Enterprise Risk Modeling Based on Related Entities

Zbigniew Krysiak

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Zbigniew Krysiak,
Associate Professor of Finance at Warsaw School of Economics
zbigniew.krysiak@poczta.onet.pl

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About the Author

Zbigniew Krysiak, PhD, is an associate professor at the Warsaw School of Economics and 2011 visiting professor of finance at Pepperdine University in California. He earned a PhD in economics from Warsaw School of Economics for his research into the application of options and real options in default risk assessment and company valuation, and he holds an MBA in banking and financial engineering from University in Toulouse in France. He is the author of more than 100 publications and books concerning finance, risk management, financial engineering and banking, and he serves as a chairman of the council board for the quarterly issued *Journal of Property Finance*. He has about 20 year experience in business. He was an executive manager and board member in various types of commercial businesses including PepsiCo, AIG Bank, PKO BP Bank and Inteligo Bank, and was chairman of the board of the Banking Guarantee Fund.

Abstract

The costly, time-consuming and complicated process of enterprise risk management (ERM) can be improved in many companies and made less tedious for managers by using reasonable data and templates obtained from peer group entities. The models used to calculate economic capital (EC) often underestimate its value because they do not consider decision-maker perception about risk. We assume here that managers, as the decision-makers, have appropriate business understanding and they can provide substantial information about risk characteristics regarding all business processes. Therefore we are focused, in this paper, on collecting data from managers across the different businesses to derive the appropriate knowledge about risky events, the importance of particular types of risk, the relationship between the risk outcomes and the level of risk control in a particular industry. We conclude that the collected data has a high potential for use as a benchmarking reference and analysis for improving ERM models for individual businesses.

JEL Classification: G21, G22, G32

Keywords: Enterprise Risk Management, Economic Capital, Risk Modeling, Risk Measures, Utility Theory

1. Introduction

One of the key issues in enterprise risk management (ERM) is the allocation of economic capital (EC) based on identified risks. Most of the methods used for assessing EC are based on the value at risk (VaR) approach.[1] These methods originated from the financial sector and have proven to be unreliable. The literature on the subject, mostly used by ERM executives, is frequently written based on the cases and experiences of financial enterprises.[2] Business owners and managers from outside the financial sector have a harder time knowing what types of risk are most important in their industry and what value of capital should be allocated to a particular type of risk. This kind of information would be very helpful when an enterprise is about to implement ERM. Knowledge of the 10 most important risks and their potential impact on losses and EC allocation could convince decision-makers to implement ERM. Application of the benchmarking information can contribute to more effective, less expensive and more successful ERM implementation.

Implementation of ERM usually takes a long time yet managers want quick results. Therefore, it is important to offer managers tools that will allow them to quickly identify the most important risks. To arrive at these tools, the author conducted a research study of 36 types of enterprise risk, collected from companies operating in the European market. These risks have been characterized by measures including the probability of risky events, the

[1] Jorion, *Value at Risk.*
[2] Fraser, Schoening-Thiessen and Simkins, "Who Reads What Most Often?" 73-91.

exposure at risky events and the level of control managers have on risk drivers or risk sources. The study was conducted at the end of 2010 and yielded approximately 300 responses regarding the values of risk measures related to each type of risk. The findings show that the costly, time-consuming and complicated process of ERM implementation could be improved in many companies, thus encouraging more managers to start ERM. We will discuss several improvements, including benchmarking reasonable data and creating risk templates based off data from peer group entities.

We assumed there are some common characteristics for companies in similar businesses or branches of the economy that can be considered as a good basis for the benchmark. Based on the research study, we created models to assist in ERM implementation in companies similar to the test group of businesses. We proposed three classes of models to be used as aids during ERM implementation:

- Model loss control (MLC), based on the relationship between losses and the level of risk control
- Model frequency control (MFC), based on the relationship between intensity of risky events and the level of risk control
- Model top ten (MTT), based on the 10 most important risk types

An efficient ERM implementation process should be concentrated on the most important risks for any given company. We proposed four lists of 10 of the most important risks, classified by the following factors: exposure at risk, the level of risk control, the probability of a risky event and the expected losses. At the very end, based on the collected research data, we present the idea for the estimation of the value of the capital, which should be allocated to cover the losses if risk is realized. The estimated capital (economic capital) was expressed as a multiplier of the net income. The exposure at risk and the expected losses presented in the models are reflected in multipliers of net income, which is used to calibrate the models independent of the size of the company.

2. Impact of Decision-maker's Utility Function for Enterprise Risk Management

An explosion of ERM applications took place in 2004, mainly triggered by demand to comply with regulations imposed on audit committees by the New York Stock Exchange (NYSE). Concepts and principles for ERM implementation in public companies were derived from the Committee of Sponsoring Organizations of the Treadway Commission (COSO), created in 2004. At the same time, in the banking sector, a set of recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision, called Basel II, was being

implemented. This resulted in strong decline in economic capital in banking sector around the globe.[3] We believe that solutions implemented by Basel II had a significant impact on the underestimation of enterprises risk, which many experts questioned before the implementation began.[4] Basel II triggered the moral hazard, which likely lead to the underestimation of the loan provisions and banks' perception of an enterprise's risk. Three years after ERM implementation started, the financial crisis began globally. There is some evidence that ERM enforcement by regulators did not challenge companies to creatively engage good quality ERM implementation, but rather led to the opposite.[5] Increasing maturity and awareness of managerial resources allocated for ERM implementation was a main factor in the improvement and increasing quality of ERM, which was observable in company value behavior.[6]

