ON THE DETERMINANTS OF ENTERPRISE RISK MANAGEMENT IMPLEMENTATION

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THIS DRAFT: OCTOBER 2007

ABSTRACT

Corporate governance failures and new legislation have emphasized the importance of enterprise risk management (ERM) in preventing fraudulent reporting. Despite the increased attention on ERM, little research has been done to explain why some organizations embrace ERM while others do not. The objective of this paper is to explore how the board composition is related to the degree of enterprise risk management implementation. Our main results reveal that the position of the CEO in the board has an important influence on the level of ERM. Furthermore, we find that board independence by itself is not sufficient to induce higher levels of ERM. Board independence is only significantly related to ERM when there is a separation of CEO and chairman. Firms with an independent board and a separation of CEO and chairman show the highest level of ERM. One possible explanation for our results is that CEOs do not favour ERM implementation and are able to withstand pressure from the board when they are occupying the seat of chairman.

Keywords: Enterprise risk management, CEO, Board of directors, Corporate Governance, Chief Risk Officer

JEL classification: G3, G32, G34

* This paper has been developed with the support of "The Commission of Universities and Research of the Innovation Department, Universities and Enterprise of the Catalan Government and the European Social Funds".

The author gratefully acknowledges the comments of Prof. J. Rialp, F. Arcelus, and the seminar participants at the Autonomous University of Barcelona.

I. INTRODUCTION

The Enron failure, together with other high profile corporate collapses, has led to a debate concerning the efficiency and the role of corporate governance. These corporate governance failures culminated in the passage of the Sarbanes Oxley Act (SOX) on July 30, 2002, which have emphasized the importance of enterprise risk management, hereafter referred to as ERM in preventing fraudulent reporting. In fact, a recent survey of global CEOs found that ERM is a priority among more than one-third of CEOs (39 percent strongly agree) and their boards (38 percent) (PwC 2004). A fundamental aspect of management's responsibility is to provide reasonable assurance that resources are adequately controlled and financial statements are accurate and informative. While ERM potentially provides a significant source of competitive advantage for those who can demonstrate a strong ERM capability and discipline (Stoh, 2005), not all organizations are adopting it. Initial literature has looked at firm characteristics related with ERM implementation, but little is known about how existing corporate governance characteristics influence ERM implementation. The purpose of this paper is to investigate how a company's board composition is related to the degree of ERM practices.

This paper contributes mainly to field of corporate governance by providing new evidence on the relationship between board composition and ERM. In addition we also suggest a measure to test the degree of ERM derived from the COSO theoretical paper on ERM. Our main results reveal that the position of the CEO in the board has an important influence on the level of ERM. Furthermore, we find that board independence alone is not a sufficient condition to induce higher levels of ERM. Board independence is only significantly related to ERM when there is a separation of CEO and chairman. Firms with independent board and separation of

CEO and chairman show the highest level of ERM. The results of this study underline the importance of the corporate governance recommendations about CEO and chairman separation. In what follows, we discuss the prior research and hypothesis development. Afterwards, we focus on the sample description and the research method. Finally, we describe the results and formulate the conclusions and limitations of this research.

II. PRIOR RESEARCH AND HYPOTHESES DEVELOPMENT

Existing agency theory proposes a series of mechanisms that seek to reconcile the interests of shareholders and managers, including the utilization of internal control mechanisms such as monitoring by non-executive directors (Fama and Jensen, 1983), monitoring by large shareholders (Shleifer and Vishny, 1986), the incentive effects of executive share ownership (Jensen and Meckling, 1976) and the implementation of internal controls (Matsumura and Tucker, 1992). An additional instrument of shareholder monitoring is the statutory audit whereby independent auditors report annually to shareholders on the appropriateness of the financial statements prepared by management (Watts and Zimmerman, 1983). The clear implication for corporate governance from an agency theory perspective is that adequate monitoring or control mechanisms need to be established to protect shareholders from management's conflict of interest (Fama and Jensen, 1983). Since the corporate scandals and the creation of new corporate governance codes, ERM has been considered as a valuable element of the corporate governance structure.

Risk management has evolved from a narrow, insurance based view to a holistic; all risk encompassing view, commonly termed Enterprise Risk Management. In September 2004, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) issued *Enterprise Risk Management—Integrated Framework*, to provide a model framework for

ERM. That framework defines ERM as *"a process, effected 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 risks to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives."* Nocco and Stultz (2006) argue that ERM is beneficial to most firms because it allows them to manage risks in a manner that avoids costly left tale outcomes.

