

# “Enterprise risk management and business performance during the financial and economic crises”

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| <b>ARTICLE INFO</b> | Tony K. Quon, Daniel Zeghal and Michael Maingot (2012). Enterprise risk management and business performance during the financial and economic crises. <i>Problems and Perspectives in Management</i> , 10(3) |
| <b>RELEASED ON</b>  | Wednesday, 17 October 2012   |
| <b>JOURNAL</b>      | "Problems and Perspectives in Management"  |
| <b>FOUNDER</b>      | LLC “Consulting Publishing Company “Business Perspectives”   |



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

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## Enterprise risk management and business performance during the financial and economic crises

### Abstract

Increased volatility in the business world has exposed the inadequacy of traditional but fragmented approaches to risk management. This has led to an integrated approach to measuring and managing risks known as enterprise risk management (ERM). While past studies of ERM disclosures have examined it within the context of corporate governance and internal control, its relationship to business performance has received little attention. While firm performance changed radically between 2008 and 2009 during the financial crisis and economic recession, only minor increases in risk exposure, risk consequence or risk management strategies were found from 2007 to 2008. ERM information does not predict or have any appreciable effect on business performance.

**Keywords:** enterprise risk management, business performance, Canadian corporations.

**JEL Classification:** D8, L25.

### Introduction

The objective of this paper is to examine the relationship between enterprise risk management (ERM) information content and firm performance. We examine the non-financial companies listed on the Standard & Poor's (S&P) Toronto Stock Exchange (TSX) Composite Index for 2007 and 2008 through a content analysis of their annual reports. We rate risk exposure, risk consequences and risk management information among fourteen types of risk. To examine firm performance, we collected a variety of market, operational and accounting performance measures for 2006-2009, using the Compustat Research Insight database. *We hypothesize that ERM information is predictive of firm performance.*

ERM is a management process that requires a firm's management to identify and assess the collective risks that affect firm value and apply an enterprise wide strategy to manage those risks in order to establish an effective risk management strategy (Meulbroek, 2002). The primary goal of risk management is to maximize shareholder value (CAS, 2003; COSO, 2004; Beasley et al., 2008; Pagach and Warr, 2011; Hoyt and Liebenberg, 2011). Hoyt and Liebenberg (2011) argue that profit maximizing firms should consider implementing an ERM program only if it increases expected shareholder wealth. Recently, risk management has evolved from a narrow view that focuses on evaluating risk from a "silo" perspective to a holistic all-encompassing view (Tufano, 1996; Liebenberg and Hoyt, 2003; Beasley et al., 2005; Pagach and Warr, 2011).

Managing each risk class in a separate silo creates inefficiencies due to lack of coordination between the various risk management departments (Fabozzi and Drake, 2009). Proponents of ERM argue that by integrating decision-making across all risk classes, firms are able to avoid duplication of risk management expenditure by exploiting natural hedges.

Firms that engage in ERM should be able to better understand the aggregate risk inherent in different business activities (Meulbroek, 2002; Hoyt and Liebenberg, 2011). Since risks are interdependent across activities, they might go unnoticed in the traditional risk management model in "silos" (Hoyt and Liebenberg, 2011). Increasing numbers of companies have implemented or are considering ERM programs (Protiviti, 2007; Hoyt and Liebenberg, 2011; Accenture, 2011). The consulting firms have established specialized ERM practices. Universities, particularly those in the US, the UK, Ireland, and Canada, have developed ERM courses, programs and research centres. Rating agencies have begun to consider ERM in the rating process (Acharyya, 2007; Hoyt and Liebenberg, 2011). In May, 2008, S&P announced its intention to include ERM assessments of non-financial companies (S&P, 2009).

A series of company failures, corporate scandals, and fraud are among the reasons for companies to effectively implement risk management programs. These companies' failures are caused by poor risk management and corporate governance (Manab et al., 2010). Rosen and Zenios (2001) emphasize that corporate governance is vital for effective ERM and that none of the ERM components can be achieved without corporate governance compliance. Corporate governance and risk management are interrelated and interdependent. The stability and improvement of the company's performance are highly dependent on the effective role of both components (Sobel and Reding, 2004; Manab et al., 2010).

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This work was supported by research funding from the Telfer School of Management and from the CGA Canada – Accounting and Governance Research Center there. The authors thank the editor and two anonymous reviewers for constructive comments and questions that improved the manuscript.

