

Valuation of Bankruptcy Risk for Lithuanian Companies

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This article is about the importance of valuation of companies' bankruptcy risk and its methods. Bankruptcies of enterprises are one of the most popular economic appearances that cause a lot of negative effects for companies, employees, other associate firms and institutions, also for the state and society. The perspectives and succession of company's performance is a concern not just of the company itself, but also of other associate subjects such as investors, shareholders, banks, customers, suppliers and other business partners. One of the most popular ways to measure bankruptcy risk this time is E. Altman method. But there are no researches and conclusions about the relevance of this method for Lithuanian companies. After the application of E. Altman method for 56 Lithuanian joint stock companies the result showed, that it produces meaning error. This method puts too many companies to high or very high bankruptcy risk classes. So a more accurate model for bankruptcy risk prediction is needed.

It is important to evaluate as many characteristics of the company as it is possible in order to estimate real probability to crash. Company is a complicated object and it is characterized by a lot of various ratios. Besides, there are no concrete values of each ratio that would be received as good or bad. Each company has its strong and weak characteristics. That's why it is necessary to evaluate not a single ratio, but the system of ratios in order to get the right estimation of the company and its bankruptcy risk. So the methodology that would let join a lot of variables for this purpose is needed.

Cluster analysis is the method that lets evaluate and systematize a lot of variables, reduce them to one ratio. Statistical classification is one of the most important and independent research methods of social-economic occurrences and is widely used in all or almost all spheres of science when doing various statistical researches. Classification lets summarize the information, abridge the data set that is needed for the analysis, by making a choice of one or several classes that are concerned. It is especially important when there is a need to compare the objects, because the objects in the same class are similar.

This methodology is suitable for bankruptcy risk estimation as well. The point of the methods described in various books is to group the objects so that the similarity of the object in one class would be the largest and the dissimilarity among classes would be significantly large. Such methodology is not the most suitable for this purpose, so another classification method that we have created is offered. The purport of it is to find the outside points in the objects set that are typical representatives of

the classes. The classes are combined depending on these typical representatives.

When the classification of Lithuanian joint stock companies was made by this principle, the results showed that the only company "Dirbtinis pluoštas" in 2000 had a very large probability to go bankrupt and it really crashed in 2001. More than half of the enterprises that had the high bankruptcy risk really crash after 2 or more years. Extreme attention must be paid to these companies that have large probability to go bankrupt in two or more years successively.

Four the most important ratios for bankruptcy risk estimation were found by regression analysis. They are return on assets, net profit before taxes / assets, liabilities / assets and gross profit margin.

According to the improved bankruptcy risk estimation model, suitable for Lithuanian enterprises, each company for its bankruptcy risk valuation purpose can be measured by four ratios and be compared with the typical representatives of the classes. The company is set to the class, where its dissimilarity with the typical representative is the smallest.

Keywords: *evaluation of bankruptcy risk; E. Altman model; classification method.*

Introduction

Companies come across various risks in their performance. They proliferate especially when the markets and competition grow. Objective valuation of situation, ability to determine the risk, decisions made right and pat in finance, investment, technique and technology, organization of work, creation of new products and services are important presumptions to safeguard the stability and succession of the company performance. Sometimes one wrong decision can be the reason of bankruptcy of a well working enterprise.

Perspectives and succession of the firm's performance is a concern not just of the company itself, but also of other associate subjects such as investors, shareholders, banks, customers, suppliers and other business partners (Rees B., 1995). Bankruptcies of enterprises are one of the most popular economic appearances and cause a lot of negative effects for companies, employees, other associate firms and institutions, also for the state and society.

Two to six percent of all companies a year go bankrupt in market economy (Isachsen A. J., Hamilton C., 1992). That's why bankruptcy is defined as a macroeconomic problem (Purlys C., 2001), an inevitable appearance in market economy (Tvaronavičienė M., 2001).

So, the managers of the company must constantly look for the ways and means to avoid bankruptcy and to secure their performance success and succession. One of the most effective bankruptcy diagnostic and preventive means is the analysis of the firm's performance. It is not possible to rule the company's resources properly, determine the right tendencies of use of resources, make optimal decisions in investment and finance and prepare the forecasts of further development without close and timely analysis. Only the companies that make proper analysis and where the managers seek to rule the processes that are concerned with business risk efficiently, can determine forthcoming crisis beforehand, react with expedition and reduce the risk of bankruptcy. A. Kovaliov (1994) maintains that the analysis of the company performance when it is done systematically is the universal way to avoid bankruptcy.

Security of succession of company performance is one of the most important tasks for managers. It is important to the firm's outside subjects (creditors, suppliers, potential investors and others) timely to determine the imminent troubles in the firm's performance or even its shutdown. E. Altman method is one of the most popular ways to measure bankruptcy risk this time. But the **problem** is that there are no researches and conclusions about the relevance of this method for Lithuanian companies.

That's why the **aim** of this article is to check up the relevance of E. Altman model for Lithuanian companies and to offer more accurate way to estimate the bankruptcy risk if this model is not exact.

