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Financial Risks: Cases Of Non-Financial Enterprises

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1. Introduction

From the anatomic point of view an integral system of risk management consists of risk measurement and management. This chapter is devoted to assessing the financial risks of small and medium-sized enterprises (SME) in the non-financial sphere as a constituent part of quantitative and qualitative risk measurement techniques.

In the assessment of financial risks of enterprises in the non-financial sphere, and in small and medium-sized enterprises in particular, it is recommended that the principles of Occam and KISS (keep it simple, stupid) be used as guidelines. The application of these principles in relation to the choice of the methods of financial risks assessment means that mainly simple methods - and those known by enterprise specialists - should be used. These sufficiently simple methods are the following: special ratios method and expert examination method.

The author evaluates the development of discriminant and conditional probability methods of financial risk assessment in nine East European countries. The usage of these methods enables small and medium-sized enterprises to assess, predict and manage risks related to liquidity, credit, decreasing financial stability and insolvency/bankruptcy.

In doing this research we applied an approach built on conditional probability models (logit and probit analysis) on source reviews and the author's own experience. Selection and assessment of the described models of insolvency/bankruptcy and provisions of financial risk assessment are based on the author's personal opinion.

The chapter proceeds as follows: after the introduction in Section 2 the financial risk definition is introduced and a three-level classification of financial risk is presented. Next, in Section 3 the development of financial ratios will be described and a review of using classic models for assessing insolvency/bankruptcy, multiple discriminate analysis (MDA) type models and their development in nine countries of Europe are given. Then in Section 4 a discussion will be conducted about the usage of express analysis of financial risks on the basis of the principles of the analysis of enterprise economic turnover balance sheet and quick tests as a simple instrument. Tests to assess the risks to the enterprises at different stages of the life cycle will also be discussed. At the end of chapter 4 a case study of the risk occurrence reasons is provided. It is possible to position these factors on a scale of risk probabilities by employing expert assessment. In Section 5 a critical evaluation of the methods of measuring the financial risks of enterprises in the non-financial sphere are discussed and future ideas are given. At the end of the chapter we offer some concluding

ideas. In the appendix, we attach reference materials containing 31 models, developed in nine countries enabling determination of enterprises' and their partners' insolvency risk.

2. Introducing financial risks management for enterprises in the non-financial sphere

Financial risk has both objective and subjective bases. The objective basis of financial risk refers to an apriori uncertainty of the external environment related to an enterprise. The subjective basis of financial risk is based on the fact that risk is realised through the activity of an entrepreneur (an individual) for it is he/she who assesses risky situations, creates a number of outcomes and makes decision. Comprehension of the nature of financial risk and classification makes it possible to build up a system of integral risk management, relying on the existing elements of the organisation of enterprise management. We track the shift of the risk concept as hazard or "something that goes wrong" to the risk concept as uncertainty between entrepreneurs and their aims. These aspects are considered in Section 2.

2.1 The financial risk concept, its classification for enterprises in the non-financial sphere

There are different approaches that can be used when defining risk and financial risks. Holton (2004) described risk as composed of exposure and uncertainty. Financial risk definition can be conventionally divided into two groups. The first approach deals with risk as a hazard of potential losses and is related to the definition of financial risk. It is given in terms of investment risk (assets) and in terms of feasibility of making a structure of liabilities (Chapman, 2006; Kovalev, 2000). The second approach considers financial risk as probability of the occurrence of unfavourable financial consequences under the influence of various factors. It means that financial risk is a complex risk, since it focuses all enterprise risks and is used in monetary terms (Hawkins, 2003). We consider that such a limited comprehension of risk does not allow for a complete, complex technique of its assessment and analysis.

In the document ISO (2009) Risk Management – Principles and guidelines ISO 31000:2009 provides a new approach to risk definition. The definition of risk given by ISO 31000:2009 (taking into account two comments) is "*risk - effect of uncertainty on objectives. Objectives can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process) (Note 2). Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence. (Note 4)*". Taking into account the above, we define financial risk as the influence of uncertainty of occurrence of unfavourable financial consequences in the form of income or/and capital loss. This definition is the most reasonable and acceptable in practical activities.

One of the first risk classifications was suggested by J. M. Keynes (1936). Types of financial risk in the enterprise risk system are given in the works by J. Fraser and B. Simkins (2010), R. Moeller (2007), R.G. Picard (2004) and I.N. Dulova (2011). In the research by D. Luo and B. Sun (2010) a three-level classification of financial risks is introduced, though it may be applied only in the case of enterprise mergers and acquisition.

We consider that it is possible to use the three-level classification of financial risks. The three-level classification of financial risks of non-financial enterprises is given in fig. 1.

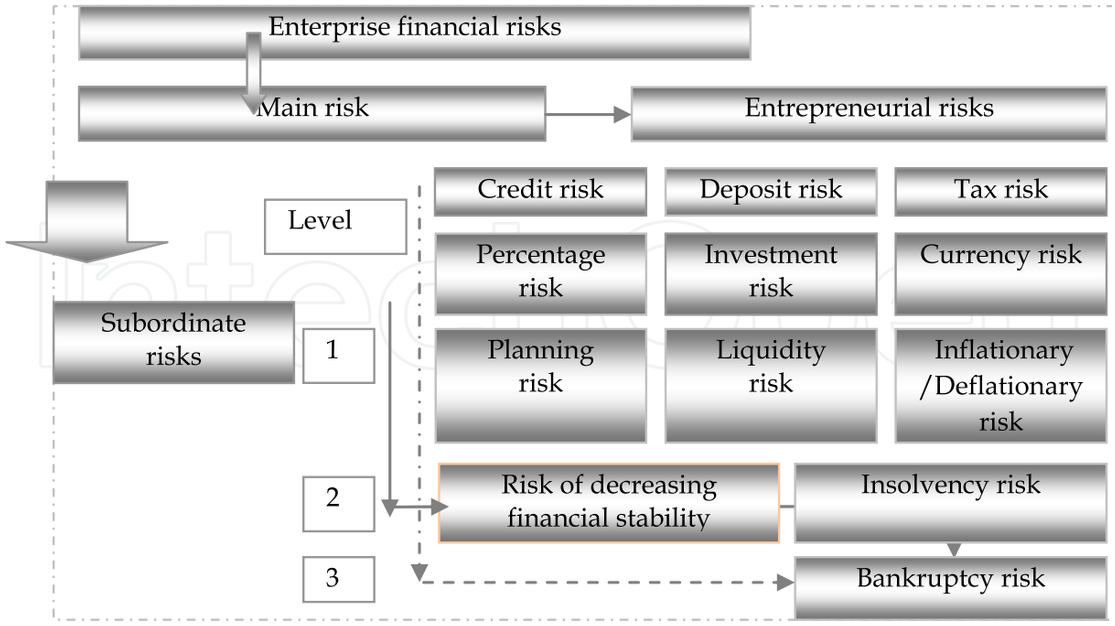


Fig. 1. Three-level classification of financial risks

The classification shown allows us to use a system of financial ratios which in our opinion makes it possible to integrate a system of risk management with a planning system of enterprise.

The first level of financial risk is represented by the concrete risks of an enterprise. The second level of risks refers to the risk of decreasing financial stability and insolvency risk. Selection of these two risks is connected with the fact that quantitative methods exist that enable assessment and prediction of the risk of decreasing financial stability and insolvency. The third level comprises bankruptcy risk which is assessed by financial sector representatives in connection with credit risk monitoring.

The risk of decreasing financial stability is the reflection of the reduction of monetary and merchandise flow balance, incomes and expenditure, and means and sources of their formation.

Solvency risk is an external expression of the financial state of an enterprise. The risk of the first level may trigger the risks of the second level which in their turn may lead to the risk of bankruptcy of an enterprise. In addition, credit risk may directly trigger bankruptcy risk (according to existing legislation).

Classification of financial risks is necessary for applying the most efficient methods, their assessment and management. In our opinion in establishing the system of financial risk management at an enterprise, which is adequate for the external and internal environment, we should rely on the following principles of its creation:

1. Compound approach to management. It is necessary to consider every risk not separately but in combination.
2. As a result of a compound approach it is reasonable to use an indicator, characterising the combined impact of all types of financial risks (indicator of common financial risk).

3. Introduction of a regular and compulsory procedure of identification, analysis and control of different types of financial risk at an enterprise. Activities in financial risk management should not be carried out periodically along with emerging problems but continually, regularly and the procedure of financial risk management should be one of the functions of the system of enterprise management.

2.2 System of risk management

The financial crisis actualised the interest in financial risk management but this interest is mainly connected with financial risk management in financial institutions (banks, insurance and investment companies) for which risk management is obligatory in compliance with existing laws (Basel II and Solvency II). For example, in the EU it is regulated on the basis of Basel II and Solvency II (see Basel Committee on Banking Supervision, 2003; Solvency II framework, 2009).

Much uncertainty in risk management of SMEs has been provoked by Basel II (Hensces, 2010). Risk management in large, small and medium-sized enterprises differs both according to the level of maturity and applied methods. Financial risk management of enterprises in the non-financial sphere should be considered as an integral part of enterprise risk management. The main countries of the European Union, the majority of participants in the non-financial sector of the economy, have small and medium-sized enterprises.

Bibliometric research of nine classes of risk management is applicable to five types of risk used in small and medium-sized enterprises (Brancia, 2011). The research undertaken by Hensces Thomas (2006, 2010a) in the field of practice of risk management in German small and medium-sized enterprises testifies to the fact that risks are strongly focused on the business owners. According to the study the most widespread method of risk management is considered to be business planning, though there is no strong link between planning and management. The same conclusion was made referring to balanced scorecard (BSC) as BSC combines successfully with risk management (Scholey, 2005). The results of the study lead to the conclusion that risk management is carried out in a rather rudimentary way. Similar conclusions can be attributed to the other countries of the EU and Russia (Netsymailo, 2009). In their research the authors K. Dumičić, M. Dumičić and R. Cukrov (2005) analysed protection instruments for different types of financial risk in Croatian companies.

The system of risk management should interact with other elements of the system of the management of entrepreneurial activity. The main elements of creating an integral system of managing strategy, quality and risk at the enterprises in the non-financial sphere are as follows: management by processes, strategic management, total quality management, audit (internal and external), system of organisation a production (BSC, theory of constraints [TOC]) and risk management. Depending on the combination of the main elements we consider four key approaches to the creation of an integrated system of risk management at an enterprise (Fig.2).

For example, the approach based on process is more widely used at medium-sized Latvian enterprises in the non-financial sphere. This is connected to the fact that a great number of Latvian enterprises, driven by a regard for their business competitiveness, have introduced a quality management system.

From the anatomic point of view, a system of risk management has two functions of the system of risk management and risk measurement. Fig. 2 shows the constituents of each of the functions. Let us consider the component of "Risk Measurement".

The existing methods and technologies of risk assessment can be conventionally divided into two large groups appropriate for the assessment of all types of risks and separate types of risks. The first group includes the following methods – BPEST, PESTLE, SWOT analysis, statistical analysis (VaR, Conditional Risk) etc. The second group involves the following methods – threat analysis, fault tree analysis, method of financial ratios etc.