Knight (2006) expresses the above-mentioned point in the following way: “Corporate governance may be regarded as the glue which holds the organization together in pursuit of its objective. Risk management provides the resilience.”

The paper proceeds as follows. The nature and objectives of enterprise risk management are discussed. Then the effect of ERM on business performance is examined through a review of the literature. After a discussion of the research objective and the research methodology, the results and analysis of the relationship between enterprise risk management and business performance are presented, followed by the conclusions.

### **1. The nature and objective of ERM**

Organizations long have practised what is now called enterprise risk management (ERM). Treating risks by transferring it through insurance or other financial products has also been common practice (CAS, 2003; Nocco and Stulz, 2006). The job of the corporate risk manager was a low level position in the corporate treasury with responsibility for the purchase of insurance, hedging interest rate and foreign exchange exposures. Today, the treasury has a growing role in risk management (Conrad, 2010). In recent years, however, corporate risk management has expanded well beyond insurance and hedging of financial exposures to include other kinds of risks – operational risk, reputational risk and most recently strategic risk (Nocco and Stulz, 2006; Quinn, 2010). Today, a large number of companies have elevated ERM to a senior management responsibility. The risk management function is now directed by a senior executive with the title of Chief Risk Officer (CRO). The role of the CRO has been widely adopted in risk intensive businesses such as financial institutions, energy firms and non-financial firms with significant investment activities and/or foreign operations (Lam, 2000; CAS, 2003; Nocco and Stulz, 2006; Quinn, 2010). The CRO reports to the Chief Financial Officer (CFO) or Chief Executive Officer (CEO), and in some companies, the CRO reports directly to the board of directors (Lam, 2000).

Successful organizations know what they are and what they want to be in the future. But organizations can have different approaches to risk (AICPA/CICA, 1999). Risk appetite, the level of risk an organization is willing to assume, is closely linked to corporate philosophy, culture and strategy (Lamm-Tennant and Lightfoot, 2010). Risk appetite is taken in the context of the corresponding rewards associated with the risk. A thought paper developed by Ernst & Young Global Limited (2010) notes that a

comprehensive discussion of risk appetite should be linked to defining the overall strategy of a company, involving both top management and the board of directors. The board should take into account the risk expectations of shareholders, regulators and other stakeholders. In addition, the culture of the company and the capacity to manage risks should be an integral part of defining risk appetite. Furthermore, risk appetite should be translated into the risk tolerance of the company. Risk tolerance is stated in terms of the amount of risk a company is willing and able to keep in executing its business strategy –in other words, the limits of a company’s capacity for taking on risk (Lipton, 2009; Lamm-Tennant and Lightfoot, 2010; Ernst & Young Global Limited, 2010).

Once risk appetite and risk tolerances are properly defined and aligned, it becomes the responsibility of management and the board of directors to communicate these throughout the organization to ensure that actions of the company at all levels are in line with the risk the company is willing to accept (Ernst & Young Global Limited, 2010). Management’s role is to guide and review ERM efforts, consider whether the residual risks are acceptable, and approve plans to mitigate serious risks. The board’s role is to oversee the ERM process, monitor how risks are evaluated, prioritized and mitigated, review the company’s assessment and mitigation plans for serious risks, and improve or reshape management’s decision (Lam, 2000; Sobel and Reding, 2004).

The major objective of ERM is to increase shareholder value (Sobel and Reding, 2004; Bowling and Rieger, 2008; Lajili and Zéghal, 2005). It achieves this by first improving capital efficiency through the provision of an objective basis for allocating corporate resources. It is able to do this by reducing expenditures on immaterial risks and exploiting natural hedges. Secondly, enterprise risk management can support informed decision-making by exposing areas of high risk and suggesting risk-based advances. Thirdly, enterprise risk management will help build investor confidence by establishing a process which, by its activities, can stabilize financial results and demonstrate to all stakeholders that the organization practises sound risk stewardship (Tillinghast-Towers Perrin, 2000; Lajili and Zéghal, 2005).

### **2. The effect of ERM on business performance: a literature review**

Smithson and Simkins (2005) provide an excellent review of the literature examining the relationship between the use of risk management and the value of the firm. Of the ten studies reviewed, nine used

Tobin's Q as a proxy for the firm's value. We consider business performance to be synonymous with maximizing shareholder value.

