Does Enterprise Risk Management Increase Firm Value?

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Enterprise Risk Management (ERM) has emerged as a construct that ostensibly overcomes limitations of silo-based traditional risk management (TRM), yet little is known about its effectiveness. The scant research on the relationship between ERM and firm performance has offered mixed findings, and has been limited by the lack of a suitable proxy for the degree of ERM implementation. Using Standard and Poor's (S&P) newly available risk management rating, we find evidence of a positive relation between increasing levels of TRM capability and firm value but no additional increase in value for firms achieving a higher ERM rating. Considering these results, we suggest directions for future research.

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1. Introduction

The crisis that started in 2007 with US financial institutions caused a panic that rippled across global markets, and practically froze credit markets in 2008. Some have blamed the crisis on a "failure of conventional risk management in financial institutions" (Fraser and Simkins, 2010, p.27). Others have extended the blame to include enterprise risk management (ERM), a new paradigm that had started to supplant conventional risk management, especially within the large financial institutions at the heart of the crisis (Hampton, 2009, p.66).

The crisis has once again brought risk management to the forefront, not just among top executives within firms, but also among members of Congress and government regulators. However, this concern about risk management had been gaining steam for several years. For instance, section 404 of the Sarbanes-Oxley Act of 2002 requires a top-down risk assessment, which includes the identification of material risks on financial statements. In 2004, the New York Stock Exchange (NYSE) implemented new corporate governance rules requiring audit committees of listed firms to be more involved in risk oversight. The new rules have motivated many boards to require the review and approval of risk management processes and top risk exposures by their audit committee.

In response to the financial crisis, in October 2008, Congress enacted the Emergency Economic Stabilization Act (EESA), which created the Troubled Asset Relief Program (TARP), to help troubled financial institutions. TARP stipulates that participating firms must certify that executive compensation programs do not encourage excessive risk taking. In May 2009,

Senators Schumer and Cantwell proposed legislation, the Shareholder Bill of Rights, which requires public companies to create stand-alone risk committees comprised entirely of independent directors who are responsible for the establishment and evaluation of risk management practices. In October 2009, the Federal Reserve proposed guidance that places responsibility on the board of directors for establishing appropriate incentive compensation arrangements and effectively monitoring risk exposures created by incentive compensation arrangements. New rules from the Securities and Exchange Commission (SEC) effective February 28, 2010 require enhanced risk-related disclosures in proxy and annual statements. Disclosure is required indicating the relationship of a company's compensation policies and practices to risk management and the board of director's leadership structure, and role in risk oversight.

Driven by this intense flurry of government and stock exchange activities related to risk management within corporations, trade and business publications directed at top management are full of articles related to enterprise risk management (ERM); yet academic research in the area is still rare. We believe, one main roadblock to this research is the difficulty in developing a valid and reliable measure for the ERM construct. Beasley, Pagach, and Warr (2008) and Hoyt and Liebenberg (2010) use the appointment of a chief risk officer (CRO) as a proxy for ERM implementation, while Gordon, Loeb, and Tseng (2009) develop their own ERM index.

Results on the relationship between ERM and various measures of firm value have been mixed. Beasley, Pagach, and Warr (2008) investigate equity market reactions to senior management appointments to oversee a firm's ERM processes. Their results suggest firm

specific benefits of ERM. For non-financial firms, they find that market reactions to appointment announcements are positively related to firm size and volatility of previous earnings, but negatively related to leverage and the ratio of cash to liabilities. They cannot make the same claim for financial firms and argue these firms may be more driven by other demands for risk management, such as from regulators. Hoyt and Liebenberg (2010) found a positive relation between firm value and the appointment of a CRO. Gordon, Loeb, and Tseng (2009) found that the relation between ERM and firm performance depended on how well ERM implementation was matched with firm specific factors.

We use a newly available measure to investigate the relation between the extent of risk management implementation and firm performance. Since 2007, Standard and Poor's (S&P) has included a risk management rating as a component in its overall rating of insurance companies. The rating is a sophisticated and comprehensive index that assesses the risk management culture, systems, processes, and practice within the insurer.

S&P assigns risk management "ERM ratings" over five categories, which we interpret as indicating increasing levels of risk management sophistication ranging over three traditional risk management (TRM) levels and two enterprise risk management (ERM) levels. Our study offers a unique setting to investigate the relationship between risk management and firm value for two reasons. First, insurance firms are arguably leaders in implementing sophisticated risk management programs; second, the year 2008 was characterized by extreme uncertainty in which a superior risk management program should provide an advantage. Overall, our results indicate a positive relation between "ERM rating" and firm value as the rating increases over the first three

categories — the first three categories are indicative of increasing levels of TRM — but no additional increase in firm value as the rating moves beyond TRM into what we consider the ERM realm.

The paper is organized as follows. First, in our literature review, we cover the evolution of risk management research from "irrelevance" to ERM, focusing on the distinction between TRM and ERM. Next, we motivate the variables we use in the study, including a description of S&P's new risk management rating for insurance companies. In our research design section, we describe the data and model. After detailing the results, we conclude with suggestions for future research.

2. Literature Review

Risk management has been a widely debated topic from the early days of Finance research where it was considered irrelevant (Modgliani and Miller, 1958) under perfect market conditions. The debate continues today as firms adopt ERM programs and accounting[1] and finance academics begin to investigate their effectiveness. The following discussion covers the evolution of this topic and distinguishes between what we call "TRM" and "ERM".

