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Determiners of enterprise risk management applications in Turkey: An empirical study with logistic regression model on the companies included in ISE (Istanbul Stock Exchange)

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Enterprise risk management (ERM), which came along with the change in the understanding of risk management in companies, refers to evaluation of all the risks as a whole and managing them in line with the targets of the company. This study aims at determining the ERM application levels of the companies included in the Istanbul Stock Exchange and the factors that affect these applications. Existence of ERM in the companies was related with having senior manager in charge of risk management. In order to explain ERM applications with profitability, leverage and company size a Logistic Regression model was established. As a result of the analysis it was determined that about half of the financial sector companies within the ISE employed a chief risk officer (CRO), which means a culture of risk management has been founded within these companies. Moreover, it was determined that profitability of the companies do not have any significance in ERM applications while the most important factors that affect the applications were found to be leverage and company size.

JEL Classifications: M40, M42, C10

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Introduction

Together with globalization, developments in international financial relations; increase of international capital mobility, proliferation of complex financial products and increase in financial transaction volumes resulted in a world bearing a variety of risks. These developments, in turn, increased concerns about risk management.

As a result of the negative incidents that have developed around the world risk management practices have gained importance. The company scandals such as Barings Bank, Metallgesellschaft, Orange Country, Long Term Capital Management Fund (LTCM) of 1990s and Enron, Parmalat, Worldcom of 2000s had serious social and economic cost.

In order to preserve and sustain financial stability effective risk management has become an inevitable requirement for both national and international financial markets (Bolgün and Akçay, 2005).

Companies have two different perspectives in terms of risk management. One of them is the approach in which risks are handled and managed one by one. In the other approach all the risks are evaluated and managed as a whole, which is called ERM.

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Enterprise Risk Management (ERM)

Recently, ERM approach has been considered as a more effective method for determining and evaluating company decisions and strategies. Although there are a variety of definitions of ERM the most extensive definition was made one COSO (Committee of Sponsored Organizations). COSO define 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 risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objective" (COSO, 2004; Moeller, 2007; Collier and Ampomah, 2006; Baumann et. al., 2006). Although there are a variety of definitions of ERM this definition of COSO is the most comprehensive one. This definition has been used frequently in the previous studies in literature. Some of these studies are: Pagach and Warr (2008), Ciorciari and Blattner (2008), Rikhardsson et al. (2006).

In this definition of COSO, the risks are defined as useful factors for reaching the institutional goals of the companies. Sometimes companies need to foresee, measure, evaluate and manage risks effectively in a proactive manner in order to reach the expected gains. Therefore, ERM culture should be adapted into the corporate culture. Moreover, ERM application provides the enterprise with added value and it can become a tool for institutionalization of the company.

Most of the previous academic studies concerning ERM are theoretical but there are also some certain recent studies supported with empirical findings. These studies usually search for the features of the companies that have been able to make ERM a part of their corporate culture and effects of risk management culture on the performance of the company.

Literature review and hypotheses development

Liebenberg and Hoyt (2003), in their study on 26 samples composed of American and Canadian companies wanted to find out the determiners of ERM. In this study that employed Logistic regression model, the variables of stock price volatility, leverage, market/book value rate, financial opacity, institutional ownership, industry and size were taken as the determinants of ERM. As a result of the analysis, leverage was found to be the most important determiner of ERM.

Hoyt and Liebenberg, in their study in 2006 wanted to measure the influence of ERM on business value. In the study they evaluated 125 companies. As a result of analysis, they found a statistically significant positive and linear correlation between the business value (Tobin's Q) and ERM.

In their last study Hoyt and Liebenberg's (2009) analyzed ERM's determiners and effects of ERM on business value of Insurance companies. It was determined that ERM has positive correlation with company size and institutional ownership while it has negative correlation with leverage and reassurance use. Also, positive correlation was found between ERM and business value in this study.

Pagach and Warr (2007), in their study where they employed Hazard model reached the conclusion that it was more probable for the large and institutionalized companies with highly volatile assets to adopt ERM.

