cost tradeoff made by boards and shareholders, an important finding is that corporate governance had an impact on firm performance during the crisis (Erkens et al., 2012). Even though there are no simple answers to the question of how the crisis could have been prevented, effective risk management could have informed the board of directors and management to the problems before they reached the point that created complications for the U.S. economy and the global financial markets. Even though the problems that caused the crisis are complicated, they showed some evidence that management did not fully understand the scope and complexity of the risks. Academics argue that the starting point for avoiding these problems in the future could be the adoption of ERM that can identify, monitor and address risk across business activities (Storero, 2009).

There are a few studies looking into the effect of ERM on firm performance, during the financial crisis. Baxter et al. (2013) uses Standard & Poor's ERM rating and investigates the determinants of ERM quality and its relationship with firm value. This is done for financial firms during 2006–2008 which covers the crisis period. Their results suggest that higher quality ERM programs support the firm performance by helping to mitigate losses and taking advantage of opportunities. However, their results show no association between ERM quality and stock returns during the crisis, but a strong relationship between the two during the post-crisis period in 2009. This suggests that firms with greater ERM programs recovered faster from the crisis, which could be an indicator of the long-term benefits of ERM (Nocco & Stulz, 2006; Pagach & Warr, 2010). Another study looking into this matter is Aebi et al. (2012), where they investigate whether risk governance is related to the banks stock returns during the financial

crisis. They find evidence that banks that had a CRO in place which reported directly to the board, performed significantly better than banks where the CRO reported to the CEO. However, they find no significant result of better bank performance for those with a risk committee in place, which is a way of identifying ERM firms according to Hoyt and Liebenberg (2011).

A study specifically related to ours is the one conducted by Quon et al. (2012), where they examine the relationship between ERM and firm performance by looking at non-financial firms listed on Toronto Stock Exchange (TSX). To examine ERM and firm performance, they do an analysis of the company's annual reports and collect a variety of market, operational and accounting performance measures for the time period 2006-2009. They find no significant impact of ERM on firm performance during the financial crisis. However, the results are not complete and there is a lack of information regarding the data and methodology of their study. Overall, the research does not give a clear analysis of ERM's effect on non-financial firms.

Since risk management has been said to be related to corporate governance, Fahlenbrach and Stulz (2011), Erkens et al. (2012) as well as Beltratti and Stulz (2012) focuses on corporate governance variables that affected the banks' performance during the financial crisis. They found that firms with high institutional ownership and board independence had worse stock returns during the crisis, which is similar to the findings of Aebi et al. (2012). They argue that banks with higher institutional ownership took more risks before the crisis which resulted in larger shareholder losses during the crisis. The firms with larger board independence raised more equity capital during the crisis, which then led to a wealth transfer from shareholders to debtholders. Lins, Volpin, and Wagner (2013) also studies corporate governance aspects during the crisis, looking specifically at how family control affects valuations and corporate decisions. They find that family-controlled firms underperform significantly and that they tend to cut investments compared to other firms, which is associated with greater underperformance.

The methods of identifying ERM are mixed between using public data and surveying firms, and it is still unclear which measures best capture ERM and provide the most reliable results in terms of the relationship between ERM and firm performance. However, it seems that the size of the firm plays a big role in the decision to implement ERM as well as the industry, management and governance. An obstacle of using public data is the difficulty of identifying firms that engage in ERM since they are not obliged to disclose information about their ERM usage (Liebenberg & Hoyt, 2003).

As presented in this section, most of the theories are pointing at the direction that ERM should create value for the firm. However, there is empirical evidence suggesting otherwise as well. Therefore, the following hypothesis will be tested for to determine if ERM has an impact on firm performance.

H₀: Enterprise Risk Management does not have an impact on stock returns during the 2007-2008 financial crisis

H₁: Enterprise Risk Management does have an impact on stock returns during the 2007-2008 financial crisis

3. Data and variables

3.1. Sample selection

There should be no better time to measure the impact of ERM than during times of crisis when these programs are put to the test. If ERM helps the firms to mitigate risks during the crisis, then this effect should be reflected in their financial performance as well (Baxter et al., 2013). Therefore, to analyze the relationship between ERM and firm performance, we look at the most recent financial crisis in 2007-2008. Similar to previous studies made about the firm performance and the financial crisis we conduct our research using 18-month data from July 2007 to December 2008 (Fahlenbrach & Stulz, 2011; Beltratti & Stulz, 2012; Aebi et al., 2012). We begin the investigation period in mid-2007 because this is generally regarded as the period when the market got unstable and end our investigation period in the end of 2008 since the market started to recover from 2009 and onwards. This 18-month period also corresponds to the greatest loss of bank wealth since the Great Depression (Beltratti & Stulz, 2012). Looking at stock prices for the S&P500 and OMX30 from January 2007 until December 2009 in Appendix A, one can see that the big fall in prices hit in mid-2008 for both the U.S. and the Swedish market. However, one can already see decreasing stock prices from mid-2007 until its recovery in beginning of 2009.

Our final sample consists of 156 non-financial firms that were publicly listed at the end of December 2006 on the Stockholm Stock Exchange. We use the following criteria to collect data for our sample. First, we restrict our sample to non-financial firms listed on the Nasdaq Stockholm that were publicly traded at the end of 2006 and available on the Bloomberg database. The non-financial firms were chosen according to the Industry Classification Benchmark (ICB) that resulted in 8 out of 10 industries available for our sample (basic materials, consumer goods, consumer services, health care, industrials, oil & gas, technology and telecommunications). This sample selection resulted in 217 non-financial firms. From these firms, 61 were removed from the sample since not enough data was available during our selected time period. Missing data such as total assets and liabilities that could be collected from the annual reports were not excluded and instead added after a search was made in their financial statements in end-2006.

There are a few firms that have either merged or ceased to exist since the financial crisis and does not have annual reports available. These were excluded from our sample because the annual reports for these firms are necessary in order to collect information for the ERM and

governance variables. However, if annual reports were missing for existing firms then these were contacted by email in order to collect data for the year 2006. This exclusion of firms that have merged or ceased to exist might give rise to a survivorship bias. A survivor bias can lead to overly optimistic assumptions of the firm's performance, since failures are ignored. It may also underestimate the effect of ERM, as firms without ERM are more likely to drop from the sample. However, we do not expect this bias to have an effect on the relationship itself.

3.2. Measuring firm performance

Our primary definition of firm performance is buy-and-hold stock returns, measured during an 18-month period from July 2007 until December 2008. Several researches have used this measure when studying the firm's performance during the financial crisis of 2007-2008 (Fahlenbrach & Stulz, 2011; Beltratti & Stulz, 2012). More specifically, studies such as Aebi et al. (2012), Erkens et al. (2012) and Baxter et al. (2013) have used this firm performance measure when analyzing the relationship between risk management, corporate governance and firm performance during the 2007-2008 financial crisis. Buy-and-hold is an investment strategy in which an investor buys stocks and holds them for a longer time period, regardless of the variations on the market. The idea behind it is that an investor who uses this strategy selects stocks actively, but once in a position, is not worried about the short-term price movements. Therefore, we find this measure as a good estimate for how the firms performed during the financial crisis. We gather monthly data on historical stock prices from July 2007 until December 2008 from the Bloomberg database and calculate the stock returns for each firm. The historical prices are adjusted to reflect the stock splits, spin-offs, dividends and rights offering.

$$\text{Buy-and-hold stock return} = \frac{\text{Stock price Dec 2008} - \text{Stock price July 2007}}{\text{Stock price July 2007}}$$