The **objects** of this research are 56 Lithuanian joint stock companies and their financial ratios of 1995-2005.

Regression analysis will be used for the valuation of the correctness of ratios that are in E. Altman model and the classification method will be used to find the more relevant method for the bankruptcy risk estimation.

The damages of the enterprises' bankruptcy and its estimation methods

The bankruptcies of the enterprises make a lot of economic and social problems not only for the company itself, but also for the state. It is proven that bankruptcies of the enterprises are harmful for the state's economy, because:

1. usually old and large companies that have deep traditions and a lot of employees go bankrupt;
2. new small companies that have several employees appears;
3. bankruptcies of the enterprises make a lot of economic and social problems for the state;
4. as often as not the government must solve the problems that were conditioned by the bankruptcies of the companies' even private firm's;
5. new firms have no skills to organize and manage the trade, they appreciate the importance of the market researches, qualification of employees, their skills, quality of organization of their work undersell. (Purlys C., 2001)

The economic problems are the output loss, weak competitive ability of general state's economy, the taxes

not paid to the governmental budget, unmet requirements of creditors and so on. Social problems are unemployment growth, low living standards, dissatisfaction of people of weak economy in the state, feeling of uncertainty about future and so on (Valackiene A., 2005). Although the bankruptcies of the enterprises have some positive aspects (economy dispose not efficient and not perspective companies, technique and production progress' are encouraging, the possibility to discharge the excess of employees appears, it lets liquidate capabilities that are not used and so on), but the negative influence is much stronger (Mackevicius J., 2005).

According to the data of Statistical Department of Lithuania, there were 2404 companies that crashed within 10 years (from 1993 to 2003) in our state. The number of bankruptcies grows approximately 1.5-2 times every year. Mostly wholesale and retail trade and manufacturing companies go bankrupt. Looking at the type of the firms, the closed joint stock companies go bankrupt mostly while joint stock companies and private companies crash rarely a bit.

Lawsuit of bankruptcy can be brought against the company if there is one of these specifications:

1. the firm does not pay the salaries timely;
2. the firm does not pay for goods and services timely, it does not return the credits and does not apply other undertakings;
3. the firm does not pay the lawful taxes, other compulsory fees and (or) the sums that were adjudged;
4. the firm publicly announced to its creditor (creditors) that cant or will not apply the undertakings;
5. the firm has no assets or incomes that can be used to pay its liabilities and bailiff sent back the receiving orders to creditors (Sidlauskas A., 2004).

Bankruptcy forecast models can help to reduce or even eliminate the danger of bankruptcy, to decree the effective strategic decisions (Bivainis J., Garskaitė K., 2000). There can be found several methods to forecast bankruptcy in special literature:

1. the examination of various indications that show the probability to bankrupt;
2. valuation of changes in financial report items and their influence on the firm's financial stability;
3. the application of system of financial coefficients.

The application of these three methods of company performance analysis can be the most efficient way to determine the probability to go bankrupt. A lot of authors note and the practice shows that there is no ideal method to forecast the bankruptcy till now. Some methodologies are more suitable for one industry, other techniques – for another industry. So a lot of researchers think that the different models for each industry or company must be created and they must be tested after several years, because the business conditions are constantly changing, competition grows, inflation processes happen and so on.

The use of financial coefficient is one of the simplest and maybe most correct ways to calculate the probability of bankruptcy. But the application of this method brings forward a difficult question – what financial coefficient or coefficients, their combinations or systems use?

The first authors – P. Fitzpatrick, W. Hickman, A. Winakor and R. Smith that began the researchers of bankruptcy according to data of financial reports in 1920-1930, used one or two coefficients (Mackevicius J., Poskaitė D., 1999). But the practice showed that the conclusions about the firm's bankruptcy according to one or two ratios are not correct. As often as not there is a situation when some ratios reach critical limit but others are quite good (Kovaliov A. P., 1994). So new bankruptcy forecasting models appeared and they involved the calculation of several coefficients.

E. Altman model has the largest theoretical and practical meaning. It is

$$Z = 1,2X_1 + 1,4X_2 + 3,3X_3 + 0,6X_4 + 0,999X_5,$$

Where X_1 – working capital / total assets,
 X_2 – retained earnings / total assets,
 X_3 – EBIT / total assets,
 X_4 – market value of equity / total liabilities,
 X_5 – sales / total assets.

This model is suitable for the public companies that are registered in the security market. Depending on Z-Score the conclusion about the firm's bankruptcy is made. Generally speaking, the lower the score, the higher the odds of bankruptcy. Companies with Z-Scores above 3 are considered to be healthy and, therefore, unlikely to enter bankruptcy. Scores in between 1.8 and 3 lie in a grey area. If the Z-Score is less than 1.8, the probability to go bankrupt is very large. Obviously, a higher score is desirable. The author says that the precision of bankruptcy forecast after one year is 90 percent, the precision of bankruptcy prediction after 2 years is 70 percent and it is 50 percents after three years.