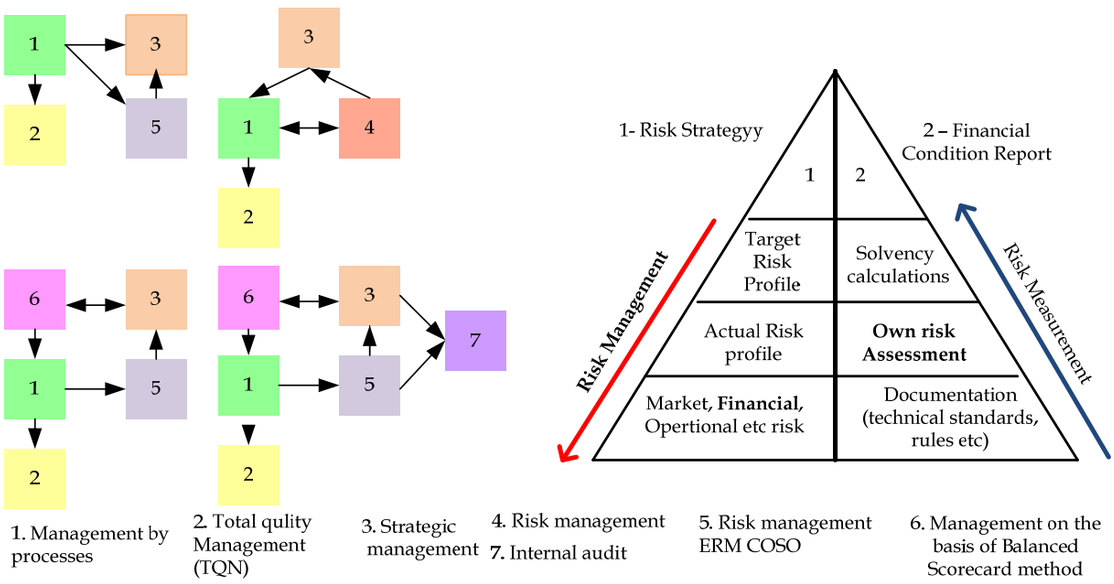


Fig. 2. Elements of the creation of risk management integral system in enterprises in the non-financial sphere

3. Brief review of using a system of financial ratios and models of risks assessment

In this section we discuss the issues of the development of the system of financial rations with a view to the initial point of the development of the techniques of financial risks assessment. We will review the work of Altman (1968) and Ohlson (1980) as well as other articles using discriminant analysis and logistic regression. An evaluation of classical models, such as MDA, in nine countries in Eastern Europe will be at the end of this section.

3.1 Development of financial ratios as an instrument of financial risk assessment

Usage of financial ratios to analyse the activities of an enterprise started a century ago. The history of creating a ratio analysis can be considered as the history of the development of methods of financial risks assessment for the participants in the financial and non-financial sectors of the economy. It is possible to single out three periods in the development of the methods of financial risks assessment: initial stage (from 1891 to 1960), establishment (1960-2000) and improvement (from 2000 to present). This periodisation is conventional but may differ from the periodisation of other authors (Belovary, Giacomino & Akers, 2007).

The key trend of the research during the initial stage was to find financial ratios that could give predictions of an enterprise's solvency and bankruptcy in due time. In 1891 a liquidity coefficient was used for the first time. The name of the founder of the liquidity coefficient is

not known but at present the liquidity coefficient and its normative values are used to assess liquidity risk in the short-term.

Crises periods in history are closely connected with the history of the development of ratio analysis. For instance, in 1905 there already existed a system of financial ratios (ten ratios, the author – James Cannon), in 1917 a system of normative values for financial ratios was created (the author - William Laugh) and in 1919 the dependence of an enterprise on its branches was studied and established (see Horrigan, 1968; Anjum, 2010).

Normative values of financial ratios in assessing financial risk serve as indicators for quantitative assessment of separate types of risks and are helpful in establishing a map of financial risk. The existence of differences in the value of financial ratios relating to branches supposes the necessity to track and collate indicators with average branch values. The data on average branch indicators are produced by statistical bodies and credit institutions.

R. Smith was one of the first researchers who in 1930 mentioned some financial ratios that testify to the solvency and financial problems of an enterprise. Smith studied different ratios of 29 bankrupt enterprises over ten years. Financial ratios were compared with the previous period indicators and their change trends were analysed compared with financial situations and changes in economic activities results.

Eight ratios were selected from the object of the research which, according to Smith, characterised the probability of bankruptcy. All these ratios were subdivided into two groups. Further R. Smith and A.H. Winakor (1935) (see Horrigan, 1968) carried out much broader research analysing the financial ratios of 183 bankrupt enterprises and the trends of their change. The findings of the study do not differ substantially from Smith's previous research. Many years later J.O. Horrigan (1968) came to the conclusion that Smith's method can be considered as the first attempt to use scientifically grounded methods to predict possible bankrupts and this is an important step in the development of financial analysis. Merwin's study (1942) can be viewed as the main turning point in the development of financial analysis. He reported that when comparing successful firms with failing ones, the failing firms displayed signs of weakness as early as four or five years before failure (Bellovary et al., 2007). Merwin (1942) found three ratios that were significant indicators of business failure - net working capital to total assets, the current ratio and net worth to total debt.

3.2 Classic models of assessment: For and against

Starting from the 1960s and 1970s the models of the assessment of enterprise insolvency risks were created. In 1962 Jackendoff researched the correlation of profitable and unprofitable firms. On the basis of his research Jackendoff came to the conclusion that the two correlations are the following highly profitable firms: ratio of current liquidity and net working capital to general assets. Moreover, profitable firms had lower debt-to-worth ratios than unprofitable firms. During that period models were created, named Z-assessment functions, which make it possible to carry out the assessment of future risks of company bankruptcy. These models were developed by using different methods - multiple discriminate analysis (MDA), logit analysis, the WILCOX method and others. These models are also used to assess creditworthiness and carry out a comparative analysis of different subjects. The first models were developed by using MDA. The founders of these models are W.H. Beaver (1967) and E.I. Altman (1968). From the period of the emergence of bankruptcy

prediction models they have been subject to continuous analyses and critiques. These critical remarks boil down to the following:

- models do not take into account the seasonal factor and cyclic trends of the economy;
- models are developed on the basis of selection of an enterprise which is not always representative;
- models were developed on the sample of the statistical data of enterprises, representing a certain sector of the country's economy, but it is supposed to be used for other countries' enterprises.

Many studies (e.g. Bellovary et al., 2007) have shown limitations of practical application and the question is: "Why do we continue to develop new and different models for bankruptcy prediction?" The answer to the question is hidden in the desire to develop models with higher intellectual capacity at the expense of the increase of the number of indicators numbers. An increase of the number of indicators incorporated into the model of enterprise bankruptcy prediction does not mean an increase of its usefulness (Jones, 1987). The research by J. Bellovary et al. (2007) introduces convincing proof that the MDA type models have a relatively high accuracy of bankruptcy prediction (from the lowest - 32 % to 92% accuracy). The authors of bibliometric research (Genrih & Voronova, 2011) also confirm the conclusion about relatively high reliability of MDA type models.

A conducted analysis of the application of classic models of the MDA type demonstrated that Altman's models (1968, 1977, 2004, 2006 and 2010) and H. Fulmer's model are well known in different countries and many researchers carry out the monitoring of these models. Research by J. Mackavičus and A. Rakštelienė (2005) focuses on the application of Altman's models to predict company bankruptcy in Lithuania. Research by A. Stunžienė and V. Boguslauskas (2006) revealed that Altman's method, when applied to 56 Lithuanian joint stock companies, produced considerable errors. Research by R. Šneidere (2009) and Genriha & Voronova (2010) was undertaken according to the MDA type models and the monitoring of these models was carried out in Latvia. According to the data by P. Antonowicz (2007), monitoring of the application of 16 models of foreign authors in Poland demonstrated that models by Altman (1968, 1984) and Altman & Lavallee (1981) are placed within the framework of the best six models.

Table 1 gives the results of the analysis of the application and monitoring of four classic MDA type models in nine countries of East Europe conducted by the author. The findings express the author's personal opinion which is based on the bibliographic research of the sources of information.

During numerous studies (e.g. Belovary, 2007) of the models W.H. Beaver and E.I. Altman determined a number of substantial drawbacks. The most significant of these refer to the existence of the so-called "uncertainty zone" in the areas of decision-making. As a result, specialists in the field of financial management (in the first turn banking sector) completely refused to use the models of bankruptcy risk assessment, based on discriminant analysis, and began to pay more attention to other, more modern econometric tools, mainly the so-called logit models.

A number of researchers, in particular C. Lennox (1999), stated that in practice logit models enable more effective assessments of bankruptcy risks than can be provided theoretically by MDA. Moreover, the usage of logit regression model supposes wide opportunities for

Model	Model type and interpretation of results. Assessment of bankruptcy threat level	Country								
		1	2	3	4	5	6	7	8	9
Altman model (1968) public manufacturing companies	$Z = 1.2 \cdot WC / TA + 1.4 \cdot RE / TA +$ $+3.3 \cdot EBIT / TA + 0.6 \cdot MVE / TL + \cdot S / TA$ If $Z < 1.81$ a firm is not financially healthy and there is a high probability that it will go bankrupt within five years'; $1.81 < Z < 2.99$ - the "grey zone" – the area where companies are free of bankruptcy risk; If $Z > 2.99$ it concerns a completely financially healthy firm.	+/−	+/−	+/−	+/−	+/+	+/−	+/−	+/−	+/−
Altman Z' model (1983) for private companies (manufacturing)	$Z' = 0.717 \cdot WC / TA + 0.847 \cdot RE / TA +$ $+3.107 \cdot EBIT / TA + 0.420 \cdot OC / TL +$ $+0.998 \cdot S / TA$ If $Z^I > 1.23$ bankruptcy is not likely; if $1.23 < Z^I < 2.90$ - bankruptcy cannot be predicted (grey area); if $Z^I > 2.9$ bankrupt cy is likely.	+/−	+/−	+/−	+/+	+/+	+/−	+/+	+/−	+/−
Altman Z'' model (1993) for private companies	$Z'' = 6.56 \cdot WC / TA + 3.26 \cdot RE / TA +$ $+6.72 \cdot EBIT / TA + 1.05 \cdot OC / TL$ If $Z'' > 2.6$ bankruptcy is not likely; if 1.1< $Z'' < 2.6$ - bankruptcy cannot be predicted (grey area); if $Z'' < 2.6$ bankruptcy is likely.	+/−	+/−	+/−	+/+	+/+	+/−	+/−	+/−	+/−
Fulmer's H model	$H = 5.528 \cdot RE / TA + 0.212 \cdot S / TA +$ $+0.073 \cdot EBT / OC + 1.27 \cdot CF / TL -$ $-0.12 \cdot TL / TA + 2.335 \cdot CL / TA + 0.575 \cdot$ $\cdot Ln(TA) + 1.08 \cdot WC / TL + 0.894 \cdot$ $\cdot Ln(EBIT / I) - 6.075$ If $H > 0$ very low chance of bankruptcy; $H = 0$ critical point; If $H < 0$ - very large probability of bankruptcy.	−/−	−/−	−/−	−/−	+/+	−/−	−/−	+/−	−/−

Table 1. Assessment of the application of classic models of MDA type

Symbols adopted for table 1: CL - current liability; EBT - earnings before taxes; $EBIT$ - earnings before interest and taxes; I - interest; MVE – market value of equity; OC - own capital; RE - retained earnings; S – sales; STL - short-term liability; TA –total assets; TL - total liability; WC – working capital. 1 – Belarus; 2 – Estonia; 3 – Czech Republic; 4 - Poland; 5 – Latvia; 6 – Lithuania; 7 - Romania; 8 – Russia; 9 – Ukraine. In the numerator is indicated -if model is used (+) and if it is not used (-). In the denominator is indicated - if this model monitoring is conducted(+) and if it is not conducted (-) (carried out by the author according to the results of the given list of literature).

implementing manifold econometric tests, which make it possible to assess statistical value for both the model as a whole and the separate variables which form it. In addition, unlike

MDA, logit regression enables not only coming to a conclusion relating to the group of potential bankrupts (which testifies to the limits of the interpretation of the results of the accounts while using the models built on the basis of MDA) but also to assess enterprise bankruptcy risk on the quantitative scale.

A critique of Altman's models was undertaken in the works by Shumway (2001) and Chavan and Jarrow (2004) who employed a discrete hazard model or multiperiod dynamic logit model. These authors' hazard models were developed on the basis of the data of joint stock companies which are listed on NYSE, AMEX and NASDAQ stock exchanges. Their models have higher trustworthiness of bankruptcy prediction results than the simpler logit model.

Enterprises are more likely to default if they are less profitable and less liquid. It is banks that initiated the development of default models because they made use of the advantages of possessing a clients' base and developed these models in compliance with the requirements of the institutions that have supervision responsibilities over financial markets. Default modelling helps identify factors that influence the ability of enterprises to pay back borrowed money. Loan default is closely related to enterprise bankruptcy.

There are three features of the logit model: identify enterprise characteristics that determine financial health accounting ratios of the enterprise, identify appropriate weights to combine these factors into a single measure of financial health of the enterprise and this single measure of financial health is then mapped into a probability of default (PD). Publically available logit models are presented in table A1 (see appendix).