3.3. Measuring Enterprise Risk Management

Hoyt and Liebenberg (2011) use publically available data, specifically annual reports, to collect information about firms with ERM. This has become a common way to identify and measure ERM firms (Seik et al., 2011; Tahir & Razali, 2011; Eckles et al., 2014). Therefore, we use the same method to collect data for our ERM variable. In our study, ERM is be measured using a dummy variable, where 1 indicates that the company is practicing ERM and 0 otherwise. Since companies are not required to report if they engage in ERM, we perform a detailed search in

each of the 156 firms' annual reports from 2006 to 2007, and look for keywords. The specific terms "Enterprise Risk Management", "Chief Risk Officer", "Risk Committee", "Strategic Risk Management", "Consolidated Risk Management", "Holistic Risk Management" and "Integrated Risk Management" are searched for. We chose these particular search strings because the second and third phrases are important methods for the implementation and management of an ERM program, and the other phrases are synonymous with ERM (Liebenberg and Hoyt, 2003). If there is a match for these keywords in the annual reports then this will be looked through to determine if ERM is in place. If there is no match with these search words, we will look under their "Risk Management" section, to see if there is a sign of integrated risk management in the company. We will also search in the firm's news media online for the years 2006 and 2007. If none of these searches give us a hit, then this would indicate that the firms do not have an ERM program in place, and therefore, the ERM variable in the model will be equal to zero. In Appendix B, some examples are given of the search word hits in the annual report of the firms we analyzed, which is in line with the findings of Hoyt and Liebenberg (2011).

3.4. Control variables

In our model, we control for several of variables that might affect the relationship between ERM and firm performance. These are collected for the end-year 2006, which is the last complete year before the financial crisis and might help to explain the performance of the non-financial firms. These variables are collected primarily from the Bloomberg database, however, some of the governance variables had to be hand collected from the firm's annual report. The choices of control variables are based on different studies that have used the buy-and-hold stock return as a performance measure during the financial crisis.

The first variable is the firm size, measured as the natural logarithm of total assets, which in prior literature has come to explain variations in stock returns and firms decision to implement ERM programs (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013; Lins et al., 2013). To control for the relation between capital structure and firm value we include a variable for the firms' leverage, calculated as the ratio of the total amount of debt relative to assets (Erkens et al., 2012; Baxter et al., 2013; Lins et al., 2013). Financial leverage can improve firm value to the extent that it reduces free cash flow that might have been invested in subprime projects instead. However, too much leverage can also increase the probability of bankruptcy and cause the owners to bear financial distress costs (Hoyt & Liebenberg, 2011). The third variable is beta which is included in our model to control for market risk (Baxter et al., 2013; Lins et al., 2013). Beta measures the volatility of the stock price relative to the market index, OMX30, which is

a market capitalization-weighted index that consists of the 30 most traded stocks on the Stockholm Stock Exchange. To examine whether the market valuation of the firm, and therefore the market's growth expectations, are related to the performance during the crisis, we control for the market-to-book ratio (Aebi et al., 2012; Baxter et al., 2013; Lins et al., 2013).

We will also control for the relation between future returns and past returns by including the past 6-month buy-and-hold stock return as of the start date in July 2007. This will be included as a variable in our model to investigate whether firms performing well before the crisis are taking on larger risks, which are then reflected in poor performance during the crisis (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013; Lins et al., 2013). Some studies are including longer periods for the lagged stock returns, but in our research there are many firms dropping out of the sample if we include longer than 6-month returns, due to missing data. When studying the stock price movements for the markets (Appendix A), we found the 6-month period before July 2007 to be a good estimate for how the stocks performed just before the crisis.

Two other control variables that are commonly used in the ERM literature are firm complexity and sales growth (Gordon et al., 2009; Hoyt & Liebenberg, 2011; Baxter et al., 2013). We control for number of segments in the company as a definition for firm complexity. That is, more segments are considered to increase a firm's complexity. There can be two different segments defined by the company in their annual report, the business segment or geographical area, in which one of these are the primary segment that we use to define the firm's complexity. Previous studies have also controlled for the effect of growth opportunities on firm value using the ratio of capital expenditure to assets (Allayannis & Weston, 2001). However, this data is missing for the majority of our sample. Therefore, we use historical one-year sales growth as a proxy for future growth opportunities which is calculated as the percentage increase or decrease of revenue, comparing end-year 2006 with same period prior year (Hoyt & Liebenberg, 2011; Baxter et al., 2013).

Additionally, we include three governance variables in our model which is commonly used in the risk governance literature. The first governance variable is the institutional ownership which is measured as the percentage of shares held by institutions owning more than 5% of equity. Institutional ownership is defined as the number of stocks in a firm owned by pension funds, insurance companies, investment firms or other large entities that manage funds on behalf of others. As such large owners can have the necessary knowledge and power, this variable may either improve the effectiveness of other corporate governance systems or work as a substitute for them (Aebi et al., 2012; Erkens et al., 2012). The second governance variable is the board

size, which is measured as the natural logarithm of the number of directors on a company's board. The number of directors on the firm's board include full-time directors only, meaning that deputy members will not be counted for (Aebi et al., 2012). Board independence is our last corporate governance variable which is defined as independent directors without any relation to the company except for their board seat. We classify directors as independent if they are non-executive directors, meaning not full-time employees (Aebi et al., 2012; Erkens et al., 2012).

Lastly, we control for possible variations in the stock returns by including the firms industry in our model. We base the industry indicators on the 10 industries available for the ICB. Since we are looking at non-financial firms 9 out of these 10 industries are included, where the 10th industry is financial firms. However, the industry referred to as "utilities" is excluded from our sample. This is due to the fact that no data for the firm performance is available for the two firms that are classified under this category, leaving us with a total of 8 industries. Dummy variables are used in the model in order to indicate a firms industry using the 1-digit ICB codes.

Table 1
Sample information

This table reports information about our sample such as number of firms in the different industries, their ICB codes and number of firms with and without ERM programs in place.

1-digit ICB	Industry	# of firms	# of firms with ERM	# of firms without ERM
1000	Basic Material	11	3	8
3000	Consumer Good	16	1	15
5000	Consumer Service	21	2	19
4000	Health Care	21	4	17
2000	Industrial	57	14	43
0001	Oil & Gas	1	1	0
9000	Technology	26	2	24
6000	Telecom	3	2	1
	Total	156	29	127

4. Research design

4.1. Estimation of the model

We use cross-sectional regression analyses to examine the relationship between firm performance and ERM during the financial crisis. Our estimated model will regress 18-months buy-and-hold stock returns on the ERM and control variables. We include firm size, leverage, beta, segments, sales growth, market-to-book and dummy variables indicating a firm's industry (1-digit ICB). In addition, we control for lagged stock returns for the previous 6-months starting from July 2007, as the performance during the crisis period may reflect a reversal of pre-crisis performance. In the model, we also include three governance variables that have shown to have an impact on firm performance during the financial crisis, which is institutional ownership, board size and board interdependence. In order to analyze and test our hypothesis we use the same method as Aebi et al. (2012), Erkens et al. (2012) and Baxter et al. (2013), and regress our model using ordinary least squares (OLS). The multiple linear regression model and its estimation using ordinary least squares is a widely used tool in econometrics and allows us to estimate the relation between a dependent variable and a set of explanatory variables, which will look like the following.

$$\text{Firm Performance} = \beta_0 + \beta_1 \text{ERM} + \beta_2 \text{Firm Size} + \beta_3 \text{Leverage} + \beta_4 \text{Beta} + \beta_5 \text{Ownership} + \beta_6 \text{Board Size} + \beta_7 \text{Independence} + \beta_8 \text{Past Return} + \beta_9 \text{Segments} + \beta_{10} \text{Sales Growth} + \beta_{11} \text{M/B} + \beta_n \text{Industry} + \varepsilon_i$$

Firm Performance: Buy-and-hold stock returns measured from July 2007 to December 2008.

ERM: Dummy variable indicating if a firm has an Enterprise Risk Management program.

Firm Size: Natural log of total assets.