The valuation of bankruptcy risk of Lithuanian joint stock companies by E. Altman model

E. Altman model was applied to 56 Lithuanian joint stock companies according to their financial data of 1995-2001. Six of these companies are already gone bankrupt. Each company and their distinct year were treated as a separate object, so the data basis of 250 objects was tested. After the application of E. Altman model to these objects the results were: 90 objects of 250 had very large probability to do bankrupt, 73 objects had large probability to do bankrupt, the bankruptcy was possible for 14 objects and the rest 73 objects had small probability to go bankrupt.

According to E. Altman method the company "Dirbtinis pluostas" that failed in 2001 had very large probability to go bankrupt since 1998. "Kauno audiniai" that failed in 2003 had the very large probability to go bankrupt in 1995, 1998, 1999 and 2001 years. "Lietuvos kuras" that failed in 2001, "Trinyciai" that failed in 2003, "Sema" and "Siauliu stumbras" that failed in 2005, had such probability since 1997 the first one and 1995 another one. The conclusion is that the company can fail after three or more years after the moment when it goes to the class where the risk of bankruptcy is very high.

On the other hand, a lot of companies that did not fail

and work till now were also set to this class. There were 29 of 53 companies that had very large probability to go bankrupt in one or several years, but reality is that only six of these companies failed. So, the conclusion is that E. Altman model is not correct for Lithuanian companies and a new method is required.

The possibilities to apply the classification method for bankruptcy risk estimation

Following a logical consideration, the companies that go bankrupt have a lot of bad financial ratios and it is a feature that make them different from other companies that operate successfully and have a lot of good financial ratios. A company is complicated object and is characterized by a lot of various ratios. Besides, there are no concrete values of each ratio that would be received as good or bad. Each company has its strong and weak characteristics. That's why, it is necessary to value not a single ratio, but the system of ratios in order to get the right estimation of the company and its bankruptcy risk. So, the methodology that let joint a lot of variables for this purpose is needed.

Cluster analysis is the method that lets evaluate and systematize a lot of variables, reduce them to one ratio. Statistical classification is one of the most important and independent research methods of social-economic occurrences and is widely used in all or almost all various spheres of science when doing various statistical researches. It took a long time since scientists acknowledge the importance of analysis of problems that are connected with object comparison and classification. There are a lot of algorithms how to do this. We can find them in mathematics and statistics books of Lithuania authors, for example V. Cekanavicius, G. Murauskas (2000, 2002), J. Kruopis (1993), and foreign authors such as S. A. Aivazian (1974), V. R. Klecka (1980), J. A. Voronin (1985), B. S. Everit (1993), A. Afifi (1996), V. S. Mhitarian (1998), R. A. Jahson (1998), M. Berenson (1999), K. Walsh (2000) and others. But it was hardly realized in practice for a long time. Later foreign scientists tried to apply the classification methods for various tasks in medicine, biology, archaeology and some others. This method was successfully applied in Russia for researches in agriculture to sort and analyze localities. Russian scientist S. A. Aivazian, Z. I. Bežajeva and O. V. Staroverov applied this method for determination of types of customers' behaviour, for the analysis of differentiation of behaviour and consumption. There can be found more other possibilities to adapt classification method but the cases when it is really applied in practice are still very few.

The aims of classification are constantly increasing and the structure of classification process is also going more rich and complicated. Earlier it was just technical problem but now there is also the problem how to make the classification procedure. But rising difficulties is not the valid excuse to ignore classification procedures that are necessary for analysis.

Classification lets summarize the information, abridge the data set that is needed for the analysis, by making a choice one or several classes that are concerned. It is important especially when it is needed to

compare the objects, because the objects in the same class are similar.

This methodology is suitable for bankruptcy risk estimation as well. The point of the methods described in various books is to group the objects so that the similarity of the object in one class would be the largest and the dissimilarity among classes would be significant large. Such methodology is not the most suitable for this purpose, so there is offering another classification method that we created. The purport of it is to find the outside points in the objects set that are typical representatives of the classes. The first two outside points will be reverse and can be treated as the best (has the smallest probability to go bankrupt) and the worst (has the largest probability to go bankrupt) company. The classification into three classes also lets find the firm that has average ratios in the set. The classes are combined depending on typical representatives. Each object is set to the class where the distance between this object and the best representative of corresponding class is the least.

Creation of bankruptcy risk estimation model for Lithuanian companies

On the ground of this principle an attempt is made to find a more appropriate than E. Altman model to estimate the risk of firms' bankruptcy. There will be analyzed the companies data of 1995-2001 years for a new method creation and then it will be tested with the data of 2002-2005 years.

In order to correct E. Altman model there was hypothesize that five ratios that are in E. Altman model are really the most important ones, but there is needed to correct the coefficients in regression equation or intervals of Z-Scores in each class.