A. Traditional Risk Management (TRM)

Some finance scholars responded to Modgliani and Miller's (1958) "risk management irrelevance principle" by citing capital market imperfections and proposing theories that explain why risk management can increase firm value. In traditional risk management (TRM) research,

[1] Much of the impetus for the accounting focus on ERM comes from The Committee of Sponsoring Organizations (COSO) of the Treadway Commission. Refer to Gordon, Loeb, and Tseng (2009) for more information.

scholars propose that the existence of these imperfections allows risks to impose real costs on firms and that risk management can increase firm value by reducing total risk, typically measured as some type of volatility. Researchers have identified various value-increasing benefits of risk management that can generally be classified as reduction in expected costs related to the following: tax payments, financial distress, underinvestment, asymmetric information, and undiversifiable stakeholders.[2]

Such studies help in understanding the reasons that firms decide to hedge risk and provide a theoretical justification for the link between risk management and firm value. Allayannis and Weston (2001) directly investigate the relation between risk management and firm value. Among their sample of large nonfinancial firms with foreign currency exposures, Allayannis and Weston (2001) find that firms using foreign currency derivatives had on average, almost a five percent higher firm value than non-users. More studies[3] followed showing a positive relation between risk management, specifically hedging using derivatives[4], and firm value.

[2] For risk management related research for these items see the following: tax payments (Mayers and Smith, 1982; Smith and Stulz, 1985; MacMinn, 1987; Mian 1996; Ross, 1996; Leland, 1998; and Graham and Rogers, 2002); financial distress (Mayers and Smith, 1982; Smith and Stulz, 1985; Nance, Smith, and Smithson, 1993; Dolde, 1995; and Haushalter, 2000); underinvestment (Myers, 1977; Bessembiner, 1991; Froot, Scharfstein, and Stein, 1993; Nance, Smith, Smithson, 1993; and Géczy, Minton, and Schrand, 1997); asymmetric information (DeMarzo and Duffie, 1995 and Breeden and Viswanathan, 1998); and undiversifiable stakeholders (Stulz, 1984; Mayers and Smith, 1990; Stulz, 1996; and Tufano, 1996).

[3] See, for example, Graham and Rogers, 2002; Nelson, Moffitt, and Afflect-Graves, 2005; Carter, Rogers, and Simkins, 2006; and Bartram, Brown, and Conrad, 2009.

[4] The studies listed so far involve financial risk management, specifically hedging using derivatives. Until the late 1970s, risk management focused on reducing losses related to pure risks, that is hazard risks, and not about reducing losses related to speculative types of risks, such as financial risk. Financial risk management did not become practical until the development of the options-pricing model by Finance academics (Black and Scholes, 1973 and Merton, 1973). This model gave rise to the derivatives industry, which allowed the hedging of financial risk.

However, Guay and Kothari (2003) question the results of these studies after finding that derivatives positions of most non-financial companies are too small to significantly affect firm value. They surmise that derivatives usage is likely a fine-tuning mechanism for a firm's much larger overall risk management program, which includes other activities, such as operational hedges. In support of this view, Jin and Jorion (2006) investigate oil and gas firms and find no evidence that firms using derivatives to hedge their oil and gas risk increase firm value relative to firms that do not hedge.

The studies mentioned up to now investigate risk management using derivatives to hedge risk as a proxy for risk management activities. Other studies investigate the relationship between financial and operational hedging, and typically proxy financial hedging by derivative usage and operational hedging by geographic and segment diversification. Chowdhry and Howe (1999) argue that derivatives are used to mitigate short-term currency exposures, while operational hedges are better suited for handling long-run currency exposures. Later studies examine whether financial and operational hedging are substitutes or complements, and most find evidence of a complementary relationship.[5]

Another strand of the finance literature argues that firms should not engage in any effort to manage idiosyncratic risk. In the 1960s, building on Markowitz's (1952) work on diversification and portfolio theory, various researchers (Treynor, 1961, 1962; Sharpe, 1964; Lintner, 1965; and Mossin, 1966) developed the capital asset pricing model (CAPM). In this

[5] See, for example, Allayannis, Ihrig, and Weston, 2001; Pantzalis, Simkins, and Laux, 2001; and Kim, Mathur, and Nam, 2006.

model, investors are compensated only for bearing systematic (non-diversifiable) risk but not for bearing idiosyncratic (diversifiable) risk. In other words, a firm's cost of capital (required rate of return) should depend only on the firm's systemic risk, not the total risk of the firm, because investors can eliminate the diversifiable risks of individual firms by holding a well-diversified portfolio. The systemic risk of a firm is also called "market risk" because this risk (and the firm's cost of capital) depends on the covariance of the firm's security returns with the returns of the broad market, not on the firm's overall volatility (variance). The systemic risk of the firm is represented by the familiar β in the CAPM. An implication of CAPM is that firms should not use risk management to reduce firm-specific risks because investors can eliminate firm idiosyncratic risks through diversification.