Leverage: Total liabilities divided by total assets.

Beta: Measures the volatility of the stock price relative to the volatility of the market index.

Ownership: Percentage of shares owned by institutional investors.

Board Size: Natural log of the number of directors on a firm's board.

Independence: Percentage of independent outside directors on the board.

Past Return: Buy-and-hold stock returns measured from January 2007 to June 2007.

Segments: Measured as the sum of reported primary segments in the company.

Sales Growth: Percentage growth in sales from year 2005 to year 2006.

M/B: Market value of equity divided by book value of equity.

Industry: Dummy variables indicating a firm's industry membership, based on 1-digit ICB.

4.2. Endogeneity

One major concern in corporate governance studies is endogeneity which usually makes the interpretation of the results difficult. However, our empirical structure of looking at ERM's impact during the financial crisis, which is an exogenous macroeconomic shock, allows us to reduce endogeneity concerns that make it difficult to identify ERM's effect on firm performance. This is due to the reverse causality as we regress the firm's crisis performance on pre-crisis firm characteristics (Aebi et al., 2012). More specifically, we use measures for the ERM and control variables just before the external shock in 2006 to explain changes in the firm performance during 2007-2008. We can therefore generally eliminate any spurious causality caused by the endogeneity problem (Baek et al., 2004). We are aware that factors other than the ERM variable could be a reason for the variation in the crisis performance as well, and that the firm characteristics that we investigate could be correlated with other variables in our model also introducing endogeneity problems. Unfortunately, there are no valid instruments to econometrically account for a possible endogeneity in this case. Therefore, as other papers on risk management, corporate governance and firm performance during the financial crisis (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013; Lins et al., 2013), we follow another road and argue that all the firm variables included in our model have theoretical motivations.

Another potential source of endogeneity is the inclusion of the past 6-month stock return as a control variable in our model. Due to autocorrelation in the dependent variable, the lagged stock return may be correlated with the error term resulting in biased regression coefficients. To check for the robustness of our results, we estimate our model without the past return variable and find the results to remain qualitatively similar (Appendix D).

5. Empirical results and analysis

5.1. Descriptive statistics

Table 2 reports descriptive statistics for the 156 non-financial firms' performance, the ERM and the control variables that were presented in the previous section. As expected, Table 2 shows that our sample of non-financial firms performed very poorly during the financial crisis, where the average (median) firm had a stock performance of – 55.6% (-58.9%) over the 18-months period. This is comparable to the stock returns reported by Beltratti and Stulz (2012), where they had an average of -51.5% (-52.3%) for a sample of 164 international banks. Aebi et al. (2012), however, reports a return of -38.0% (-42.9%) for the 372 U.S. banks during the same 18-month crisis period. This means that the average return for non-financial firms in Sweden was worse than for the banks in the U.S. during the 2007-2008 financial crisis. One of the reasons for this could be the Troubled Asset Relief Program (TARP) that the U.S. government launched in October 2008. This program were to purchase assets from troubled companies, and equities from financial institutions to strengthen the financial sector and restore the economic growth (Erkens et al., 2012). Our sample performed better during the 6-month period before July 2007 with a mean of 7.3% (2%), but not compared to Erkens et al. (2012) where they had an average stock return of 22% for the 296 financial firms. However, they measured their lagged return from January to December 2006, which is different from ours.

The average asset value for the firms, end-year 2006, is 12.70 (1.29) billion SEK, which means that our sample includes much smaller firms compared to the sample of Aebi et al. (2012) and Erkens et al. (2012). Their studies only include firms with a total asset value above USD 10 billion (87 billion SEK). Our asset values range from a maximum of 258.43 billion SEK to a minimum of 23.81 million SEK, which shows the differences in firm size. The average debt-to-asset ratio is 21.9% (19.4%), which means that the firms did not take on much leverage the year before the crisis in 2006. Average beta for our sample is 2.77 (1.93) indicating that the stock prices were more volatile than the market, measured as the OMX30 index. The firms in our sample had on average 2.87 (3.00) number of segments, and an average sales growth of 35.7% (13.5%) from 2005 to 2006, a rather high growth rate. The market-to-book ratio had a mean of 8.66 (3.03), indicating that the stocks were highly overvalued just before the crisis. This could be one of the reasons for the big decline in stock prices when the market got unstable during the crisis (Aebi et al., 2012). However, the high standard deviation for the sales growth and market-to book indicates that the data in our sample is spread over a wider range of values.

Regarding the ERM variable, we find that 18.6% of the non-financial firms in our sample (29 firms out of 156) had an ERM program in place during the financial crisis. This can be compared to the findings of Aebi et al. (2012), where they found 12.6% of the banks having a CRO in their executive board and 8.1% having a dedicated risk committee in place. Both of these variables are ways of measuring ERM firms as we have seen in previous literature (Liebenberg & Hoyt, 2003; Hoyt & Liebenberg, 2011). Looking at the corporate governance variables, the mean for the institutional ownership variable is 19.7% (17.1%), which is lower than presented by Aebi et al. (2012) where they found the average to be 29.9% (25%). The mean of the board size in our study is 7.87 (8.00) which is also lower than Aebi et al. (2012), where average board size was 10.77 (10.00). However, one of the reasons for these differences could be that we include smaller firms in our sample which then effects the average outcome of the governance variables as well. Board independence is our last governance variable which has a mean of 64.2% (66.7%). This is smaller than the results of Erkens et al. (2012) and Aebi et al. (2012), where they found the average to be 82% and 77.5%, respectively. However, compared to earlier studies the percentage of independent directors is larger, especially for Swedish listed firms, confirming an increase of board independence caused by regulatory (Swedish Corporate Governance Board, 2016). Overall, Adams and Mehran (2003) argue that the governance of financial firms may differ from that of non-financial firms, due to regulatory differences, which can be a reason for the differences in the outcomes.

Table 2
Descriptive statistics

This table reports descriptive statistics for all variables used in the main analysis of our study. The firm size and board size are not measured in natural logarithms in this table. Firm size is in MSEK.

	Mean	Minimum	Median	Maximum	Standard deviation	N
Buy-and-hold Return	-0,556	-0,948	-0,589	0,219	0,232	156
ERM	0,186	0,000	0,000	1,000	0,390	156
Firm Size	12703,336	23,806	1287,863	258427,000	35242,162	156
Leverage	0,219	0,000	0,194	0,839	0,157	156
Beta	2,766	-17,733	1,926	53,792	7,074	156
Ownership	0,197	0,000	0,171	0,590	0,161	156
Board Size	7,872	3,000	8,000	15,000	2,390	156
Independence	0,642	0,125	0,667	1,000	0,210	156
Past Return	0,073	-0,428	0,020	1,958	0,316	156
Segments	2,865	1,000	3,000	8,000	1,486	156
Sales Growth	0,357	-0,534	0,135	11,247	1,115	156
M/B	8,658	0,090	3,030	327,867	28,306	156

To obtain a first impression on potential differences between firms with ERM and non-ERM programs, we compare the firm performance and the various control variables between these two groups. The results are presented in Table 3. Firstly, the results show that the crisis stock returns do not differ significantly between firms with and without ERM programs. However, there is a significant difference between ERM and non-ERM firms when it comes to the board size, board independence, number of segments and sales growth. ERM firms have on average larger boards which is consistent with the findings of Aebi et al. (2012). On the other hand, ERM firms have less independent directors on their board. On average, ERM firms have more business or geographical segments in the company, which can be explained by more complex firms seeking to implement integrated risk management (Gordon et al., 2009; Hoyt & Liebenberg, 2011). One major difference between these two groups is that ERM firms had much smaller sales growth the year before the crisis, when compared to non-ERM firms. The revenue growth, from year 2005 to 2006, was twice as large for firms without ERM, which is a proxy for the firm's future growth opportunities (Hoyt & Liebenberg, 2011; Baxter et al., 2013).