On the ground of classification method, there were made four classes by five ratios, used in E. Altman model. Only four companies – "Lifosa" in 2000 and 2001, "Lithun" in 2000, "Dirbtinis pluostas" in 2000 and "Lietuvos kuras" in 1999 had very large probability to go bankrupt. The last two companies really fail in 2001. "Alytaus tekstile" since 1996 till 2001, „Grigiskės“ since 2000 till 2001, "Kauno audiniai" in 1998, 1999 and 2001 years, "Lietuvos dujos" since 1998 till 2000, "Lietuvos kuras" since 1996 till 1998, "Sema" since 1999 till 2001, "Trinyciai" since 1996 till 1997 and since 1999 till 2001, "Ventus-nafta" since 1999 till 2000, "Vilniaus baldu kombinatas" in 1999 and 2001 years and some other companies in one year had large probability to go bankrupt. Most firms that were in this class for three years or more really failed. A lot of companies of port industry and some other firms ("Naftos terminalas" in 2000 and 2001 years, "Klaipėdos juru krovinių kompanija" in 1996 and 2001 years, "Lietuvos juru laivininkystė" in 1995 and 1996 years, "Lisco Baltic Service" in 2001, "Invalida" since 1999 till 2001, "Sanitas" in 2000 and 2001 years) had the least risk to fail. Other companies had medium risk to go bankrupt.

Companies can also be divided into three classes. Then the firms that are in the first class have small risk to fail, the risk of bankruptcy is medium in the second class and it is large in the third class. Almost all companies

that were in the third and fourth classes (very high and high risk) in the last case now fell into the highest risk (third) class.

So, the conclusion is that this method is more appropriate than E. Altman model because there were less firms that fell into the highest risk class but did not fail and there were put all those firms that really failed.

There can also be the second hypothesis that the ratios in E. Altman model are not the most informative for the estimation of bankruptcy risk for Lithuanian companies. This hypothesis was tested using 27 various financial coefficients. The importance of each ratio was estimated by statistical software NCSS and regression analysis was used for this purpose. The dependent variable was class that was given to each object like so: the third class was bestowed to the companies (their years) that go bankruptcy after 2 years, the second class was bestowed to those that go bankruptcy after 5 years and the first class was bestowed for the rest companies. Ten the most informative ratios for bankruptcy risk estimation are:

1. ROA,
2. retained earnings / total assets,
3. EBIT / total assets,
4. total liabilities / total assets,
5. gross profit margin,
6. turnover of assets,
7. gross profit / total assets,
8. gross profit / capital,
9. turnover of receivable sums,
10. ROE.

The results show that profitability ratios are the most informative for the forecast of bankruptcy risk. The distribution of the companies among classes differs a bit according to the choice of number of the most important ratios. The aim is to minimize the number of companies that have very high risk to go bankrupt, because too large the riskiest class is one of the weakness' of E. Altman model. The least number of objects (27 of 250) that have the highest risk to fail was in the case of six ratios. Then 28 objects have the least probability to go bankrupt. The rest companies have the average probability to fail. The typical representatives of the classes are these: "Naftotiekis" in 1996 is the best representative of the first class (the least risk), "Naftos terminalas" in 2001 is the best representative of the second class (the average risk) and "Dirbtinis pluostas" in 2000 is the best representative of the third class (highest risk).

The comparison of the three best representatives of the classes and their six the most important ratios showed that two ratios – retained earnings / total assets and turnover of assets have no the significant difference among the classes, so they were rejected. So, four ratios – ROA, EBIT / total assets, total liabilities / total assets and gross profit margin left. The distribution of the companies among classes is: 7 objects are in the first class, 224 objects are in the second class and 19 objects are in the third class. It means that some companies that were in the outside class passed to the middle class, but the best representatives of the classes stay the same.

The results of classification of Lithuanian companies into three classes on the ground of four the most informa-

tive ratios showed that the highest risk to go bankrupt had "Dirbtinis pluostas" since 1999 till 2000, "Lietuvos kuras" since 1998 till 1999, "Kauno audiniai" in 1998 and 2001, "Trinyciai" since 1999 till 2001, "Sema" in 1999, "Alytaus tekstile" in 1996 and 1999, "Lifosa" in 2000 and 2001, "Vilniaus baldų kombinatas" in 1999, "Birzu akcine pieno bendrove" in 1999, "Ventus-nafta" in 2000, "Kauno energija" in 2000 and "Lithun" in 2000.

"Naftotiekis" in 1996 and 1997, "Alita" in 1996, "Stumbras" in 1996, "Kalnapilis" in 1997 and 1998, "Utenos trikotazas" in 1998 had the least risk to fail. The rest companies that were not mentioned left in the second class where the probability of bankruptcy is average.

As the middle class is the largest one, it is hard but very useful to foresee which companies are near the third class where the risk of failure is high. This can be estimated by the classification into four classes. The results in this case are: the only company "Dirbtinis pluostas" in 2000 is in the riskiest class. 24 objects (of 250) have high risk to fail (the third class). There are all those objects that were in the riskiest class by companies' classification into three classes and some others that came from the middle class in the first case: "Kauno audiniai" in 1999, "Alytaus tekstile" in 1997 and 1998, "Snaige" in 1995 and "Mazeikiu nafta" in 1998 and 1999. "Lifosa" in 2001 is the best representative of this class.