Although the ERM model has become very popular, there are still many doubts as to its effectiveness. Many managers think ERM is centered on the kind of risk management performed in banking institutions. This sort of approach discourages many enterprises from using the model. Some ERM definitions highlight credit and market risk too much because their authors were strongly rooted in financial institutions.[7] There is nothing wrong with using the experience of the financial sector, but it is very dangerous to rely on that too much. Also, the many instances of unsuccessful risk management in the financial sector in the past frequently have resulted in damaging ERM's reputation. Fortunately, there has been a move to increase the quality of risk management models, which should defray reputational risk and improve financial results by decreasing volatility of profits.[8]

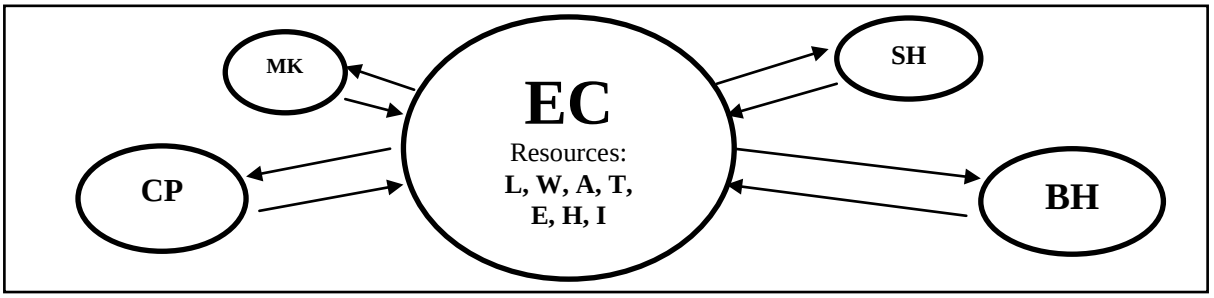
It is our position that compared to the traditional risk management process, ERM should be focused on a holistic, rather than a silo-based, approach. We think the models used for EC determination underestimate its value because they do not consider the utility of the decision-makers, although the risk that is ultimately assumed by the enterprise or transferred out of the enterprise includes that component. Therefore, there is the discrepancy between the real risk cumulated in the company and the risk expressed as measured by VaR models. The decision-maker's utility function influences his decisions in every area of his business activity in association with all ongoing daily transactions. Within ERM processes, outsiders and

[3] Jajuga and Krysiak, eds., *Credit Risk of Mortgage Loans.*
[4] Danielsson, et al. "An Academic Response to the Basel II."
[5] Pagach and Warr, "The Characteristics of Firms That Hire Chief Risk Officers," 185-211.
[6] Ibid., and Shimpi, "Enterprise Risk Management from Compliance to Value," 52-55.
[7] Lam, *Enterprise Risk Management*.
[8] Shimpi, *Integrating Corporate Risk Management.*

insiders periodically make a big number of decisions. All of these decisions impact the value of risk cumulated in the company.

Figure 1 presents the complexity of a multidirectional transaction, which is composed of decisions taken by different people within and outside the organization.

Figure 1. Risk transfer between parties dealing with an enterprise



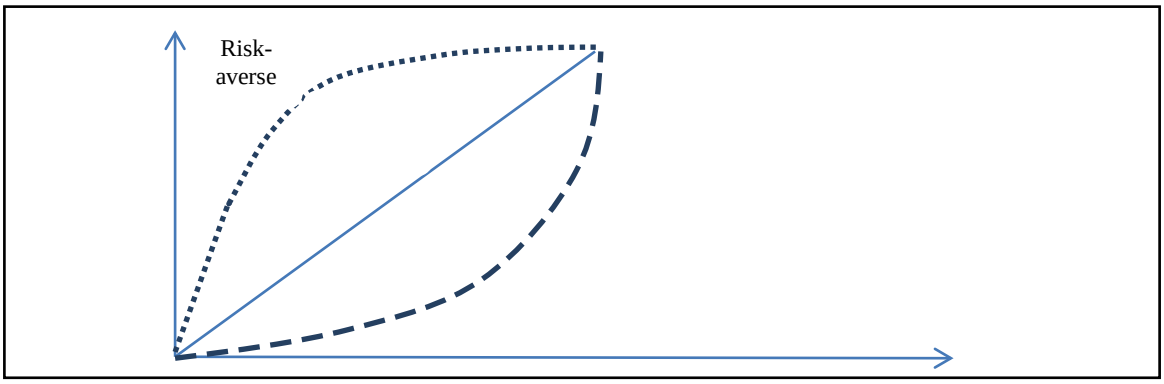
Elements within and without the organization: MK: Market, CP: Counterparties and Customers, SH: Shareholders, BH: Bondholders, EC: Economic Capital
Resources: L: Land, W: Labor, A: Assets, T: Technology, E: Entrepreneurship, H: Intangible & Intellectual Assets and Human Resources, I: Information

