

The quantitative assessment of market risk in small and medium - sized enterprise In The Slovak Republic

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Abstract

Small and medium-sized enterprises (SMEs) in Slovakia do not pay sufficient attention to market risks, they do not form the prerequisites, or preventive measures of the risks assessed, which would prevent the problem. The essence of the article is based on the collected and processed data from the survey to analyze, assess and evaluate the impact of the factor, which is the number of employees to evaluate the market risk identified by managers of SMEs in the Žilina region of Slovakia. The analysis of market risk is carried out through the analysis of the selected statistical characteristics using the point and interval estimates and methods of mathematical statistics. The results of the survey showed that the number of employees has an impact on the amount of the value of the market risk of SMEs in the Žilina region and therefore it is not possible to underestimate it.

Keywords: risk, analysis, assessment, evaluation, market, small and medium-sized enterprise.

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1. Introduction

The European Commission states that “the source of lifeblood” of the European economy lies in 23 million small and medium-sized enterprises which represent more than 98% of the business community. They provide two-thirds of the total employment in the private sphere, and over the last five years, they have created approximately 80% of new jobs (Belas, Bartos, Habanik & Novak, 2014).

The Slovak economy is greatly dependent on the small and medium-sized enterprises, because they create 72% of job positions and 67% of the added value that extends well beyond the EU averages (67% and 58%). The majority of enterprises operate in the field of services and retail trade sectors, but production also represents an important sector, although it does not include a very high number of SMEs, accounting for 25% of the jobs and 22% of the added value creating the SMEs within the corporate economy (SBA Survey, 2014). Considering the Slovak Republic, regional disparities constitute a particularly important problem. Lessman (2009) notes that Slovakia shown the highest level of regional disparities among the countries of the OECD in the five-year average for the period 1996 - 2000. Although the economic performance across the country converges on the level of the European level, however, economic growth is concentrated in Bratislava region and the economic performance of the rural regions still lagged behind (Stofko, Soltes & Stofkova, 2016). In this context, there is a particularly important need to examine the economic phenomena of the Slovak Republic not only at national but also at regional level.

The aim of article is on the basis of obtained and processed data from the survey to analyze, assess, and evaluate the impact of the factor, which is the number of employees to evaluate the market risk identified by the managers of SMEs in the Zilina region of the Slovak Republic. The analysis of market risk will be carried out through the analysis of the selected statistical characteristics using point and interval estimate and 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 mean value and variance of risks when evaluating managers of SMEs. Then, using statistical testing, there will be determined the conditions for the implementation of interval estimates (two-sided confidence interval). Determination of the impact of market risk from the perspective of the number of employees in SMEs using point estimate is a place of a particular point estimate of a mean value of market risk, where the value of risks will lie on with a probability of 0.95, whereas the managers of enterprise are more interested in 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** that is, 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) (Dvorský et al., 2016) and statistical software Statgraphic centurion XV (Software Statgraphics Centurion XV., 2014; Betakova, Lorko & Dvorsky, 2014).

2. Importance of market risks in small and medium-sized enterprises

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

The business environment is determined by personality characteristics and motives of individual entrepreneurs. Business situations are often unique in their unpredictability, complexity and changing

requirements during the business process (Kozubikova, Belas, Bilan & Bartos, 2015). Therefore, risk management and assessment of the current market situation in relation to the potential risks should be a matter of course in the interest of each management of the enterprise, whether small or medium-sized.

Regarding the foreign literature, understanding market risks is more inclined to financial risk, and market risks from our perspective are defined as marketing and business risks. According to James Lam (2003) business risk is the risk of loss due to 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, and is essentially the risk that revenues will not cover costs within a given period of time. Market risk is the exposure to potential loss that would result from changes in market prices or rates. All companies are exposed to some forms of market risk. The level and form of market risk exposure differ by industries, and by companies within an industry. The relevant prices or rates (sometimes called the market risk factors) might include equity or commodity prices, interest rates, and foreign exchange rates. 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.