Pagach and Warr (2008), in another study, searched for the effects of ERM on long term business performance. They found that ERM applications decrease stock price volatility of businesses and it has negative correlation with market/book values rate changes in profit

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fluctuations. They also determined that leverage of the banks increased after ERM applications. However this study concluded that ERM does not create value.

In their multivariate analysis, Beasley et al. (2008) searched for the cost and benefits of ERM. In this study 120 samples belonging to the years 1992-2003 were used. The results of the analysis revealed that cost and benefits of ERM are unique for each business.

In their study concerning business performance and ERM Gordon et al., (2009) analyzed three factors. These are listed as environmental ambiguity, company size, complexity of the company, industrial competition and board of directors. In this study performed using data belonging to reports of 112 companies it was determined that the correlation between ERM and performance of the companies depends on appropriate matching of the five variables.

Model

Employment of a high level director as a risk manager or chief risk officer, which is accepted to be an indicator of ERM applications and searching for statistically significant correlations of these applications with profitability, leverage, company size in businesses were taken as the topic of this study where the following model was formulated and analysis was performed to this end:

$$CRO = \beta 0 + \beta 1 Lev + \beta 2 Size + \beta 3 Pro + \varepsilon$$

In establishment of this model the models and variables used in the studies of Hoyt and Liebenberg (2009); Pagach and Warr (2008); Gordon et al. (2009); and Beasley et al. (2008) were taken as the basis.

In this application there hypotheses are going to tested. These hypotheses are:

H1= There is a linear and positive correlation between company size and ERM applications

H2= There is a linear and positive correlation between leverage and ERM applications

H3= There is a linear and positive correlation between profitability and ERM applications.

Research Methodology

The aim, scope, limits and execution of the study

The aim of this study is, taking the examples in Turkey as a starting point, to establish the factors that influence ERM applications of enterprises. To this end, for some companies of financial sector listed in ISE statistically significant correlations between ERM applications and variables of profitability, leverage and company size were searched for and an explanation was made to define effects of these variables on ERM applications.

The main sampling unit of analysis made was financial sector companies listed on the ISE. There are 67 financial sector companies listed on ISE. In order to set up the sampling unit 50 of these companies were randomly chosen. The most important reason for choosing the financial sector companies was the fact that they are quite open to any risk. Within the model established the data included in the year 2007 activity reports of these companies were used because when this study was performed the legal reports of these companies

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belonging to the mentioned period were prepared covering the whole period. Moreover, this period was considered as a relatively normal period for Turkish economy.

One of the most significant indicators of adoption of risk management culture by companies is existence of a high level director in charge of risk management, a chief risk officer (CRO). Therefore, a company was considered to have adopted ERM applications if it had employed a chief risk officer while it was considered the opposite way if it had not employed a chief risk officer.

Variable definitions and measurement

In the model a positive correlation was esteemed between the independent variables and the dependent variable.

Independent Variables

Leverage (Lev): This ratio is calculated dividing short and long term foreign assets by total liabilities. Leverage shows the ratio of assets financed by foreign assets within the total assets (TSPAKB, 2004). A high level of leverage reveals that the company uses external assets at a high degree. Therefore it would increase the possibility of experiencing the exchange rate and market risks accompanying interest rate risk depending on the type of resource used. Thus it was assumed that the businesses functioning with a high level of leverage would care more about risk management in order to avoid these risks. A positive correlation is expected between this variable and CRO variable.

Company Size (Size): In accordance with the expectation that as the companies grow in size their institutionalization tendency would increase, so they would be managed more professionally and employ a chief risk officer and start ERM applications, this variable was added to the model. Positive correlation is esteemed between this variable and CRO.for calculating company size, sales and total assets are commonly used values in the literature. Because the samples of this study are financial sector companies this variable was determined to be the total assets of the companies.

Profitability (Pro): For businesses the future is always unclear and full of surprises. They should be foreseen effectively and it should be deemed that those who do that and manage risks well would have a high level profitability. Therefore, the companies with high level of profitability are expected to employ a chief risk officer. A positive correlation is esteemed between CRO and profitability variable.