All transactions and decisions are directly linked with the above resources. The value of the company's resources should be protected against the downside of risk, or worst-case scenario. This protection can be obtained by allocating the appropriate value of the economic capital, which at the same time maximizes the probability of enterprise survival. To protect the company against default and ensure its survival staff with the appropriate skills and resources need to be allocated and do "their job by keeping the company alive."[9] The EC is responsible for enterprise survival from the perspective of financial resources, which are finally used to cover any losses against risk realization. This model, called survival enterprise risk management by economic capital (SERMEC), is rooted in the principles of ERM; therefore, it is important to understand how the quality of ERM can impact successful SERMEC implementation.[10]

How a decision-maker deals with uncertainty depends ultimately on his attitude toward risk. A decision-maker's risk attitude characterizes his willingness to engage in risky views. One of the fundamental axioms of utility theory is that rational decision making requires individuals to be consistent in their risk attitude. Individuals and organizations are classified as risk-neutral, risk-averse or risk-inclined. In practice, we observe that individuals are not consistent, which has led to other ways to frame risk attitudes.[11]

[9] Smith, "Business Survival Skills."
[10] Krysiak, "Achieving Enterprise Stability."
[11] Ragsdale, *Spreadsheet Modeling & Decision Analysis.*

Figure 2. Utility curves for risk-neutral and risk-inclined investors



A risk-averse individual or organization has a concave utility function, as illustrated in Figure 2. A risk-averse individual or organization is prepared to pay more than the expected value associated with an uncertainty to be sure costs do not become too great. Purchasing insurance is an example of risk-averse behavior. Risk aversion also applies to profits. In that case, a sure profit that is less than the expected value is preferred to the uncertainty associated with the alternative. Most individuals and organizations are risk-averse when it comes to large potential losses. A risk-seeking individual or organization has convex utility function, as illustrated in Figure 2. Many entrepreneurs are risk-inclined. They repeatedly pursue ideas with a negative expected value or a small probability of major success. An individual is risk-neutral if he is indifferent between the expected value of the uncertain consequences and the actual potential gamble. A linear utility function is used to reflect risk neutrality in Figure 2. For this type of individual, maximizing the expected value is the same as maximizing the expected utility. The certainty equivalent is the amount an individual would accept as equivalent to the risky decision. Any dollar amount offered above the certainty equivalent is preferred to the risky decision. Offers of less money than the certainty equivalent would lead the decision-maker to stay with the risky decision. The risk premium is the difference between the expected value and the certainty equivalent of the gamble. The risk premium is the amount of money a manager is willing to give up by avoiding the risk.

3. Triangular Balance Between Objectives, Capital and Risk in ERM

How can the decision-maker's utility function be calculated into the balance between objectives, capital and risk events? Enterprise risk management has been defined by COSO as "a process, affected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite to provide reasonable assurance regarding the achievement of entity objectives."[12] COSO's definition combines three key and strongly related elements: the strategic goals, the identification of risk events and the risk appetite (available capital), which are essentials for enterprise management.[13] Strategic goals have to be established in accordance with the level of available capital, which is derived from the value of risks associated with those goals. This kind of consistency should be ensured during the planning, budgeting, management and execution process, otherwise, sooner or later, the company will experience low efficiency, lack of liquidity or bankruptcy.

Ensuring the consistency between strategic goals, identification of risk events and risk appetite is the most challenging issue for new implementers of ERM since this requires specific guidance on what to do in their cultural context. When there is a lack of information on how to bring all the silos of risk management together beyond implementing a common reporting system and language, the success of ERM implementation can be questionable. By putting together the information reflecting ERM characteristics of peer group enterprises, we can create templates to be used as guides during the ERM implementation or while adjusting an existing ERM system. This approach can be assumed as a learning process within an enterprise using the learning curve of others and it can be treated as intelligent self-teaching and self-adjusting organization in the ERM process.

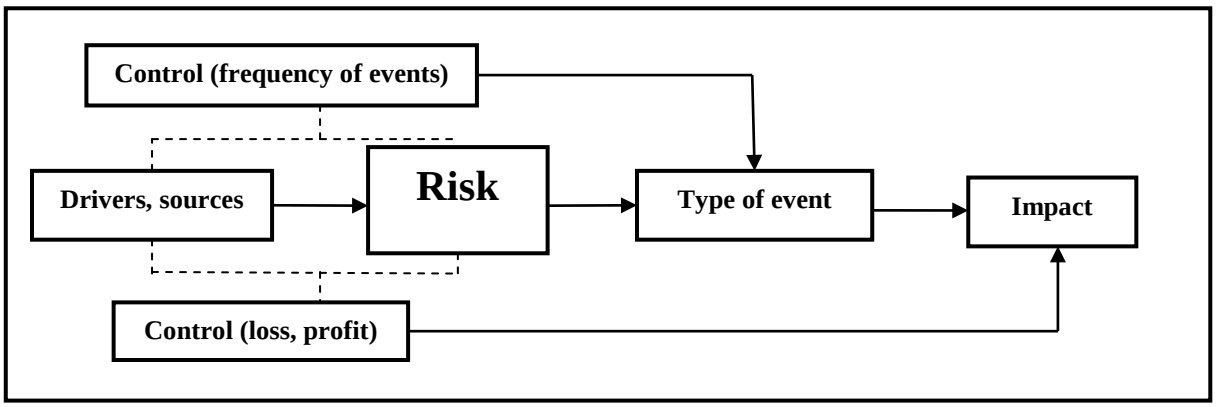
This paper aims to create some benchmarking characteristics relevant for a peer group of ERM implementers. We believe very strongly that organizations have cumulated very valuable wisdom that must be utilized by their managers. There should be no doubt that the experience of all managers—not only finance or risk managers—can be translated into measures, descriptive procedures and probably some models that could have much more value than anything derived through mathematical reasoning. Experienced, responsible and well-educated people with a strong commitment to the enterprise goals know very well the frequency of risky events leading to losses and they can name all dangerous incidences and account for their outcomes. This kind of behavior and approach in the business is nothing new and is essential for all professionals. The most difficult task to execute in ERM is creating