However, several researchers countered with asset pricing models in which idiosyncratic risk does matter, for example, because investors may hold undiversified portfolios.[6] Froot and Stein (1998) develop a capital allocation/structure model for financial institutions[7] in which information-intensive assets cannot be frictionlessly hedged. Froot (2007) builds on this model to include customer aversion to insolvency risk, which is an important consideration for financial institutions because their customers typically have a greater concern about solvency risk than do investors. Overall, an implication is that in deciding whether to allocate capital for an investment, the decision should reflect the co-variation of the investment's risk with the firm's existing portfolio of risks.

[6] See, for example, Levy (1978), Merton (1987), Green and Rydquist (1997), and Goyal and Santa-Clara (2003).
[7] Financial institutions are excluded in previous risk management research using derivatives because financial institutions are both users and providers of derivatives.

B. Enterprise Risk Management (ERM)

Traditionally, risk management has been compartmentalized and uncoordinated within a firm. Risk had been managed in silos with corporate risk managers focusing on pure risks[8] while the treasury department used derivatives to reduce financial risks, such as interest rate, credit, market, and foreign exchange risk. ERM attempts to deal with additional risks such as operational or strategic risks. The goal of ERM is the coordinated management of all risks faced by a firm, whether it is risk related to corporate governance, auditing, supply chains, distribution systems, IT, or human resources. Unlike TRM's silo-based risk management, the purpose of ERM is to gain a systematic understanding of the interdependencies and correlations among risks. A fundamental concept of ERM is the aggregating of risks into portfolios, then hedging the residual risk, which is more efficient and value-maximizing than dealing with each risk independently. Applying concepts of portfolio theory, ERM can increase firm value because the risk of an aggregate portfolio should be less than the sum of the individual risks if the risks are not 100% correlated, especially if natural hedges exist.[9]

In a call for risk management research that focuses on the coordination and strategic allocation of risk, Stulz (1996) proposes that academic theory expand beyond considering that

[8] Pure risks are also known as hazard risks, which are typically insurable. These are accidental risks for which there is no possibility of gain, such as property and liability risks, as opposed to business risks, such as financial, operational, and strategic risks for which there is a possibility of gain.

[9] The classic example of such enterprise risk management is an insurance company that sells life insurance and annuities to similarly situated customers to hedge mortality risk. Considering risks in a portfolio, life insurance and annuities are natural hedges. Hedging the risks separately through reinsurance is inefficient. Firm value can be increased by hedging only the residual risk of the portfolio. Similarly, one subsidiary of an MNC could be long on one currency while another division is shorting the currency — in this case, what is good for subsidiary managers may be inefficient for the firm as a whole.

the goal of risk management is "variance minimization". In other words, the goal of risk management should not be to reduce total risk, but to allocate risks to play on a firm's strengths. A basic concept of ERM is that a firm should reduce exposure to risk in areas where it has no comparative information advantage and exploit risks in areas where it has an advantage, meaning that total risk can possibly increase under ERM risk allocation.

Schrand and Unal (1998) posit that corporate managers should coordinate risk management activities by hedging exposure to activities in which they are likely to earn zero economic rents (homogeneous risks), such as investments in efficient markets, while increasing exposure to core-business activities (Barney, 1991) in which they enjoy comparative information advantages. Such a coordinated approach can generate a decreasing, neutral, or increasing effect on total firm risk. Since Schrand and Unal (1998), there has been very little work related to coordinated risk management in the Finance literature. Recently, Zhang, Cox, and McShane (2010) use insurance industry data to investigate the coordination of risks across completely different functions of the enterprise while controlling for other factors that affect hedging decisions. They consider investments to be a homogenous risk for insurers and underwriting to be a core-business risk and find evidence that insurers are coordinating risk management by hedging investment risk in order to take on more underwriting risk.

A few papers have indirectly investigated the determinants of ERM implementation among firms. Liebenberg and Hoyt (2003) investigate the determinants of ERM adoption, using the appointment of a chief risk officer (CRO) as a proxy for ERM implementation. Their main finding is that more leveraged firms are more likely to appoint a CRO. In a similar study, Pagach

and Warr (2010) find that firms with more leverage, higher earnings volatility, poorer stock performance, and a CEO whose compensation increases with stock volatility are more likely to have a CRO. Using survey data, Beasley, Clune, and Hermanson (2005) find ERM implementation in their sample of firms to be positively related to factors such as the presence of a CRO, firm size, and whether the firm is in the insurance or banking industry.

Two studies indirectly investigate the relation between ERM implementation and firm value. Hoyt and Liebenberg (2010) find a positive relation between firm value and the appointment of a CRO. In an event study of the market reaction to the appointment of senior executives to oversee a firm's ERM process, Beasley, Pagach, and Warr (2008) find firm-specific benefits of ERM for non-financial firms, but not for financial firms. Gordon, Loeb, and Tseng (2009) develop their own ERM index and find that the relation between ERM and firm performance is conditional on the match between ERM implementation and firm specific factors.

Beasley, Pagach, and Warr (2008) indicate that a limitation of using the CRO variable is that it does not capture the extent of ERM program implementation. In the next section, we describe the measure used in this study, which we believe comprehensively captures the complexity of ERM and reflects the extent of its implementation.

3. Variable Motivation

Our risk management variable is novel, but the other variables are motivated by the previous risk management literature.

