



The Market Risk Analysis and Methodology of its More Effective Management in Smes in the Slovak Republic

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ARTICLE INFO

Received December 24, 2016
Revised from February 27, 2016
Accepted April, 29 2017
Available online June 15, 2017

JEL classification:

M21, G32, L52, L26.

DOI: 10.14254/1800-5845/2017.13-2.10

Keywords:

risk management,
proposal of methodology,
market, small and medium-sized
enterprises.

ABSTRACT

The worldwide surveys indicate that many enterprises still fight with the application of corporate risk management. Problems with the risk management application are observed in the Slovak enterprises, too. According to our survey, just the market risk is one of the most important risks of SMEs in Slovakia especially when they do not manage it sufficiently. They do not deal with conditions or the preventive measures which could reduce or prevent the problem. The aim of this paper is to present the results of the survey oriented on the business risks faced by the SMEs in Zilina region with a special focus on the market risk and proposing the methodology of enterprise risk management for more effective market risk control. The analysis of the market risk is carried out through the analysis of the selected statistical characteristics using the point and interval estimates and other methods of mathematical statistics. The results of the survey showed that the influence of the market risk on value of the SMEs in Slovakia should not be underestimated.

INTRODUCTION

The business environment changes worldwide and it has impact on an entrepreneurship and related activities (e.g. Čámská, 2015). Especially effects of the global financial crisis, legislative measures on disclosure of information related to business financial reporting have resulted in increased demands on the owner's effective management of all business risks (Belas et al., 2014). Reaction of the theory and practice of corporate management to changes in the business environment resulted in a creation of a risk management system in enterprises (Enterprise Risk Management). Applying risk management in the company is the global trend, according to several foreign

and domestic authors (Hopkin, 2010; Merna, 2007; Global State of Enterprise Risk Oversight, 2015). It enables an integrated approach to risk management, early risk identification, assessment of risk consequences, improving corporate culture in a sense of positive approach to risk management, etc. This approach is focused on negative but also positive deviations from a planned state, further it is proactive, continuous, value-based and focused on process management across the enterprise.

Based on the worldwide surveys, e.g. Global State of Enterprise Risk Oversight (2015), it is possible to assess that there are still some shortcomings in terms of its application although there is the increasing interest in an implementation of risk management and the proven benefits of this implementation in the company. According to foreign studies, e.g. Report on the Current State of Enterprise Risk Oversight: Update on Trends and Opportunities (2015) only 25% of managers believe that their company has an effective integrated approach to risk management. Global surveys show that even though the risk management of the company is not a new discipline, the current models of risk management are not flexible enough to be able to take into account the dynamics of the market.

According to the surveys in Slovakia and opinions of the authors dealing with the risk management issues e.g. Varcholová (2008); Urbancová et al. (2015); Kral et al. (2015); Vodak et al. (2014), the approach to risk management is in many enterprises, in comparison with developed countries, less systematic and applied with certain reserves. The enterprises lack an overall framework for risk management which is not sufficiently connected and works without following the strategy of the company. It deals with problems of content definition, liability for risks, the lack of early identification, and insufficient focus on identifying sources of risk. The most enterprises are aware of a presence of the business risks but the importance of business risks is perceived with a varying intensity and solutions are often limited to informal risk assessment. In practice it is not common that the procedures of risk management are a natural part of a serious management decision making.

The proposal of methodology for application of enterprise risk management is one part of the paper. It presents more specific guidance, e.g. steps how to apply risk management in the Slovak enterprises. It is useful for different types of businesses and it assumes rational adaptation of a risk management application to specific conditions of the enterprise.

The risk market analysis will be carried out through the analysis of the selected statistical characteristics using point and interval estimates and other methods of mathematical statistics (analysis of variance). The result of the analysis of the selected statistical characteristics of the market risk will be a point estimate of a mean value and variance when evaluating SMEs' managers. Then, using statistical testing, there will be determined the conditions for the implementation of the interval estimates (two-sided confidence interval).

Determination of the impact of market risk using the point estimate is a particular estimated point of a mean value of the market risk from the perspective of the number of employees in the SMEs. This point is estimated with a probability of 0.95. Generally the enterprises' managers are more interested in the interval as point value. The results obtained from the survey are based on the business experience of owners of SMEs, managers and their attitude to risk as well as their ability to manage risk.

In order to meet the stated objective, there were used empirical methods of examination (questionnaire, interview with the competent persons of SMEs), statistical induction of applying statistical methods as the analysis of variance using the quantitative tools of statistics (percentage, average values, heteroscedasticity, Cochran's test, Bartlett's test, Levene's test, Kolmogorov-Smirnov test, F-test, Kruskal-Wallis test, point and interval estimate, graph of the mean values) with the help of statistical software Statgraphic centurion XV (2014). Similar approaches were applied by Dvorský et al., 2016 or Betáková et al., 2014.