3.3 Adapted models: Experience of East European countries

When selecting models which allow carrying out an assessment of any impending crisis at an enterprise leading to insolvency/bankruptcy, it is recommended to use as a guideline already developed models of predicting bankruptcy, taking into account the conditions of specific country. Starting from the 1990s many East European countries saw a boom in adopting or/and creating models of enterprise insolvency/bankruptcy.

In tables A2, A3 and A4 the author introduced the summary of the models, mostly spread over nine countries of East Europe (see appendix). It is necessary to rely on the results of the tests about verification of accuracy/validity of the findings as a result of the usage of these models. These models can be used to assess their own enterprise financial risks, competitors' risks or business partners both in their own country and also foreign countries which eventually ensure the enterprise assessment and risk management. As a rule, all the given models (tables A2, A3 and A4) comprise publically accessible indicators. tables A2, A3 and A4 introduce the most popular models of discriminant type, making it possible to assess the existence/development of insolvency/bankruptcy risk in East European countries.

Model monitoring is employed in many countries, for example, Poland, Latvia un Russia (Antomowicz, 2007, 2011; Sneidere, 2007; Genriha&Voronova, 2010; Alekseeva, 2011). According to the data by Antonowicz (2007) over 34 models of Z score type were developed and monitored in Poland, whose range of accuracy is from 95% to 57%. Regardless of the great practical value of the assessment of enterprise insolvency/bankruptcy risk, the majority of studies conducted recently are of economic character and do not possess a revolutionary feature which was characteristic of the works by Altman and Ohlson.

The process of the development of discriminant models related to separate branches/regions can be used for individual countries. This trend is especially topical with reference to Russia and Ukraine (see table A3). For example, the static and dynamic models of the assessment of chemical and oil chemical enterprises' stability (Russia, Kramin T.V., 2003), bankruptcy risk of medium-sized enterprises of the printing and publishing industry (Russia, Leo Xao Suan, 1999), six-factor model of predicting the risk of losing solvency for the non-ferrous industry (Russia, Vishnjakov Ja., 2000) and two models of SNEs predicting bankruptcy (Lugovskaya, 2010). The treatment of the problem of bankruptcy assessment of Russian small enterprises was expressed in the works of detective A.E. Krioni (2009). In our opinion, this study causes some interest. He suggested using a financial integrity index instead of discriminant models. We argue that by creating an integrity index Krioni made a logical mistake in the denominator of the formula which may be removed by introducing a discounted capital value for the number of years of the enterprise's existence.

Besides the models, adapted to the conditions of Ukraine (shown in table A3), it is worth mentioning the model of the financial state of food and agricultural industry enterprises used by O.A. Smetanjuk (2007) and A.V. Chupis(1999) (. Among the works, highlighting the assessment of bankruptcy in Ukrainian enterprises the model developed by E.M. Andrushaka deserves special attention. This model (Andrushaka, 2004) can be considered as a hybrid model with elements of the taxonometric approach. In compliance with the accounting algorithm, an integral indicator of enterprise bankruptcy (Z) is determined

$$Z = \sqrt{\sum_{i=1}^{n} (1 - N_i)^2 \, sign(1 - N_i)} = \sqrt{U} \tag{1}$$

where

N_i - relation of the i indicator financial state to its normative value;
n - a number of indicators (in this model $n = 3$);
N_1 -a ratio of absolute liquidity divided by its normative value which equals 0.2;
N_2 - a ratio of own capital concentration divided by its normative value which equals 0.5;
N_3 - an indicator of own capital profitability, divided by its normative value which equals $0.1 + 1.1 \cdot b^3$ and b is annual inflation rate.

This model allows the calculation of Z on the basis of the value of the deviations of relevant indicators from normative ones. Deviations best side should reduce an indicator Z and at worst side increase it. The relationship described by equation (2) helps determine this signal:

$$sign(x) = \begin{cases} 1, X > 0 \\ 0, X = 0 \\ -1, X < 0 \end{cases} \tag{2}$$

When all indicators N_i are on the normative level and better than it, $Z = 0$, if $\sum_{i=1}^{n} (1 - N_i)^2 \, sign(1 - N_i) < 0$ then it is assumed that $U = 0$. The higher value of Z means the higher probability of bankruptcy.

Development of the model's insolvency/bankruptcy assessment was not so widespread in Estonia and Latvia (table A4). As for Lithuania, the number of developed discriminant models

has been greater than in Estonia and Latvia, but they developed on a small statistical base and appropriate monitoring of accuracy of the employed models is not executed (table A4).

4. Composite instruments of the assessment of enterprise financial risks

In this section we will review the methods of risk assessment related to composite measure expanding upon the Tamari approach (1966) that are widespread in the Russian and German speaking countries. We also offer for usage the analysis of financial risks on the basis of the principles of the analysis of the balance sheet of enterprise economic turnover and the system of express tests of financial risks assessment for enterprises being at different stages of life cycle. Finally the chapter will provide a case study of risk occurrence reasons.

4.1 Composite measure of risk management

The third chapter is devoted to the analysis of the possibility of using classic and adopted models of financial risk assessment developed on the bases of multivariate discriminant analysis and conditional probability models. However, in our opinion, there are some other instruments of financial risk assessments which can also be more widely employed for these objectives. It is possible among the methods of financial risks assessment related to the composite measure group to single out firstly the risk index model introduced by Tamari (1966) and later extended by Moses and Liao (1987). A well known technique of detecting a crisis situation was developed by L.V. Doncova and N.A. Nikiforova (2009), with the changes introduced by G.V. Savickaja (2009), which can be used for identifying financial risks. The given technique is similar to Duran's technique by using the principles of creation, rather it is based on the score evaluation of six indicators than three indicators. The given models are static in the sense that they reflect the results of the previous period and to a large extent are more valid for a current assessment than for prediction of financial risk.

To assess insolvency risk cash flow is used rather rarely (Bellovary et al., 2007). There are different opinions on whether cash flow information can be used to predict the bankruptcy of a company. Some researchers (e.g. Zavgren, 1983; Watson, 1996) come to the conclusion that cash flow does not have sufficient proof in bankruptcy assessment, while others (e.g. Beaver, 1966; Aziz & Lawson, 1989; Foster & Ward, 1997; Sharma, 2001) prove the validity of using cash flow analysis in bankruptcy prediction. That is why it is worth noting the Quick Test (Peter Kralicek, 1990) being a one-dimensional test and used in German-speaking countries. The assessment of an enterprise's financial state is carried out on the basis of four indicators (stability, liquidity, profit/loss and profitability). Based on results of indicators, points are assigned. The final resulting value is the determined as a simple arithmetic mean of the points obtained for individual indicators. To determine two indicators the Quick Test is used on cash flow that in our opinion can contribute to the extension of an enterprise's possibilities in prediction of financial risk. The application of Kralicek's Quick Test (Kralicek, 1993) is expedient in dynamics to track the development trends.

The author's practical experience demonstrates that by using tests to discover financial risks, it is possible to employ Duran's technique (Voronova & Romancevičа, 2005). The given technique is based on the creation of integral value, applying the summing up of three main indicators characterising enterprise solvency with certain meaningful coefficients and further enterprise shifts from the first to the fifth classes: 1st class – an enterprise with good financial stability reserves, secure debt recovery; 2nd class – an enterprise with a steady level of debt risk

not yet considered as problematic; 3rd class – problematic enterprise the financial state of which can be estimated as average. There is weakness of individual indicators; 4th class – an enterprise with an unstable financial state; 5th class – an enterprise with a critical financial state. The enterprise is completely unstable from the financial point of view and is loss-making.

Name of Indicators		Class Limits Appropriate Criteria				
		Class 1	Class 2	Class 3	Class 4	Class 5
Capital profitability	%	>30	29.9-20	19.9-10	9.9-1	<1
	point	50	49.9-35	34.9- 20	19.9-5	0
Liquidity ratio	value	>2.0	1.99-1.7	1.69-1.4	1.39-1.1	<1
	point	30	29.9-20	19.9-10	9.9-0	0
Financial independence ratio	value	>0.7	0.69-0.45	0.44-0.3	0.29-0.2	<0.2
	point	20	19.9-10	9.9-5	5-1	0
Class limits	point	100	99,9-65	64-35	34-0	0
Characteristic of an enterprise according to the risk level		below the accep-table risk	acceptable risk	high level risk	level risk of bankruptcy	actually insolvent

Table 2. Enterprise classification classes according to the level of solvency

Table 2 reflects the necessary indicators, scores and class limits of the appropriate criteria according to solvency level. Rating number (B) is determined as a sum of scores on each indicator $B(R_i)$. Determination of scores on a separate indicator is fulfilled by the method of linear interpolation. Linear interpolation (Meijering, 2002) is the simplest method of getting values at positions in between the data points, according to the following formula:

$$B(R_i) = B_{i\min} + \frac{B_{i\max} - B_{i\min}}{R_{i\max} - R_{i\min}} \cdot (R_i - R_{i\max}) \tag{3}$$

where

$B_{i\max}, B_{i\min}$ - being at positions in between the data points of a certain class;
$R_{i\max}, R_{i\min}$ - an interval of an indicator's value relevant to a certain class of i indicators.

The benefit of the introduced method is simplicity which allows this method to be applied as a constituent part of the test for evaluating enterprise solvency risk. For example, under the leadership of the author from 2005 to 2010 Duran's technique was used more than 300 times for express assessment of the financial risk of Latvian enterprises. In two cases the evaluated results did not conform to reality and the express analysis had to be supplemented with a deeper analysis of the stability of industrial activity.

4.2 Review of the financial stability indicators for risk assessment

The author considers it possible to implement express analysis of financial risks on the basis of the principles of the analysis of the balance sheet of enterprise economic turnover. The methodology was developed by M.S. Abrjutina and A.V. Grachev (1998) for the purpose of

defining the critical point in the field of steady equilibrium in the system of structural ratios of equity and loan capital of an enterprise. N. Lace and Z. Sundukova (2010) researched different approaches for the evaluation of the level of financial stability including the evaluation of financial stability suggested by M. S. Abrjutina and A.V. Grachev (1998). The authors (Lace & Sundukova, 2010) came to the conclusion that the classification and structure of assets, as well as the financial policy of an enterprise, can be the most important factors for the evaluation of financial stability.

The given results confirm the fact that the concept of economic turnover balance sheet (ETB) is acceptable for the assessment of second level financial risks. Practical research on the sample of six Latvian branches (in terms of small, medium and large enterprises and a branch as a whole) in defining actual and sufficient ratios for financial stability indicators (current liquidity ratio and owner equity to total assets ratio) were executed by N. Lace and Z. Sundukova (2010).

Express assessment of financial risks can be fulfilled using the same methods which are applied for assessing enterprise financial soundness. Let us consider the methods of express analysis of financial risks, based on the analysis of the net assets value (NAV) and the principles of the analysis of an enterprise's ETB.

Assessment of enterprise financial soundness on the basis of NAV supposes the comparison of NAV with company capital (CC) and its minimum value ($CC_{\min}$) in compliance with the law, regulating the registration right of an enterprise. The following variants of NAV ratios CC and outcomes from the given comparisons are possible: NAV>CC- normal situation at an enterprise, financial risks are under control; NAV=CC – situation is critical, it is necessary to carry out the analysis of the financial situation, separate kinds of financial risks cause fears; NAV<CC, NAV> $CC_{\min}$ – situation is critical, eating away of own capital is evident. What is required is deep analysis of financial state. Introduction of anti-crisis management into operation is desirable, many kinds of financial risks cause fears. NAV< $CC_{\min}$ - crisis situation, extraordinary increase of own capital, threat of insolvency, pessimistic development of the scenario of enterprise existence threatening its winding up. NAV=0 and NAV<CC<0 – crisis state, own capital is used up inefficiently, the enterprise should be liquidated.

These six different situations have been considered and a diagnosis has been stated. Each diagnosis requires making certain managerial decisions for decreasing risks, having their own specifics for individual countries. This finding related to Russia can be found in the study by V. M. Voronina (2007). The technique ETB is based on the principle of national accounts. The construction of economic turnover balance sheet relies on the process of structuring enterprise property and combining enterprise property and the structure of enterprise assets with the capital structure.

This concept is based on the division of assets (A) of an enterprise into financial (FA) and non-financial assets (NFA). In its turn, financial assets are divided into mobile (MFA)[1] and non-mobile (NMFA)[2]. Non-financial assets are divided into long-term non-financial assets

[1]Mobile financial assets are highly liquid financial assets: cash and easily convertible short-term financial assets.