Of the ten studies, one looks at interest rate and foreign exchange (FX) risk management by financial institutions, five consider interest rate and FX risk management by industrial corporations, one considers commodity price risk management by commodity users and three study commodity risk management by commodity producers. In the case of interest rate and FX risk management, the evidence shows a positive relationship between risk management and the value of the firm (Cyree and Huang, 2004). The five studies of industrial corporations' use of FX derivatives (including one study that also included interest rate derivatives) found evidence that risk management adds value (Alayannis and Weston, 2001; Bartram, Brown and Fehle, 2004; Kim, Mathur & Nam, 2004; Allayannis, Lei and Miller, 2004).

With respect to the use of commodity price risk management, the evidence suggests that whether or not risk management adds value depends on whether the company is a user or producer of the commodity. For example, Callahan (2002) found a negative correlation between the extent of gold hedging and the performance of firm stock price. Lookman (2004) found that for undiversified exploration and production (E & P) firms where commodity price is a primary risk, hedging is associated with lower firm value. For diversified firms with an E & P segment, hedging is associated with higher firm value. However, in the aggregate, no association with hedging and firm value is detected. Jin & Jorion (2004) examined the risk management activities of 119 U.S. oil and gas producers and found that risk management is not related to firm value. The single study of commodity risk management by commodity users carried out by Carter, Rogers and Simkins (2004) found that full price hedging by airlines was associated with significantly higher firm values.

A study by Guay and Kothari (2003) concluded that corporate derivative positions in general are far too small to account for the valuation premium reported by Allayannis and Weston (2001) and that the positive association between derivatives and value is more a reflection of the tendency of successful companies to use derivatives.

We found three empirical papers on ERM and its effect on shareholder value. Beasley, Pagach and Warr (2008) use a sample of 120 firms announcing the appointment of a senior executive overseeing the

enterprise's risk management processes from 1992 to 2003. They find that the univariate average two-day market response is not significant, suggesting that a general statement about the benefit or cost of implementing ERM across all types of entities is not possible. However, their multiple regression analysis finds significant relationships between the magnitude of equity market returns and certain firm specific characteristics. For the non-financial firms in their sample, announcement period returns are positively associated with firm size and the volatility of the prior period's reported earnings and negatively associated with leverage and the extent of cash on hand relative to liabilities. For financial firms, however, there are fewer statistical associations between announcement returns and firm characteristics. These results suggest that the costs and benefits of ERM are firm-specific.

Pagach and Warr (2011) examine the characteristics of firms that adopt ERM and find support for the hypothesis that firms adopt ERM for direct economic benefit rather than to merely comply with regulatory pressure. A recent study by Hoyt and Liebenberg (2011) provides evidence of the value relevance for insurance companies. They estimated the effect of ERM using Tobin's Q and find a positive relationship between the use of ERM and firm value. The ERM premium of roughly 20 percent is both statistically and economically significant.

### 3. Objectives and research methodology

The objective of this paper is to explore the relationship between ERM and firm performance for the 156 non-financial firms on the Standard & Poor's Toronto Stock Exchange (TSX) Composite Index during 2007 and 2008. Companies in the financial sector will be examined in a future study. The time period was chosen primarily because of the 2008 financial crisis and the economic recession that followed.

We examined the 2007 and 2008 Annual Reports of Canadian corporations listed on the S&P TSX Composite Index. The population of interest was comprised of all companies listed in both years on this index, which accounts for about 70% of the total capitalization of all companies on the Toronto Stock Exchange.

The extent of ERM reported by firms is examined using content analysis of their annual reports (Zéghal and Ahmed, 1990; Milne and Adler, 1999), particularly the Management Discussion and Analysis (MD&A) and the Notes to the Financial Statements. We looked for fourteen different types of risks under the general headings of financial, busi-

ness and operational risks. To examine firm performance, we collected a variety of market, operational and accounting performance measures for 2006-2009, using the Compustat Research Insight database.

The 2008 crisis was financial in nature, affecting credit and liquidity, and evolved into an economic recession, affecting business investment, consumer confidence and demand for goods and services. Thus the crisis presented at minimum increased financial, credit, market, and economic risks to companies.

ERM is the process by which a company manages the risks that it faces, and involves three dimensions or steps. The identification of the risks in terms of the firm’s exposure to risk and the consequences of that risk must be considered, before the consideration of management strategies to deal with the risks.