1. METHODOLOGY

The paper analyzes the impact of gross regional product per capita (USD) (x_1), foreign direct investment per capita (USD) (x_2) and the average monthly nominal wage of the regular employee (USD) (x_3) on the export of goods per capita (USD) (y). To carry out analysis, inputs of 25 regions of Ukraine were employed. We analyzed data for six years (from 2010 to 2015), using a methodology for processing panel data with support of the GRET software.

1. IMPORTANCE OF MARKET RISKS IN SMES

A comprehensive international study carried out by The Economist Intelligence Unit and Dun & Bradstreet (Customer and Supplier Risk Management, 2013) showed that the enterprises that not only manage the risk, but also regularly evaluate the success of its management, achieve better results. Without a systematic approach, the enterprises are dependent on a reactive extinguishing of arising issues.

The business environment is determined by personal characteristics and motives of individual entrepreneurs. Business situations are often unique in their unpredictability, complexity and changing requirements during the business process (Kozubíková et al., 2015). Therefore, the risk management and assessment of the current market situation in relation to the potential risks should be of course a matter in the interest of each management of the enterprise, whether small, medium or large-sized.

There is no universal definition of the market risk and there can be found differences depending on an authors' approach. Regarding the foreign literature, understanding the market risks is more inclined to the financial risk. The topic of the financial risks for SMEs operating in the Czech Republic and Slovakia is covered e.g. in Kozubíková, Ključnikov and Smrčka (2016). The market risks from our perspective are defined as the marketing and business risks for paper's purposes. According to James Lam (2003) the business risk is the risk of loss due to the unexpected changes in the competitive environment, or to trends that damage the franchise or operating economics of a business. It includes issues such as strategy, client management, product development, and pricing and sales. It is essentially the risk that revenues will not cover costs within a given period of time. This approach takes into account only the negative deviation from the planned and expected state. E.g. Hnilica and Fotr (2009) take into account also the possibility of positive deviations which create a source of an unexpected profit and large entrepreneur success.

The market risk is the exposure to a potential loss that would be triggered by changes in market prices or rates. All companies are exposed to some forms of the market risk. The level and form of the market risk exposure differ by industries, and by companies within an industry. The major types of market risks are (Lam, 2003): interest rate risk, foreign exchange risk, commodity risk, equity risk, basis risk, other market driven risk. In addition to the most common market risk types listed above, there are other market risks, such as option risks and exposures to other market prices.

John. J. Hampton (2009) defines the market risk as the risk of the marketing risk in an effort to reach out to customers, or develop markets for products or services. The Chief Marketing Officer directly manages how the company enters the markets, finds customers or clients, set prices and sells goods or services. Subcategories of risk include: needs risk, distribution risk, volume risk, pricing risk.

In Slovak and Czech professional literature Fotr and Souček (2011) and Varcholová (2008) market (commercial) risks are related to the application of the products and the services in the domestic and foreign markets. They are very closely linked to the activities of the competitors, the behaviour of the customers and the method and speed of a market saturation. They are mainly in

the form of sales or price risks. They also include the risks arising from international trade as, for example, diversity of mentalities, language barrier, diversity of legal systems, etc. The market risk has a significant impact on the enterprise operation on the market. It also influences the creation of the enterprise value and the use of new opportunities. Mihok (2006) states the overall risk of the enterprise is made up of the market and specific risks. The market risk is the risk that is associated with uncertainties arising from the economy, which apply to all enterprises. This systematic risk arises from the nature of the external environment of the enterprises (Nedeliaková et al., 2015). Specific risk is tied directly to the enterprise or its activities and is unique (e.g. operational or financial risk).

The enterprise activities are usually connected with each other and therefore an occurrence of one kind of risk factors spreads into other fields as well. Problems with the competition and the market prices result in troubles with enterprise financing because of poor performance. We can continue. Although investment decisions do not have a direct relation to the market risks the connection is very tied. If the enterprise invests in the product which would not have enough market potential it will not find enough customers under an originally chosen price. Investment decision making is a hard process because of long-term investment and expensiveness. Especially the crisis period has serious impacts on investment decision making (Svecová, Scholleová and Fotr, 2012) and ongoing enterprise prosperity.