Prior research on ERM has mainly focused on firm-specific characteristics associated with ERM adoption. Kleffner et al. (2003) examined characteristics of Canadian companies and their ERM adoption status. Companies adopting ERM cited "the influence of the risk manager (61%), encouragement from the board of directors (51%), and compliance with Toronto Stock Exchange (TSE) guidelines (37%)" as the key factors causing their adoption of ERM. Liebenberg and Hoyt (2003) used Chief Risk Officer (CRO) appointments to examine the determinants of ERM adoption. The authors found that companies appointing a CRO had higher leverage. Furthermore, Beasley et al. (2005) show that the presence of a CRO, board independence, managerial involvement, firm size and auditor type is associated with a greater stage of ERM adoption. Finally, Pagach and Warr (2007) show that firms that are more leveraged, have more volatile earnings and exhibit poorer stock market performance, are more likely to initiate an ERM program. Additionally, they find that ERM is used for reasons beyond basic risk management, including offsetting CEO risk taking incentives and seeking improved operating performance.

The decision to implement ERM, are made by the board of directors rather than by the CEO (Lam, 2001), but Walker et. al. (2002) notes that because of its scope and impact, ERM requires strong support from senior management. However, Kleffner et al. (2003) found that

encouragement from the board of directors is one of the most important driving forces, while management does not appear amongst the mayor driving forces. Besides, the benefits of ERM may not be obvious for managers, since part of their remuneration is typically given in stock options, for which the value increases with increased stock volatility. We therefore belief it may be interesting to examine how managers deal with the pressure of the board of directors to implement ERM. We particularly investigate the relationship between board independence and ERM and the relationship between the separation of CEO and chairman and ERM.

Board independence

In their respective reports on corporate governance, both Cadbury (1992) and OECD (2004) emphasize the value of increased non-executive representation on boards' suggesting that non-executives are capable of bringing greater independence and impartiality to board decisions. Consistently, Beasley (1996) finds an inverse relation between the percentage of outside directors on the board and the incidence of fraudulent financial reporting. Similarly, Firms with a majority of inside directors are found to be more likely to engage earnings management compared to a control sample matched by industry and size (Peasnell, et al., 2000). Furthermore, non-executives are expected to favor more extensive risk management and (internal or external) auditing in order to complement their own monitoring responsibilities, since they have the objective of identifying and rectifying reporting errors deliberately or otherwise made by managers. In a similar context, O'Sullivan (1997) finds that companies with a higher proportion of non-executive directors are more likely to purchase the monitoring of directors' and officers' insurance compared to boards with a lower proportion of non-executives. This suggests that companies with greater non-executive representation may favor a more comprehensive control, risk management and (internal or external) audit.

In order to reduce the likelihood of fraudulent reporting, and opportunistic behavior in general, board could demand investments in higher quality control and risk management practices and/or purchase of higher quality audit services. Numerous studies have reported a positive relationship between the independence of the board and the demand for external audit quality, as measured by the audit fees (O'Sullivan, 2000; Carcello et al., 2002; Hay and Knechel, 2004). In addition, Beasley et al. (2005) show that board independence is associated with a greater stage of ERM adoption.Therefore, one may view outside directors as more concerned with the quality of the financial and non-financial reports than are management directors, who face greater conflicts of interest.

HYPOTHESIS 1: *There is a positive relation between the percentage of outside directors on the board and enterprise risk management.*

Separation of CEO and Chairman

The UK Code of Best Practice (Cadbury Committee, 1992) recommends that the positions of chair and CEO should be held by different individuals. In addition, Jensen (1993) points out that when the CEO also holds the position of the chairman of the board, internal control systems may fail, as the board cannot effectively perform its functions including those of evaluating and firing CEOs. Similarly, Fama and Jensen (1983) argue that concentration of decision management and decision control in one individual reduces a board's effectiveness in monitoring top management. In addition, Goyal and Park (2002) point out that the sensitivity of top executive turnover to firm performance is significantly lower for firms that vest the titles of CEO and chairman in the same individual.

Pagach and Warr (2007) find that ERM is used for reasons beyond basic risk management, including offsetting CEO risk taking incentives and seeking improved operating performance. They find that the likelihood of hiring a Chief Risk Officer increases as CEOs compensation packages become more sensitive to stock volatility. A possible explanation for their result is that the board recognizes that the CEO has an incentive to increase risk, and tries to control the risk behaviour from the CEO by implementing a risk management program.