ERM is important because risks can affect the performance of a company. The effect of ERM on performance will differ depending whether on which of the three dimensions of ERM (risk exposure, risk consequences and risk management) is being examined. While higher risk exposure and more severe consequences can lead to worse performance, a different risk management strategy can lead to better performance. For each risk there are specific factors that can affect firm performances but always within the three dimensions mentioned above. While we examined fourteen different types of risk, this paper focuses on market and economic risks. Increased market risk in terms of increasing competition for a company’s goods and services and/or increased economic risk arising from a slowdown or contraction in the business cycle can result in a drop in net income due to the potential for lower revenues and/or higher costs.

For each type of risk, we categorized the levels of risk exposure, of risk consequences, and of risk management according to the categorization in Table 1 (as discussed in AICPA/CICA (1999)).

Table 1. Levels of risk exposure, consequence and management

| Risk exposure | Risk consequence | Risk management |
|---------------|------------------|-----------------|
| Rare          | Insignificant    | Accept risk     |
| Improbable    | Minor            | Reduce risk     |
| Possible      | Moderate         | Transfer risk   |
| Probable      | Major            | Avoid risk      |
| Certain       | Catastrophic     |                 |

In an earlier paper (Maingot et al., 2012), we found only marginal changes in disclosures between 2007 and 2008 in how companies reacted to the risks presented by the 2008 crisis. In this study, we started by

documenting the changes in firm performance after their annual reports of 2007 and 2008. If there were more changes in the levels of risk exposure and risk consequence before and after the financial crisis, then we would have tried to link these with changes in firm performance. However, since there were only marginal changes in the risk profiles, we examined two groups of companies, those with better versus those with worse firm performances, to see if there were corresponding differences in their risk disclosures.

This paper looks at whether the average levels of risk exposure and consequences in 2007 and 2008 were at all predictive of firm performance changes from 2007 to 2008 or from 2008 to 2009. We examine changes in firm performance using operational, accounting and market measures; more specifically, we look at sales changes, changes in EBIT margins, and changes in Tobin’s Q, respectively. Tobin’s Q is the market value of equity plus the book value of liabilities divided by the book value of assets (Cummins et al., 2006). Unlike other performance measures, Tobin’s Q does not require risk adjustment or normalization. It reflects market valuations and is relatively free from management manipulations (Lindenberg and Ross, 1981). While previous studies have focused on firm value, we have taken a more balanced, comprehensive look at firm performance by examining operational, accounting and financial market performance.

#### 4. Results and analysis

This section compares the average levels of risk assessment for companies with different operational, accounting and market performances in 2007-2008 and in 2008-2009. The 2008 financial crisis had either immediate or delayed impacts on firm performance in 2007-2008 and 2008-2009, depending on whether performance was measured using sales, EBIT margins or Tobin’s Q.

**4.1. Changes in operational performances (as measured by changes in sales).** The 2008 financial crisis had a delayed effect on changes in sales in 2008-2009 with no immediate impact on changes in sales in 2007-2008. While most companies increased their sales from 2007 to 2008, most companies had decreased sales from 2008 to 2009. Thus the effects of the financial crisis on sales were not immediate but rather delayed.

*4.1.1. Average levels of market and economic risk exposure.* Tables 2 and 3 summarize the averages and standard deviations of the market and economic risk exposure levels for companies with positive versus negative sales changes. Table 2 shows that of companies reporting market risk exposures in 2008,

95 have positive and only 12 have negative sales changes from 2007 to 2008. However, from 2008 to 2009, only 38 have positive and 70 have negative sales changes. Thus the 2008 financial crisis had a delayed rather than an immediate effect on sales. Moreover, all the companies with negative sales changes in either period reported that risk exposure levels were “certain” in their 2008 annual reports. Somewhat unexpectedly, the companies with positive sales changes in the same periods reported a slightly lower average level of market risk exposures; however, the differences are not statistically significant.