The same 7 objects as in the first case have the least risk to go bankrupt. The best representative of this class is also the same – "Naftotiekis" in 1996. So the most companies have the average probability to fail and this result is quite reliable, because 97 percent of the firms were the same in the second class comparing both cases of classification. The best representative of this class is also the same – "Naftos terminalas" in 2001. So the comparison of results of firms' classification into three and four classes showed that at bottom, the riskiest class in the first case was divided into two classes (high risk and very high risk) in the second case.

The results of classification showed that "Dirbtinis pluostas" had very high risk to fail in 2000 and it really failed in 2001. More than half companies that had high risk to go bankrupt really failed after 2 or more years. A lively attention must be paid to the companies that are in this class for several years successively.

So, according to the new bankruptcy estimation model, the risk of bankruptcy can be estimated for any company. It needs to compare its four coefficients with correspondent ratios of the typical representatives of the classes. The values of the most important coefficients of the best representatives are shown in the table below. A new firm is set to the class, where its dissimilarity with the typical representative is the least.

Table

The best representatives of the classes and the most important ratios

Class	The risk to fail	The best representative	ROA	EBIT / total assets	Total liabilities / total assets	Gross profit margin
4	Very high	"Dirbtinis pluostas" in 2000	-0.3054	-0.2955	0.8061	-0.1209
3	High	"Lifosa" in 2001	-0.2539	-0.2509	0.7770	-0.0121
2	Average	"Naftos terminalas" in 2001	0.0258	0.0258	0.0010	0.3058
1	Low	"Naftotiekis" in 1996	0.2878	0.3688	0.1276	0.6529

It's wonder what risk of bankruptcy by this method had the companies that are already failed.

"Trinyciai" have gone bankrupt in 2003. The distances between its ratios of 2002 year and the coefficients of the best representatives are those:

$$d(O, O_4) = |-0.3054 - (-0.0653)| + |-0.2955 - (-0.0653)| + |0.8061 - 0.4919| + |-0.1209 - 0.0206| = 0.9259;$$

$$d(O, O_3) = 0.6919$$

$$d(O, O_2) = 0.9584$$

$$d(O, O_1) = 1.7839$$

It is obviously that it had high risk to fail in 2002.

The same calculations were done for "Siauliu stumbras" according to its data of 2002 year:

$$d(O, O_4) = |-0.3054 - (-0.0355)| + |-0.2955 - (-0.0355)| + |0.8061 - 0.4890| + |-0.1209 - 0.1915| = 1.1595;$$

$$d(O, O_3) = 0.9255$$

$$d(O, O_2) = 0.7248$$

$$d(O, O_1) = 1.5503$$

It failed in 2005. It had the average risk to go bankrupt in 2002, but it drew to the class of high risk. Unfortunately there were not found the data of 2003 and 2004 years, so there was not ability to find the tendencies. The more accurate tendencies of changes of bankruptcy risk can be estimated by making the calculation on the ground of data of not a year but half-year or shorter period of time.

"Ekranas" crashed in this year (2006). Its risk to go bankrupt was still average in 2004, but it drew to the high risk, because the distance to the risky class was not large comparing it with the distance to safe (first) class.

$$d(O, O_4) = |-0.3054 - 0.0018| + |-0.2955 - 0.0018| + |0.8061 - 0.4885| + |-0.1209 - 0.1309| = 1.1740$$

$$d(O, O_3) = 0.9400$$

$$d(O, O_2) = 0.7103$$

$$d(O, O_1) = 1.5358$$

The financial data of the first half of 2005 year shows that this company really went to the third (risky) class in

2005 and the distance to the fourth (very high risk) class is not large:

$$d(O, O_4) = |-0.3054 - (-0.0521)| + |-0.2955 - (-0.0521)| + |0.8061 - 0.5392| + |-0.1209 - (-0.0373)| = 0.8472;$$

$$d(O, O_3) = 0.6636$$

$$d(O, O_2) = 1.0371$$

$$d(O, O_1) = 1.8626$$

So these samples show that the new method of bankruptcy risk estimation is correct and secure for Lithuanian companies.

Conclusions

1. The companies come across various risks in their performance. Objective valuation of situation, ability to determine the risk, decisions made right and pat in finance, investment, technique and technology, organization of work, creation of new products and services are important presumptions to safeguard the stability and succession of the companies' performance. Bankruptcies of enterprises are one of the most popular economic appearances and cause a lot of negative effects for companies, employees, other associate firms and institutions, also for state and society. So, the managers of the companies must constantly look for the ways and means to avoid bankruptcy and to secure their performance success and succession. Bankruptcy forecast models can help to reduce or even eliminate the danger of bankruptcy, to decree the effective strategic decisions.
2. One of the most popular ways to measure bankruptcy risk this time is E. Altman method. But the results of application of this method for 56 Lithuanian joint stock companies showed, that it produce meaning error. The probability to crash is too large for lots of companies. So E. Altman model is not correct for Lithuanian companies and a new method is required. The classification method was offered for creation of better bankruptcy risk estimation method.
3. Statistical classification is one of most important and independent research methods of social-economic occurrences and is widely used in all or almost all spheres of science when doing various statistical researches. Classification lets summarize the information, abridge the data set that is needed for the analysis, by making a choice one or several classes that are concerned. The classes are combined according to typical representatives.
4. On the ground of classification method, four risk classes were distinguished and the best representatives of the classes were found. The risk to go bankrupt for each company is estimated by comparison of the firm's coefficients with the ratios of the best representatives. Regression analysis produced four most important ratios for bankruptcy risk. They are ROA, EBIT / total assets, total liabilities / total assets and gross profit margin. A new firm is set to the class, where its dissimilarity