A. Dependent variable (Firm Value)

Our dependent variable is *Firm Value,* which we proxy for using Tobin's Q, the most commonly used measure of firm value in empirical risk management studies (Smithson and Simkins, 2005). We calculate Tobin's Q as the market value of equity plus the book value of liabilities divided by the book value of assets. This version of Tobin's Q is suitable for insurance companies because the book value of an insurer's assets is a good approximation of replacement costs (Cummins, Lewis, and Wei, 2006; Hoyt and Liebenberg, 2010).

B. Independent variable of interest (ERM rating)[10]

Financial rating firms, such as Standard and Poor's (S&P), rate the ability of a firm to pay back creditors. A firm with a higher rating will have lower borrowing costs, which should translate to higher firm value, all else equal. This effect will be intensified for insurers because the policyholder is a contingent debtholder. In essence, policyholders are both customers and main creditors of insurance companies. As described in McShane, Cox, and Butler (2010), insurers with higher ratings command higher premiums because they are perceived as safer by policyholders. Premiums are the main revenue source for an insurance firm, implying that a

[10] Most of the information in this section comes from the following documents on Standard and Poor's website: Insurance Criteria: Refining The Focus of Insurer Enterprise Risk Management Criteria (2006); Enterprise Risk Management: ERM Development in the Insurance Sector Could Gain Strength in 2008 (2008); and Enterprise Risk Management is Improving in Bermudan and North American Insurers (2008).

higher credit rating leads to higher returns, and supporting empirical evidence has been found (see, e.g., Cummins & Nini. 2002).

We use the new risk management rating from S&P as a proxy for degree to which an insurer has implemented a risk management program.[11] S&P rates the financial strength of insurers based on eight components, and gradually started to add the newest component, ERM, for insurers in 2006.[12] S&P investigates the following to determine the "ERM rating" for each insurer: risk management culture, risk control processes, emerging risks management, risk and economic capital models, and strategic risk management. At the base of the ERM program is the firm's risk management culture. A major S&P consideration in this area is the importance of the risk management process to C-suite executives because ERM only works if the "tone is set at the top". The governance structure should reflect the influence of risk and risk management considerations on corporate-wide decision-making, including the transparency with which the risk management philosophy is communicated across the organization and the extent to which risk management influences management compensation and budgeting.

Next are the three pillars of the ERM program: (1) the ability of the insurer's risk control processes in identifying, analyzing, and keeping losses within defined risk tolerances, (2) the

[11] We only include insurers in our data set because at this time S&P produces an ERM rating only for insurers and not for non-financial firms. An advantage of using only insurance firms is that these firms are in the business of pricing risk and thus should be further down the road in risk management sophistication than non-financial firms. An advantage of a single industry study is that we do not have to add variables to control for the considerable differences across industries. An obvious disadvantage is that we cannot generalize these results outside the insurance industry.

[12] The other seven components are financial flexibility, earnings, liquidity, management strategy, market position, investments, and capital adequacy. S&P added the ERM component for insurers first, and plans to add it later for non-financial firms. Also, S&P does not include an ERM component for all insurers but is increasing the number over time.

capability of the insurer to scan the environment to anticipate and prepare for emerging risks, and (3) the effectiveness of the insurer's risk and economic capital models to realistically provide insight into possible risks facing the insurer and support to other ERM processes.

A strong risk management culture at the base and the three well-designed pillars are essential to supporting the firm in achieving effective strategic risk management for which a key consideration is the extent to which the insurer has integrated risk management with core strategic planning processes. Firms with a higher ERM rating should have an advantage in anticipating and dealing with the next big risk, lower volatility of earnings, and greater ability to allocate capital to attain higher risk-adjusted returns.

S&P places each insurer into one of five "ERM rating" categories. A *weak* ERM program lacks reliable loss control systems for one or more major risks. An *adequate* ERM program has reliable loss control systems, but may still be managing risks in silos instead of coordinating risks across the firm. The ERM program is rated *adequate with a positive trend* if it exhibits strong/excellent risk control systems, but still lacks a well-developed process for making coordinated risk/reward decisions that are necessary for effective strategic risk management. A *strong* ERM program has progressed beyond silo risk management to deal with risks in a coordinated approach, the capability to envision and handle emerging risks, and has well-developed risk control processes and a focus on optimizing risk-adjusted returns that are necessary for effective strategic risk management. An *excellent* ERM program has the same

characteristics as a *strong* ERM program, but is even further into the implementation, effectiveness, and execution of the ERM program.[13]

S&P expects that insurers "with an adequate ERM program should not experience disproportionate losses in a normally adverse environment", whereas, "Strong/Excellent insurers are expected to exhibit lower losses in difficult times and especially in extremely adverse times." The S&P ERM rating is from April 2008, and other data we use are from 2008, which we consider to be an extremely adverse year for financial institutions, especially the later half. Thus, the 2008 downturn offers an excellent setting to investigate the relation between ERM rating and firm value during "extremely adverse times".