Table 2. Average market risk exposure levels (with standard deviations)

|                                       | 2007-2008               | 2008-2009               |
|---------------------------------------|-------------------------|-------------------------|
| Companies with positive sales changes | 4.97 (0.23)<br>(n = 95) | 4.92 (0.36)<br>(n = 38) |
| Companies with negative sales changes | 5.00 (0.00)<br>(n = 12) | 5.00 (0.00)<br>(n = 70) |
| p-value                               | 0.84                    | 0.17                    |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

Table 3 shows that, of companies reporting economic risk exposures in 2008, 113 have positive and only 15 have negative sales changes from 2007 to 2008, while only 38 have positive and 92 have negative sales changes from 2008 to 2009 (there were more companies reporting the level of economic risk exposure than those reporting the level of market risk exposure).

Table 3. Average economic risk exposure levels (with standard deviations)

|                                       | 2007-2008                | 2008-2009               |
|---------------------------------------|--------------------------|-------------------------|
| Companies with positive sales changes | 4.88 (0.36)<br>(n = 113) | 4.71 (0.52)<br>(n = 38) |
| Companies with negative sales changes | 4.73 (0.46)<br>(n = 15)  | 4.92 (0.27)<br>(n = 92) |
| p-value                               | 0.35                     | 0.009                   |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

While the average economic risk exposure levels reported by the 113 companies with positive sales changes in 2007-2008 is unexpectedly higher than the average level reported by the 15 companies with negative sales changes in 2007-2008, this difference is not statistically significant. However, the average economic risk exposure level of 4.92 reported by the 92 companies with negative sales changes in 2008-2009 is statistically significantly higher than the average level of 4.71 reported by the 38 companies with positive sales changes in 2008-2009 (p-value = 0.009 for the two-tailed test). This suggests that the average level of economic risk exposure is predictive of sales changes from 2008 to

2009, with higher economic risk exposure associated with negative sales changes.

4.1.2. *Average levels of market and economic risk consequences.* Tables 4 and 5 summarize the averages and standard deviations of the levels of market and economic risk consequences for companies with positive versus negative sales changes.

Table 4. Average market risk consequence levels (with standard deviations)

|                                       | 2007-2008               | 2008-2009               |
|---------------------------------------|-------------------------|-------------------------|
| Companies with positive sales changes | 3.27 (0.51)<br>(n = 93) | 3.19 (0.57)<br>(n = 37) |
| Companies with negative sales changes | 3.00 (0.60)<br>(n = 12) | 3.26 (0.50)<br>(n = 69) |
| p-value                               | 0.13                    | 0.49                    |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Table 5. Average economic risk consequence levels (with standard deviations)

|                                       | 2007-2008                | 2008-2009               |
|---------------------------------------|--------------------------|-------------------------|
| Companies with positive sales changes | 3.54 (0.60)<br>(n = 110) | 3.50 (0.65)<br>(n = 36) |
| Companies with negative sales changes | 3.47 (0.52)<br>(n = 15)  | 3.54 (0.56)<br>(n = 91) |
| p-value                               | 0.73                     | 0.74                    |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Companies with positive sales changes from 2007 to 2008 tend to have higher levels of economic and market risk consequences than companies with negative sales changes in the same period. This is the opposite of what one might expect. However, companies with positive sales changes in 2008 to 2009 tend to have lower levels of both economic and market risk consequences than companies with negative sales changes in the same period. This is more in line with what one might expect. However, neither of the two apparent differences is statistically significant.

The 2008 financial crisis had more of a delayed than an immediate impact on sales. However, of the eight comparisons above, only one comparison between firms with different operational performances (in 2008-2009) yielded a statistically significant difference (in economic risk exposure).

4.2. **Changes in accounting performances (as measured by changes in EBIT margins).** The effect of the 2008 financial crisis on EBIT margins was more pronounced in 2008-2009 than in 2007-2008. While most companies had higher EBIT margins in 2008 compared to 2007, most companies had lower EBIT margins in 2009 compared to 2008. Thus the effects of the financial crisis on EBIT margins were more delayed than immediate.

4.2.1. Average levels of market and economic risk exposure. Tables 6 and 7 summarize the averages and standard deviations of the levels of market and economic risk exposure for companies with higher versus lower EBIT margins.