[12] COSO, "Enterprise Risk Management."
[13] Fraser, Schoening-Thiessen and Simkins, "Who Reads What Most Often?" 73-91.

long-term, cooperative and responsible decision-makers out of all employees. Getting employees to act in such a way ensures consistency between objectives, budget (capital) and risk events. This kind of culture is an organization's most important risk management strategy. Therefore much more work is needed in the areas of research and case studies because risk executives are mainly looking for more practical instructions on the best practices at the different stages of ERM implementation.[14]

Nowadays, managers and employees understand the meaning behind words like objectives, capital (budget) and risk. In ERM systems, staff at each level should get information about goals, capital and losses associated with any kind of business tasks. To make ERM work efficiently, we need to consider workers' utility functions in every business process. These could be supported by two types of facilities. First, we need to provide employees with some kind of updated benchmark templates about objectives, capital and types of risks. These templates could be obtained by collecting the knowledge and information about the typical characteristics of these components at peer companies or similar businesses. Second, we should empower, encourage, educate and equip all employees with tools so that they can be open minded in analyzing all business events, decisions and processes, by decomposing them every time on risk sources, risk drivers, impact (loss), type of events and frequency of the events.[15] A visual representation of the decomposition of risk is presented in Figure 3.

Figure 3. Five-dimensional space of risk[16]

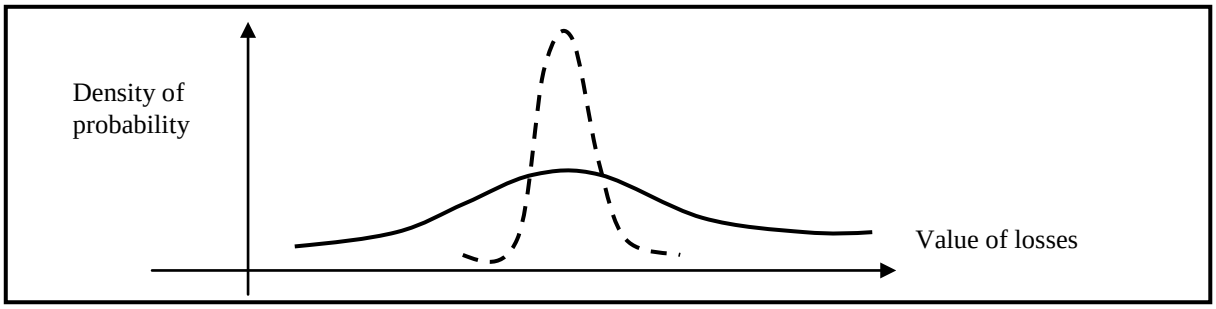


From Figure 3, we can learn that decomposing business events provides new knowledge about risk drivers and their impact, and at the same time this new knowledge can

[14] Ibid.
[15] Monahan, *Enterprise Risk Management.*
[16] Ibid.

be used as a feedback to control the frequency of risky events and their impact by implementing certain actions. The quality of risk control within an organization can be measured as the volatility of losses, presented in Figure 4. It implies there should be some functional relationship between volatility of losses, probability of risky event and level of risk control. The higher the level of control, the lower the losses should be. This method of control leads to declining the total risk cumulated at an enterprise (inherent risk). The increasing quality of the risk control process declines the total inherent risk but the residual risk cannot be fully shifted away.