Managers may not benefit from implementing ERM, since part of their remuneration may be given in stock options for which the value increases with increased stock volatility. In addition, ERM adds an additional layer of monitoring and probably reduces the freedom of managers to pursue personal benefits over shareholder benefits. Therefore, it is interesting to investigate how managers deal with the pressure of the board of directors to implement ERM. In line with previous research, we believe that CEOs who also serve as chairman may have stronger control over the board of directors which could lead to lower levels of ERM:

HYPOTHESIS 2: *There is a positive relation between the separation of CEO and chairman and enterprise risk management.*

HYPOTHESIS 3: *There is a joint positive relation between enterprise risk management on the one hand and board independence and the separation of CEO and chairman on the other hand.*

III. SAMPLE SELECTION

We focus our study on one particular industry to maximize comparability between firms in terms of business environment, degree of competition and risk. The sample is composed

entirely of firms from SIC code 2834-Pharmaceutical preparations, an industry used in previous corporate governance research (Robb et al., 2001). Firms in this particular industry are faced with the same array of risks and seem to display a sufficient amount of variation in ERM practices. The pharmaceutical companies are capital intensive and rely primary on the stock market to finance their R&D projects. Furthermore, it is a competitive industry, with pressure to perform, generating incentives to cut corners if results are not satisfactory. In fact, the SEC enforcement list contains several pharmaceutical companies that manipulated numbers in response of bad results. Therefore, we believe that this industry is ideal to study ERM and its relationship to the board composition. We selected randomly 100 listed firms with SIC code 2834 – Pharmaceutical preparations, out of a total population of 213. All firms are listed on Amex, NYSE or NASDAQ.

IV. RESEARCH METHOD AND DEFINITION OF VARIABLES

Our approach for analyzing ERM is based on OLS regression consistent with previous research. We test the degree of the ERM against board independence (BOD-I), separation of CEO and chairman position (SEP_CEOC), firm size (LN_TA), free float (FF), leverage (LEV) and the auditor type (BIG4). Our model is based on Beasley et al. (2005) and Pagach and Warr (2007).

ERM = f (BOD-I, LN_TA, LEV, FF, BIG4) (1)

ERM = f (SEP_CEOC, LN_TA, LEV, FF, BIG4) (2)

ERM = f (BOD-I, SEP_CEOC, BODI*SEP_CEOC, LN_TA, LEV, FF, BIG4) (3)

Measuring Enterprise Risk Management

We use the COSO-ERM (2004) framework and prior work by Knechel (2002) to define relevant control and risk management procedures and derive an aggregate ERM measure. We use control and risk management measures which reflect the organization's own assessment of control and risk management efforts. For each company, all publicly available information was evaluated (10-K's, proxy statements related to fiscal year 2004 and the company website) for information about specific types of controls and risk and related ERM practices. Previous research (e.g. Liebenberg and Hoyt, 2003) used a single event like the appointment of a Chief Risk Officer to proxy for ERM. This study wants to explore which elements of the COSO-ERM (2004) framework are addressed by companies from one sector and how the degree of ERM is related to board composition. Similar to Knechel (2002), we expect that the disclosure of control and risk management practises indicates that the organization is very sensitive to the need to identify and manage those specific risks. Furthermore, it is reasonable to expect that firms with elaborated risk management practises want to signal this to the market. We consider 7 aspects of ERM, similar to COSO-ERM framework (2004). Compared to COSO-ERM (2004), we combined risk identification and risk assessment into one category.

We constructed our ERM measure as follows: In a first stage we constructed an initial list of 254 possible items to consider. In a second stage, we asked 5 senior auditors to evaluate the list and select the questions they consider most relevant to measure the degree of ERM. Based on their assessment we retained all questions that were selected by at least three different auditors. The final list is composed out of 70 questions, scoring 1 or 0. Table 1 gives an overview of the measure of ERM.

Independent test variables

Our analysis focuses on the link between the board composition and ERM. We consider both board independence and the separation of CEO and chairman. The data is collected from the company's 2004 annual reports.

- ***Board Independence (BOD-I).*** Similar to previous literature (e.g. Carcello et al. 2002, O'Sullivan, 2000), we define board independence as the percentage of the board members which are considered to be independent.