(LNFA)[3] and current non-financial assets (CNFA) (including inventories).

According to Abrjutina & Grachev (1999) the concept of financial balance and stability is reached, in the case of non-financial assets they are financed at the expense of own capital (OC), whereas financial assets - at the expense of debt capital (DC). The main principles of the technique are as follows:

1. Structuring of accounting balance sheet, separating economically homogeneous elements into assets and liabilities:

$$A = FA + NFA = (MFA + NMFA) + (LNFA + CNFA) \tag{4}$$

$$C = OC + DC \tag{5}$$

Table 3 shows classification of assets.

Classification of assets by operating cycle time				Classification of property by form			
Assets	Non-financial assets	Financial assets	In total	Property (*P*)	Own	Debt	In total
Non-Current (*N*)	*NNA*	*NFA*	*NCA*	Non – monetary form	OC_{NMF}	DC_{NMF}	$P - CFA$
Current (*C*)	*CNA*	*CFA*	*CA*	Monetary form	OC_{MF}	DC_{MF}	*CFA*
In total	*NFA*	*FA*	*A*	In total	*OC*	*DC*	*P*

Table 3. Classification of assets/property by operating cycle time and by form

Current assets (CA) can be divided into own current assets (OCA) and debt current assets (DCA). Own current assets (OCA) are provided by a part of own capital (OC), but debt current assets (DCA) are provided by entire debt capital (DC). Own current assets, being financed at the expense of own capital, are called working capital (WC):

$$WC = CA - CL \tag{6}$$

An enterprise with negative working capital may lack the funds necessary for growth and is in a state of instability.

2. Determination of the indicator of financial and economic stability (IFS):

$$IFS = OC - NA \tag{7}$$

$$IFS = FA - DC \tag{8}$$

Creation of three-positional static scale (see table 4).

The given scale is simple, but it does not exclude the possibility of deepening (but simultaneously complicating) the analysis as well as determining *FIS* in dynamics.

[2]Non-mobile assets comprise long-term assets, all kinds of accounts receivable and quick deposits.

[3]Including fixed assets, intangible assets, incomplete construction.

3. After further division of assets into subgroups it is possible to single out five different variants of the state of enterprise stability (see table 5).

The author supplemented these characteristics of stability with risk scale. According to the research by Abrjutina & Grachev (1998) the number of complex characteristics accounts for 340 combinations of shifts. The research of all types of shifts from one level of the state of enterprise stability to another over the analysed periods is not expedient while using ETB as a method of express diagnosis.

4. Conducting positioning of the state of financial stability on the map of financial stability (see fig. 3).
5. Creation of dynamic scale of financial stability.

The risk zone is characterised by the lack of own funds including those in monetary terms. A larger part of enterprise property is borrowed. To leave the risk zone what is required is growth of own capital, introduction of the plan of economical usage of own monetary funds and costs reduction. The financial strain zone is a zone of relative financial stability and welfare.

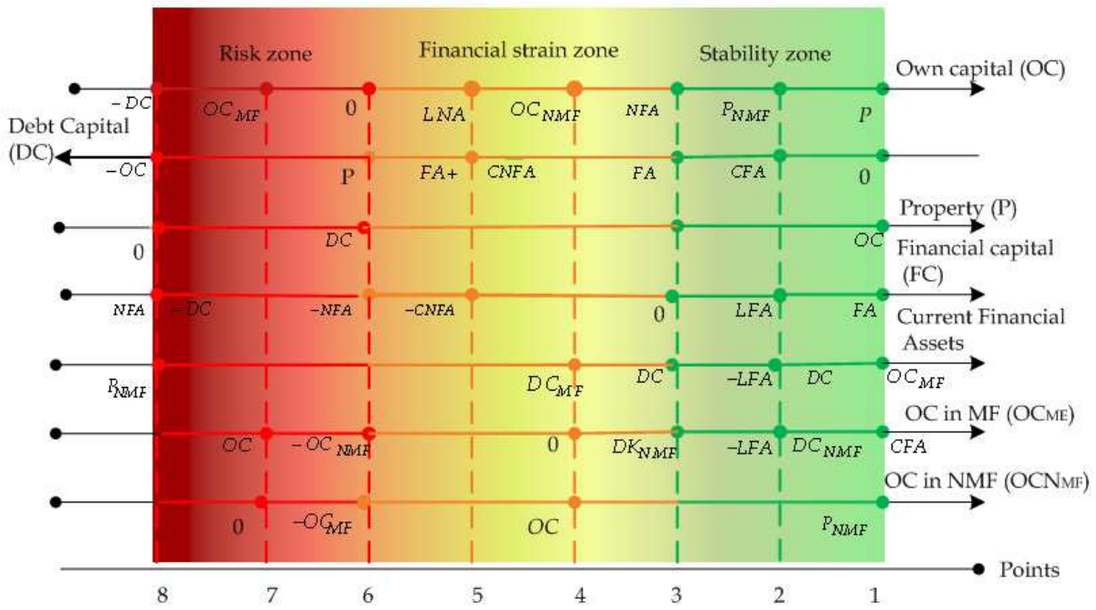
Variants of the state of enterprise stability	Value of indicator *FIS*	Evaluation of own capital	Evaluation of debt capital
State of stability	$FIS > 0$	$OC > NSFA$	$DC > FA$
State of equilibrium	$FIS = 0$	$OC = NSFA$	$DC = FA$
State of uncertainty	$FIS < 0$	$OC < NSFA$	$DC < FA$

Table 4. Static (main) scale of financial-economic stability of an enterprise

Characteristics of variants	Name		Characteristics of financial risk level of	
			risk	influence
Mobile financial assets exceed other liabilities	Super stability (absolute solvency)	Stability	Not substantial	Not significant
Mobile financial assets are less than all the other liabilities, but the amount of all financial assets is bigger than all the other liabilities	Sufficient stability (solvency guaranteed)		Little value	Not significant
Own capital is equal to non-financial assets, but financial assets are equal to all liabilities	Financial balance (lack of stability margin)		Moderate	Justified
Own capital is more than long-term financial assets, but less than all the amount of non-financial assets	Admissible financial strain (potential solvency)	Instability	Sensitive	Not accessible
Own capital is less than long-term non-financial assets	Risk zone (loss of solvency)		Critical	Not accessible

Table 5. Variants of financial state stability and risk of enterprise (Abrjutina & Grachev with the author's supplements)

Enterprise own capital is used to finance long-term non-financial assets but not sufficiently. Financial capital has a negative value and own monetary funds appear only by approaching the financial equilibrium point. It is necessary to undertake operative planning of cash flow usage, improve the work in the field of strategic planning and introduce changes to the enterprise marketing policy.



1 – super stability point; 2 - point of sufficient stability; 3 - point of financial equilibrium; 4 - point of stability loss; 5 - point of insufficient stability; 6- instability point; 7- risk point; 8 - bankruptcy point.

Fig. 3. Map of financial stability

4.3 A system of tests for determining financial risks for enterprises being at different stages of life cycle

Based on the studies of the origin and application of financial ratios for assessing financial risks described in chapter 3, we can come to the conclusion that the application of financial ratios to analyse financial risks in general brings good results.

However, the length of the life cycle of an enterprise for different countries in various branches differs. The theory of economic cycles has been known for over 2,500 years. The most recognised cycles are those proposed by N. Kondratjev and Kutchin with a length of three to five years concerned with a relative value of material resource reserves at enterprises, the Dzagler cycles, lasting seven to ten years occurring as a result of the interaction of different credit-monetary factors and the S. Kuznet cycles with a length of around 29 years, resulting from the terms of reproduction in building (Dagum,2010). The problems of risk and business cycles are investigated by Cower (2003), the issues of financing procedures in the framework of business cycle theory are covered by Mallick (2008) within six and 11-16 years. The link between credit risk and cyclical processes in the economy was researched by Koopman and Lucas (2003). However, the given research related to macroeconomic models of default assessment and does not allow for assessing the default of a certain borrower.

Most authors, for example Kislingerová (2004), mention that those phases of corporate life cycle can be identified according to the value of cash flow. According to the model by Reiners (2004) there are in total 16 combinations of phases of corporate and market life cycle. Different researchers (Shorokova, 2006), emphasise various sets of characteristics unique to each stage of their models.

Based on the research of entrepreneurial cycles (Dagum,2010; Korotayev & Trirel, 2010) we offer some practical recommendations – before starting to research a risk system it is recommended to position an enterprise according to the age scale of enterprise risk 5-6, 11, 16-17, 22, 45-67 … years[4]. An attentive reader may come to the practical conclusion, why planning with horizon of 5 years is used.

However, regardless of the number of stages (Shorokova, 2006), there are some commonalities in their conclusions. Firstly, the model stages are sequential. Secondly, each stage is a result of the previous one and is difficult to revert. Thirdly, all models consider a wide range of contextual organisations. To analyse risks the author uses three-stage models of life cycle of an enterprise. At the start-up stage an enterprise from the point of view of financial risk is more prone to the impact of external factors. Taking into account that an enterprise can control only internal factors at this stage it is required to control a share of loan capital, profitability of main activity and liquidity indicators. However, because of instability of stability indicators at a given stage, further factors are the indicators of the efficiency of the main activity of the enterprise: volume of sales, production, cost value. It is important to assess their dynamics. Depending on the change in dynamics of profit from sales and cost value, the level of financial risk will be determined (see Table 6).

Level of financial risk	Evaluation indexes		
	Fixed assets cove rage ratio *FACR*	Dynamics of indexes	
		Profit from sales	Cost value per unit
Minimum	$FACR \geq 1$	$P_p(t) = P_p(0) + at$	$I_p(t) = I_p(0) - at$
Moderate	$FACR \geq 1$	$P_p(t) = P_p(0) + at$	$I_p(t) = I_p(0) + at$
High	$FACR \leq 1$	$P_p(t) = P_p(0) - at$	$I_p(t) = I_p(0) - at$
Situation of occurrence of financial risk	$FACR \leq 1$	$P_p(t) = P_p(0) - at$	$I_p(t) = I_p(0) + at$

Table 6. Determination of the level of financial risk of an enterprise at the start-up stage

At the stage of the assessment of the risk of enterprises being at the start-up stage in addition to the above – it is necessary to take into consideration the condition of financial stability of an enterprise in operation. At the expansion stage, a rapid increase in profit and stabilisation of financial indicators in relation to own and loan capital occurs. The profit is considered as fast growing dynamics of indicators. It is possible to assess the level of financial risk of an enterprise at this stage on indicators of relationship between own and loan capital. The profit is viewed as fast growing, dynamics of volume of sales is positive (see table 7). At the maturity stage an enterprise operates in full swing, the indicators are stable but due to increasing competition and wearing out of capital it may shift to the

[4]For example, in autogenetics it is possible to determine critical points on the age scale of enterprise risk with more precision. We find it possible to use astrogenetics for this purpose (Budjashkina, 2003, 2003a).

decline stage. In this case it is necessary to control the volume of sales and the turnover of assets will testify to the reduction of competitiveness of production and increase in stock. At this stage it is not possible to judge the level of the financial risk of an enterprise according to the indicators of cost value and profits from sales. A state of renovation of assets may be introduced which can show the indicators, but it does not always mean the increase of the financial risk of an enterprise (see table 8).