with the typical representative is the least. This method is more appropriate than E. Altman model because there were less firms that fell into the highest risk class but did not fail and there were put all those firms that really failed.

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Lietuvos įmonių bankroto rizikos vertinimas

Santrauka

Įmonių veikloje visada buvo ir yra įvairių rizikos rūšių. Jų ypač daugėja plečiantis rinkoms ir didėjant konkurencijai. Objektivyus situacijos įvertinimas, gebėjimas nustatyti riziką, laiku priimti teisingi sprendimai finansų, investicijų, technikos ir technologijų, darbo organizavimo, naujų produktų ir paslaugų kūrimo bei kitose srityse yra svarbios prielaidos užtikrinti įmonės veiklos stabilumui ir tęstinumui.

Įmonės veiklos perspektyvos ir tęstinumas rūpi ne tik pačiai įmonei, bet ir su ja susijusiems subjektams: investuotojams, akcininkams, bankams, pirkėjams, tiekėjams ir kitiems verslo dalyviams. Įmonių bankrotai – vienas plačiausiai paplitusių rinkos ekonomikos reiškinių, jie sukelia daug neigiamų padarinių ne tik pačiai įmonei ir jos darbuotojams, bet ir kitoms įmonėms bei institucijomis, valstybei ir visuomenei.

Taigi įmonių vadovai turi nuolat ieškoti būdų ir priemonių įmonių bankrotams išvengti ir jų sėkmingos veiklos tęstinumui garantuoti. Viena veiksmingiausių bankroto diagnostikos ir prevencijos priemonių yra įmonių veiklos analizė. Be laiku atliktos ir nuodugnios analizės neįmanoma tinkamai valdyti įmonės išteklių, nustatyti tinkamų jų naudojimo tendencijų, priimti optimalių investicinių ir finansinių sprendimų bei parengti įmonės tolesnės raidos prognozių. Tik įmonės, kuriose tinkamai organizuota analitinė veikla ir kurių vadovai atsakingai bei atidžiai stengiasi kuo efektyviau valdyti su verslo rizika susijusius procesus, gali anksčiau nustatyti artėjančią veiklos krizę, operatyviai į ją reaguoti ir sumažinti bankroto tikimybę.

Dažniausiai įmonių bankroto tikimybė nustatoma E. Altmano metodu. Tačiau problema ta, kad Lietuvoje nėra atlikta tyrimų ir padarytų išvadų apie šio metodo tinkamumą mūsų šalies įmonėms.

Todėl šio straipsnio tikslas yra patikrinti E. Altmano metodo tinkamumą Lietuvos įmonių atveju ir pasiūlyti bankroto tikimybės nustatymo modelio patobulinimus.

Tyrimo objektu pasirinktos 56 Lietuvos akcinės bendrovės ir jų 1995-2005 metų finansiniai rodikliai.

E. Altmano modelyje esančių rodiklių tinkamumui įvertinti naudota regresinė analizė, o tinkamesnio bankroto rizikos įvertinimo modelio paieškai – klasifikavimo metodas.

Pagal E. Altmano modelį buvo įvertintos 56 Lietuvos akcinės bendrovės atsižvelgiant į 1995-2001 metų finansinius duomenis. Iš jų šešios įmonės jau yra bankrutavusios. Kiekviena įmonė skirtingais finansiniais metais buvo traktuojama kaip atskiras objektas, todėl nagrinėta gana didelė – 250 objektų aibė. Apskaičiavus visiems objektams (įmonėms skirtingais finansiniais metais) Z reikšmes, gauti tokie rezultatai: 90 objektams iš 250 gresia labai didelė tikimybė bankrutuoti, 73 objektų tikimybė bankrutuoti yra didelė, 14 objektų galimas bankrotas, o likusiems 73 – bankroto tikimybė labai maža. Apibendrinus rezultatus galima teigti, kad įmonė bankrotą pasiekia mažiausiai po trejų metų nuo patekimo į klasę, kurioje tikimybė bankrutuoti labai didelė.

Kita vertus, į šią klasę pateko ir daug kitų įmonių, kurios nebankrutavo, dirba ir net pakilo į aukštesnę klasę. Iš viso šioje klasėje teko būti net 29 įmonėms iš 53-jų nagrinėtų vienais ar kiais metais. Taigi daugiau nei pusė nagrinėtų įmonių turėjo labai didelę tikimybę, pasak E. Altmano, bankrutuoti, tuo tarpu iki šiol iš jų realiai bankrutavo tik šešios. Manymume, kad tai gana didelė paklaida, todėl reikalinga tikslesnė metodika.