Table 3
Comparison of ERM and non-ERM firms

This table presents a comparison of the variables used in the study's main analysis between firms with ERM and firms without ERM. The equality of means is tested using a standard t-test where the p-values are presented in the fourth column. The firm size and board size are not in natural logarithm in this table. Firm size is in MSEK.

	ERM in firm		Difference	P-value	# of obs. - ERM in firm	
	Yes	No			Yes	No
Buy-and-hold Return	-0,514	-0,565	0,051	0,290	29	127
Firm Size	14840,323	11649,999	3190,324	0,595	29	127
Leverage	0,197	0,224	-0,027	0,402	29	127
Beta	2,392	2,851	-0,459	0,651	29	127
Ownership	0,195	0,197	-0,002	0,955	29	127
Board Size	9,138	8,071	1,067	0,030**	29	127
Independence	0,576	0,657	-0,081	0,061*	29	127
Past Return	0,100	0,067	0,033	0,502	29	127
Segments	3,517	2,717	0,801	0,021**	29	127
Sales Growth	0,186	0,396	-0,210	0,094*	29	127
M/B	6,161	9,228	-3,067	0,364	29	127

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level

5.2. Multivariate analysis

Table 4 reports the results for the multivariate analysis where regressions are made for the buy-and-hold stock returns from July 2007 to December 2008 on alternative sets of control variables. The control variables used in the first regressions are chosen in accordance with previous studies made on risk management and corporate governance, which have used stock returns as a measure of firm performance during the financial crisis (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013). However, since these studies conduct their research on financial firms, they also include bank and insurance specific variables which are excluded from our model. Overall, our results for the non-financial firms may differ from prior studies finding on financial firms, due to the differences in regulatory and organizational structure (Adams & Mehran, 2003). The regression in column 1 corresponds to the study by Aebi et al. (2012), where we analyze the ERM variable and the three governance variables together with the past return, firm size and market-to-book. The regression in column 2 follows Baxter et al. (2013), and examines the ERM variable together with control variables such as the past return, firm size, leverage, beta and market-to-book. In the third column, we regress the ERM variable together with variables from Erkens et al. (2012), which are institutional ownership, board independence, firm size, leverage and past return.

In order to perform the last regression (column 4), we first do a correlation analysis on all the variables in our model to see if any of these are highly correlated with each other, and if so, exclude those from the regression. Appendix C, reports the correlation matrix for all the variables in our model. The results show that the firm size variable is highly correlated with the ERM variable, board size and number of segments. This can be due to the fact that firm size is the driver of these variables since larger firms are generally those who will have the capacity to implement ERM, have bigger boards and more business and geographical segments in the firm (Hoyt & Liebenberg, 2011). Another variable in the correlation analysis, that might cause problems in our model, is the board size which is correlated with the board independence and ERM variable. Therefore, in our regression in column 4, we exclude the firm size and the board size variables, to avoid multicollinearity in our model. We also exclude the lagged stock return (Past Return) from this regression due to the possibility of autocorrelation with the dependent variable, as mentioned in the endogeneity chapter. However, in this last regression we include variables for sales growth and number of segments which are commonly used in ERM and firm performance studies as well (Gordon et al., 2009; Hoyt & Liebenberg, 2011; Baxter et al., 2013).

In all of the regressions, the ERM variable estimated in our model is not significant. This indicates that having an ERM program, risk committee or CRO in place does not have an effect on the non-financial firms' stock returns during the financial crisis. Therefore, we cannot reject our null hypothesis that ERM has no impact on firm performance. The results differ from the majority of the previous studies that emphasized on the importance of ERM to the value of the firm (Gordon et al., 2009; Hoyt & Liebenberg, 2011; Seik et al., 2011; McShane et al., 2011; Gates et al., 2012; Eckles et al., 2014; Grace et al., 2015; Farrell & Gallagher, 2015). However, our findings are similar to Aebi et al. (2012), Quon et al. (2012), and Baxter et al. (2013) where they find no significant relationship between ERM and firm value during the financial crisis. A few other studies examining ERM and firm performance also found little support of the proposition that ERM is value creating (Beasley et al., 2008; Pagach & Warr, 2010; Tahir & Razali, 2011). A possible explanation for the lack of significant impact is that not all of the firms implementing ERM are positioned to actually benefit from the adoption (Pagach & Warr, 2010). Beasley et al. (2008) provide an explanation for this, saying that ERM can have an impact on shareholder value but that the reasons may depend upon the characteristics of the individual firm, suggesting that a clear statement about the benefits and costs of ERM is not possible. It could also be that our data is too noisy or our tests too weak to pick up the changes. On the other hand, it could be that ERM takes longer time to implement and benefit from, suggesting that the effects of an ERM program could only be seen in the long-run (Nocco & Stulz, 2006; Pagach & Warr, 2010).

The coefficient on institutional ownership is negative and statistically significant in all specifications. This confirms the findings of Aebi et al. (2012) and Erkens et al. (2012) that large owners did not seem to have provided effective monitoring with respect to the risks taken in the firms. They argue that banks with higher institutional ownership took more risk prior to the crisis which resulted in larger shareholder losses during the crisis period. This seems to be true for our sample of non-financial firms as well. The coefficient on board size is positive and significant, which is in line with the findings of Aebi et al. (2012) that firms with larger boards also had better stock performance during the financial crisis. However, previous studies have found the opposite as well, showing that bigger board size has negative impact on the firm performance. This supports the argument that problems of poor communication and decision-making may reduce the effectiveness of larger boards (Yermack, 1996; Guest, 2009). The board independence variable is never significant in our model and validates the findings of Hermalin

and Weisbach (1991) as well as Bhagat and Black (2002), as they found no significant relationship between independent directors and firm value for non-financial firms.

The past 6-month buy-and-hold return is positive and statistically significant. Unlike the findings of Aebi et al. (2012), our results show that non-financial firms that performed well before the crisis also did better during the crisis period. This suggests that the firms did not take on larger risks prior to the crisis. However, the results for the lagged stock return is different between studies, depending on how long and when the lagged variable is measured (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013). The variable for number of segments in the firm is positive and significant which is consistent with the findings of Baxter et al. (2013), where higher number of segments also increases the firm's performance during the crisis. This finding is interesting because more segments are usually considered to increase a firm's complexity and prior literature suggested that firms with more complex operations may have performed worse during the crisis (Erkens et al., 2012). However, this does not seem to be the case for our sample of non-financial firms. The beta variable in our model is negative and significant, indicating that firms taking on more risks than the market before the crisis, performed worse during the crisis period. The coefficients for the rest of the control variables in our model such as firm size, leverage, sales growth and market-to-book are insignificant.

Table 4
Regression analysis

This table reports the results for the OLS regressions of buy-and-hold stock returns on the ERM and control variables. Each regression is using an alternative set of control variables chosen from the research papers: (1) Aebi et al. (2012), (2) Baxter et al. (2013), (3) Erkens et al. (2014), and (4) where highly correlated variables are excluded from the regression to control for multicollinearity. The t-statistics are reported in the parentheses.