- ***Separation of CEO and chairman (SEP_CEOC).*** Previous literature (Jensen, 1993; Fama and Jensen, 1983, Cadbury Committee, 1992) argues that the board looses power to the management when there is no separation between the position of the chairman and the CEO. Dummy variable = 0 if the CEO is also the Chairman of the Board of Directors, 1 otherwise.

Independent control variables

Previous literature has found several firm characteristics to be related with the amount of risk to be managed and the appointment of a Chief Risk officer.

- ***Agency costs (FF, LEV).*** Agency costs arise from both equity and debt financing. We include free float (FF) to control for agency costs of equity, and leverage (LEV), measured as long-term debt over total assets, as a proxy for the agency costs between a company and its outside debtholders (Watts and Zimmerman 1986). Milgrom and Roberts (1992) argue that larger shareholders are possibly more willing and able to play an active monitoring role. Pagach and Warr (2007) show that firms that are more leveraged are

more likely to initiate an ERM program and Liebenberg and Hoyt (2003) found that companies appointing a Chief Risk Officer had higher leverage.

- ***Size (LN_TA).*** We include firm size, measured by total assets. As an organization's size increases, the scope of events threatening it is likely to differ in nature, timing, and extent. In addition to having a greater need for more effective enterprise-wide risk management techniques, larger entities may have greater ability to implement ERM due to greater resources (Colquitt et al., 1999). Furthermore, Beasley et al. (2005) show firm size is associated with a greater stage of ERM adoption.

- ***Audit Firm (Big4).*** Beasley et al. (2005) show auditor type is associated with the stage of ERM adoption. This binary variable takes values of 0 if it has a non-Big 4 auditor and 1 if it has a Big 4 auditor.

V. RESULTS

We first discuss the descriptive statistics of the variables used in this study. In table 1, we present the decomposition of the dependent variable. We observe that firms score well on objective setting and risk identification, while they score weakly on control activities score and monitoring. Using equal weight for each of the 7 aspects, the average ERM score is about 34 percent, which means that on average, firms provide information on 34 percent of ERM issues included in our framework. The company with the highest degree of ERM provides information on 90 percent of all items, while the company with the lowest degree of ERM provides only information on 9 percent. The ERM measure we use in the regression analysis is the weighted average of the categories. The results of our empirical analyses are not different when using an unweighted measure of the ERM as dependent variables.

---------- Insert table 1 about here ----------

Table 2 presents the descriptive statistics for the dependent and independent variables. The average firms scores 34 (out of 100) on ERM, while only 42 percent of all firms had a Chief Risk officer appointed, a percentage similar to the findings in Beasley et al. (2005). In addition, we find that the average board independence is around 72 percent and in 55 percent of the cases the CEO occupies the seat of the chairman of the board (contrary to corporate governance recommendations). The pharmaceutical firms are on average relatively large, with a mean of 6802 million dollars of assets. Furthermore, the average firm has more than 50 percent of its shares publicly traded and 71 percent has a Big4 auditor. Finally, on average 19 percent of a company's total assets consist of long term debt.

---------- Insert table 2 about here ----------

High correlation amongst independent variables could affect the significance level of the variables. We checked for multicollinearity and found no problem (mean value of VIF of 1.20). Table 3 presents the correlation matrix between all variables used in this study. We find that the ERM scores are strongly correlated with the presence of a Chief Risk Officer. Finally, the variable BOD-I, SEP_CEOC, LN_TA and BIG4 are correlated with both the ERM score and presence of a Chief Risk Officer (CRO).

---------- Insert table 3 about here ----------

Table 4 presents the OLS regression results for the three hypotheses. The models are significant and explain between 25 percent and 52 percent of the variance in the dependent variable. Model 1 tests the relationship between ERM implementation and board independence, while model 2 presents the results for the relationship between ERM and separation of CEO and chairman. Finally, we look for the interaction term between board independence and the separation of CEO and chairman. Model 3 present the results for the entire sample when including an interaction term, while models 4 and 5 focus on a subsample. Model 4 presents the relationship between ERM and board independence for companies where the CEO is also the chairman (SEP_CEOC=0), while model 5 presents this relationship for companies where there is a separation (SEP_CEOC=0).