Table 6. Average market risk exposure levels (with standard deviations)

|                                    | 2007-2008               | 2008-2009               |
|------------------------------------|-------------------------|-------------------------|
| Companies with higher EBIT margins | 4.95 (0.28)<br>(n = 61) | 4.97 (0.16)<br>(n = 38) |
| Companies with lower EBIT margins  | 5.00 (0.47)<br>(n = 61) | 4.97 (0.24)<br>(n = 70) |
| p-value                            | 0.47                    | 0.96                    |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

Table 7. Average economic risk exposure levels (with standard deviations)

|                                    | 2007-2008               | 2008-2009               |
|------------------------------------|-------------------------|-------------------------|
| Companies with Higher EBIT Margins | 4.89 (0.36)<br>(n = 72) | 4.85 (0.36)<br>(n = 47) |
| Companies with Lower EBIT Margins  | 4.83 (0.38)<br>(n = 58) | 4.86 (0.38)<br>(n = 85) |
| p-value                            | 0.64                    | 0.64                    |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

All companies with lower EBIT margins in 2008 than in 2007 reported that market risk was “certain”, while companies with higher EBIT margins reported that market risk was slightly lower than “certain”. On the other hand, companies with lower EBIT margins in 2008 than in 2007 had a lower level of economic risk exposure than companies with higher EBIT margins in the same period. Neither difference is statistically significantly non-zero.

Companies with higher versus lower EBIT margins from 2008 to 2009 do not appear to have any difference in the average levels of market or economic risk exposure.

4.2.2. Average levels of market and economic risk consequences. Tables 8 and 9 summarize the averages and standard deviations of the levels of market and economic risk consequences reported by companies with higher versus lower EBIT margins in 2007-2008 and 2008-2009.

Table 8. Average market risk consequence levels (with standard deviations)

|                                    | 2007-2008               | 2008-2009               |
|------------------------------------|-------------------------|-------------------------|
| Companies with higher EBIT margins | 3.27 (0.52)<br>(n = 59) | 3.19 (0.52)<br>(n = 37) |
| Companies with lower EBIT margins  | 3.19 (0.54)<br>(n = 47) | 3.26 (0.53)<br>(n = 69) |
| p-value                            | 0.45                    | 0.49                    |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Table 9. Average economic risk consequence levels (with standard deviations)

|                                    | 2007-2008               | 2008-2009               |
|------------------------------------|-------------------------|-------------------------|
| Companies with higher EBIT margins | 3.51 (0.61)<br>(n = 70) | 3.49 (0.51)<br>(n = 45) |
| Companies with lower EBIT margins  | 3.54 (0.57)<br>(n = 57) | 3.54 (0.63)<br>(n = 84) |
| p-value                            | 0.75                    | 0.91                    |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Companies with higher EBIT margins from 2007 to 2008 have a higher average level of market risk consequences than companies with lower EBIT margins; however, companies with higher EBIT margins from 2007 to 2008 disclose a lower average level of economic risk consequences than companies with lower EBIT margins. These differences are not statistically significant.

Companies with higher EBIT margins in 2008-2009 have a slightly lower average level of market and economic risk consequences than companies with lower EBIT margins. Again, the differences are not statistically significant. The 2008 financial crisis had more of a delayed than an immediate effect on EBIT margins. With respect to this measure of accounting performance, none of the eight comparisons of companies with higher versus lower EBIT margins revealed any statistically significant difference in risk assessments.

4.3. Companies with different financial market performance (as measured by Tobin’s Q). The 2008 financial crisis had an immediate negative effect on Tobin’s Q (and on similar measures such as the one-year market returns) from 2007 to 2008. Remarkably, the financial market bounced back from 2008 to 2009.

4.3.1. Average levels of market and economic risk exposure. Tables 10 and 11 summarize the averages and standard deviations of the levels of market and economic risk exposure and consequences for companies with higher or lower Tobin’s Q in 2007-2008 and in 2008-2009.

Table 10. Average market risk exposure levels (with standard deviations)

|                                 | 2007-2008                | 2008-2009               |
|---------------------------------|--------------------------|-------------------------|
| Companies with higher Tobin’s Q | 4.80 (0.45)<br>(n = 5)   | 4.97 (0.24)<br>(n = 88) |
| Companies with lower Tobin’s Q  | 4.98 (0.19)<br>(n = 106) | 5.00 (0.00)<br>(n = 23) |
| p-value                         | 0.061                    | 0.49                    |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

Table 10 shows that, of companies reporting market risk exposures in 2008, only 5 have higher Tobin’s

Q in 2008 than in 2007 and 106 have lower Tobin's Q during the same period. However, from 2008 to 2009, the relationship was markedly different, with only 23 having lower Tobin's Q and 88 having higher Tobin's Q.