Dependent variable: Buy-and-hold returns				
	1	2	3	4
Constant	-0,488 (-2,382)	-0,390 (-2,259)	-0,282 (-1,494)	-0,276 (-1,807)
ERM	-0,008 (-0,134)	0,029 (0,510)	0,004 (0,070)	0,011 (0,236)
Firm Size	-0,000 (-0,002)	0,002 (0,140)	0,010 (0,810)	
Leverage		-0,133 (-1,132)	-0,057 (-0,489)	-0,080 (-0,681)
Beta		-0,005 (-1,922)*		-0,004 (-1,721)*
Ownership	-0,417 (-3,613)***		-0,369 (-3,177)***	-0,412 (-3,629)***
Board Size	0,135 (1,669)*			
Independence	0,035 (0,384)		-0,010 (-0,109)	0,015 (0,174)
Past Return	0,125 (0,028)**	0,119 (2,064)**	0,119 (2,100)**	
Segments				0,026 (2,032)**
Sales Growth				-0,007 (-0,448)
M/B	0,001 (0,326)	0,001 (1,140)		0,001 (1,014)
Industry Indicators	Yes	Yes	Yes	Yes
Observations	156	156	156	156
R-squared	0,231	0,179	0,211	0,240

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level

6. Additional analysis

6.1. Alternative measures of firm performance

Our main analysis uses raw stock returns to capture firm performance. Although we control for cross-industry variation in stock returns by including industry indicators, we also perform a robustness test using abnormal stock returns as an alternative measure for firm performance. Similar to Gordon et al. (2009), Erkens et al. (2012) and Baxter et al. (2013), we calculate abnormal returns using Jensen's alpha, which is a measure for the risk-adjusted performance of a stock in relation to the expected market return, measured as the capital asset pricing model (CAPM). Additionally, we wanted to use alphas from Carharts four-factor model as well, but due to limited data available for some of the factors this was not possible. More specifically, we use the same procedure as for our main results and repeat the full model regression, presented in Appendix D, after re-measuring stock returns as abnormal returns from July 2007 to December 2008. The results are found in the first four columns in Appendix D, which is similar to the regressions made in Table 4, where we used three studies alternative set of control variables to perform different regressions (Aebi et al., 2012; Erkens et al., 2012; Baxter et al., 2013). The fourth regression controls for multicollinearity in our model, by excluding highly correlated variables. The alphas are estimated as the intercept of the following time-series regression, which is estimated at firm level using monthly data.

$$R_{i,t}-r_{f,t}=\alpha_i+\beta_i(R_{M,t}-r_{f,t})+\varepsilon_{i,t}$$

where $R_{i,t}-r_{f,t}$ is the excess return to the respective firms stock in month t, and $\beta_i(R_{M,t}-r_{f,t})$ is the market model, where β_i is the monthly beta measured for respective firms stock and market index (OMX30), $R_{M,t}$ is the market return in month t (OMX30), and $r_{f,t}$ is the risk-free rate in month t (Swedish T-bill 3 month).

As an alternative measure for firm performance we also use the profitability measure ROA, which is similar to the method of Aebi et al. (2012). ROA is an indicator of how profitable a company is relative to its total assets and gives an idea of how efficient management is at using its assets to generate earnings. We define ROA as the firm's cumulative net income over the years 2007 to 2008, divided by total assets as of year-end 2006. For this regression we remove the lagged stock return (Past Return), since it is not relevant for the relationship with the firm performance measure. Instead, we add a lagged ROA variable (Past ROA), which is measured as the firm's net income divided by the book value of equity, both variables as of year-end

2006. The results of this test is reported in the four columns after the abnormal returns in Appendix D. We find that our results continue to be qualitatively similar to those reported in Table 4. Thus, our conclusion on the relation between crisis performance and ERM is not sensitive to alternative measures of firm performance.

Moreover, the levels of R-square in our regressions are raised when using ROA instead of stock returns. For example, the R-square in the first regression increased from 0.231 to 0.437, indicating that the model is stronger in explaining the effect of ERM on firm performance when using ROA instead of buy-and-hold stock returns. This is similar to the findings of Baxter et al. (2013).

6.2. Alternative definition of the crisis period

We also extend the crisis period to include 21-months from July 2007 to March 2009, just like Aebi et al. (2012). This time period might capture the financial crisis better since the market was still unstable until the beginning of 2009 (Appendix A). The results for this is reported in the four last columns in Appendix D. We find that the results from this analysis are qualitatively similar to those reported in Table 4. Thus, our conclusion on the relation between the firm performance and ERM is not sensitive to an alternative definition of the crisis period.

The coefficients of our control variables yield practically the same results as the main findings, except for firm size and market-to-book which are significant when using abnormal returns (Erkens et al., 2012; Aebi et al., 2012). Further, sales growth is significant when using ROA (Baxter et al., 2013), as well as the board independence variable (Aebi et al., 2012). Although some control variables are significant using different performance measures, the results are similar when it comes to the effect of ERM on firm performance, which confirms the robustness of our main results.

6.3. Three time-period analysis

To further analyze the effects of ERM during the financial crisis, we investigate whether ERM might have had an effect on firm performance during different time periods of the crisis. Therefore, we do an additional analysis where we divide our buy-and-hold stock returns into three time periods, categorized according to the Baxter et al. (2013) definition of the global crisis period. We classify the period from January 2008 to August 2008 as the pre-crisis, the period from September 2008 to February 2009 as the time of the crisis, and the period from March 2009 to October 2009 as post-crisis. Baxter et al. (2013) found no significant relationship

between ERM and firm performance for the pre-crisis and crisis period, but a positive ERM effect for the post-crisis period. This suggests that firms with ERM programs recovered faster from the crisis than firms without ERM, which could indicate that the benefits of ERM can be seen in the long-run (Nocco & Stulz, 2006; Pagach & Warr, 2010).

Table 5 reports the regression results based on pre-crisis, crisis and post-crisis buy-and-hold-stock returns, using the set of control variables from the Baxter et al. (2013) study. Our results show no significant relationship between ERM and firm performance during any of the three time periods of the crisis. Thus, our conclusion that ERM has no impact on firm performance remains the same, even if we look at the time period before, during and after the crisis.

Table 5
Three time-period analysis

This table reports the results from the OLS regression of buy-and-hold stock returns on the ERM and control variables chosen in accordance to Baxter et al. (2013). We classify the period from January 2008 to August 2008 as the pre-crisis, the period from September 2008 to February 2009 as the time of the crisis, and the period from March 2009 to October 2009 as post-crisis. The t-statistics are reported in the parentheses.

Dependent variable: Buy-and-hold returns			
	Pre-crisis	Crisis	Post-crisis
Constant	-0,151 (-0,876)	-0,115 (-0,658)	0,064 (0,090)
ERM	-0,004 (-0,071)	-0,043 (-0,737)	-0,115 (-0,486)
Firm Size	-0,005 (-0,437)	0,006 (0,445)	0,030 (0,600)
Leverage	-0,147 (-1,249)	-0,064 (-0,539)	0,107 (0,221)
Beta	-0,006 (-2,291)**	-0,002 (-0,640)	-0,004 (-0,394)
Past Return	0,021 (0,359)	0,091 (1,560)	-0,084 (-0,356)
M/B	0,001 (0,937)	-0,000 (-0,394)	-0,001 (-0,256)
Industry Indicators	Yes	Yes	Yes
Observations	156	156	156
R-squared	0,189	0,184	0,053

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level

7. Conclusions

There have been two different explanations in the empirical literature on ERM's supposed impact on firm performance, where most of them suggests that ERM is value creating, others have argued that it does not. However, no studies have been made on ERM's effect on firm performance on the Swedish market during the financial crisis, nor have there been much studies done on non-financial firms. Therefore, the aim of the thesis was to investigate whether ERM, in non-financial firms listed on the Stockholm Stock Exchange, has had an impact on firm performance during the 2007-2008 financial crisis. As most theoretical literature on ERM suggests, the goal of it is to increase shareholder value through the integration of risks across business activities. Firms see the risks as a portfolio instead of managing it in silos, where the focus is not only on the downside of risk but also the opportunities (Bromiley et al., 2014). However, there are also those suggesting otherwise and referring to risks as something investors should diversify themselves and not be compensated for (Markowitz, 1952).