The ERM rating variable allows us to overcome the problems associated with previous work on the relation between risk management and firm value. As discussed previously, Guay and Kothari (2003) and Jin and Jorion (2006) present arguments on possible problems with previous work that finds a positive relation between hedging and firm value. They argue that derivatives usage only has a marginal impact on firm value relative to other risk management factors, and that results are likely to be spurious if these other factors add value and are positively correlated with derivatives usage. We overcome this problem by using the S&P ERM rating variable, which captures all aspects of the risk management program and reflects the

[13] S&P uses the term "ERM rating" for these five categories to indicate the level of ERM implementation. While we use this S&P terminology in the remainder of this paper, we consider the "weak", "adequate", and "adequate with a positive trend" ratings to indicate increasing sophistication of traditional risk management (TRM) implementation and the "strong" and "excellent" ratings to indicate increasing levels of ERM implementation. In other words, we consider these five levels to represent not five levels of ERM implementation, but five levels of risk management ratings, ranging from weak TRM to excellent ERM. We thank an anonymous reviewer for pushing us towards this understanding.

extent of its implementation. The ERM variable is also superior to using the announcement of a chief risk officer (CRO) as a binary indicator of ERM implementation as in previous studies, which does not capture the extent of ERM implementation.

We translate the S&P ERM ratings into numerical scores suitable for statistical analysis as follows: Weak = 1, Adequate = 2, Adequate with a Positive Trend = 3, Strong = 4 and Excellent = 5. Based on our review of the past risk management literature, we expect the degree of ERM implementation by an insurer to be positively related to firm value.

C. Control Variables

We investigate the relationship between ERM rating and firm value after controlling for variables that are motivated by previous risk management research. We expect the *Size* variable to be positively related to performance because larger firms should be more capable of capturing economies of scale in underwriting insurance contracts. Liebenberg and Sommer (2008) find that larger property-liability insurers generate higher returns on equity, and McShane and Cox (2009) find similar results for life-health insurers, which they attribute to the greater market power and economies of scale and lower insolvency risk of larger insurers. We follow previous research in applying the natural logarithm of total assets as our size proxy. If greater *Leverage* implies greater default risk, then rational policyholders should pay lower prices for policies issued by more leveraged insurers (Sommer, 1996), which implies a negative relation between leverage and return. Our measure for leverage is the financial leverage index, which is the ratio of return on average assets to return on average equity.

We proxy for *Systemic Risk* using the insurer's beta, which we expect to be negatively related to firm value. An insurer with greater systemic risk will discount expected cash flows at a higher rate, which should result in a relatively lower firm value (Shin and Stulz, 2000). We also employ control variables for *Profitability* (return on assets), *Cash-flow Volatility* (standard deviation of the free cash flow over the previous five years scaled by the average free cash flow over the previous five years), and *Growth Opportunities* (average annual sales growth over the previous five years). We expect our results to be similar to those found in past previous risk management research, that is, firm value is positively related to profitability and growth opportunities and negatively related to cash-flow volatility.

We control for insurer complexity by adding a variable that indicates the number of lines of business (LOB) in which the insurer operates. We operationalize this by counting the number of four-digit Standard Industrial Classification (SIC) codes in which the insurer does business. The managerial discretion hypothesis of Mayers and Smith (1988) suggests that insurers operating in fewer lines of business (less complex insurers) should have lower monitoring costs for owners, resulting in higher returns. Therefore, we expect the complexity variable to be negatively related to firm value. The number of SIC codes for insurers in our sample ranges from one to eight.

For reasons explained later, we also include an ERM^2 variable to investigate any non-linear relation between ERM and firm value. Table 1 shows the variable descriptions and expected signs.

TABLE 1

Variable Definitions and Expected Signs

This table provides the definition and the expected sign for each independent variable. Dependent variable is **Firm Value**, which is proxied by Tobins Q: market value of equity plus the book value of liabilities divided by the book value of assets. Point data, such as total assets is measured at the end of 2008. Average data is the average of the value on the last day of 2007 and the value on the last day of 2008. Return data is measured over the period from the last day of 2007 to the last day of 2008.

Independent Variables	Exp. Sign	Definition
ERM Rating	+	S&P ERM rating for each insurer in April 2008: Weak =1, Adequate = 2, Adequate with a Positive Trend = 3, Strong = 4, and Excellent =5
ERMrating^2	+/–	Squared value of the S&P ERM score for each insurer.
Size	+	Natural logarithm of total assets at end of 2008
Financial Leverage	–	Financial leverage index: ratio of return on average assets to return on average equity for 2008
Systemic Risk	–	Insurer's beta (β)
Profitability	+	Return on assets (ROA) in percent for 2008
Cash-flow Volatility	–	Standard deviation of the free cash flow over the previous 5 years (years 2004 to 2008) scaled by the average free cash flow over the previous 5 years (years 2004 to 2008).
Growth Opportunities	+	Average annual sales growth in percent over the previous five years (2004 to 2008)
Complexity	–	Number of four-digit Standard Industrial Classification (SIC) codes in which insurer operates.

4. Research Design

This section describes our data and model.

A. Data

Our main independent variable of interest is S&P's ERM rating, which determines the firms in our data set. S&P released ERM ratings for 152 insurer groups as of April 2008. As our measure of firm value is Tobin's Q, we can use only publicly-traded insurers in our investigation. Thus, our final data set consists of the 82 publicly traded insurers for which S&P released an ERM rating. Data for the other variables were obtained from the Thomson Banker One databases.