Figure 4. Impact of quality control on volatility of losses

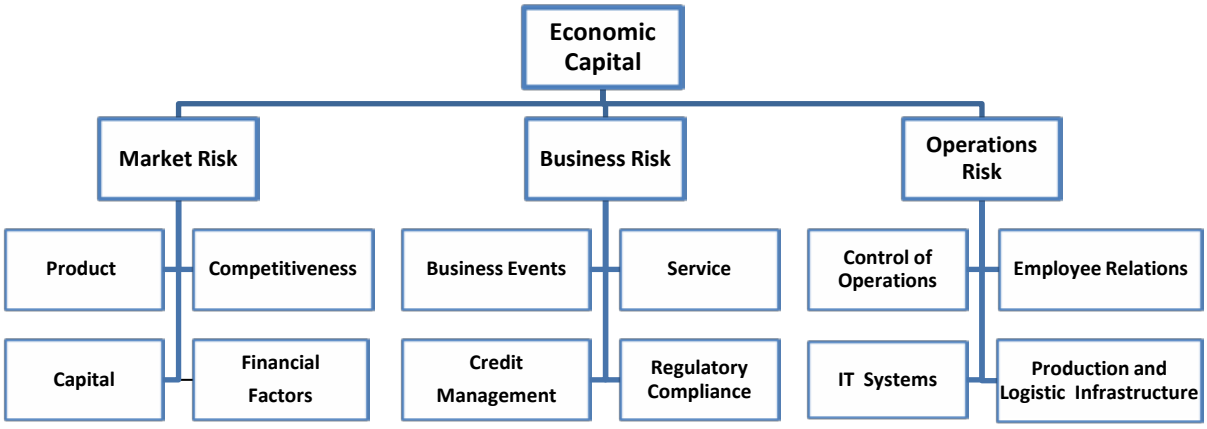


The application of the decomposed risk analysis (DRA) approach provides better fundamental explanation for the estimated value of the capital, which is needed to realize assumed strategic goals in combination with identified risk characteristics and their degree. We think the DRA approach is very important in obtaining better clarity of risk components, definitions and drivers, which improves risk identification, quantification and control. The word “risk” is too much misused and in many cases it became unclear what somebody meant or understood when using the word. Therefore, we think DRA helps to display the correct meaning in a particular context. This method very much helps with monitoring the discrepancy between assumptions about the risky events made during the planning process and realized outcomes. In that process, the benchmarking models help to draw more convincing conclusions about the “real picture of our enterprise” in terms of economic capital allocation. Because the critical part of business success and successful ERM implementation is survival of the company,[17] any methodology that helps to identify the discrepancy between needed and available capital is essential to avoid default or bankruptcy.

[17] Krysiak, “Achieving Enterprise Stability.”

Economic capital can be defined as a level of equity that is adequate to cover losses incurred during risk realization. An enterprise should be able to identify the main risk sources and monitor their impact on profit and loss. To allocate appropriate economic capital, we have to quantify negative outcomes of risk realization based on the mapped risk matrix within the organization. The research study was conducted to show other ways to estimate an average value of economic capital. We divided risks into three areas like market risk, business risk and operations risk. Each of these three areas was subdivided into four groups. We obtained in total 12 groups of risk, and each of the groups was then divided into three specific risks types so that we finally obtained 36 risk types. The risk areas and risk groups are presented in Figure 5. The risk types will be presented in the next section.

Figure 5. Examples of main risk sources to be covered by economic capital



4. Research Methodology

One of the most important goals of the research was to obtain some benchmarking information to assist ERM implementers. The research study was focused on collecting the information from managers of the different enterprises operating in the European market. We collected characteristics such as probability of risk event (PRE), exposure at risk event (EAR) and level of risk control (LRC) for 36 risk types, presented in the Table 1 below. The types of risk involved covered basically every area of enterprise activity and therefore the engagement of all kinds of managers was an important condition. Answering these questions wouldn't be possible without the wisdom of the managers, who better reflect the risk profile of any kind of business than do the analysts with their econometric or mathematic models.

About 300 managers, responding to the questionnaire presented in Table 1, reported about the probability of a particular risk event, exposure at a particular risk event and the level of control over certain risk types. To simplify the process, we asked managers to mark an X in

one of the six windows in Table 1. Each window was assigned a certain range of values for each measure. Probability of risk events ranged between 0 and 1. Exposure at risk was expressed as a percentage of net income (NI). This relative measure was used afterward for calculating the expected loss. Level of risk control took discrete grades from 0 to 5. In asking managers for the evaluation of risk types, we delivered an operational definition as follows: What specific business actions and transactions could negatively impact this type of business? What could the result be? For example: If employee compensation is not adjusted accordingly, then we could lose good experts and incur the cost of replacing and training new employees.

Table 1. Structure of the questionnaire with risk areas, risk groups and risk types

Risk Area	Risk Groups	Risk Types	PRE: Probability of Risk Event						EAR: Exposure At Risk [% NI]						LRC: Level of Risk Control					
			0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
Operations Risk	Control of Operations	Cost Structure																		
		Procedures and Tools of Control																		
		Management and Responsibilities																		
	Employees Relations	Employees Compensations																		
		Knowledge and Education																		
		Procedures Serving Employees																		
	IT Systems	Quality of IT Systems																		
		Management of Malfunctions																		
		Outsourcing IT																		
	Production and Logistic Infrastructure	Production and Warehousing Capacity																		
		Discontinuity and Time Downs																		
		Fraud, Theft, Reliability, Quality																		
Business Risk	Business Events	Technological Changes																		
		Regulatory Changes																		
		Continuity of Activity																		
	Service	Quality and Continuity of Service																		
		Service Infrastructure Management																		
		Outsourcing																		
	Credit Management	Credit Capacity and Worthiness																		
		Account Receivables																		
		Liquidity of Funding Sources																		
	Regulatory Compliance	Management Responsibility																		
		Third Party Responsibility																		
		Warranty and Product Responsibility																		
Market Risk	Product	Product and Services Development																		
		Sales and Distribution																		
		Quality of Product and Services																		
	Competitiveness	Price Strategy																		
		Marketing and Market Share																		
		Product and Services Offer																		
	Capital	Investment Project's Strategy																		
		Shareholders and Stakeholders Relations																		
		Capacity and Reliability of Sources																		
	Financial Factors	Financial and Tax Costs																		
		Solvency and Cash Flow																		
		Exchange Rate																		