Level of financial risk	Evaluation indexes			
	Fixed assets coverage ratio ($FACR$)	Borrowed and own capital ratio	Dynamics of indexes	
			Borrowed and own capital ratio	Financial leverage
Minimum	$FACR \geq 1$	$K_{boc} \leq 1$	$K_{boc}(t) = K_{boc}(0) - at$	$FL(t) = FL(0) + at$
Moderate	$FACR \geq 1$	$K_{boc} \geq 1$	$K_{boc}(t) = K_{boc}(0) - at$	$FL(t) = FL(0) - at$
	$FACR \geq 1$	$K_{boc} \leq 1$	$K_{boc}(t) = K_{boc}(0) + at$	$FL(t) = FL(0) - at$
High	$FACR \geq 1$	$K_{boc} \geq 1$	$K_{boc}(t) = K_{boc}(0) + at$	$FL(t) = FL(0) - at$
	$FACR < 1$	$K_{boc} \leq 1$	$K_{boc}(t) = K_{boc}(0) - at$	$FL(t) = FL(0) + at$
	$FACR \leq 1$	$K_{boc} \geq 1$	$K_{boc}(t) = K_{boc}(0) - at$	$FL(t) = FL(0) + at$
	$FACR \geq 1$	$K_{boc} \leq 1$	$K_{boc}(t) = K_{boc}(0) + at$	$FL(t) = FL(0) + at$
Situation of occurrence of financial risk	$FACR < 1$	$K_{boc} \geq 1$	$K_{boc}(t) = K_{boc}(0) + at$	$FL(t) = FL(0) + at$

Table 7. Determination of level of financial risk of an enterprise at the expansion stage

At the maturity stage the criteria of the level of financial risk assessment are the following dynamics of sales volume and working capital turnover. Methods of special coefficients are usually applied to discover financial risk by using publically available information. To investigate the causes of insolvency it is common practice to mention the following combinations of two reasons: small value of own capital and loss-making activities as well as changes in the market and loss-making activities.

Level of financial risk	Evaluation indexes		
	Fixed assets coverage ratio (FACR)	Dynamics of indexes	
		Net turnover(NT)	Turnover of circulating assets
Minimum	$FACR \geq 1$	$NT(t) > NT(0)$ [5]	$K_a(t) > K_a(0)$
Moderate	$FACR \geq 1$	$NT(t) > NT(0)$	$K_a(t) < K_a(0)$
High	$FACR \leq 1$	$NT(t) < NT(0)$ [6]	$K_a(t) > K_a(0)$
Situation of occurrence of financial risk	$FACR < 1$	$NT(t) < NT(0)$	$K_a(t) < K_a(0)$

Table 8. Determination of the level of financial risk of an enterprise at the maturity stage

[5] $NT(t) = NT(0) + at$

[6] $NT(t) = NT(0) - at$

4.4 Case study of the risk occurrence reasons

To manage financial risks it is not enough to assess them by using the instruments of financial analysis. It is necessary to probe into the reasons for risk occurrence and employ opportunities for removing/decreasing the impact of these reasons within the financial state of an enterprise. BPEST, SWOT and E-SWOT analyses are recommended in order to identify the role of financial problems in the system of strengths and weaknesses of an enterprise. Expert methods of financial risks assessment and the reasons for their occurrence are especially useful in cases of the shortage of necessary information and the involvement of enterprise personnel into the process of risk assessment. Incorporation of large numbers of employees at the stage of identification, description and risk assessment is an important step in the creation of the system of risk management. To apply an expert method we recommend using scales of the assessment of the value of the reasons of risk development (or value of risk types) and the occurrence of risk possibility assessment in scores or in terms of probability.

Assessments of the value of reasons/types of risks can be conducted by using a score scale (for example ten score). If the reasons/risks can be sorted out in decreasing scale then in order to find the coefficient of significance it is possible to use Fishburn's formula (9) (Fishburn 1970; Baron & Barrett 1996; Potapov & Evstafjeva 2008):

$$w_i = \frac{2 \cdot (m - i + 1)}{(m + 1) \cdot m} \tag{9}$$

where
m -a number of reasons/risks in a group;
i – an ordinal number of reason/risk in a group.

If the reasons/risks have equal value, then the significance coefficient is identified according to the formula:

$$w_i = 1/m \tag{10}$$

To define the probability of the occurrence of the certain risk types/reasons we can assume as a basis the following distribution of probabilities (p_i): low risk 0 – 0.25; moderate risks 0.26 – 0.4, high risk 0.41 - 0.7 and critical risk 0.71 - 1.0.

Table 9 gives an example (conventional) of the assessment of the reasons of the occurrence of enterprise liquidity risks. The given example illustrates the possibility of using an expert method for the analysis and quantitative assessment of the reasons of financial risks occurrence.

Identification of the possibility of risk occurrence is carried out according to the formula (11)

$$R_i = \sum_{i}^{n} w_i \cdot p_i \tag{11}$$

By engaging several experts assessment is conducted either on the basis of all experts' collective opinion or on the basis of individual assessment.

The results of the individual experts' assessments are summarised taking into account coefficients of expert competence, then is determined coefficient of concordance of experts' opinions and is carried out the concordances test analysis.

Reasons of the origin of liquidity risk (R_{li})	Range	w_i	p_i	$w_i \cdot p_i$
R_{l1} Irrational usage of fixed assts				0.144
R_{l11} Presence of large amounts of non-used equipment	8	0.04	0.6	0.024
R_{l12} Presence of spare areas	4	0.13	0.5	0.065
R_{l13} Possible losses at the process of realisation of the investment object due to changes in its quality assessment	5	0.11	0.5	0.055
R_{l2} Irrational management of working capital				0.172
R_{l21} Presence of super normative reserves of finished goods	1	0.2	0.4	0.08
R_{l22} Presence of super normative material reserves	2	0.18	0.5	0.09
R_{l23} Errors in the system of operational management of product shipment to customers	9	0.02	0.1	0.002
R_{l24} Inappropriate control over terms of payment for production	6	0.09	0.5	0.045
R_{l3} Operational risks. Problems with liquidity management				0.076
R_{l31} Absence of the system of internal audit of working capital accounts	3	0.16	0.3	0,048
Negligence of employees engaged in loading/unloading of production/materials	7	0.07	0.4	0.028
Assessment of the possibility of the occurrence of liquidity risk taking into account the reasons for risk origin - moderate risk				0.392

Table 9. Example of the assessment of the reasons of the occurrence of enterprise liquidity risk

If the number of reasons/types of risks is over ten then for the convenience of implementing an expert assessment they should be united in subgroups and a coefficient of groups' values should be determined according to the formula (9) with further convolution.

Financial risk management is an integral part of a complex system of enterprise risk management and financial risks should be positioned in the map of enterprise risk. As a result, by carrying out an assessment of financial risks it is necessary to use expert methods (assessment with the usage of the scale of the occurrence of an event and the severity of consequences). The introduced approach of risk assessment using the range of reasons/types of risk is supplemented by determining the priority of reasons/types of risk according to Fishburn's formula.

5. Discussion

A pessimistically oriented reader could come to the conclusion that if methods and models do not allow reaching an acceptable result and risk assessment, then they will not be evaluated if the supervisory bodies do not require assessment. Such a position is not in compliance with the idea of entrepreneurship i.e. making reasonable decisions in the circumstances of risk and uncertainty.

What about the way out? To use, for assessment, not a single model but a combination of models. A.Miller (2002), S. Kealhofer (2003), A. Boykova (2010) and many other researchers (whose position we also share) conducted the monitoring of developed models holding the same view.

Enterprise financial risks have different risk-forming factors which change in relation to the stage of enterprise life cycle. It is necessary to position an enterprise on a temporary risk scale and use different indicators for the assessment of financial risk level according to the stage of life cycle. Our test system of enterprise risks related to its location at the life cycle stage and can be developed for four to five stage cycles in the future.

As for small and medium-sized enterprises we recommend using express analysis methods such as Quick Tests and Duran's technique at the stage of the creation of a system of risk management, including financial risk management. The usage of these types of models allows assessing which risk zone an enterprise is located or will be located according to the results of plan indicators. The application of these methods does not require calculation of a great number of indicators (from four to eight). However, in order to use Kralicek's Quick Test we need information about cash flow which is not always accessible for public analysis. Application of Kralicek's Quick Test in express assessment of financial risks needs experimental checks with a view to specific economic conditions of the countries.

Research in selecting models of discriminant type, particularly in the Baltic countries, Ukraine and Russia, suitable for assessing financial risks of bankruptcy should be continued. It is necessary to monitor MDA type models more efficiently (not less than once in five years) to select the most viable models with a view to branch and country specifics.

6. Conclusions

The development of the system of managerial accounts and usage of a simplified conception enterprise economic turnover balance sheet (ETB) (as the first step to its implementation) is an instrument for both assessment and creation of a system of financial risk monitoring.

Based on the analysis of over 100 studies of the authors from nine countries the author chose those Z-score methods (see Appendices) which are more interesting. They were developed by means of representative selection of enterprises and are frequently mentioned/used for the purposes of the risk assessment of their own enterprises and business partners. We are not going to set the task of teaching how to build discriminant models, on the contrary – our goal is to provide information about sufficiently simple instruments of the second and third types of risk assessment (risk of financial stability loss, insolvency and bankruptcy) using official accountancy data and established financial ratios which have a long-standing history of practical utilisation.

The main principle of financial risk management of small and medium-sized enterprises is to plan and control their activities, using simple proven instruments but not rejecting new ones; in this way you will be able to manage the development of your business.

7. Appendices

Symbols adopted for tables 2, 3, 4 and 5: $A = TA$ - assets (total assets); AA - average assets; AAR - average account receivable; ATA - average level of total assets; BSP - balance sheet profit; C -cash; CA - current assets; C_b - cash and bank account; CF - cash flow; CL - current liabilities; CS - cost of sales; CR - rate loan repaid; C_u - customers; COA - costs of operation activity; $COGM$ - cost of goods sold; D - debt; D - debt capital; D_a - depreciation; D_u - duties; E - equity; $EBIT$ - earnings before interest and taxes; EMV -equity market value; FA -fixed assets; FU - funds provided by operations;

$FOWC$ - financial or onerous working capital; $FSTA$ - financial short term assets; $FINLEV$ - financial leverage; GP - gross profit; I - inventories; I_n - interest; IE - interest expense; IN – interest paid; L - liability (short- and long-term); TL - total liabilities; LTL - long- term liability; $\ln(E)$ - natural logarithm of an own capital of the enterprise; NCS - net credit sales; ND - net debt; NP - net profit; $NRS = NR = NS = NSR$ - net revenue from sales (net revenue, net sales, net sales revenue); NI - net income; NE - net earnings; $NPATI$ - net profit after tax and interest; NWC -net working capital; NP – net profit; NI - net income; NS - net sales; NT - net turnover; NI_t - net income for the most recent period; PBT - profit before tax; $NWKSA$ - needs of working capital; OC - own capital; OCA - own current assets; OCF - cash flow from operating cash flows; OE - operating expenses; $OSTL$ - onerous short term liabilities; OP - operating profit; OOC - other operating costs; OWC - owner's working capital; P - profit; P_o - overdue payable; PS - profit from sales; PBT - profit before tax; $PBIT$ - profit before interest and tax; QR - Quick ratio; T - turnover; TA - total assets; TC - total capital; TCA -total current assets; TL -total liabilities; TCL - total current liabilities; TD - total debt; TI -total income; TS - total sales R - revenue; Rr -refinancing rate; RS - return on sales(RS - revenues from sales); ROA - return of assets; ROE - return on equity; RTO -revenue from total operations; RP - retained profit; S - sales (net) (E-expected; B- breakeven); S_t - stocks; STD - short-term debtors; STL - short-term liabilities; T_A - growth rate of enterprise assets; T_E - growth rate of own capital of the enterprise; WC - working capital.

Model	Type of model
Logit-model Ohlson J (1980)	$P = \frac{1}{1+e^{y}}$ $\qquad CHIN = \frac{NI_t - NI_{t-1}}{\lvert NI_t\rvert + \lvert NI_{t-1}\rvert}$ $y = -1{,}32 - 0.407 \cdot SIZE - 6.03 \cdot TL/TA - 1.43 \cdot WC/TA + 0.076 \cdot CL/CA -$ $-1.72 \cdot OENEG - 2.37 \cdot NI/TA - 1.83 \cdot FU/TL - 0.285 \cdot INTVO - 0.521 \cdot CHIN$ $ZIZE = \log(\text{TA/GNP price-level index})$ $OENEG = \begin{cases} 1, if\ TL > TA \\ 0, if\ TL < TA \end{cases}$ $INTVO = \begin{cases} 1, if\ \text{NI} < 0\ \text{for the last two years} \\ 0, if\ \text{NI} > 0 \end{cases}$
Logit-model Begley J., et al. (1996)	$P = \frac{1}{1+e^{y}}$, $y = -1.249 - 0.211 \cdot SIZE - 2.262 \cdot TL/TA - 3.451 \cdot WC/TA - 0.293 \cdot CL/CA -$ $-0.907 \cdot OENEG + 1.080 \cdot NI/TA - 0.838 \cdot FU/TL - 1.266 \cdot INTVO -$ $-0.960 \cdot CHIN$
Logit-model Grigaravičiaus (2003)	$\Pr(1) = \frac{e^{-z}}{1+e^{z}}$; $\Pr(0) = \frac{1}{1+e^{z}}$; $Z = -0.762 + 0.003 \cdot CA/TL + 0.424 \cdot WC/TA - 0.06 \cdot TA/E + 0.22 \cdot E/CL -$ $-0.774 \cdot PBIT/TA + 6.842 \cdot ROA - 12.262 \cdot CS/NWC - 5.257 \cdot R/TA$
Logit-model Minussi J. et al. (2007)	$P = \frac{1}{1+e^{y}}$, $WOWKSA = FOWC/S$; $FOWC = FSTA - OSTL$; $y = -5.76 - 2.53 \cdot FOWKSA + 0.48 \cdot FINLEV - 0.17 \cdot EBIT/IE - 1.02 \cdot OWKSA -$ $-0.63 \cdot (CA - CL)/S$; $OWKSA = OWC/S$.