2. ANALYSIS AND ASSESSMENT OF THE MARKET RISK OF SMES USING THE METHOD OF MATHEMATICAL STATISTICS

The next part of the paper is processed of analysis and assessment of selected statistical characteristics of the market risk of SMEs according to the number of employees using the method of mathematical statistics of analysis of variance. This method is possible used because we all data are in quantitative form.

2.1 Results of SMEs Survey in The Zilina Region

In 2015, there was realized the statistical survey of the business risks of the small and medium-sized enterprises in the Žilina region. In the Žilina region, there were polled 164 small and medium-sized enterprises, in the form of an empirical research (questionnaires and interviews with the competent persons from SMEs). In the Žilina region, 80.49% of business owners stated the market risk as the biggest risk of the business at the moment.

Classification and the frequency (in absolute numbers) of SMEs for research purposes according to the number of employees: Microenterprise (up to 10 employees) - 92, Small enterprise (10 - 50 employees) - 27, Medium-sized enterprise (up to 499 employees) - 12.

The point estimates have been calculated on the basis of selected statistical characteristics (SSC), which are necessary for the processing of mathematical statistics method, i.e. analysis of variance:

- μ - Average value of the enterprise risk
- σ - Standard deviation of the value of the enterprise risk
- σ^2 - Variance of the values of the enterprise risk

Selected statistical characteristics and their point estimates are listen in Tab 1.

According to the stated purpose in the introduction of the paper, and with the use of statistical methods and tools, we examined whether or not the factor such as the number of employees in the enterprise in the Žilina region has an impact on the mean (average) values of the market risks. Meeting the objective there has been used statistical induction, which consists of a wide range of

statistical methods and its findings obtained from the sample extend the base file. The results of statistical induction have been processed using the point estimate. We have been able to find the estimate of the mean value of the market risk of the base file using a single value or point.

Table 1. Point estimates of the selected statistical characteristics (SSC) of the market risk in the three groups of SMEs according the number of the employees (elaborated by authors)

Risk	SSC	SME		
		Micro-enterprise (up to 10 employees)	Small enterprise (10 - 50 employees)	Medium-sized enterprise (up to 499 employees)
Market	μ	52.29	51.22	55.67
	σ	19.53	16.17	20.73
	σ^2	381.43	261.47	429.73

Source: own calculations

Then we used the quantitative method of "analysis of variance". We set analysis of variance using either a parametric or non-parametric test. For the calculation of the parametric tests there have to be met two essential conditions. First is connected with the resulting p-value of the market risk of the homoscedasticity test (i.e. identity of variance) and second is the test verifying the normality of groups of SMEs which must be higher than the level of significance (we have chosen 0.05). The evaluation of the differences in the mean values of the market risk among the groups of SMEs was the result of the analysis of variance. Using the interval estimate we have identified not only the single best estimate, but a whole interval of the potential estimates of the mean value of the market risk of the base file with the probability of 0.95.

2.2 Analysis and Assessment of the Market Risk of Smes Using The Method of Mathematical Statistics

There could not be used the parametric test of the mean values of the risk for the analysis of variance of the market risk. Non-parametric test of market risk medians in the three groups of SMEs according to the number of employees in the Žilina region was realized, whereas the conditions have been met. The condition of homoscedasticity - we have verified the identity of variances of different groups using the following tests:

- Cochran test: p-value = 0.385,
- Bartlett´s test: p-value = 0.649,
- Levene´s test: p-value = 0.919.

It can be concluded from the results of the individual tests that the resulting p-value was higher in all tests than the level of significance we have chosen. The condition of the normal distribution of the market risk in the enterprises, according to the number of employees, using the Kolmogorov-Smirnov test included:

- P-value of enterprises with the number of employees up to 9 is 0.01,
- P-value of enterprises with the number of employees up to 50 is 0.571,
- P-value of enterprises with the number of employees up to 499 is 0.555.

On the surface the significance, we refuse the assumption that microenterprise risk assessment (with the number of the employees bellow 10) comes from the normal distribution.

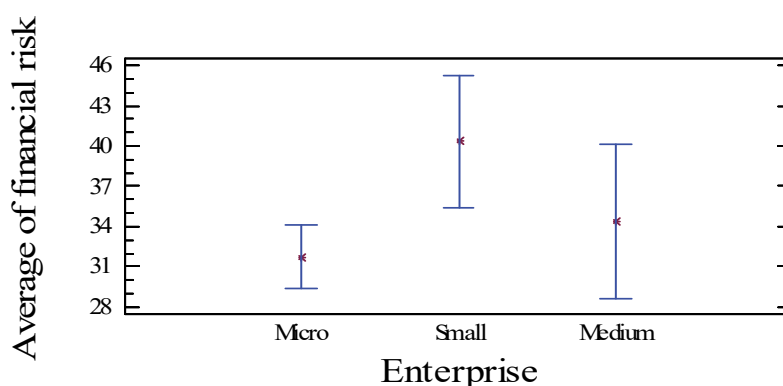
Table 2. Analysis of variance of the market risk values according to the number of the employees (elaborated by authors)