The risky event is assigned a maximum value of potential losses reflected in monetary terms and called EAR. Let's assume we have a certain amount of accounts receivable related to a particular customer. This amount is called exposure at risk. If the customer defaults (risky

event), then we lose that amount of money. But if there was some control in place, reflected by the level of risk control, higher than zero (LRC>0), then we can execute and recover some part of that amount. The control of risk is associated with establishing appropriate instruments to protect the value of resources exposed to risk. For example, the partial recovery of the accounts receivables at the customer's default could be realized by arranging an insurance policy before default occurs. In the research study, the exposure at risk is expressed as percentage of net income. This approach ensures the comparability between companies regardless of scale and type of the business.

Let's take another simple example regarding the exposure at risk and impact of control on losses. If one of the top engineers is going to leave the company, the appropriate question in that case would be, how much are we going to lose over the year if no action or no control is performed against that event or the undertakings are not adequate. These examples explain the relationship between the potential losses and level of control over risky events.

This way, managers could evaluate the characteristics of risky events based on their knowledge of the business, which we think is of the highest value. Simply put, this kind of benchmark is superior to hiring expensive consultants and econometricians. Obtaining that kind of benchmark based on the views of managers who successfully carry out their business responsibilities and went through the ERM implementation would be the best practice to apply for new ERM implementers. With this kind of research methodology, we believe risk evaluation incorporates the utility function of the managers as experts and decision-makers, which is likely to conclude with a different demand for economic capital than that purely calculated in the VaR models.

The research study also had the following detailed goals:

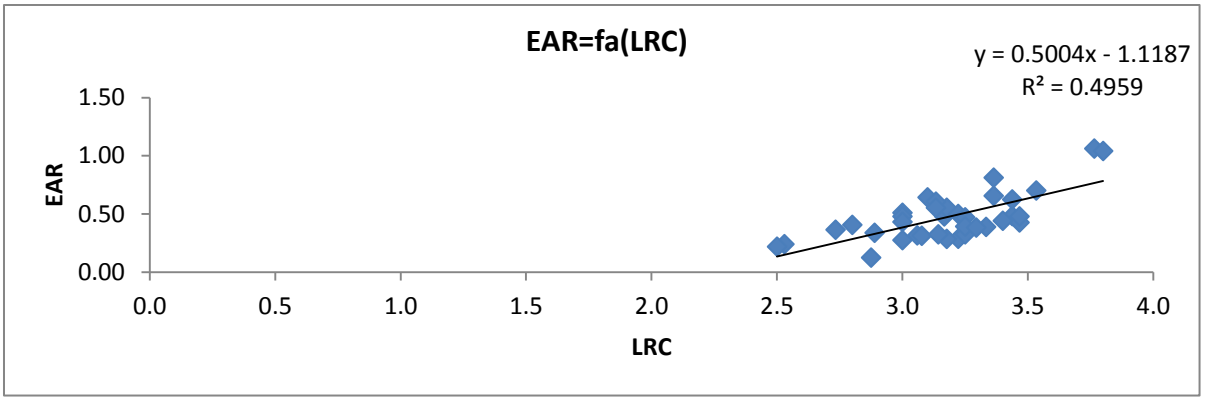
- Identify the relationship between the probability of risk event and level of risk control
- Identify the relationship between exposure at risk and LRC
- Calculate the value of expected loss (EL)
- Identify the relationship between the EL and LRC
- Create a list of the 10 most important risks in respect to: LRC, PRE, EAR and EL

5. The Research Results

Based on the collected data from the questionnaire, we calculated average values of the probability of risk events, exposure at risk, level of risk control and expected losses for each type of risk. Simple linear regression analysis was performed for the following functions—

EAR = f(LRC), PRE = f(LRC) and EL = f(LRC)—to find the strength of the relationships between considered variables.

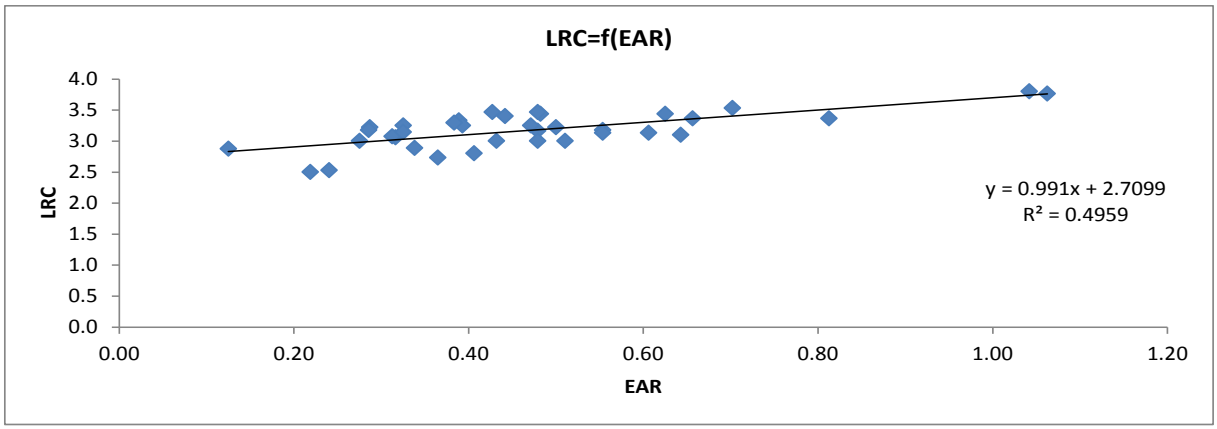
Figure 6. Relation between the exposure at risk and level of risk control