Dependent Variable

Chief Risk Officer (CRO): It was predetermined that appointment of a chief risk officer as the risk manager in companies reveals existence of ERM applications there. Therefore, if a chief risk officer is employed as a high level director, which is deemed to be indicator of ERM applications, this variable is given 1; and if not it is given 0 value. This variable was formed through examination of administrators' data and organization structure given in the activity reports of the companies belonging to year 2007. Other studies where existence of ERM applications were associated with employment of a chief risk officer are Beasley et al. (2008), Pagach and Warr (2007), Pagach and Warr (2008), Hoyt and Liebenberg (2006), Liebenberg and Hoyt (2003).

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Natural logarithm of profitability and company size variables used in the model was also included. Because of too large margins revealed by profitability and company size (total assets) values of the companies natural logarithms were preferred in order to harmonize the data.

Results and analysis

Descriptive statistical analysis

Descriptive statistics pertaining to dependent and independent variables used in the model are given in Table 1. The average of chief risk officers of the sampling is 0.580'dir. The ratio of those having a chief risk officer to the number of those that do not is nearly equal in the sampling. The leverage of the companies in the sampling is 0.005 the lowest and 0.930 the highest. The average of the leverage pertaining to the companies in the sampling is 0.594. Company size, determined to be the total assets and profitability were included in the model with their natural logarithms. On Table 1minimum, maximum and average values of the companies in the sampling according to their logarithmic values are given.

TABLE 1. DESCRIPTIVE STATISTICS OF THE VARIABLES USED IN THE MODEL

Variables	N	Minimum	Maximum	Mean
CRO	50	0.000	1.000	0.580
LEV	50	0.005	0.930	0.594
SIZE	50	15.256	25.224	21.399
PRO	50	0.000	21.592	18.707

Logistic regression analysis

The results of the binary logit regression analysis performed to measure the effects of leverage, profitability and total assets of the companies on CRO are given in Table 2.

TABLE 2. ERM DETERMINERS FIRST MODEL RESULT

Variables	Beta	Standard Error	Wald	Sig.	Exp(Beta)	95.0% C.I.for EXP(B) Lower	95.0% C.I.for EXP(B) Upper
Constant	-15.311	6.199	6.100	0.014	0.000		
SIZE	0.441	0.299	2.173	0.140	1.554	0.865	2.791
PRO	0.188	0.167	1.263	0.261	1.207	0.869	1.676
LEV	4.793	1.930	6.168	0.013	120.623	2.746	5.30E+03
Observed (n)		50		-2 Log likelihood		38.346	
ERM Available (n)		29		Cox & Snell R^2		0.448	
ERM Unavailable (n)		21		Nagelkerke R^2		0.602	
Omnibus Tests of Model Coefficients (Chi-square)		29.684		Sig.(Chi-square)		0.0001	
Classification Percentage		0.78		Hosmer and Lemes.		Chi-square 7.725	(df8)sig. 0.461

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In Table 2, the analysis results reached after including all the variables in the analysis are given. The fact that the classification rate is over 70% reveals that the companies in the sampling were chosen effectively. It is visible that correct groups were assigned according to the general classification rate 78% of the companies. The possibility value (p-value) of Chi-square test statistics proves that the last form of the model was statistically significant. Moreover, the importance value of the chi-square value (7.725) calculated according to the result of Hosmer and Lemeshow test that show the general significance of the model was found to be 0.461. As this value is over the critical possibility value α=0.05, the hypothesis that there is no lack of harmony in the model is accepted. After these statistics that reveal general significance of the model it is necessary to check P-values of the variables used in the model in order to examine their significance levels. When the p-values are checked among the variables used in the model only leverage was found to be statistically significant. However, it is visible that the p-value of total assets variable is very close to the 10% significance limit. Therefore, in the next model the variable of profitability was removed. The second model set can be explained as follows:

$$CRO= \beta 0+\beta 1Lev+\beta 2Size+\varepsilon$$

The results of this model are given in Table 3. The classification rate, which is one of the statistics measuring significance of the model in general is 0.74. This ratio reveals that the companies had been assigned to groups 74% correctly. Ki-Square test statistics which was determined as 27.419 and the p-value of 0.000 are very significant. The significance value of the ki-square value (7.740) determined according to the result of Hosmer and Lemeshow test was 0.459. Since this value is larger than α=0.05 critical probability the hypothesis which suggest that the model does not have lack of correspondence is accepted. Moreover the independent variables used in the model, that is total assets and leverage ratio, account for the change observed in the dependent variable (CRO) by 0.422 according to Cox & Snell R2 value and 0.568 according to Nagelkerke R2 value. These ratios are considerably high. All these statistics demonstrate that the constructed model is generally significant and can be used to measure the change that might take place in the independent variable.

TABLE 3. ERM DETERMINERS SECOND MODEL RESULTS

Variables	Beta	Standard Error	Wald	Sig.	Exp(Beta)	95.0% C.I.for EXP(B) Lower	95.0% C.I.for EXP(B) Upper
Constant	-13.142	5.647	5.416	0.020	0		
SIZE	0.515	0.279	3.414	0.065	1.673	0.969	2.88
LEV	4.287	1.841	5.420	0.020	72.747	1.969	2.69E+03
Observed (n)		50		-2 Log likelihood		40.61	
ERM Available (n)		29		Cox & Snell R2		0.422	
ERM Unavailable (n)		21		Nagelkerke R2		0.568	
Omnibus Tests of Model Coefficients (Chi-square)		27.419		Sig.(Chi-square)		0.0000	
Classification Percentage		0.74		Hosmer and Lemes.		Chi-square 7.740	(df8) sig. 0.459

The significance of the independent variables used in the model and their effect on the dependent variable might be studied after testing the general significance of the model. The p-values in Table 3 indicate the significance level of the independent variable. Accordingly, total assets are significant at 10% and leverage ratio is significant at 5%.

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Exp(Beta) value indicates how many times the probability is increased by one unit change in the independent variable while all other variables are stable. According to this, one unit change in the total assets while all the other variables are kept constant increases the ERM applications of the firm; that is, employing a CRO, by 1.673. A change in the leverage ratio while all the other variables are constant increases the ERM applications of the firm; that is employing a CRO, by 72.747 times. These results in general indicate that the possibility of ERM applications increase due to the increase in the size of the firm and the leverage ratio. The fact that leverage value has a greater effect compared to total assets demonstrates that the firms' probability of using ERM applications is increased by the precarious foreign assets used by the firm.

Conclusion

In this study, ERM application levels of some financial sector companies listed on ISE and the factors that influence ERM application levels were examined taking into consideration the previous studies performed in this field.

As a result of the analysis made it was concluded that the financial sector companies of ISE included in the study have an average level tendency to employ chief risk officers. In other words, half of the financial sector companies of ISE show willingness to apply ERM.

It was determined that among the independent variables used for finding out the factors that influence ERM, such as company Size, Leverage and Profitability the most significant variable was Leverage. The variable of profitability on the other hand was found to be insignificant, which means there is no significant influence of profitability of the companies in Turkey on employment of a CRO which was taken as the indicator of ERM applications. The factors that affect ERM applications were found to be leverage and company size, both of which affect ERM positively.

These results reached comply with the study of Liebenberg and Hoyt performed in 2003 on determiners of ERM. In that study it was stated that a high leverage increases the possibility of employment of a CRO, which is the indicator of ERM applications. Similarly, the company size increases the possibility of employment of a CRO. The study concluded that company size is 10% significant in terms of employment of a CRO, while leverage was found to be 5% significant.

Considering the results reached in this study it can be concluded that, in terms of their financial features, among the companies listed on Istanbul Stock Exchange the ones applying ERM effectively are benefiting leverage at a higher level compared to other companies and their sizes are larger.

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