<i>Enterprise</i>	<i>Number of enterprises</i>	<i>The average in group</i>
Micro-enterprise	66	42.77
Small enterprise	16	61.57
Medium-sized enterprise	15	48.36
P- value = 0.042		

Source: own calculations

In relation to the fact that the calculated p-value of the Kruskal-Wallis non-parametric test of the analysis of variance is smaller than 0.05 (Table 2), we can say that there are statistically significant differences among the medians of the values of the market risk according to the number of the employees of the small and medium-sized enterprises in the region of Žilina with the reliability of 0.95.

Figure 1. The average values of the market risk in the groups of SMEs according to the number of the employees (elaborated by authors) Source: own calculations



Graphic analysis of market risk (Figure 1) confirmed the test results using the methods of mathematical statistics "Analysis of variance". We can confirm that the number of the employees has impact on the mean value of the market risk designated by managers of SMEs in the Žilina region.

2.3 Interval Estimates of the Selected Statistical Characteristics of the Market Risk

Based on the knowledge of the selected statistical characteristics of the assessment of the market risk by the managers of SME from the Žilina region (Tab. 1) we found the probability model

of the normal distribution of the mean value of market risk. Subsequently, we performed generalized conclusions on the assessment and the evaluation of the market risk by the managers of SME in the Žilina region in the Slovak Republic and created the base file. An important factor in statistical induction was the development of the calculation of the interval estimates with the specified probability of 0.95. Since it was a sample of the managers and owners of SMEs in the Žilina region, expressing general conclusions on the assessment of market risk, we have counted on the potential uncertainty with probability of 0.05.

The point estimates of the sample file of the selected statistical characteristics, such as mean value, variance and standard deviation of the market risk, calculated in Tab. 1 represent the point estimates of the base file, which are the basis for the determining the interval estimates. The interval estimates of the base file, such as the mean value and standard deviation of the market risk of the assessment of the SMEs' managers are calculated in Tab. 3 with the probability of 0.95:

- μ_d – Lower limit of the interval estimate of mean value,
- μ_h – Upper limit of the interval estimate of mean value,
- σ_d – Lower limit of the interval estimate of standard deviation,
- σ_h – Upper limit of the interval estimate of standard deviation.

Table 3. Interval estimates of the mean value and of the standard deviation of market risk of SMEs with reliability 95% (elaborated by authors)

Risk	SME					
	Micro-enterprise (up to 10 employees)		Small enterprise (10 - 50 employees)		Medium-sized enterprise (up to 499 employees)	
Market Risk	μ_d	μ_h	μ_d	μ_h	μ_d	μ_h
	48.24	56.33	43.02	59.42	45.39	65.94
	σ_d	σ_h	σ_d	σ_h	σ_d	σ_h
	17.06	22.84	16.32	28.40	11.45	27.45

Source: own calculations

Based on the results of the Kolmogorov-Smirnov test of the mean value of the market risk we analyzed and evaluated, we cannot take into account the interval estimates of the selected statistical characteristics (mean value and standard deviation) with the probability of 0.95. The reason is that the assessment of market risk by the managers in the microenterprises does not follow the condition of probability model of normal distribution. We have determined the interval estimates of the mean value and standard deviation of the market risk by the managers of SMEs in the Žilina region using the method of mathematical statistics with the probability of 0.95. On the basis of this fact we can conclude that it is a high degree of significance of results analyzed and assessed in the processed survey.

3. Proposal of the Risk Management Methodology Application in the Slovak Enterprises for the Needs of the Market Risk Management

The basis of the proposed methodology is formed by the risk management standard ISO 31000:2009 Risk Management - Principles and guidelines which provides only a general, universal character and it is based mainly on terminology concepts. The proposed application of the risk

management methodology in the Slovak enterprises for the needs of the market risk management provides more specific guidance for the implementation of the risk management in the enterprises in Slovakia. The methodology consists of the following nine steps:

Establish strategy, policies and responsibility for the risk management

- The primary prerequisite for an implementing the risk enterprise management is to have sufficient support from the top management. It is very important that the management of the company are interested in prevention. At this point it is necessary to develop strategy, policy, principles and establish responsibility for the risk management in the company.
- The overall enterprise strategy has to be clear even before the implementation of the enterprise risk management. If the company does not have any strategy and it only flows in the changing barriers created by the industry and the whole economy the tasks of the risk management could not be specific at all.