Logit – model Lukason (2006) trading companies

$$P = \frac{1}{1+e^{K}},$$

$$K = 0.123\ln(A) + 37.188 \cdot NP / AA + 0.006 \cdot TN / AAR \cdot +22.816 \cdot CF / S$$

Logit-model Haydarshina G.A. (2008)

$$C^{BR} = \frac{e^{y}}{1+e^{y}} \qquad y = \alpha_0 + \alpha_1 \cdot Corp\_age + \alpha_2 \cdot Cred + \alpha_3 \cdot CA / CL + +\alpha_4 \cdot EBIT /$$

$$/IE + \alpha_5 \cdot \ln(E) + \alpha_6 \cdot Rr + \alpha_7 \cdot \mathrm{Re}\,g + \alpha_8 \cdot ROA + \alpha_9 \cdot ROE + \alpha_{10} \cdot T\_E + \alpha_{11} T\_A$$

$$Corp\_age = \begin{cases} 0 \text{ - if an enterprise was established more than 10 years ago,} \\ 1 - \text{if an enterprise was established less than 10 years ago.} \end{cases}$$

$$Cred = \begin{cases} 0 - \textit{if credit history is positive,} \\ 1 - \text{ othewise.} \end{cases}$$

Ratio	Economic sector			Ratio	Economic sector		
	1	2	3		1	2	3
α_0	10.2137	30.7371	35.0326	α_7	-1.3698	-0.6913	-0.8023
α_1	0.0303	3.7033	4.1834	α_8	-6.3609	-5.0894	-8.4776
α_2	6.7543	8.9734	9.0817	α_9	-0.2833	-15.3882	-10.8005
α_3	-3.7093	-8.6711	-8.7792	α_{10}	2.5966	7.3667	7.1862
α_4	-1.5985	-7.0110	-8.5601	α_{11}	-7.3087	-20.0294	-22.7614
α_5	-0.5640	-1.6427	-1.6834	1 – industry; 2 – full and energy industry; 3 – trade.			
α_6	-0.1254	-0.1399	-0.4923				

$$\mathrm{Re}\,g = \begin{cases} 0 - \text{ if an enterprise is located in Moscow,} \\ 1 - \text{ if an enterprise is located in other regions of Russia.} \end{cases}$$

Characteristics of enterprise bankruptcy: If $0.8 < C^{BR} \le 1$ is maximum risk; if $0.6 < C^{BR} \le 0.8$ high risk; if $0.4 < C^{BR} \le 0.6$ average risk; $0.2 < C^{BR} \le 0.4$ low risk; if $0 < C^{BR} \le 0.2$ minimum bankruptcy risk.

Logit-model Genriha, Pettere& Voronova (2011)

$$PD = \frac{1}{1+e^{-z}}; \quad L(x_i;a,b)_i = \frac{1}{1+e\{-(a+b\cdot x_i)\}};$$

$$Z = 25,998 \cdot L_1 + 33,358 \cdot L_2 + 16.208 \cdot L_3 - 5.662$$

x_i	Rate	a	b
x_1	PBT / E	-3,03080	-2,06326
x_2	NT / TA	-1,07324	-3,59669
x_3	LTL / TA	-6,80139	4,35983

Characteristics of enterprise bankruptcy risk: PD states default probability when during one year an enterprise will not be able to pay back its credit obligations for a period longer than 90 days.

Logit-model (Static and dynamic) Alekseeva (2011)	$P = \frac{1}{1+e^{y}}$; $y = (-(32.633 - 1.082 \cdot S / TA - 6.932 \cdot NP / TA + 3.697 \cdot L / A - 5.712 \cdot LTL / A - -1.573 \cdot \ln(E))$; $P_{t+1} = \frac{1}{1+e^{-Y}}$; $Y = 9.91 \cdot P_t + 0.213 \cdot \frac{P_t}{P_0} - 3.58$ P_{t+1} -probability of enterprise bankruptcy per year *t+1*, per year *t* and in a year *t-1*.

Table A1. Brief description of the logit models for assessing the risk of enterprises bankruptcy

Country and name of model		Model type and interpretation of results. Assessment of bankruptcy threat level
Czech Republic	Classic Altman's model for the Cz	$Z = 1.2 \cdot NWC / A + 1.4 \cdot E / A + 3.3 \cdot EBIT / A + 0.6 \cdot EMV / L + +1 \cdot S / A + 1 \cdot P_0 / S$ If $Z > 2.9$ - financially stable enterprise and if $Z > 2.9$ - threat of bankruptcy.
	Bonity index IB	$IB = 1.53 \cdot CF / D + 0.08 \cdot A / D + 10 \cdot EBT / A + 5 \cdot EBT / R + +0.3 \cdot I / R + 0.1 \cdot R / A$ If $IB > 3$ can be marked as extremely, $IB > 1$ is good and $IB < -2$ are directly jeopardised by bankruptcy.
	Czech index IN05 Neumaierová &Neumaier (2005)	$IN05 = 0.13 \cdot A / D + 0.04 \cdot EBIT / I_n + 3.97 \cdot EBIT / A + 0.21 \cdot R / A + +0.09 \cdot CA / STL$ If $IN05 < 0.9$, the enterprise with a high probability (86%) moves towards bankruptcy and if $IN05 > 1.6$ the enterprise creates EVA with probability of 67%.
Poland	FD model I	$FD = 9.498 \cdot OP / AA + 3.566 \cdot E / A + 2.903 \cdot (NE + D_a) / TL + 0.452 \cdot CA / /CL - 1.498$ If $FD \le 1.1$ the probability of bankruptcy is high; $1.1 < FD < 2.6$ the probability of bankruptcy is indefinite (grey area); $FD > 2.6$ the probability of bankruptcy is low.
	Holda (ZH) (2006)	$Z_H = 0.605 \cdot +0.681 \cdot CA / CL - 0.0196 \cdot TL / TA \cdot 100 + 0.00969 \cdot (NP / AA) \cdot 100 + 0.000672 \cdot (ACL / (COA - OOC) \cdot 360 + 0.157 \cdot R / AA$ If $Z_H = -0.3$ the probability of bankruptcy is high; $-0.3 < Z_H < 0.1$ the probability of bankruptcy is indefinite (grey area); $Z_H > 0.1$ the probability of bankruptcy is low.
	Model B. Prusak (Z_{BP1})	$Z = 6.5245 \cdot OP / AA + 0.148 \cdot OE / (ASL - SF - SFL) + +0.4061 \cdot (CA - DC) / STL + 2.1754 \cdot OP / NS - 1.5685$ If $Z < -0.13$, the enterprise with a high bankruptcy risk; if $-0.13 \le Z \le 0.65$ grey area, if $Z > 0.65$ the probability of bankruptcy is low.

	J. Gajdka D. Stosa (1996)	$Z2 = 0.7732059 - 0.0856425 \cdot S / AA + 0.0007747 \cdot L / COGS \cdot 365 + +0.9220985 \cdot NP / AA + 0.6535995 \cdot GP / NS - 0.594687 \cdot TL / AA$ If $Z > 0.45$ no threat to the enterprise; if $Z < 0.45$ threat of bankruptcy.
	Poznan Model *Hamrol, Czajka, (2004),*	$Z_{HCP} = 3.562 \cdot NR / TA + 1.588 \cdot (CA - I) / CL + 4.288 \cdot FA / TA + +6.719 \cdot PS / NSR - 2.368$ If $Z > 0$ very low chance of bankruptcy; $Z = 0$ critical point; if $Z < 0$ - very high probability of bankruptcy.
Romania	Model B – Băileştea nu (1998)	$B = 0.444 \cdot CA / CL + 0.909 \cdot (NP + D_a) / (CR + I_n) + 0.0526 \cdot CA / /C_u + 0.0333 \cdot P / CS \cdot 100 + 1.414$ If $B < 0.5$ the enterprise with a high bankruptcy risk; if $0.5 < B < 1.1$ - high financial risk zone; $1.1 < B < 2.0$ - moderate financial risk zone; $B > 2.0$ - financially appropriate zone.
	Model I – Ivonciu (1999)	$I = 0.333 \cdot S / FA + 5.555 \cdot GP / TI + 0.0333 \cdot NCS / AAR + 0.714229 \cdot \cdot ND / EBIT + 1.333 \cdot (CA - I) / CL + 4.0 \cdot (ES - BS) / BS - 1.66032$ $EBIT = R - Expenses$. If $I < 0$ bankruptcy is imminent; $0 < I < 1.5$ - high bankruptcy risk with a 64-81% probability; $1.5 < I < 3$ - uncertainty bankruptcy risk with a 46-64% probability; $3 < I < 4.5$ - there is a moderate risk of bankruptcy with a 29-46% probability; $4.5 < I < 6.0$ - low bankruptcy level with a 12-29% probability; $I > 6$ - shows a good financial state and the bankruptcy probability is very low (0-12%).
	Angel Model (2002)	$A = 5.676 + 6.3718 \cdot NP / R + 5.3932 \cdot CF / A - 5.1427 \cdot D / A - -0.0105 \cdot L / T \cdot 360$ If $A < 0.0$ bankruptcy/failure situation; $0 \le A \le 2.0$ uncertainty situation demanding prudence; $A > 2.05$ non bankruptcy situation, a good financial situation.

Table A2. MDA models for assessing the risk of insolvency/bankruptcy Czech Republic, Poland and Romania

Country and name of model		Model type and interpretation of results. Assessment of bankruptcy threat level
Belarus	Byelorussion Model	$Z_B = 0.111 \cdot OCA / CA + 13.239 \cdot CA / FA + 1.676 \cdot S / TA + +0.515 \cdot NP / A + 3.80 \cdot E / TC$ If $Z_B > 8$ then the enterprise bankruptcy does not threaten; if $5 < Z_B < 8$, risk of bankruptcy is small; if $3 < Z_B < 5$, financial condition is average, there is the risk of bankruptcy under certain circumstances; if $Z_B < 1$ the enterprise is bankrupt.
Rus-sia	Fedotova (1995)	$R = -0.3877 - 1.0736 \cdot CA / CL + 0.0579 \cdot D / TA$ If $Z < 0$ there is probability that an enterprise remains solvent; if $Z > 0$ bankruptcy is probable.