The relationship between the exposure at risk and the level of risk control, presented in Figure 6, shows that the higher values of identified exposures at risk are assigned higher levels of risk control.[18] Many risk sources and risk events are not easily identified and appropriate control isn't in place. The potential for discovering high exposures is influenced by efficiency and the quality of the control system within an enterprise. Since high exposures generate relative high losses when risk is realized, the higher the exposure at risk, the higher the level of risk control should be applied. Usually in the ERM process, improvement in quality of control leads to better identification of value of exposure at risk. A poor control process is not able to detect risk sources or risk drivers of significant value. Improving control quality leads finally to an increasing ability to discover exposures with higher values.

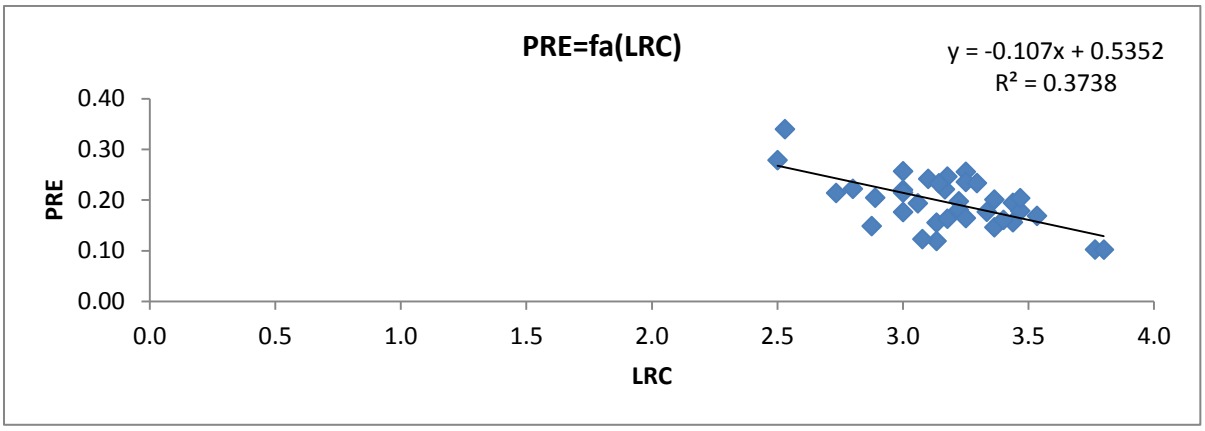
Figure 7. Relationship between level of risk control and exposure at risk

[18] We have to be very careful trying to interpret these relationships. Presented relationships are based on average values of risk characteristics of all type of risky events across the surveyed entities. To present more clearly the impact factors on level of risk control, the multiple regression analysis can be developed. This was not the purpose of this research at this stage.



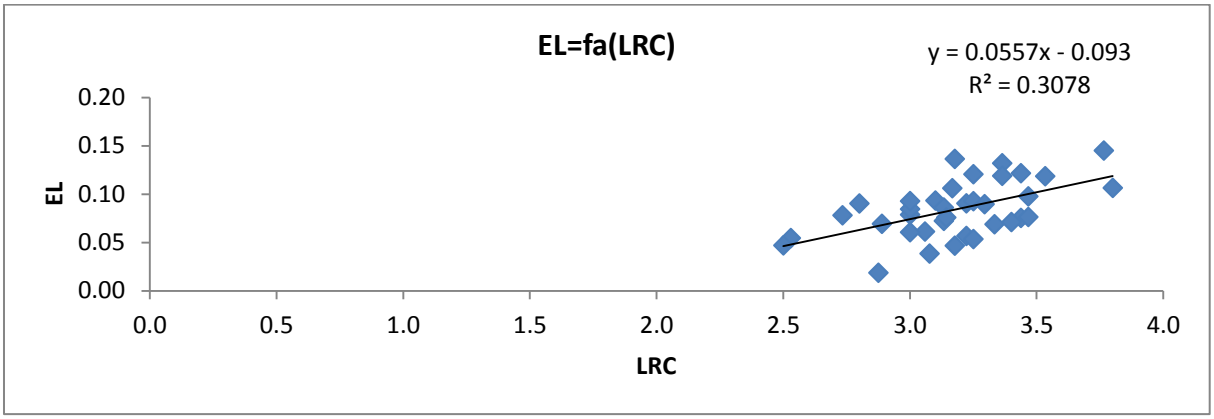
The relationship between the level of risk control and the exposure at risk, presented in Figure 7, is the opposite of Figure 6. It can be interpreted as the managers identifying the value of exposure at risk and then assigning an appropriate level of control. Therefore, we can say, the value of exposure at risk drives the control quality and forces the organization to keep the appropriate quality of control to avoid big losses. A coefficient of determination is equal to 0.5, which implies that the level of risk control is only up to 50 percent explained by the value of the exposure at risk. This can be interpreted as there is much room for improvement and, secondly, that there are other factors to consider for the organization in an ERM system.