To answer our research question, we find no evidence that ERM has an effect on firm performance during times of crisis. That is, we fail to reject our null hypothesis that ERM does not have an impact on stock returns during the 2007-2008 financial crisis, which is similar to the findings of Aebi et al. (2012), Quon et al. (2012) and Baxter et al. (2013). A possible explanation for this is given by Beasley et al. (2008), where they argue that ERM can have an impact on shareholder value but that the reasons may depend on the characteristics of the individual firm, suggesting that a clear statement about the benefits and costs of ERM is not possible. So depending on the industry and the firm-specific attributes, ERM can have different effects on the firm's performance. It can also be that the realized benefits and advantages of an ERM program can only be seen in the long-run (Nocco & Stulz, 2006; Pagach & Warr, 2010).

Overall, our study provides insight into why some Swedish listed non-financial firms were affected more than others during the crisis. We do find some evidence that firms with higher institutional ownership had worse stock returns than other firms during the crisis. A potential explanation to this finding is that firms with higher institutional ownership took more risk prior to the crisis, which resulted in larger shareholder losses during the crisis period. We also find that firms with bigger board size had better stock performance during the crisis, proving that the problem of poor communication and decision-making was not an issue for the larger boards. These results suggests that corporate governance factors had an important impact on how the firms performed during the crisis, through influencing firm's risk-taking and financing policies.

A limitation to our study is that we have only focused on the Swedish market, which gives us a smaller sample, and this is due to the time constraint since each firm's annual report had to be analyzed. Further, the scope of our thesis was to only look at non-financial firms since little literature was written about their risk management structure and performance during the crisis. This may have reduced our sample as well. Another limitation is that we can not measure the maturity and intensity of the TRM and ERM usage in the firms. Since companies are not required to disclose their ERM processes, there could also be more companies in our sample that engage in ERM, but that does not want to reveal their stages of implementation. These limitations may reduce the extent to which our results may be generalized.

Future studies should use larger samples and include both financial and non-financial firms in order to make a comparison between their results. They can also look for better measures for the ERM variable, which defines the different levels of risk management in the non-financial firms. Our study has nonetheless contributed with a better understanding of ERM and its impact on firm performance, especially for non-financial firms. We hope that researchers continue in their attempts to better understand the determinants of ERM since it has become a big focus in today's risk management and governance literature.

References

- Adams, R., & Mehran, H. (2003). Is corporate governance different for bank holding companies? *Economic Policy Review- Federal Reserve Bank of New York*, 9(1), 123-142.
- Aebi, V., Sabato, G., & Schmid, M. (2012). Risk management, corporate governance and bank performance in the financial crisis. *Journal of Banking & Finance*, 36(12), 3213-3226.
- Ai, J., Brockett, P. L., Cooper, W. W., & Golden, L. L. (2012). Enterprise risk management through strategic allocation of capital. *Journal of Risk and Insurance*, 79(1), 29-55.
- Allayannis, G., & Weston, J. P. (2001). The Use of Foreign Currency Derivatives and Firm Market Value, *Review of Financial Studies*, 14(1), 243-276.
- Altuntas, M., Berry-Stölzle, T. R., & Hoyt, R. E. (2011). Implementation of enterprise risk management: Evidence from the German property-liability insurance industry. *Geneva Papers on Risk and Insurance-Issues and Practice*, 36(3), 414-439.
- AstraZeneca. (2017). AstraZeneca Annual Report and Form 20-F Information 2007. Retrieved from https://www.astrazeneca.com/content/dam/az/Investor_Relations/annual-reports-homepage/2007-Annual-Report-English.pdf.
- Baek, J., Kang, J., & Suh Park, K. (2004). Corporate governance and firm value: Evidence from the Korean financial crisis. *Journal of Financial Economics*, 71(2), 265-313.
- Baxter, R., Bedard J. C., Hoitash, R., & Yezegel, A. (2013). Enterprise Risk Management Program Quality: Determinants, Value Relevance, and the Financial Crisis. *Contemporary Accounting Research*, 30(4), 1264-1295.
- Beasley, M. S., Clune, R., & Hermanson, D. R. (2005a). Enterprise risk management: An empirical analysis of factors associated with the extent of implementation. *Journal of Accounting and Public Policy*, 24(6), 521-531.
- Beasley, M., Pagach, D., & Warr, R. (2008). Information conveyed in hiring announcements of senior executives overseeing enterprise-wide risk management processes. *Journal of Accounting, Auditing & Finance*, 23(3), 311-332.
- Beltratti, A., & Stulz, R.M. (2012). The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics*, 105(1), 1-17.

- Bhagat, S., & Black, B. S. (2002). The non-correlation between board independence and long-term firm performance. *Journal of Corporation Law*, 27(2), 231-273.
- Biovitrum. (2017). Biovitrum Annual Report 2007. Retrieved from http://www.sobi.com/Global/Financial%20information/Annual%20Reports/Annual%20Report_07_ENG.pdf.
- Bowling, D. M., & Rieger, L. A. (2005). Making sense of COSO's new framework for enterprise risk management. *Bank Accounting and Finance*, 18(2), 29-34.
- Bromiley, P., McShane, M. K., Nair, A., & Rustambekov, E. (2014). Enterprise Risk Management: Review, Critique, and Research Directions. *Long Range Planning*, 48(4), 265-276.
- Casualty Actuarial Society (CAS). (2003). Overview of Enterprise Risk Management. Retrieved from <http://www.casact.org/area/erm/overview.pdf>.
- Colquitt, L. L., Hoyt, R. E., & Lee, R. B. (1999). Integrated Risk Management and the Role of the Risk Manager. *Risk Management and Insurance Review*, 2(3), 43-61.
- Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2004). *Enterprise Risk Management – Integrated Framework*. New York, NY.
- Desender, K. A. (2011). On the Determinants of Enterprise Risk Management Implementation. *Enterprise IT governance, business value and performance measurement*, Nan Si Shi and Gilbert Silvius, eds., IGI Global.
- Eckles, D. L., Hoyt, R. E., & Miller, S. M. (2014). The impact of enterprise risk management on the marginal cost of reducing risk: Evidence from the insurance industry. *Journal of Banking & Finance*, 43, 247-261.
- Erkens, D. H., Hung, M., & Matos, P. (2012). Corporate governance in the 2007-2008 financial crisis: Evidence from financial institutions worldwide. *Journal of Corporate Finance*, 18(2), 389-411.
- Fahlenbrach, R., & Stulz, R.M. (2011). Bank CEO incentives and the credit crisis. *Journal of Financial Economics*, 99(1), 11-26.
- Farrell, M., & Gallagher, R. (2015). The Valuation Implications of Enterprise Risk Management Maturity. *Journal of Risk and Insurance*, 82(3), 625-657.

- Froot, K. A., Scharfstein, D. S., & Stein, J. C. (1993). Risk Management; Coordinating Corporate Investment and Financing Policies. *Journal of Finance*, 48(5), 1629-1658.
- Gates, S., Nicolas, J. L., & Walker, P. L. (2012). Enterprise risk management: A process for enhanced management and improved performance. *Management accounting quarterly*, 13(3), 28-38.
- Gordon, L. A., Loeb, M. P., & Tseng, C. Y. (2009). Enterprise risk management and firm performance: a contingency perspective. *Journal of Accounting and Public Policy*, 28(4), 301-327.
- Grace, M. F., Leverty, J. T., Philips, R. D., & Shimpi, P. (2015). The Value of Investing in Enterprise Risk Management. *Journal of Risk and Insurance*, 82(2), 289- 316.
- Guest, P. (2009). The impact of board size on firm performance: Evidence from the UK. *European Journal of Finance*, 15, 385–404.
- Hermalin, B. E., & Weisbach, M. S. (1991). The Effects of Board Composition and Direct Incentives on Firm Performance. *Financial Management*, 20(4), 101-112.
- Hoyt, R. E., & Liebenberg, A. P. (2011). The Value of Enterprise Risk Management. *Journal of Risk and Insurance*, 78(4), 795-822.
- Isyuk, V. (2013). Financial versus demand shocks in stock price returns of U.S. non-financial firms in the crisis of 2007. *International Economics*, 133, 29-49.
- Irwin, N. (2011, June 24). Five economic lessons from Sweden, the rock star of the recovery. *Washington Post*. Retrieved from https://www.washingtonpost.com/business/economy/five-economic-lessons-from-sweden-the-rock-star-of-the-recovery/2011/06/21/AGyuJ3iH_story.html?utm_term=.8e41d788c871.
- Jankensgård, H. (2016). Do Hedging Cash Flows Really Increase Corporate Investment? Lund University School of Economics and Management, Department of Business Administration.
- Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review*, 76(2), 323-329.