	Sayfullin& Kadykov (1996)	$R = 2 \cdot OCA / CA + 0.1 \cdot CA / STL + 0.08 \cdot P / RS + 0.45 \cdot R / AA + NI / O$ If $Z < 0$ bankruptcy is imminent.
	Davidova &Beljakov (1999)	$Z = 8.38 \cdot WC / A + EBIT / AA + 0.054 \cdot$ EBT$/AA + 0.63 \cdot EBIT / OC$ If $Z < 0$ bankruptcy is imminent; If $0 < Z < 0.18$ - high bankruptcy risk with a 60-80% probability; $0.18 < Z < 0.32$ - average risk of bankruptcy with a 35-50% probability; $0.32 < Z < 0.42$ - there is low bankruptcy level with a 15-20% probability; $Z > 0.42$ - bankruptcy probability is very low (10%).
	SMEs Model Lugovskaya (2010)	$Z = -0.05 - 0.61 \cdot C / CL + 0.07 \cdot$ CA/CL $+ 0.34 \cdot (C + STD) / CL -$ $-1.13 \cdot (C + STD) / TA + 1.35 \cdot ROA + 8.42 \cdot C / TA$
Ukraine	Martinen ko (2000)	$LV = 1.0 \cdot CA / CL + 2.5 \cdot OC / L + 2.86 \cdot WC / E + 2.0 \cdot (FA + S_t) /$ $/ A + 3.3 \cdot NI / S$ Level of viability: $LV > 5.01$ - high; $4.16 < LV \le 5.0$ - average; $4.15 < LV \le 2.26$ low; $LV \le 2.25$ very low.
	Small enterprise model (2009)	$Z = 0.0820 \cdot QR + 0.0209 \cdot TD / E + 0.0987 \cdot CA / CL + 0.9915 \cdot S /$ $/TA - 1.253$ If $Z < 0$ financial state is not satisfactory and an enterprise is not in crisis state or has the threat of crisis development. If $Z > 0$ financial state is satisfactory and crisis state is less probable.
	Tereshhenko (2003)	$Z = 1.04 \cdot CA / CL + 0.75 \cdot OC / TC + 0.15 \cdot NR / AA + 0.42 \cdot$ $\cdot OCF / S + 1.8 \cdot OCF / TA - 0.63 \cdot NS / BC - 2.16$ If $Z < -0.55$, then the financial state of an enterprise is not satisfactory; if $-0.55 < Z < 0.55$, then it is impossible to make plausible conclusions about the financial state of the enterprise; if $Z > 0.55$, then the financial state of an enterprise is considered to be satisfactory.

Table A3. MDA models for assessing the risk of insolvency/bankruptcy Belarus, Russia and Ukraine

Country and name of model		Model type and interpretation of results. Assessment of bankruptcy threat level
Estonia	T-model industrial bankruptcy model	$T = 2.44E \cdot /TA + 0.348 \cdot T / TA + 0.306 \cdot TA / CL \cdot$ If $T > 0.37$, the enterprise with a high bankruptcy; if $0.37 < T < 1.22$ the probability of bankruptcy is small; $T > 1.22$ the enterprise's condition is good.
	P-model (Trade)	$P = 0.603 \cdot NS / CA - 0.71 \cdot \log(NS \cdot 100 / WTE) + 0.88 \cdot TL / TA$ P turning point model offers 0.616

	E-model (energetic)	$E = 0.370 \cdot OP / TA - 0.843 \log(T) + 0.587 \cdot C_b / NWC$
Latvia	Shorin/ Voronova Z_{2L}	$Z_{2L} = 2.5 \cdot WC / TA + 3.5 \cdot RP / TA + 4.4 \cdot PBT / TA + 0.45 \cdot OC / L + +0.7 \cdot S / TA - 2.4$ If $Z_{2L} > 0$ very low chance of bankruptcy; $Z_{2L} = 0$ critical point; If $Z_{2L} < 0$ - very large probability of bankruptcy
Lithuania	Garškaite´ (2003)	$Z = -0.3877 - 1.0736 \cdot CA / CL + 0.0579 \cdot L / E$ If $Z = 0$ value is 0, then probability of company's bankruptcy equals 50%. If $Z < 0$, then probability of company's bankruptcy is very low. The lower Z value the lower probability for company to go into bankruptcy. If $Z > 0$, then probability of company's bankruptcy is higher than 50% and higher ratio indicates higher probability for company to go into bankruptcy.
	Stoškus et al., 2007	Classification functions: for successful enterprises $Y_0 = 4.77 \cdot NP / NS + 5.88 \cdot TCA / TCL + 9.51 \cdot TD / TL - 5.80 \cdot (CA - I) /CL - 6.42$ For failed enterprises $Y_1 = 2.82 \cdot NP / NS + 2.90 \cdot TCA / TCL + +6.43 \cdot TD / TL - 2.92 \cdot (CA - I) / CL - 2.94$ The enterprise is classified to group, the function of which has a greater value

Table A4. MDA models for assessing the risk of insolvency/bankruptcy Estonia, Latvia and Lithuania

8. References

Abrjutina, M.S.; Grachev, A. V. (1998). *Analiz finansovo-ekonomicheskoy deyatelьnosti predpriyatiya,* Delo i Servis, ISBN 5-8018-0037-9, Moscow, Russia

Alekseeva, J.A. (2011). Oczenka finansofogo sostoyaniya i prognozirovaniya bankrotstva predpriyatiya. Moskva, 31p. Available from: <www.hse.ru/data/2011/03/18/1211254568/Автореферат_Алексеева.pdf>

Anjum, S. (2010) An overview of financial ration from 1900's till present day. International Journal of Research in Commerce & Management, Vol. No. 1 , Iss. No 8, pp.126-130.

Altman, E. (1968). Financial ratio, discriminant analysis and prediction of corporate bankruptcy. *Journal of Finance*, 23, pp. 589-609.

Altman, E.; Haldeman, R.; Narayanan, P. (1977). ZETA Analysis. A new model to identify bankruptcy risk corporations. *Journal of Banking and Finance. Vol1*. No 1. pp. 29-54.

Altman E.; Resti A.; Sironi A. (2004). Default and Recovery Rates in Credit Risk Modelling: A Review of the Literature and Empirical Evidence, *Economic Notes*, Vol. 33, Iss.3, pp. 183-208.

Altman, E.; Hotchkiss, E. (2006). *Corporate Financial Distress and Bankruptcy*. 3 end. John Wiley and Sons, New York.

Altman, E.; Lavellee, M.Y.(1981). Business failure classification in Canada. *Journal of Business Administration* Summer, pp.147-164.

Altman, E. (2010). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, Vol. 23, No. 4 (Sep., 1968), pp. 589-609.

Andruchak, E.M. (2004). *Diagnostika bankrotstva ukrainckih predprijatiy*, Kiev: Ukraine

Antonowicz, P. (2007). *Metody oceny i prognoza kondycji ekonomiczno-finansowej przedsiębiorstw* Wyd. Oddk, Gdańsk , pp. 1-207, ISBN: 978-83-7426-411-2

Antonowicz, P. (2011). Procesy upadłościowe przedsiębiorstw w Polsce w latach 2009-2010 - 2-letni raport z badań, Wyd. KPF w Polsce, luty, 2011, Gdańsk – Warszawa

Aziz, A.; Lawson, G.H. (1989) Cash Flow Reporting and Financial Distress Models: Testing of Hypothesis. *Financial Management,* 1989, 18(1), pp. 55-63.

Baron, H. F.; Barrett, B. E. (1996). Decision Quality Using Ranked Attribute Weights, *Management Science* 42(11): 1515–1523, DOI: 10.1287/mnsc.42.11.1515

Basel Committee on Banking Supervision (2003), *Overview of the New Basel Capital Accord: Consultative Document,* Basel: Bank for International Settlements.

Bellovary, J.; Giacomino, D.; Akers, M. (2007). A review of Bankruptcy Prediction Studies: 1930 to Present. Marquette. *Journal of Financial Education*, 1-1-2007. Pp.1-47.

Begley, J.; Ming, J.; Watts, S. (1996). Bankruptcy Classification Errors in the 1980s: An Empirical Analysis of Altman's and Ohlson's Models, *Review of Accounting Studies*, 1, pp. 267—284.

Beaver, W. (1967). Financial ratios as predictors of failure. *Journal of Accounting Research, Supplement*, Vol. 5, pp. 71-111.

Boyкova A.V. (2010). Prognozirovanie vozmozhnosti bankrotstva predpriyatiya: podhody I modeli. *Ekonomicheskie i gumanitarnye issledovaniya regionov*, N4, 51, pp. 347-364, Available from: <http://cegr.ru/downloads/journal_4_2010.pdf>

Brancia, A. SMEs risk management: an analysis of existing literature considering the different risk streams. The 8th AGSE International Entrepreneurship Research Exchange, Swinburne University of Technology, Melbourne, Australia. pp. 225-239. ISBN 978-0-9803328-7-2

Budjashkina, S. (2003). *Astrogenetika dlya predprinimateley*. Riga. Centrs "Astrogenetika", Latvia.

Budjashkina, S. (2003). Riska vadīšanas modelēšanas komercdarbībā. RTU 44. Starptautiskā zinātniskā konference. 9.-11.10. Riga, pp. 88.

Dagum, E. B.(2010) Business Cycles and Current Economic Analysis. *Estudios Economa Aplicada,*Vol. 28-3, pp. 577-594.

Davydova, G.V.; Belikov, A. Ju. (1999). Metodika kolichestvennoy oczenki riska bankrotstva. *Upravlenie riskom*. N 3, pp. 13-20.

Doncova, L.V.; Nikiforova, N.A. (2009). *Analiz finansovoy ochetnosti*. Delo i Servis,ISBN 978-5-8018-0340-1, Moscow, Russia.

Dulova, I.N.; Dubrovskij, V.Ž.; Kuzьmin, E.A.(2011). Ochenka finansivogo riska v prognozah denezhnyh potokov mnogoproduktovogo predpriyatiya. Vypusk Chelyabinskogo gosudarstvennogo universiteta. No.6 (221), Ekonomika, Vyp. 31, pp.100-107.

Dumičić, M. Dumičić and R. Curkov (2005). Financial risk management instrument usage in large and medium-sized enterprises – business survey in a transition country. Irving Fisher Committee Central Bank Statistics Bulletin 22, pp. 96-99.

Fishburn, P. (1970). *Utility theory for decision making*. Wiley. ISBN 0471260606, New York. *Finansovoe polozhenie predpriyatiya (oczenka, analiz, planirovanie). (*1998). Pod. red. A.V. Chupisa. Universalnaya kniga. Sumy.

Foster,B.P.; Ward,T.J. (1997) Using Cash Flow Trend to Identify Risk of Bankruptcy. *The CPA Journal*, September 1997. pp. 60-61.

Frazer, J.; Simkins B.J. (2010). *Enterprise Risk Management: Today's Leading Research and Best Practices for Tomorrow's Executives.* Kolb Series in Finance, ed. Wiley, Hoboken, New Jersey: John Wiley & Sons. ISBN 9780-470499085

Genriha, I.; Pettere, G.; Voronova, I. (2011). Entrepreneurship Insolvency Risk Management: case Latvia. *International Journal of Banking, Accounting and Finance* (IJ BAAF).

Genriha, I.; Voronova, I. (2011). Methods of evaluating the creditworthiness of borrowers. SCEE'2010. Conference Abstracts proceedings. RTU Publishing House, Riga. pp. 41-42.

Genriha, I.; Voronova, I. (2010). Maksātnespējas noteikšanas modeli Latvijas uzņēmumiem *RTU IEVF Zinātniskie raksti. Ekonomiskie pētījumi uzņēmējdarbībā.* 8. *Sējums*, pp. 38-55, ISBN 1691-0737, Riga, Latvia.

Grachev, A.V. (2002). *Analiz i upravlenie finansovoj ustojchevostьju predpriyatija. Ot buhgalterskogo ucheta k ekonomicheskomu.* Fipress, 2, ISBN 5 -8001-0028-4, Moscow.

Gritcenko, L. A.; Bojarko, I.N.; Gubar, A.A. (2009). Dickriminantna model diagnostiki bankrotstva malikh pidpriiemstv. *Aktualbni problem ekonomiki*, N5 (95), pp.256-262

Grigaravičius, S. (2003). *Įmonių nemokumo diagnostika ir jų pertvarkymo sprendimai,* VDU leidykla, Kaunas

Hamrol, M.; Czajka, B.; Piechocki, M. (2004), Upadłość przedsiębiorstwa - model analizy dyskry - minacyjnej, Przegląd Organizacji, nr 6.

Hawkins, G. (2003). Company Financial Risk (And Why Attorneys Must Understand It). *Banister Financial*, INC. pp. 1-4.

Henschel, T. (2006). Risk management practices in German SMEs: an empirical investigation. *International Journal of Entrepreneurship and Small Business.* Vol. 3, No 5. pp. 584-571.

Henschel, T. (2010). SME's Appetite of Risk Management. Available from: Error! Hyperlink reference not valid..ac.uk/business/rmgic/2010/T_Henschel.pdf

Henschel, T. (2010a). Typology of Risk Management Practices: An Empirical Investigation into German SMEs. *Journal of International Business and Economics Affairs,* pp. 1 -29

Hołda,A. (2006). *Zasada kontynuacji działalności i prognozowanie upadłości w polskich realiach gospodarczych*, Wydawnictwo Akademii Ekonomicznej w Krakowie.