Figure 8. Relationship between the probability of risk events and level of risk control



In Figure 8, we observe that the probability of risky events is declining as the level of control increases. This can indicate the positive impact of the control process. The decline in probability of risky events is shown as 40 percent. The different stages and quality of ERM implementation across the surveyed organizations demonstrates low explanatory impact on the probability of a risk event. If enterprises do not keep an appropriate balance in assigning the risk control between the risky events of high probability/low exposure and risky events of low probability/high exposure, then it could be reflected in the relationship in Figure 8.

Figure 9. Relationship between expected losses and level of risk control



Expected losses were calculated as follows:

$$EL = EAR \times PRE$$

The relationship in Figure 9 can be interpreted as: The higher the expected losses, the higher the level of risk control needed. This cannot be interpreted as the higher level of risk control triggers higher losses. Statistically, the relationship is explained up to 30 percent, which means there is much space for the improvement.

In tables 2 and 3, the 10 most important risk types in respect to exposure at risk, level of risk control, expected losses and probability of risk events are reported. This benchmarking can be very useful in ERM implementation.

Table 2. Top 10 risk types with respect to EAR and LRC within the surveyed group

	Value of Exposure At Risk = EAR x NI	EAR	Level of Risk Control	LRC
1	Cost Structure	1.06	Shareholders and Stackeholders Ralations	3.80
2	Shareholders and Stackeholders Ralations	1.04	Cost Structure	3.76
3	Fraud, Theft, Reliability, Quality	0.81	Solvency and Cash Flow	3.53
4	Solvency and Cash Flow	0.70	Quality of Product and Services	3.47
5	Discontinuity and Timedowns	0.66	Product and Services Offer	3.47
6	Production and Warehousing Capacity	0.64	Credit Capacity and Worthiness	3.44
7	Liquidity of Funding Sources	0.63	Liquidity of Funding Sources	3.44
8	Continuity of Activity	0.61	Investments Project's Strategy	3.40
9	Management of Malfunctions	0.55	Discontinuity and Timedowns	3.36
10	Management Responsibility	0.55	Fraud, Theft, Reliability, Quality	3.36

The EAR represents a multiplier of net income. For example, if company A generates income of $10 million, then the value of exposure at risk in the relation to the risk type "management responsibility" is equal $5.5 million. It, of course, doesn't mean we expect to incur this value of loss since the probability of that event is lower than one. For example, for the same type of aforementioned risk, the expected loss of management responsibility equals $1.1 million, as presented in Table 3. This is the worst-case scenario and doesn't mean that loss actually happens.

Table 3. Top 10 risk types with respect to EL and PRE within the surveyed group

Value of Expected Losses = EL x NI	EL	Probability of Risk Event	PRE	
Cost Structure	0.14	Knowledge and Education	0.34	**1**
Management of Malfunctions	0.14	Technological Changes	0.28	**2**
Discontinuity and Time Downs	0.13	Regulatory Changes	0.26	**3**
Liquidity of Funding Sources	0.12	Account Receivables	0.26	**4**
Account Receivables	0.12	Management of Malfunctions	0.25	**5**
Fraud, Theft, Reliability, Quality	0.12	Production and Warehousing Capacity	0.24	**6**
Solvency and Cash Flow	0.12	Sales and Distribution	0.24	**7**
Shareholders and Stakeholders Relations	0.11	Price Strategy	0.23	**8**
Management and Responsibilities	0.11	Exchange Rate	0.23	**9**
Product and Services Offer	0.10	Product and Services Development	0.22	**10**

Based on the data from the research, we calculated that the expected value of economic capital on average should be between three and five times the level of net income value. This implies that, on average, the return on equity would be in the range or 20 percent to 33 percent.

$$\mathrm{EC} = (3-5)\ \mathrm{x}\ \mathrm{Net\ Income}$$

The above table presents risk characteristics and the lists of the 10 most important risk types can be used by ERM implementers as a reference. It was not the purpose of this study to present relationships between the risk's characteristics for particular business branches but we

wanted to show that this is possible and, in future research studies, both the level of details and the quality of data and results are likely to be improved.

Conclusion

Facilitating the ERM evaluation and implementation process with tools derived from the benchmarking studies is very important for innovation within ERM modeling and to obtain better practical and business effectiveness. The research results indicate a high potential for the benchmarking reference and analysis to improve ERM models for individual businesses. The presented study was limited because we were not sure if the goals set at the beginning of the research were attainable. The manager's utility function in evaluating economic capital and in modeling the ERM process seems to be very important since there are many applications in decision sciences methodology that don't account for this factor. The painful outcomes of the financial crisis, which are not yet behind us, are more and more reason to carefully consider the decision-maker utility function in risk modeling and implementation. The author plans to continue investigations into this topic because of its importance in developing ERM into SERMEC and for the chance to draw additional conclusions important to adjusting the models to estimate the cost of funding sources and corporate capital.

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