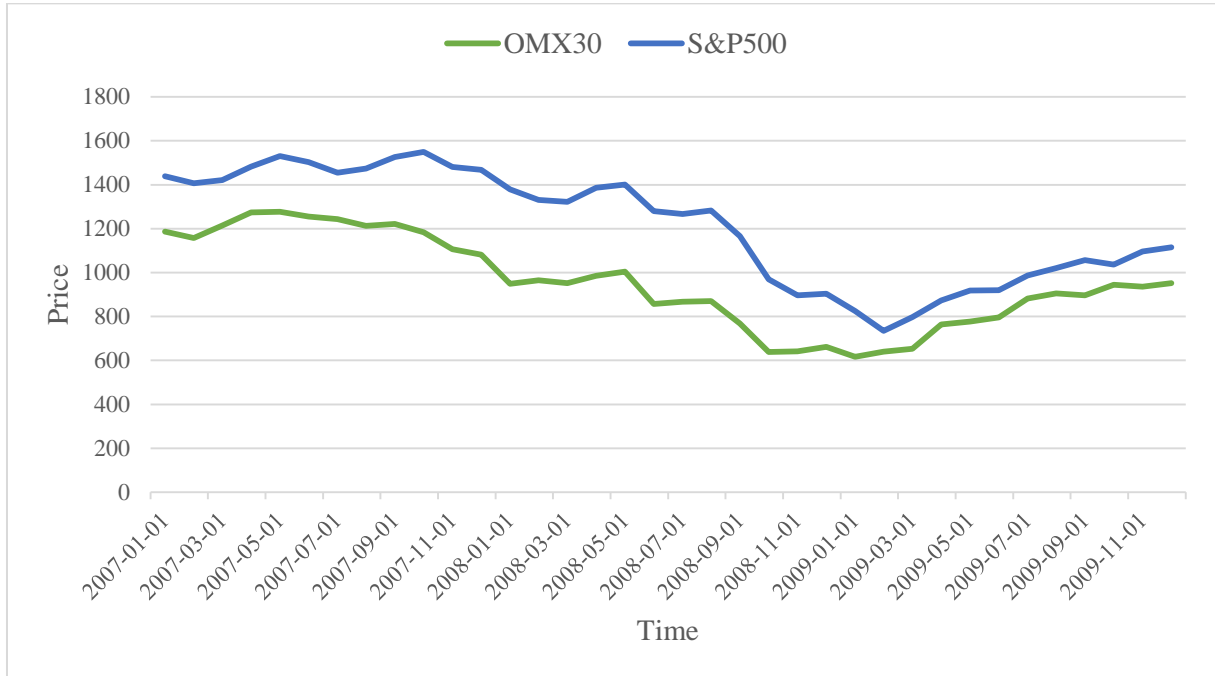
- Kleffner, A. E., Lee, R. B., & McGannon, B. (2003). The Effect of Corporate Governance on the Use of Enterprise Risk Management: Evidence from Canada. *Risk Management and Insurance Review*, 6(1), 53-73.
- Kraus, V., & Lehner, O. M. (2012). The nexus of enterprise risk management and value creation: A systematic literature review. *Journal of Finance and Risk Perspectives*, 1(1), 91-163.
- Liebenberg, A. P., & Hoyt, R. E. (2003). The determinants of enterprise risk management: Evidence from the appointment of chief risk officers. *Risk Management and Insurance Review*, 6(1), 37-52.
- Lins, K. V., Volpin, P., & Wagner, H. F. (2013). Does Family Control Matter? International Evidence from the 2008-2009 Financial Crisis. *Review of Financial Studies*, 26(10), 2583-2619.
- Lundqvist, S. (2014). Abandoning Silos for Integration: Implementing Enterprise Risk Management and Risk Governance. Lund University School of Economics and Management, Department of Business Administration.
- Markowitz, H. (1952). Portfolio Selection. *Journal of Finance*, 7(1), 77-91.
- McShane, M. K., Nair, A., & Rustambekov, E. (2011). Does enterprise risk management increase firm value? *Journal of Accounting, Auditing & Finance*, 26(4), 641-658.
- Meulbroek, L. K. (2002). A Senior Manager's Guide to Integrated Risk Management. *Journal of Applied Corporate Finance*, 14(4), 56-70.
- Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review*, 48(3), 261-297.
- Morellec, E., & Smith, C. W. (2007). Agency conflicts and risk management. *Review of Finance*, 11(1), 1-23.
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147-175.
- Nocco, B. W., & Stulz, R. M. (2006). Enterprise risk management: theory and practice. *Journal of Applied Corporate Finance*, 18(4), 8-20.

- Pagach, D., & Warr, R. (2010). The Effects of Enterprise Risk Management on Firm Performance. Retrieved from <https://ssrn.com/abstract=1155218>.
- Pagach, D., & Warr, R. (2011). The Characteristics of firms that hire Chief Risk Officers. *Journal of Risk and Insurance*, 8(1), 185-211.
- Quon, T. K., Zeghal, D., & Maingot, M. (2012). Enterprise risk management and firm performance. *Procedia – Social and Behavioral Sciences*, 62, 263-267.
- Sandvik. (2017). Sandvik Annual Report 2007. Retrieved from <http://www.home.sandvik/globalassets/4.-investors/reports/annual-reports/annual-report-2007.pdf>.
- Seik, H. Y., Yu, J., & Li, J. (2011). Enterprise Risk Management in Financial Crisis. *IUP Journal of Risk and Insurance*, 8(3), 7-21.
- Simkins, B., & Ramirez, S. A. (2007). Enterprise-Wide Risk Management and Corporate Governance. *Loyola University Chicago Law Journal*, 39, 571-594.
- Stora Enso. (2017). Stora Enso Annual Report 2007. Retrieved from <http://web.lib.hse.fi/FI/yrityspalvelin/pdf/2007/Estoraenso2007.pdf>.
- Storero, J. K. (2009). Avoiding the next financial crisis: why effective Enterprise Risk Management is essential. *Banking Law Journal*, 126(3), 241-247.
- Swedish Corporate Governance Board (2016). The Swedish Corporate Governance Code. Retrieved from http://www.corporategovernanceboard.se/UserFiles/Archive/496/The_Swedish_Corporate_Governance_Code_1_December_2016.pdf.
- Tahir, I. M., & Razali, A. R. (2011). The Relationship between Enterprise Risk Management and Firm Value: Evidence from Malaysian Public Listed Companies. *International Journal of Economics and Management Sciences*, 1(2), 32-41.
- Woon, L. F., Azizan, N. A., & Samad, F. A. (2011). A strategic framework for value enhancing enterprise risk management. *Journal of Global Business and Economics*, 2(1), 23-47.
- Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics*, 40, 185–211.

Appendix A

Stock price movements

This figure presents the stock prices, collected from the Bloomberg database, for the OMX30 and S&P500 index from January 2007 until December 2009.



Appendix B

Examples of ERM search word hits

Example 1 - Successful hit

“Biovitrum has focused at working with Risk Management as an integrated part of the Business Planning process and a new position Chief Risk Officer has been created.”