Holton, G. (2004) *Defining risk*. *Financial Analysts Journal*. Vol. 60(6), pp.19-25. Available from: <http//www.riskexpertise.com/papers/risk.pdf>

Horrigan, J. O. (1968) A short history of financial ratio analysis. *The Accounting Review*, 43(2), pp. 284-294

ISO(2009). ISO 31000:2009 Risk Management – Principles and guidelines, International Organization. Available from: <http//www.iso.org>.

Jackendoff, N. (1962). A Study of Published Industry Financial and Operating Ratios. *Economics and Business Bulletin (Temple University)*, p. 34.

Jones, F. (1987). Current techniques in bankruptcy prediction. Journal of Accounting Literature 6, pp. 131-167.

Kealhofer, S. (2003). Quantifying credit risk I: Default prediction', *Financial Analyst. Journal*, Jan/Feb *2003*, pp. 30-44.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London, Macmillan Press. Available from: <http://cepa.newschool.edu/het/texts/keynes /gtcont.htm>

Korotayev, A.V.; Tsirel, S.V. (2010). A Spectral Analysis of World GDP Dynamics: Kondratieff Waves, Kuznets Swings, Juglar and Kitchin Cycles in Global Economic Development, and the 2008-2009 Economic Crisis, *Structure and Dynamics*. Vol. 4, Nr.1. pp. 3-57.

Kovalev V.V. (2000). *Finansovyj analiz: Upravlenie kapitalom. Vybor invecticij. Analiz otchetnosti.* Moskva, Finansy i statistika. ISBN 5-279-02043-5

Kralicek, P. (1993). *Základy finančního hospodaření*. Přel. J. Spal., Praha: Linde ISBN 80-85647- 11-7.

Kralicek, P. Quick-Test zur Beurteilung von Unternehmen. Available from: <http://members.aon.at/ai-management/qt_qt.htm>aon.at/ai-management/qt_qt.htm>

Kramin, T.V. (2003). Oczenka finansovoj ustojchivocti firmy (predpriyatiya), *Problemy sovremennoj ekonomiki*, N 3/4 (7/8) Available from:< http://www.m-economy.ru /author.php?nAuthorId=250>

Krioni, A.E. (2009). Risk bankrotstva rossijskih malyh predpriyatij i metody ego predotvrazheniya .*Menedzment v Rossii i za rubezom*, N1, pp. 94-100.

Künnapas, I.(1998). Eesti tööstusettevõte pankrotiohu mudeli koostamine finantssuhtarvude ja diskriminantanalüüsi abili. Bakalaureusetöö, TÜ, 55 p.

Koopman, S.J.; Lucas, A. (2003). Business and Default Cycles for Credit Risk. Tinbergen Institute Discussion Paper TI 2003-062/2, pp. 1-22.

Lace, N.; Sundukova, Z. (2010). Company's Standards for Financial Soundness Indicators. 6th International Scientific Conference, *Business and Management* 2010, Selected papers. Vilnius, doi:10.3846/bm.2010.016

Lennox, C. (1999). Identifying Failing Companies: A Re-evaluation of Logit, Probit and DA Approaches. *Journals of Economic and Business,* 51, pp. 347-364.

Lugovskaya, L. (2010). Predicting default of Russian SMEs on the basis of financial and non-financial variables. *Journal of Financial Services Marketing,* 14, pp. 301-313. Doi:10.1057/fsm.2009.28.

Lukason, O. (2004). Esti energeetinaettevõtete pankrotimudel. TÜ ärirahan duse ja investeeringute õpperool, 62 p.

Lukason, O. (2006). Pankrotistumiste modelleerimine eesti kaubandusettevõtete näitel. Disserdatsiooni autoreferaat magister artiumi, TÜ, 79 p.

Luo, D.; Sun, B.(2010). Study on Financial Issues of Merger and Acquisition. *Orient Academic Forum*. Available from: <htt://www.<htt://www.seiofbluemountain.com/upload/product2010 019/2010cwjrhy06a2.pdf>

Mackavičus, J., Rakštelienė A. (2005). Altmanų taikymas Lietuvos įmonių bankrotui prognozuoti. *Ekonomikas teorija ir praktika.* Nr.1, I.

Martynenko, V.P. (2000). Ekonomiko-statistiskaja modelь opredeleniya veroyatnosti bankrotstva dlya predpriyatij obshhestvennogo pitaniya. *Mehanizm regulirovaniya ekonomiki*, *економікі prirodokorisnuvannia, економіка nidpriiemstva ma organizatsiia virobnitstva,* Vipusk 2, Sumi, pp.151-155.

Meijerng, E. (2002). A Chronology of interpolation: From Ancient Astronomy to Modern Signal and Image Processing. IEEE, vol. 3, pp.319-342, Available from: <http:// http://www.imagescience.org/meijering/publications/download/pieee2002.pdf>

Merwin, C. L. (1942). *Financing Small Corporation in Fife Manufacturing Industries 1926-36*. NBER. ISBN: 0-870-14130-9

Miller, A.J. (2002). *Subset Selection in Regression*. Chapman &Hall/CRC, ISBN 1-58488-171-2, Boca Raton, London

Minussi, J.; Soopramanien, D.; Worthigton D. (2007). Statistical modelling to predict corporate default for Brazilian companies in the context of Basel II using a new set of financial ratios. *Management Science Working Paper Series,* pp. 1-35.

Moeller, R. R. (2007). *COSO Enterprise Risk Management: understanding the new integrated ERM framework*. Wiley, ISBN: 978-0-471-74115-2

Moses, D.; Liao, S. S. (1987). On developing models for failure prediction. *Journal of Commercial Bank Lending*, Vol. 69, pp. 27-38.

Neumaierová, I.; Neumaier, I. (2005). Index IN05: In *Evropské finanční systémy: Sborník příspěvků z mezinárodní vědecké konference*, Brno, Masarykova univerzita v Brně, pp. 143-146.

Netsymailo K.V. (2009). Metody upravleniya riskami v deyatelьnosti cybjektov malogo predprinimatelьstva. *Vestnik OG,* N9 (103), pp. 46-52. Available from: <http://vestnik. osu.ru/2009_9/9.pdf>

Ohlson, J.A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research,* 8(1), pp. 109-131.

Picard, R.G. (2004). Typology of risk in family media enterprises. *Journal of Media Business Studies*, 2, pp. 71-83.

Potapov, D.K.; Evstafjeva, V.V. (2008). O metodah opredelenija vesovyh koefficientov v zadache ocenki nadeznosti kommerchiskih bankov. *Socialno-ekonomicheskoe polozenie Rossii v novyh geopoliticheskih i finansovo-ekonomicheskih uslovijah:realii i perspektivy razvitija,* Sankt-Petersburg, Institut biznesa i prava, pp. 191–195. Available from: <http://www.ibl.ru/konf 041208 /60.pdf>

Savickaja, G.V. (2009). *Analiz hozaistvennoy dejatelnosti predprijatij*a. Infra-M. ISBN 978-5-160 03428-7, Moscow, Russia.

Scholey, C. (2006). Risk and the Balanced Scorecard: organizations around the globe need to step up their risk management initiatives. The Balanced Scorecard can help. Available from: <http://findarticles.com/p/articles/mi_hb6419/is_4_80/ai_n292 86251/?tag=content;col1>

Sharma, D. S. (2001). The Role of Cash Flow Information in Predicting Corporate Failure; The State of Literature. *Managerial Finance*. Volume 27, No 4, pp.3-26.

Shumway, T. (2001). Forecasting Bankruptcy More Accurately: A Simple Hazard Model, *Journal of Business*, 74, pp.101-124, Available from: < http://ihome.ust.hk/accl /Shumway%20%282001%29.pdf>

Solvency II framework. *Official Journal of the European Union.* Available from: < http://eur-lex.europa.eu/Lex UriServ/LexUriServ.do?uri=OJ:L:2009:335:0001: 155:en:PDF>

Smetanyuk O.A. (2007). Algoritm vizacheniia antikrizovikh zakhodiv na osnovi rezulbtiv diagnostiki finansovogo ctanu shdpriiemstva. *Vesnik Sumskogo derzavnogo universieta*. Seriia Ekonomika, N1, pp. 163-168.

Stoškus, S., Beržinskienė, D.; Virbickaitė, R. (2007). Theoretical and Practical Decisions of Bankruptcy as one of Dynamic Alternatives in Company's Performance, Engineering Economics. No 2 (52). ISSN 1392-2785.

Stunžiené, A.; Boguslauskas, V. (2006). Valuation of Bankruptcy Risk for Lithuanian Companies. *Engineering Economics*, 49(4), pp.29-36., ISSN 1392-2785

Shirokova, G. V. (2006). Strategies of Russian Companies at the Different Stages of Organizational Life Cycle: the Attempt of Empirical Analysis. Discussion Paper

Nr.5(R)–2006. St. Petersburg State University: SPb., Available from: <http: //dspace.gsom.pu.ru/jspui/bitstream/123456789/54/1/1128E%29_2006.pdf>

Šneidere, R. (2009). *Finanšu analīzes metodes uzņēmuma maksātnespējas prognozēšanai*, SIA "Lietišķās informācijas centrs", ISBN 978-9984-826-26-4, Riga, Latvia

Tamari M. (1966). Financial ratios as a means of forecasting bankruptcy. *Management International Review*. Vol. 4, pp. 15-21.

Tereshhenko, O. (2003*).* Diskriminantnya modelь integralьnoj oczenki finansovogo položeniypredpriyatiya. *Ekonomika Ukraini*. №*8* (*501*), pp. *38-44.*

Vaino, M. (1999). Esti jae- ja hulgikaubandusettevõtete pankrotimudeli koostamine finantssuhtarvude ja diskriminantanaüüsi abil. Bakalaureusetöö, TÜ, 73 lk

Vichnjakov, Ja. D.; Kolesov, A.V.; Shemjakin, V. L. (2000). Oczenka i analiz riskov predpriyatij v usloviyah vrazhdebnoj okruzhajushhej sredy. *Menedzment v Rossis i za rubezom,* N3

Voronina, V. M. (2007). Upravlencheskie resheniya v antikrizisnom upravlenii predpriyatiem na osnove diagnostiki chistyh aktivov. *Izvestija Sankt – Peterburgskogo universiteta ekonomiki i finansov,* pp. 9-16.

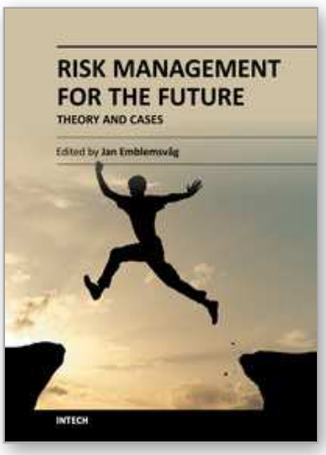
Voronova, I.; Romancēviča, J. (2005). Uzņēmumu ekonomiskās stabilitātes novērtēšana. 6 *International Scientific Conference. Public Relations: Quality, Benefits and Risks*, Selected papers, Riga, Biznesa augstskola TURĪBA, pp.134-142.

Watson, I. (1996). Financial Distress - The State of the Art in 1996. *International Journal of Business Studies*, Vol. 4, No. 2, pp. 39-65.

Xajdarshina, G.A. (2011). Effektivnaja ocenka riska bankrotstva d sovremennoj praktike finansovogo menedzhmenta na predprijatii. Available from:<http://viperson.ru/ Wind.php?ID=601029>

Zavgren, C.V. (1983). The Prediction of Corporate Failure: The State of the Art, *Journal of Accounting Literature*, Vol. 2, pp.1-37.

Zmijewski, M. E. (1984). Methodological issues related to the estimation of financial distress prediction models. *Journal of Accounting Research*, 22, pp. 59-86.



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A large part of academic literature, business literature as well as practices in real life are resting on the assumption that uncertainty and risk does not exist. We all know that this is not true, yet, a whole variety of methods, tools and practices are not attuned to the fact that the future is uncertain and that risks are all around us. However, despite risk management entering the agenda some decades ago, it has introduced risks on its own as illustrated by the financial crisis. Here is a book that goes beyond risk management as it is today and tries to discuss what needs to be improved further. The book also offers some cases.

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