Analyse the environment and establish risk criteria

- In this step it is necessary to elaborate the analysis of the internal and external business environment so that the managers can define strategic and organizational connections with the risk management. Furthermore, the managers should define risk criteria by which individual risks will be assessed e.g. determine risk capacity and risk appetite.
- Identify risks, risk resources, (threats and opportunities)
- In this step it is necessary to identify the risks. The risks should be recognized and described. The managers should ensure regular and continuous monitoring of all ongoing external and internal events affecting the achievement of objectives. It is necessary to distinguish the positive impact (opportunities) or negative effects (threats).

Risk analysis (threats and opportunities) and prioritization

- In this step it is necessary to elaborate the analysis of the identified risks based on the probability of the occurrence together with the impact. On one hand some risks can have higher probability, on the other hand their impact (consequences) on the enterprise performance and general success are low. The conjunction of the probability of the occurrence and the impact forms the risk level which determines the risk priority i.e. to which extent risks may affect the aims of the company.

Risk assessment and establishing risk catalogue

- In this step it is necessary to compare the probability of occurrence and the consequences with defined criteria mentioned in the second step. The responsible managers should decide which risks should be reduced, what the priorities are for dealing with the risks and which actions should be carried out.

Develop and implement a plan for preventive measures

- In this step it is necessary to propose preventive measures to the reduce risks. This is to ensure unacceptable risks by the intended tactics. The acceptable risk should be monitored, because of the eventual future changes in the level of the identified risks but also in their characteristics.

Evaluate the effectiveness of the preventive measures and risk management

- In the next step it is necessary to make a review of the whole risk management process. It should be provided effective communication, advice and reporting. The managers should ensure the control of the identified risks, the proposed measures, review of their effectiveness and efficiency and the implementation of the risk management plan from the perspective of continuous improvement.

Ensure monitoring and early warning systems by controlling

- The next step in the application of the enterprise risk management is providing an early warning system as continuous monitoring of key processes in the company, e.g. by controlling.

Take a positive attitude to risk

The final step in the application of the risk management in the company is that top management will create values within a business culture that will lead the managers to a positive attitude to the risk and the prevention in the enterprise.

It has to be taken in mind that the appropriate risk management is a continuous and never ending enterprise activity. All above introduced steps of the risk management could be modified during the time because of the external and internal environment changes. One-time work does not make sense. The approach to the enterprise risk management has to be systematic. At each step the risk management methodology application provides practical examples, tools and it recommends selected methods and techniques of the risk management that are important in the actual application of the risk management process in the Slovak enterprises. The methodology is useful for different types of businesses and it assumes rational application and adaptation of the risk management to specific conditions in the enterprises.

CONCLUSION

On the basis of the results of the survey analysis of the market risk of SMEs through the analysis of basic statistical characteristics of the point and interval estimates and methods of mathematical statistics, we can conclude that the number of the employees has the impact on the mean value of the market risk identified by the managers of SMEs in the Žilina region. Therefore, their impact cannot be underestimated. Defining the point and interval estimation we set out the interval of the impact of the market risk for the managers from the perspective of the number of employees in SMEs in Slovakia.

The impact of the number of the employees on the occurrence of the market risk in SMEs in the Žilina region is the highest in the medium-sized enterprises, and the lowest among the small enterprises. In the view of the volume of production and the market operation the medium-sized enterprises are more sensitive than small ones. Their operation has often very little flexibility, or there is too much dependence on the customer, or supplier, who may affect their pricing policy, low load from the perspective of the production capacity and last but not least, their profits. These aspects have the impact on the wage and tax policy of the enterprise. The rising costs are a major source of the risk for SMEs in this area.

The biggest barriers that prevent the enterprises in Slovakia from the effective control of the market risks relate to the problems with the availability of information, whether internal or external data necessary to the evaluation and the risk management, or their integration into the decision-making process. Based on the present experience, many managers are based on the knowledge of the past. However, evaluating the risk only on the basis of own experience and feelings is currently insufficient. The analysis and assessment of the research factor such as the number of the employees revealed the impact on the level of the market risk cannot be underestimated. Therefore, the owners of SMEs in Slovakia and responsible managers must redesign their approach to the assessment and management of the market risks and consider the level of the action of the risk resources for the purpose of managing risks arising from them.

For the needs of the market risk management the managers of SMEs in Slovakia should apply the proposed methodology of the enterprise risk management. This application enables better control of the market risk.

ACKNOWLEDGEMENTS

Publication of this paper was supported by the grant project VEGA no. 1/0560/16.

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