B. Model

We investigate the relation between firm value and the degree to which insurers have implemented ERM using the following model. The variable definitions and expected signs are shown in Table 1.

$$Firm\ Value = \beta_0 + \beta_1 ERMrating + \beta_2 ERMrating^2 + \beta_3 Size + \beta_4 Leverage + \beta_5 Systemic\ Risk + \beta_6 Profitability + \beta_7 Cashflow\ Volatility + \beta_8 Growth\ Opportunities + \beta_9 Complexity + \varepsilon \quad \textbf{(1)}$$

5. Results

Descriptive statistics are shown in Table 2, which includes the mean values for the dependent and independent variables for each S&P ERM rating category. The relation between ERM rating and firm value is somewhat in line with our expectation, that is, a roughly positive

relation, though it appears to peak out for ERM3 and ERM4 insurers. Accordingly, we introduce an ERM^2 variable in our analysis to test for curvilinearity in the relationship. Table 2 also indicates a positive relation between ERM rating and firm size, but no obvious pattern for the relation of ERM rating and the other control variables.

TABLE 2
Descriptive Statistics Categorized by ERM Rating

This table provides the mean values for our variables for the insurers in each ERM rating category. Variable definitions are provided in Table 1.

ERM Rating	# of Firms	Firm Value	Firm Size	Fin. Lev.	Sys. Risk	Profit-ability	CF Vol.	Grth. Opp.	Com-plexity
1	6	0.96	9389	0.15	1.37	-2.32	0.05	-0.66	2.33
2	45	0.93	14937	0.24	1.19	0.88	0.02	5.85	2.85
3	12	0.99	28475	0.23	1.09	0.12	0.05	7.09	2.45
4	14	0.99	126939	0.20	1.35	1.61	0.02	4.48	2.93
5	5	0.96	125653	0.18	1.25	1.04	0.02	9.62	3.20

Table 3 shows the Pearson correlation coefficients. The signs of the correlations of the independent variables with firm value are roughly as expected though insignificant in many cases. The only correlation above 0.5 is between two independent variables: ERM rating and size. We therefore compute the variance inflation factors (VIFs) developed by Belsley, Kuh, and Welsch (1980). With all VIFs below 2.5, collinearity is unlikely to be a problem.

TABLE 3
Pearson Correlation Coefficients

This table provides the Pearson correlation coefficients for the variables. Variable definitions are provided in Table 1. *p-values for the correlations are in italics*

	Firm Value	ERM Rating	Size	Fin. Lev.	Sys. Risk	Profit-ability	CF Vol.	Grth. Opp.	Com-plexity
Firm Val.	**1.00**								
ERMRating	0.22	**1.00**							
	0.08								
Size	0.11	0.58	**1.00**						
	0.39	*<0.01*							
Fin. Lev.	-0.18	-0.09	-0.48	**1.00**					
	0.17	*0.48*	*<0.01*						
Sys. Risk	-0.38	0.02	0.34	-0.39	**1.00**				
	<0.01	*0.84*	*0.01*	*0.00*					
Profit	0.36	0.14	0.05	0.12	-0.36	**1.00**			
	<0.01	*0.26*	*0.68*	*0.33*	*0.01*				
CF Vol	0.02	-0.14	-0.36	0.40	-0.06	-0.15	**1.00**		
	0.86	*0.29*	*<0.01*	*<0.01*	*0.69*	*0.25*			
Grth Opp.	0.11	0.06	0.06	0.05	-0.25	0.48	0.13	**1.00**	
	0.38	*0.63*	*0.67*	*0.67*	*0.05*	*<0.01*	*0.33*		
Complexity	-0.03	-0.17	-0.15	-0.03	-0.09	-0.41	0.21	-0.16	**1.00**
	0.84	*0.17*	*0.26*	*0.84*	*0.51*	*<0.01*	*0.14*	*0.24*	

Next we move on to our multivariate tests to investigate further with results shown in Table 4. We perform four different regressions to investigate the relation between ERM rating and firm value. In regression (1), ERM rating is positive and significantly related to firm value with a p-value of 0.027. In this regression, ERM rating is the only regressor and has an adjusted R^2 of 0.072. In regression (2), we add all the control variables, and ERM rating is still positive and significant at the five percent level. A squared ERM rating variable is added in regression (3) to test for non-linear effects. ERM rating is still positive and significant at the one percent level,

and the squared ERM rating coefficient is negative with a p-value of 0.026, indicating that ERM rating has a non-linear relation to firm value.

We investigate this non-linear relation further in regression (4) by using dummy variables for each ERM rating category. We omit ERM3 in the regression so results for the other ERM ratings will be in relation to ERM3. In regression (4), ERM1 and ERM2 are both negatively related at the five percent significance level to firm value relative to ERM3, while ERM4 and ERM5 are not close to having a significantly different effect on firm value relative to ERM3. Overall, regression (4) suggests that firm value increases from ERM1 to ERM3, but beyond that, there is no significant difference in firm value between ERM3, ERM4, and ERM5 firms.

Together, these regressions indicate a positive relation between ERM rating and firm value up to about the ERM3 rating, but after that point, an increase in ERM rating provides no significant difference in performance results. As discussed previously, we consider the ERM1 to ERM3 ratings to indicate an increasingly positive opinion of S&P about the insurer's implementation of traditional risk management (TRM) process while ERM4 and ERM5 indicate that the insurer has moved beyond TRM and has implemented ERM. In other words, our results suggest that increasingly sophisticated TRM is related to higher firm value, but beyond that there is no apparent increase in firm value for insurers that implement ERM.