Hampton (2009) defines market risk as the risk of 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 markets, finds customers or clients, and prices and sells goods or services. Subcategories of risk include: needs risk, distribution risk, volume risk, pricing risk.

Table 1. The Top 10 Risks for 2015 (Executive perspective on top risks for 2015, 2015).

Risk Description	Significant Impact [%] (6-10)	Potential Impact [%] (5)	Less Significant Impact [%] (1-4)
Regulatory changes and heightened regulatory scrutiny may affect the manner in which our products or services will be produced or delivered	67	11	22
Economic conditions in markets we currently serve may significantly restrict growth opportunities for our organization	56	12	32
Our organization may not be sufficiently prepared to manage cyber-threats that have the potential to significantly disrupt core operations and or damage our brand	53	14	33
Our organizations succession challenges and ability to attract and retain top talent may limit our ability to achieve operational targets	56	13	31
Our organizations culture may not sufficiently encourage the timely identification and escalation of risk issues that have the potential to significantly affect our core operations and achievement of strategic objectives	51	10	39
Resistance to change may restrict our organization from making necessary adjustments to the business model and core operations	49	14	37
Ensuring privacy/identity management and information security/system protection may require significant resources for us	52	8	40
Our organization may not be sufficiently prepared to manage unexpected crisis significantly impacting our reputation	46	17	37
Sustaining customer loyalty and retention may be increasingly difficult due to evolving customer preferences and/or demographic shifts in our existing customer base	48	10	42
Our existing operations may not be able to meet performance expectations related quality, time to market, cost and innovation as well as our competitors	46	13	41

In Slovak and Czech professional literature Fotr (2011) and Varcholova (2008) market (commercial) risks are related to the application of products and services in domestic and foreign markets. They are very closely linked to the activities of competitors, the behaviour of customers and the method and speed of 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. Market risk has a significant impact on the operation of the enterprise on the market, but also the creation of value of the enterprise and the use of new opportunities. Mihok (2006) states the overall risk of the enterprise is made up of the market and specific risk. 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 enterprise (Nedeliakova, Sekulova & Nedeliak, 2015). Specific risk is tied directly to the enterprise or its activity and is unique (e.g. operational or financial risk).

The ERM Initiative at NC State, in partnership with global consulting firm Protiviti, annually conducts research to identify risk issues on the minds of executives and boards of directors as they look out over the next twelve months. The most recent report, "Executive Perspectives on Top Risks for 2015," issued in February 2015, summarizes the concerns of the 277 board members, C-suite and other top-level executives across industries who participated in the survey. The report highlights executive perspectives for 2015 about the importance of 27 risks that relate to macroeconomic, strategic and operational issues for the upcoming year. Following (Table 1) are the top 10 risks identified in the annual risk survey, along with the percentages of respondents who identified each risk as having a "Significant Impact" on their business (Executive perspective on top risks for 2015, 2015).

3. 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

3.1. Results of SME survey in the Zilina region

In 2013, there was realized the statistical survey of business risks of small and medium-sized enterprises in the Zilina region, within the framework of the project FaME/13/MSPRISK: "The recent trends in the area of business risks faced by the small and medium-sized enterprises in the selected regions of the Czech Republic and Slovakia" (Belas, Demjan, Habanik, Hudakova & Sipko, 2015). In the Zilina region, there were polled 164 small and medium-sized enterprises, in the form of empirical research (questionnaires and interviews with the competent persons from SMEs). In the Zilina region, 80.49% of business owners stated market risk as the biggest risk of the business at the moment.

Classification of the frequency of SMEs of the market risk 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

Point estimates have been calculated on the basis of selected statistical characteristics (SSC), (listed in Tab. 2), which are necessary for the processing of mathematical statistics method, i.e. analysis of variance:

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

According to the stated purpose in the introduction of the article, 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 Zilina region has an impact on 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 extends the base file. The results of statistical induction have been processed using point estimate we have been able to find an estimate of the mean value of the market risk of the base file using a single value or point.