Logiška manyti, jog įmonės, artėjančios prie bankroto, turi daugelį prastų finansinių rodiklių, ir tuo jos turėtų išsiskirti iš likusių sėkmingai veikiančių bendrovių, kurių daugelis rodiklių yra palyginti

geri. Įmonė yra sudėtingas objektas, apibūdinamas daugeliu įvairaus pobūdžio rodiklių. Be to, nėra konkrečios (tikslios) kiekvieno rodiklio reikšmės, kuri būtų laikoma gera ar bloga. Kiekviena įmonė turi savo silpnų ir stiprių savybių. Todėl, norint tiksliai ir įvairiapusškai įvertinti įmonę bei deramai numatyti bankroto tikimybę, reikia vertinti ne pavienius rodiklius, bet jų sistemą. Tam reikalinga metodika, leidžianti agreguoti daugelį kintamųjų.

Įvertinti daugelį kintamųjų ir juos susisteminti, suvedant į keletą klasių, leidžia klasterinė analizė. Statistinis klasifikavimas yra vienas svarbiausių ir savarankiškų socialinių ir ekonominių reiškinių tyrimo metodas, plačiai taikomas daugumoje įvairių mokslo sričių, atliekant įvairius statistinius tyrimus. Uždavinių, susijusių su objektų lyginimu ir klasifikavimu, analizės svarbumą mokslininkai pripažino jau seniai, tačiau ilgą laiką praktiškai įgyvendinti siūlomus metodus buvo sunku. Vėliau užsienio mokslininkai pamažu pradėjo taikyti klasifikavimo algoritmus kai kurių medicinos, biologijos, archeologijos ir kitos uždaviniais spręsti.

Klasifikavimo tikslai nuolat plečiasi, kartu ir paties klasifikavimo proceso sudėtis tampa neišmatuojamai turtingesnė ir sudėtingesnė. Anksčiau tai buvo tik techninė problema, o dabar ją papildo ir pačios klasifikavimo procedūros sudarymo uždavinys. Tačiau kylantys sunkumai nėra pateisinama priežastis atsisakyti būtinų analizei klasifikavimo procedūrų.

Klasifikavimas leidžia apibendrinti informaciją, susiaurinti tam tikrai analizei reikalingų duomenų aibę, pasirenkant tik vieną ar kelias dominančias klases. Tai ypač aktualu siekiant palyginti nagrinėjamus objektus, nes vienoje klasėje esantys objektai yra panašūs.

Taigi ši metodika tinka ir įmonių bankroto rizikai nustatyti. Įvairioje literatūroje pateiktų klasifikavimo metodų esmė tokia: suskirstyti objektus į klases taip, kad klasės viduje objektai būtų labai panašūs, o tarp klasių skirtumas būtų didžiausias. Šiuo atveju tokia metodika nėra tinkamiausia, todėl siūlau sudaryti kitokių objektų klasifikavimo būdą, kuris nustatytų objektų aibės kraštinius taškus. Pirmieji du atrasti aibės kraštiniai kampai bus priešingi vienas kitam, ir juos galima bus traktuoti kaip atitinkamai viena – geriausiai (turinti mažiausią riziką bankrutuoti), o kita – blogiausiai dirbanti (turinti didžiausią riziką bankrutuoti) įmonė rinkoje. Klasifikuojant į tris klases, galima rasti ir įmonę, kuri atitinka rinkos vidutines rodiklių reikšmes. Pagal atrastus kraštinius objektus (klasių tipinius atstovus) formuojamos ir klasės. Kiekvienas likęs aibės objektas priskiriamas tai klasei, iki kurios tipinio atstovo atstumas mažiausias.

Remiantis šiuo klasifikavimo principu, buvo bandoma rasti tinkamesnį būdą nei šiuo metu naudojamas E. Altmano modelis įmonių bankroto rizikai įvertinti.

Norint E. Altmano modelį patobulinti ir pritaikyti Lietuvos įmonių atveju, iškelta hipotezė, kad minėtame modelyje išskirti penki rodikliai tikrai yra reikšmingiausi nustatant bankroto tikimybę, tačiau mūsų šalies įmonių atveju reikėtų pakoreguoti regresinės lygties koeficientus ar Z reikšmių intervalus kiekvienoje bankroto tikimybės klasėje, norint pasiekti didesnio tikslumo.

Pagal penkis rodiklius, naudojamus E. Altmano modelyje, suskirstius įmones į keturias klases, labai didelė bankroto tikimybė (ketvirta klasė) turi tik keturios įmonės – AB „Lifosa“ 2000 ir 2001 metais, AB „Lithun“ 2000 metais, AB „Dirbtinis pluoštas“ 2000 m. ir AB „Lietuvos kuras“ 1999 m. Pastarosios dvi 2001 metais bankrutavo. Dauguma įmonių, kurios turėjo didelę tikimybę bankrutuoti ir per nagrinėtą laikotarpį išbuvo bent trejus metus, bankrutavo. Mažiausią tikimybę bankrutuoti turi dauguma uosto pramonės įmonių, finansinio tarpininkavimo institucijos ir kai kurios kitos. Visoms kitoms įmonėms tikimybė patirti bankrotą yra vidutinė ar šiek tiek mažesnė nei vidutinė.