TABLE 4

Results of Regressions of S&P ERM Rating on Firm Value

This table shows the results of four different regressions of S&P ERM rating on firm value. In regression (4), *ERM1* is set to 1 if the insurer's S&P ERM rating = Weak, zero otherwise. *ERM2* is set to 1 if the insurer's S&P ERM rating = Adequate, zero otherwise. *ERM3* is set to 1 if the insurer's S&P ERM rating = Adequate with a Positive Trend, zero otherwise. *Note: ERM3 is omitted in the regression so the other ERMn results are relative to ERM3. ERM4* is set to 1 if the insurer's S&P ERM rating = Strong, zero otherwise. *ERM5* is set to 1 if the insurer's S&P ERM rating = Excellent, zero otherwise. The other variables are defined in Table 1.
***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	Firm Value							
	(1)		**(2)**		**(3)**		**(4)**	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Intercept	0.890	<0.001***	1.135	<0.001***	1.000	<0.001***	1.322	<0.001***
ERMrating	0.025	0.027**	0.026	0.034**	0.162	0.010***		
ERMrating^2					-0.021	0.026**		
ERM1							-0.138	0.018**
ERM2							-0.094	0.019**
ERM4							0.000	0.993
ERM5							-0.057	0.245
Firm Size			-0.012	0.364	-0.017	0.167	-0.019	0.153
Fin. Leverage			-0.505	0.001***	-0.541	<0.001***	-0.471	0.002***
Systemic Risk			-0.050	0.008***	-0.042	0.021**	-0.039	0.030**
Profitability			0.019	<0.001***	0.020	<0.001***	0.019	<0.001***
CF Volatility			-1.177	0.018**	-1.177	0.013**	-0.899	0.075*
Growth Opp.			-0.002	0.100*	-0.002	0.068*	-0.002	0.121
Complexity			0.001	0.410	0.001	0.137	0.001	0.201
Adjusted R^2	0.072		0.535		0.586		0.593	

The results for four of our control variables are as expected: financial leverage, systemic risk, and cash-flow volatility are negative and significantly related to firm value, while profitability has a positive and significant relation to firm value. Unexpectedly, firm size is insignificant in the regressions. According to the Pearson correlation analysis in Table 2, size is

significantly correlated with ERM rating. We ran a regression alternately omitting size and ERM rating from the regression. The significance of ERM rating does not change when size is omitted whereas size becomes significant when ERM rating is omitted, suggesting that the ERM rating variable co-opts the explanatory power of the size variable.

Also against expectations, the growth opportunities variable is negative and significantly related to firm value at the ten percent level in regressions (2) and (3). These results may be due to the weakness of our proxy. For growth opportunities, we use average sales growth over the previous five years. Most other risk management studies have been on samples of non-financial firms and use ratios such as annual ratios of capital expenditures or research and development to sales, which are not appropriate for financial firms. Another explanation could be that insurers are attempting to increase market share at the cost of firm value or are increasing premium revenue to be invested in the stock market at the expense of sound underwriting.

At the beginning of the paper, we described several reasons that boards of directors are becoming increasing involved in risk management activities. The regressions described in Table 4 do not control for differences in boards, which could be a possible source of omitted variable bias. Table 5 includes variables for additional testing that control for the relative strength and engagement of the board (and its committees) in risk oversight. One way we control for differences in board activity is by adding a binary variable indicating whether the insurer is listed on the New York Stock Exchange (NYSE). In 2003, the NYSE implemented new corporate governance rules specifying that the internal audit function provide management and the audit committee with ongoing assessments of the company's risk management processes and system

of internal control. We also include a variable that indicates the percent of directors that are independent, because Beasley, Clune, and Hermanson (2005) had found that firms with a higher percentage of independent directors were further along in implementing ERM.

TABLE 5

Results of Regressions of S&P ERM Rating on Firm Value

This table shows the results of three different regressions of S&P ERM rating on firm value. *Ind. Directors%* is the percent of directors on the board that are independent[14] and *NYSE Listed* is a binary variable: 1 if the insurer is listed on the New York Stock Exchange, 0 otherwise. The other variables are defined in Tables 1 and 4.
***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

	Firm Value					
	(1)		**(2)**		**(3)**	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Intercept	1.164	<0.001***	1.036	<0.001***	1.318	<0.001***
ERMrating	0.018	0.184	0.144	0.032**		
ERMrating^2			-0.020	0.054*		
ERM1					-0.111	0.077*
ERM2					-0.086	0.040**
ERM4					-0.006	0.904
ERM5					-0.065	0.212
Firm Size	-0.008	0.570	-0.013	0.329	-0.015	0.295
Fin. Leverage	-0.497	0.001***	-0.524	<0.001***	-0.453	0.003***
Systemic Risk	-0.057	0.005***	-0.049	0.013**	-0.046	0.018**
Profitability	0.016	0.011**	0.017	0.005***	0.016	0.008***
CF Volatility	-1.048	0.073**	-0.978	0.080*	-0.755	0.195
Growth Opp.	-0.002	0.236	-0.002	0.207	-0.001	0.293
Complexity	-0.011	0.248	-0.010	0.281	-0.009	0.317
Ind. Directors%	0.003	0.882	0.004	0.860	0.005	0.828
NYSE Listed	0.001	0.721	0.000	0.704	0.000	0.691
Adjusted R^2	0.530		0.570		0.578	

[14] Our main source for independent director data was each insurer's 10K form available in the EDGAR database. For a few firms for which the data was not on the 10K, we found the data from other sources, such as the insurer's website. We could not find this data for 5 firms, so omitted those firms in this regression and ended with a total of 77 insurers.