(Biovitrum, 2017)

Example 2 – Successful hit

“Since several years, Sandvik has a comprehensive program for risk management, Enterprise Risk Management (ERM). The program covers all parts of operations, business areas as well as group functions.” (Sandvik, 2017)

Example 3 – Successful hit

“Risk identification, evaluation and mitigation are facilitated by the Integrated Risk Management (IRM) team of risk management professionals.” (AstraZeneca, 2017)

Example 4 – Successful hit

“Enterprise risk management involves continuous monitoring of identified material risks and prioritizing of risks based on their likelihood at all levels in the organization, and taking them into account in the strategic and business planning processes.” (Stora Enso, 2017)

Appendix C

Correlation analysis

This table reports the Pearson correlation coefficient for all the variables from the main analysis of our study, including the eight industries as well.

	<i>Buy-and-hold</i>		<i>Firm</i>		<i>Owner</i>	<i>Board</i>	<i>Indepen</i>	<i>Past</i>		<i>Sales</i>		<i>Basic</i>	<i>Consumer</i>	<i>Consumer</i>	<i>Health</i>					
	<i>Return</i>	<i>ERM</i>	<i>Size</i>	<i>Leverage</i>	<i>Beta</i>	<i>ship</i>	<i>Size</i>	<i>dence</i>	<i>Return</i>	<i>Segments</i>	<i>Growth</i>	<i>M/B</i>	<i>Material</i>	<i>Good</i>	<i>Service</i>	<i>Care</i>	<i>Industrial</i>	<i>Oil&Gas</i>	<i>Technology</i>	<i>Telecom</i>
Buy-and-hold Return	1																			
ERM	0,085	1																		
Firm Size	-0,017	0,538	1																	
Leverage	-0,085	-0,068	0,028	1																
Beta	-0,122	-0,025	-0,214	-0,047	1															
Ownership	-0,236	-0,005	0,164	0,148	-0,048	1														
Board Size	0,015	0,364	0,686	-0,071	-0,214	0,172	1													
Independence	-0,008	-0,151	-0,310	-0,132	0,066	0,107	-0,337	1												
Past Return	0,125	0,041	-0,037	-0,003	-0,048	-0,054	-0,091	0,113	1											
Segments	0,066	0,210	0,409	0,067	-0,161	0,128	0,270	-0,107	-0,072	1										
Sales Growth	-0,010	-0,074	-0,193	0,020	0,184	-0,121	-0,183	0,005	-0,170	-0,194	1									
M/B	0,077	-0,042	-0,100	0,213	0,035	0,024	-0,019	0,014	0,012	0,101	0,074	1								
Basic Material	-0,178	0,061	0,141	-0,025	-0,148	0,019	0,172	0,008	0,032	0,093	-0,001	-0,055	1							
Consumer Good	-0,055	-0,107	0,137	0,167	-0,089	-0,001	0,184	-0,015	-0,039	0,131	-0,079	0,185	-0,093	1						
Consumer Service	-0,032	-0,092	0,009	0,076	-0,013	-0,058	0,060	0,006	0,102	0,125	-0,056	0,053	-0,109	-0,133	1					
Health Care	0,265	0,005	-0,201	-0,071	0,032	-0,039	-0,117	0,113	-0,133	-0,269	0,151	-0,002	-0,109	-0,133	-0,156	1				
Industrial	-0,063	0,116	0,102	-0,081	0,045	-0,012	-0,016	-0,126	0,093	0,006	0,048	-0,111	-0,209	-0,257	-0,299	-0,299	1			
Oil&Gas	0,043	0,168	0,018	-0,072	0,113	-0,099	-0,018	-0,027	-0,036	0,116	-0,022	0,010	-0,022	-0,027	-0,032	-0,032	-0,061	1		
Technology	-0,022	-0,125	-0,248	-0,028	0,119	0,038	-0,197	0,076	-0,081	-0,087	-0,075	-0,048	-0,123	-0,151	-0,176	-0,176	-0,339	-0,036	1	
Telecom	0,129	0,173	0,215	0,068	-0,121	0,202	0,019	-0,028	0,020	0,044	-0,013	0,083	-0,039	-0,047	-0,055	-0,055	-0,106	-0,011	-0,063	1

Appendix D

Robustness tests

This table reports the OLS regressions for the robustness check of our variables. Each robustness test is divided into four columns categorized after the research papers: (1) Aebi et al. (2012), (2) Baxter et al. (2013), (3) Erkens et al. (2014) as well as a fourth (4) column representing the multicollinearity check of our variables, where we exclude highly correlated variables in the regression.

	Alternative measure of stock returns								Alternative definition of crisis period			
	Abnormal returns				ROA				July 2007 - March 2009			
	1	2	3	4	1	2	3	4	1	2	3	4
Constant	-0,028 (-1,079)	-0,018 (-0,797)	-0,000 (-0,015)	0,030 (1,542)	0,005 (0,023)	0,213 (1,117)	0,042 (0,199)	0,313 (1,464)	-0,179 (-0,765)	-0,167 (-0,844)	-0,045 (-0,209)	-0,211 (-1,204)
ERM	-0,006 (-0,859)	-0,001 (-0,168)	-0,004 (-0,575)	0,004 (0,675)	-0,063 (-0,980)	-0,050 (-0,789)	-0,063 (-0,994)	-0,011 (-0,167)	-0,016 (-0,241)	0,023 (0,342)	-0,007 (-0,103)	-0,033 (-0,598)
Firm Size	0,004 (2,073)**	0,004 (2,351)**	0,005 (2,927)***		0,013 (0,793)	0,000 (0,000)	0,010 (0,732)		-0,015 (-0,920)	-0,018 (-1,313)	-0,009 (-0,636)	
Leverage		-0,017 (-1,117)	-0,003 (-0,188)	-0,009 (-0,632)		-0,173 (-1,332)	-0,110 (-0,841)	-0,206 (-1,262)		-0,088 (-0,652)	-0,005 (-0,040)	-0,027 (-0,199)
Beta		-0,001 (-1,463)		-0,001 (-1,410)		-0,005 (-1,545)		-0,003 (-0,759)		-0,004 (-1,405)		-0,004 (-1,350)
Ownership	-0,061 (-4,194)***		-0,055 (-3,731)***	-0,054 (-3,733)***	-0,101 (-0,767)		-0,084 (-0,647)	-0,128 (-0,808)	-0,474 (-3,612)***		-0,447 (-3,398)***	-0,494 (-3,786)***
Board Size	0,015 (1,490)				-0,017 (-0,185)				0,090 (0,975)			
Independence	0,007 (0,593)		0,002 (0,141)	-0,004 (-0,368)	0,203 (1,957)*		0,192 (1,889)*	0,013 (0,112)	0,019 (0,180)		-0,008 (-0,076)	0,051 (0,519)
Past Return	0,010 (1,400)	0,010 (1,330)	0,009 (1,288)						0,117 (1,817)*	0,115 (1,741)*	0,113 (1,756)*	
Past ROA					1,181 (8,825)***	1,157 (8,823)***	1,184 (9,062)***					
Segments				0,004 (2,349)**				-0,011 (-0,608)				0,019 (1,267)
Sales Growth				-0,002 (-1,071)				-0,063 (-2,755)***				0,019 (1,032)
M/B	0,000 (2,149)**	0,000 (2,160)**			0,000 (0,330)	0,000 (0,526)		0,001 (1,450)	0,001 (0,800)	0,001 (0,822)		0,001 (0,862)
Industry Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	156	156	156	156	156	156	156	156	156	156	156	156
R-squared	0,260	0,182	0,223	0,247	0,437	0,436	0,440	0,161	0,258	0,200	0,250	0,258

* Significance at 10% level

** Significance at 5% level

*** Significance at 1% level