For each time period, companies with a higher Tobin's Q reported a lower average level of market risk exposure than companies with lower Tobin's Q. However, these differences are not statistically significant.

Table 11. Average economic risk exposure levels (with standard deviations)

|                                 | 2007-2008                | 2008-2009                |
|---------------------------------|--------------------------|--------------------------|
| Companies with higher Tobin's Q | 4.86 (0.38)<br>(n = 7)   | 4.88 (0.36)<br>(n = 114) |
| Companies with lower Tobin's Q  | 4.86 (0.37)<br>(n = 128) | 4.84 (0.39)<br>(n = 22)  |
| p-value                         | 0.99                     | 0.64                     |

Note: Risk exposure codes: 1 – rare, 2 – improbable, 3 – possible, 4 – probable, 5 – certain.

Table 11 shows that, for 2008-2009, companies with higher Tobin's Q reported a higher average level of economic risk exposure than companies with lower Tobin's Q. This is the opposite of what one might expect but the difference is not practically or statistically significant. For 2007-2008, there was no difference in the average level of economic risk exposure, whether Tobin's went up or down.

4.3.2. *Average levels of market and economic risk consequences.* Tables 12 and 13 summarize the averages and standard deviations of the levels of market and economic risk consequences reported by companies with either higher or lower Tobin's Q in 2007-2008 and 2008-2009. Table 12 shows that, for both time periods, companies with lower Tobin's Q have a higher average level of risk consequences than companies with higher Tobin's Q. For 2008-2009, this difference is statistically significant ( $p = 0.032$ ).

Table 12. Average market risk consequence levels (with standard deviations)

|                                 | 2007-2008                | 2008-2009               |
|---------------------------------|--------------------------|-------------------------|
| Companies with higher Tobin's Q | 3.00 (0.00)<br>(n = 5)   | 3.17 (0.51)<br>(n = 86) |
| Companies with lower Tobin's Q  | 3.24 (0.53)<br>(n = 104) | 3.43 (0.51)<br>(n = 23) |
| p-value                         | 0.32                     | 0.03                    |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Table 13 shows that companies with higher Tobin's Q have a lower average level of economic risk consequences than companies with lower Tobin's Q in 2007-2008. This difference is not statistically significant. However, from 2008 to 2009, companies with higher Tobin's Q reported a statistically significantly

higher level of economic risk consequences than companies with a lower Tobin's Q. This is opposite of what one might expect.

Table 13. Average economic risk consequence levels (with standard deviations)

|                                 | 2007-2008                | 2008-2009                |
|---------------------------------|--------------------------|--------------------------|
| Companies with higher Tobin's Q | 3.43 (0.53)<br>(n = 7)   | 3.55 (0.57)<br>(n = 110) |
| Companies with lower Tobin's Q  | 3.51 (0.59)<br>(n = 125) | 3.27 (0.63)<br>(n = 22)  |
| p-value                         | 0.72                     | 0.04                     |

Note: Risk consequence levels were coded as: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, and 5 – catastrophic.

Of the eight comparisons of companies with higher or lower Tobin's Q, only two revealed statistically significant differences in risk assessments. However, while the market risk consequences are higher for companies with lower Tobin's Q, the economic risk consequences are higher for companies with higher Tobin's Q.

## Conclusion

During and after the 2008 financial crisis, companies experienced radical shifts in operational, accounting and financial market performance. While the financial crisis had an immediate effect on financial market performance, it had more of a delayed effect on operational and accounting performance as the economic recession unfolded. However, companies with such different performances generally did not report average levels of economic or market risk exposure or consequences that were statistically significantly different.

While there were differences in the observed average levels of risk assessments, they were not statistically significantly different from zero, with three exceptions. Of these three, only two were consistent with the hypothesis that higher reported risks are predictive of lower firm performance. However, with only two statistically significant differences supporting the research hypothesis, in a total of 24 comparisons, this is just slightly more than what one might expect with a .05 level of significance, assuming no association between risk assessment and firm performance. Therefore, one cannot conclude that the assessed levels of economic or market risk exposure or consequences are related to or predictive of firm performance in a way that makes sense.

Our research is based on a broader set of performance measures that places it in the middle ground with previous research which had demonstrated non-conclusive results on the relationship between ERM and firm performance. More research is needed to investigate the relationship between ERM and firm performance on a much larger sample and for a much longer period of time.

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