Table 2. Point estimates of selected statistical characteristics (SSC) of the market risk in the three groups of SMEs by number of employees (elaborated by authors).

Risk	SSC	SME		
		Micro-enterprise	Small enterprise	Medium-sized enterprise
		(up to 10 employees)	(10 - 50 employees)	(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

Then we used 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 had to be met two essential conditions and that the resulting p-value of the market risk of the homoscedasticity test (i.e. identity of variance) and the test to verify the normality of groups of SMEs must be higher than the level of significance of 0.05 we have chosen. The evaluation of differences in mean values of market risk among the groups of SMEs was the result of the analysis of variance. Using interval estimate we have identified only a single best estimate, but a whole interval of potential estimates of the mean value of the market risk of a base file with a probability of 0.95.

3.2. 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

There could not be used parametric test of 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 Zilina 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 market risk in 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 an assumption that microenterprise risk assessment with the number of employees from 10 to 50 come from the normal distribution.

Table 3. Analysis of variance of market risk values according to the number of employees (elaborated by authors).

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

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 3), we can say that there are statistically significant differences among medians of the values of market risk according to the number of employees of small and medium-sized enterprises in the region of Zilina with the reliability of 0.95.

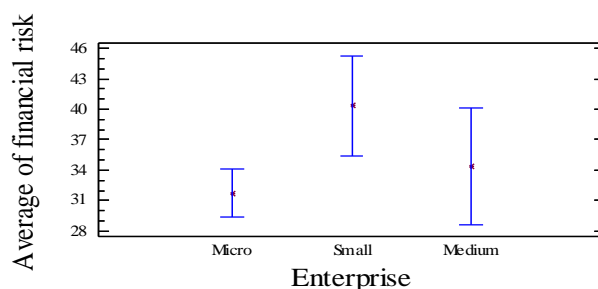


Figure 1. Graph of the average values of market risk in groups of SMEs according to the number of employees (elaborated by authors).

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 employees has impact on the mean value of the market risk designated by managers of SMEs in the Zilina region.

3.3. Interval estimates of the selected statistical characteristics of market risk

Based on the knowledge of the selected statistical characteristics of the assessment of market risk by managers of SME from the Zilina region (Tab. 2) we found the probability model of normal distribution of mean value of market risk. Subsequently, we performed generalized conclusions on the assessment and evaluation of market risk by the managers of SME in the Zilina region in the Slovak Republic and created a base file. An important factor in statistical induction was the development of the calculation of interval estimates with a specified probability of 0.95. Since it was a sample of managers and owners of SMEs in the Zilina region, expressing general conclusions on the assessment of market risk, we have counted on the potential uncertainty with probability of 0.05.

Point estimates of the sample file of the selected statistical characteristics, such as mean value, variance and standard deviation of market risk, calculated in Tab. 2 represent point estimates of the base file, which are the basis for the determining the interval estimates. Interval estimates of the base file, such as mean value and standard deviation of market risk of the assessment of SME managers with the probability of 0.95 are calculated in Tab. 4:

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 4. 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)	
	μ_d	μ_h	μ_d	μ_h	μ_d	μ_h
Market Risk	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

Based on the results of the Kolmogorov-Smirnov test of 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 a probability of 0.95. The reason is that the assessment of market risk by managers in microenterprises does not follow the condition of probability model of normal distribution. We have determined interval estimates of mean value and standard deviation of market risk by managers of SMEs in the Zilina 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 analysed and assessed in the processed survey.

4. Summary

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

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

The biggest barriers that prevent enterprises in Slovakia from effective control of market risks relate to problems with the availability of information, whether internal or external data necessary to the evaluation and management of risks, 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. Analysis and assessment of the researched factor such as the number of employees revealed the impact on the

level of market risk cannot be underestimated. Therefore, owners of SMEs in Slovakia responsible managers must rethink their approach to the assessment and management of market risks and consider the level of the action of risk resources for the purpose of managing risks arising from them.

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