---------- Insert table 4 about here ----------

The first model shows a weak significant relationship between board independence and ERM. Besides, LN_TA and BIG4 are significantly related to ERM, which is in line with previous literature. Large firms with big-4 auditors tend to have higher ERM scores. Finally, free float and leverage show a non-significant relationship. In the second model, we introduce the separation of CEO and chairman as test variable. We predicted a positive sign, given that it takes 0 if there is no separation and 1 if there is separation. The model now explains more of the variance in the dependent variable, with an adjusted R^2 of 27 percent. The test variable is highly significant ($p< 0.00$) and positive, indicating a positive relationship between ERM scores and the separation of the CEO and chairman. Models 3 to 5 relate to Jensen's (1993) point that when the CEO also holds the position of the chairman of the board, internal control systems fail, as the board cannot effectively perform its key functions including those of evaluating and firing CEOs. Similarly, Fama and Jensen (1983) argue that concentration of

decision management and decision control in one individual reduces a board's effectiveness in monitoring top management. Therefore, it could be that the relationship between board independence and ERM depends on power of the CEO over the board of directors.

Model three includes both board independence and separation of CEO and chairman as well as the interaction term between the two variables. We obtain a slightly improved model, compared to model 2. On the one hand, we observe that BOD-I become insignificant, while SEP_CEOC becomes weakly significant. On the other hand, the interaction term is highly significant. To clarify further the interaction, we present the relationship between board independence and ERM when SEP_CEOC is equal to 0 as well as when SEP_CEOC is equal to 0. Model 4 clearly shows that when there is no separation between the position of CEO and chairman (model 4), board independence is not related to the ERM score. However, when there is a separation (model 5), board independence is positively related with ERM. Therefore, it seems that it is important to combine a separation of CEO and chairman with an independent board to stimulate ERM adoption. Our results are in line with the results from Kleffner et al. (2003) which indicate the importance of the board of directors in stimulating the adoption of control and risk management measures.

V. SENSITIVITY ANALYSIS

As part of the sensitivity analysis, we first tested our results when using the unweighted ERM scores. We find this does not change the conclusions found in table 4. In addition, to further link our investigation with previous literature, we repeat our analysis using the presence of a Chief Risk Officer as proxy for the importance of ERM, similar to Liebenberg and Hoyt (2003). The results are presented in table 5. Our finding for the relationship between CRO and board composition are fully in line with our results for the relationship between ERM scores

and board composition in table 4. Both board independence and the separation of CEO and chairman are important to explain the presence of a Chief Risk officer. However, if the board is dominated by the CEO, board independence does not affect the presence of a CRO.

VI. CONCLUSION

Corporate governance failures, new legislation and recommendations have emphasized the importance of control and risk management in reducing agency costs and preventing fraudulent reporting. Despite the increased attention on ERM, little research has been done to explain why some organizations embrace ERM while others do not. The paper explores which elements of the COSO-ERM (2004) framework are addressed and how board composition is related to the degree of ERM implementation. We find that pharmaceutical companies score well on objective setting and risk identification and risk assessment, while they score weakly on control activities score and monitoring.

On the relationship between board composition and ERM, our findings reveal that the position of the CEO in the board has an important influence on the level of ERM. Furthermore, we find that board independence by itself is not sufficient to induce higher levels of ERM. Board independence is only significantly related to ERM when there is a separation of CEO and chairman. Firms with an independent board and a separation of CEO and chairman show the highest level of ERM. One possible explanation for our results is that CEOs do not favour ERM implementation and are able to withstand pressure from the board when they are occupying the seat of chairman. This study reinforces the importance of the corporate governance recommendations about CEO and chairman separation.

Finally, we acknowledge limitations in our research approach. First, we use publicly available data to proxy for the degree of ERM implementation. To the extent that annual report or other company information does not reflect the true state of control and risk management practises, our results are limited. To cope with this limitation, we tested our hypotheses using an alternative proxy for ERM. Second, this study focuses on a single industry. Therefore our result may not be generalized for other industries. Finally, there may be other organisational characteristics of ERM deployments that were not reflected in this study.