The results shown in Figure V generally support our conclusion from the previous results. The S&P ERM rating variable is positive but not significant in regression (1). However, the coefficients on the ERM rating variable and its square are even more significant in regression (2) than in the previous regression that did not include the board related variables. In regression (3), ERM1 and ERM2 are still significantly negative relative to the omitted categorical variable ERM3 while ERM4 and ERM5 are not significantly different from ERM3. These results support our previous finding that indicate a positive relation between risk management level indicated by the S&P ERM rating and firm value up to the third level but no difference after the third level.

6. Conclusion

Managing risks has become a critical function for CEOs as organizational environments become increasingly turbulent and complex. Traditionally, firms have managed risk in silos, and researchers have examined narrow slices of the corporate risk management spectrum. Previous empirical risk management research has investigated the relation between the hedging of financial risk using derivatives and firm value. In recent years, some firms have started to adopt a more comprehensive approach, called enterprise risk management (ERM), but research on the relationship between ERM and firm value has been sparse. We believe that one main constraint that limited research in this stream was the lack of an effective proxy for the degree of enterprise risk management capability and implementation. We were able to overcome this constraint by using a newly available measure of ERM (from S&P) that was comprehensive in character and overcomes some of the limitations of the earlier proxies that have been used in ERM research.

The overwhelming majority of empirical risk management research has investigated nonfinancial firms. However, financial institutions are in the business of pricing risk, and have been leaders in implementing ERM. Since 2007, S&P has incorporated an "ERM rating" for insurers in the overall ratings process. We use this new rating in our model to investigate the relation between risk management and firm value. Our interpretation of S&P's "ERM rating" is that the lower three categories (weak, adequate, and adequate with a positive trend) reflect increasing levels of traditional risk management (TRM) implementation. S&P gives a "strong" rating to insurers that have progressed beyond silo risk management. We consider a strong rating to indicate that a firm has moved past TRM to ERM, and an excellent rating means an even further move into ERM. Based on that interpretation of the S&P ERM rating, our results suggest that firm value increases as firms implement increasingly more sophisticated TRM but does not increase further as firms achieve ERM.

Our results spawn a considerable number of questions for future research. Why does a strong or excellent ERM rating not lead to higher firm value? Is it possible that a strong ERM culture constrains firm growth that gets reflected in its market value? Is it possible that firms with strong ERM systems take bigger risks in areas that constitute their core capabilities (as they are expected to), however, environmental changes may have made their core capabilities ineffective or irrelevant (Priem and Butler, 2001) thereby adversely affecting firms. Is the relationship between ERM and firm value stable and true in the long run? That is, as other firms adopt ERM systems, practices and culture, will the advantages of ERM adoption disappear?

Clearly, our setting is unique; financial firms' value imploded as investors grew wary of the fallout of the subprime lending mess. However, we expected that insurers with strong or excellent ERM ratings would distinguish themselves particularly under these extremely adverse situations. This also begs the question: What would be the relationship between ERM and firm value under more normal conditions? In the past, media reports have suggested that rating agencies have been suspected of offering ratings that are distorted by their business relationships with clients. Do our results indicate a problem with S&P's evaluation or with the ERM construct itself? As the S&P ERM rating includes a firm's risk management culture, can firm ERM capabilities and ratings change rapidly? We expect to continue our investigation into these questions as more years of ERM data become available.

S&P provides these separate ERM assessment ratings for insurance companies, and we cannot generalize the results outside the industry. From 2010, S&P plans to start including ERM discussion into corporate credit rating reports for non-financial firms, but has not decided when or whether to produce a separate ERM component for these firms. We will eagerly monitor S&P's actions and as more data becomes available, our future research will investigate the relation between ERM and firm value for firms outside the insurance industry to understand the effects of ERM based on industry differences.

Research into ERM is just beginning and as S&P expands ERM ratings to other industries, the pressure on firms to implement ERM will intensify. If a higher degree of ERM implementation does lead to higher firm value, what is the source of the value? Is it mainly due to the traditional risk management arguments for increased firm value related to the effects of

cash-flow volatility on asymmetric information, financial distress, or tax costs? Or is there some additional benefit of ERM, such as managing risks in portfolios, strategically allocating capital to maximize risk-adjusted returns, or increased ability to envision and deal with emerging risks? That is, we need to unpack the source of value to understand how much of it is attributable to ERM that goes beyond the effects of traditional risk management. We believe these are interesting questions that future research could investigate as more years of ERM data and other proxies become available.

Future work on a broad subject such as ERM can benefit from cross-disciplinary research. Just as firms are breaking down risk silos and implementing ERM, academics may have to cooperate across disciplines to gain a comprehensive understanding of ERM. For example, finance research has mainly focused on quantifiable, tactical risks, such as financial risks that can be hedged using derivatives in what we call traditional risk management, but over the past few years, accounting and finance research has broadened to investigate ERM, while strategic management research has focused on strategic risks that can be mitigated using real options and scenario analysis. We expect such interdisciplinary research would lead to more clarity on the relationship between ERM and firm performance.

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