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Table 1: Dimensions and average values of enterprise risk management

	Dimensions of Enterprise Risk Management	average
	Internal environment	**31%**
1	Is there a charter of the board?	34%
2	Information on the code of conduct/ethics?	64%
3	Information on how compensation policies align interest of managers with shareholders?	38%
4	Information on individual performance targets?	18%
5	Information on procedures for hiring and firing of board member and management?	31%
6	Information on remuneration policy of board members and management?	56%
7	Information on training, coaching and educational programs?	24%
8	Information on training in ethical values?	11%
9	Information on board responsibility?	34%
10	Information on audit committee responsibility?	23%
11	Information on CEO responsibilities?	11%
	Objective setting	**52%**
12	Information on company's mission?	65%
13	Information on company's strategy?	95%
14	Information on company's business objectives?	68%
15	Information on adopted benchmarks to evaluate results?	26%
16	Information on approval of the strategy by the board?	6%
	Risk identification and assessment	**57%**
	Financial risk	
17	Information on the extent of liquidity?	84%
18	Information on the interest rate?	82%
19	Information on the foreign exchange rate?	67%
20	Information on the cost of capital?	56%
21	Information on the access to the capital market	46%
22	Information on long-term debt instruments?	69%
	Compliance risk	
23	Information on litigation issues?	85%
24	Information on compliance with regulation?	88%
25	Information on compliance with industry codes?	58%
26	Information on compliance with voluntary codes?	11%
27	Information on compliance with recommendation of Corporate Governance?	45%
	Technology risk	
28	Information on data management?	19%
29	Information on computer systems?	36%
30	Information on the privacy of information held on customers?	24%
	Economical risk	
31	Information on the nature of competition?	89%
	Reputational risk	
32	Information on environmental issues?	69%
33	Information on ethical issues?	23%

34	Information on health and safety issues?	76%

Table 1: Dimensions and average values of enterprise risk management (cont.)

	Dimensions of Enterprise Risk Management	average
	Risk response	**30%**
	Financial risk	
35	General description of processes for determining how risk should be managed?	8%
36	Information on written guidelines about how risk should be managed?	11%
37	Response to the liquidity risk?	47%
38	Response to the interest rate risk?	51%
39	Response to the foreign exchange rate risk?	39%
40	Response to the risk related to cost of capital?	26%
41	Response to the access to the capital market	29%
42	Response to long-term debt instruments?	28%
	Compliance Risk	
43	Response to litigation risk?	67%
44	Response to compliance with regulation?	55%
45	Response to compliance with industry codes?	28%
46	Response to compliance with voluntary codes?	8%
47	Response to compliance with recommendation of Corporate Governance?	27%
	Technology risk	
48	Response to data risk?	6%
50	Response to computer systems risk?	2%
51	Response to the privacy of information held on customers?	6%
	Economical risk	
52	Response to the risk of competition?	64%
	Reputational risk	
53	Response to environmental risk?	38%
54	Response to ethical risk?	22%
55	Response to health and safety risk?	38%
	Control activities	**17%**
56	Information on sales control?	29%
57	Information on contingency plans or DRP (Disaster recovery plans)?	7%
58	Information on review of the functioning and effectiveness of controls?	37%
59	Information on segregation of duties?	3%
60	Information on authorisation issues?	13%
61	Information on documents and record as control?	11%
62	Information on independent verification procedures?	22%
63	Information on physical controls?	10%
64	Information on process control?	24%
	Information and communications	**28%**
65	Information on verification of completeness, accuracy and validity of information?	49%
66	Information on channels of communication to report suspected breaches of laws, regulations or other improprieties?	11%
67	Information on channels of communication with customers, vendors and other external	23%

	parties?	
Monitoring		**20%**
68	Information on how processes are monitored?	24%
69	Information about Internal audit?	32%
70	Information about the budget of the Internal Audit?	3%
Total Weighted Average ERM		**34%**

Table 2: Descriptive statistics

	Variable	mean	st dev	min	max
Enterprise Risk Management Score	ERM	33.57	17.65	9.33	90.00
Chief Risk Officer	CRO	0.42	0.49	0	1
Board Independence (%)	BOD-I	0.72	0.16	0.14	1
Separation CEO - CHAIR	SEP_CEOC	0.45	0.50	0	1
Ln (Total assets)	LN_TA	13.00	2.47	7.69	18.58
Free Float	FF	0.58	0.21	0.13	0.99
Big-4	Big4	0.71	0.49	0	1
Leverage	LEV	0.19	0.23	0.00	0.88

Table 3: Correlation matrix

	ERM	CRO	BOD-I	SEP_CEOC	LN_TA	FF	BIG4	LEV
ERM	1							
CRO	0.51***	1						
BOD-I	0.26*	0.29***	1					
SEP_CEOC	0.25*	0.22**	0.04	1				
LN_TA	0.35***	0.33***	0.13	-0.21**	1			
FF	-0.06	-0.12	0.14	-0.11	-0.35***	1		
BIG4	0.32***	0.35***	0.09	0.10	0.14	-0.02	1	
LEV	-0.03	-0.08	-0.05	-0.12	0.08	-0.17*	0.28***	1

Significance level of 0.10: *; Significance level of 0.05: **; Significance level of 0.01: ***

ERM:	Enterprise Risk Management Score
CRO:	Chief Risk Officer presence
BOD-I:	Board Independence (%)
SEP_CEOC:	Separation CEO - CHAIR
LN_TA:	Ln (Total assets)
FF:	Free Float
Big4:	Big-4auditor or not
LEV:	Leverage

Table 4: OLS regression: enterprise risk management explained by board composition

	Expected sign	Model 1	Model 2	Model 3	Model 4 SEP_CEOC=0	Model 5 SEP_CEOC=1
C		-15.84 (13.62)	-19.66 (12.26)	-15.65 (14.63)	-.315 (15.37)	-76.62*** (22.05)
BOD-I	+	25.55* (12.91)		2.64 (14.28)	5.87 (12.96)	54.61** (23.83)
SEP_CEOC	+		11.58*** (3.27)	-35.30* (19.24)		
BOD-I*SEP_CEOC	+			61.48** (25.17)		
FF	+	0.30 (8.45)	10.40 (8.20)	7.36 (8.07)	5.59 (9.97)	3.21 (12.80)
LEV	+	-9.86 (7.15)	-5.84 (6.98)	-3.38 (6.78)	-6.50 (7.78)	-10.94 (13.20)
LN_TA	+	2.14*** (0.69)	3.11*** (0.69)	2.83*** (0.67)	1.58** (0.77)	5.95*** (1.34)
Big4	+	10.62*** (3.39)	8.93*** (3.31)	7.39** (3.23)	8.77** (3.87)	4.02 (5.40)
R^2		0.250	0.310	0.373	0.196	0.522
adj R^2		0.210	0.274	0.325	0.118	0.456
Prob(F-stat)		0.000	0.000	,000	0.040	0.000

Significance level of 0.10: *; Significance level of 0.05: **; Significance level of 0.01: ***
Standard deviations between parentheses

ERM:	Enterprise Risk Management Score
BOD-I:	Board Independence (%)
SEP_CEOC:	Separation CEO - CHAIR
LN_TA:	Ln (Total assets)
FF:	Free Float
Big4:	Big-4auditor or not
LEV:	Leverage

Table 5: Logistic regression: Chief Risk officer presence explained by board composition

	Expected sign	Model 6	Model 7	Model 8	Model 9 SEP_CEOC=0	Model 10 SEP_CEOC=1
C		-7.82***	-6.88***	-7.67***	-6.45**	-33.51**
		(2.49)	(2.18)	(2.86)	(2.88)	(15.01)
BOD-I	+	5.51**		.911	1.25	26.51**
		(2.38)		(2.49)	(2.44)	(12.39)
SEP_CEOC	+		1.36**	-12.10**		
			(0.55)	(5.73)		
BOD-I*SEP_CEOC	+			17.65**		
				(7.47)		
FF	+	-1.04	0.13	0.12	-1.21	4.95
		(1.35)	(1.32)	(1.54)	(1.82)	(3.80)
LEV	+	-2.33**	-1.75	-0.95	-0.23	-2.43
		(1.17)	(1.17)	(1.25)	(1.45)	(3.11)
LN_TA	+	0.23**	0.39***	0.38***	0.34**	0.723
		(0.10)	(0.12)	(0.13)	(0.14)	(0.48)
Big 4	+	1.84***	1.71***	1.66***	1.20	3.07**
		(0.55)	(0.54)	(0.60)	(0.75)	(1.33)
Pseudo R^2		0.246	0.247	0.345	0.203	0.552
Prob(Chi2)		0.002	0.000	,000	0.011	0.000

Significance level of 0.10: *; Significance level of 0.05: **; Significance level of 0.01: ***
Standard deviations between parentheses

CRO:	Chief Risk Officer presence
BOD-I:	Board Independence (%)
SEP_CEOC:	Separation CEO - CHAIR

LN_TA:	Ln (Total assets)
FF:	Free Float
Big4:	Big-4auditor or not
LEV:	Leverage