Taigi apibendrintai galima pasakyti, kad šiuo atveju gauti labiau priimtini rezultatai, nes į „pavojingąsias“ klases pateko visos įmonės, kurios šiuo metu yra bankrutavusios, o tų, kurios vis dar sėkmingai dirba ir pateko į minėtąją grupę, yra žymiai mažiau nei E. Altmano modelio atveju.

Galima kelti dar ir antrąją hipotezę – galbūt E. Altmano modelyje naudojami penki rodikliai nėra patys informatyviausi vertinant bankroto riziką. Norint ją patikrinti, buvo paimti šie penki ir kiti apskaičiuoti įvairūs 22 santykiniai rodikliai bei statistiniu paketu NCSS įvertintas kiekvieno jų reikšmingumas bankrotui. Naudojama regresinė analizė kaip priklausomą kintamąją priskiriamą klasę, kuri kiekvienam objektui suteikiama tokiu būdu: įmonėms, kurioms iki bankroto liko 2 metai, priskiriama 3 klasė, įmonėms, kurioms iki

bankroto liko 5 metai, priskiriama 2 klasė, visoms kitoms – 1 klasė. Gauti šie dešimt pačių reikšmingiausių rodiklių:

1. ROA (turto graža),
2. $\frac{\text{nepaskirstytas pelnas}}{\text{turtas}}$,
3. $\frac{\text{pelnas iki apmokestinimo}}{\text{turtas}}$,
4. skolinimasis (skolos turtui),
5. bendro pelno marža,
6. turto apyvartumas,
7. $\frac{\text{bendras pelnas}}{\text{turtas}}$,
8. $\frac{\text{bendras pelnas}}{\text{kapitalas}}$,
9. gautinų sumų apyvartumas,
10. ROE.

Iš gautų rezultatų galima daryti išvadą, kad daugiausia informacijos apie įmonės galimybę bankrutuoti pateikia pelningumo rodikliai. Imant skirtingą reikšmingiausių rodiklių skaičių, įmonių pasiskirstymas tarp klasių skiriasi. Vienas svarbiausių tikslų – minimizuoti didžiausią riziką bankrutuoti turinčių įmonių skaičių, kuris pagal E. Altmano modelį yra labai didelis. Mažiausiai – 27 objektai (iš 250) pateko į rizikingiausią klasę imant šešis pirmuosius reikšmingus rodiklius. Tada mažiausią tikimybę bankrutuoti turi 28 objektai. Didžioji dalis nagrinėtų objektų (195) patenka į klasę, kur tikimybė bankrutuoti yra vidutinė. Gautų klasių tipiniai atstovai yra šie: pirmos (nerizikingiausios) – AB „Naftotiekis“ 1996 m., antros (vidutinės rizikos) – AB „Naftos terminalas“ 2001 m. ir trečios (rizikingiausios) – AB „Dirbtinis pluoštas“ 2000 m.

Paėmus šių trijų klasių atstovų šešis išskirtus reikšmingiausius rodiklius ir palyginus jų reikšmes, galima pastebėti, kad dviejų rodiklių – $\frac{\text{nepaskirstytas pelnas}}{\text{turtas}}$ ir turto apyvartumas, reikšmingo skirtumo nėra, todėl jie buvo atmesti. Taigi liko keturi rodikliai: ROA (turto graža), $\frac{\text{pelnas iki apmokestinimo}}{\text{turtas}}$, skolinimasis (skolos turtui) ir bendro pelno marža.

Šiuo atveju gautas toks įmonių klasių pasiskirstymas: rizikingiausioje (ketvirtoje) klasėje yra tik viena įmonė – AB „Dirbtinis pluoštas“ 2000 m. Didelę tikimybę bankrutuoti turi 24 objektai. Šios klasės tipinis atstovas 2001 m. buvo AB „Lifosa“.

Mažiausią tikimybę bankrutuoti turi 7 objektai, o šios klasės geriausias atstovas – 1996 m. AB „Naftotiekis“. Didžioji dauguma nagrinėtų įmonių turi vidutinę tikimybę bankrutuoti. Šios klasės geriausias atstovas – 2001 m. AB „Naftos terminalas“.

Labai didelę riziką bankrutuoti turinti AB „Dirbtinis pluoštas“ 2000 metais, iš tiesų bankrutavo kitais metais, o šiek tiek daugiau nei pusė įmonių, buvusių didelės rizikos klasėje, bankrutavo po 2 ar daugiau metų. Ypač didelį dėmesį reikėtų skirti toms įmonėms, kurios šioje klasėje išbūna keletą metų iš eilės.

Taigi pagal patobulintą E. Altmano modelį, t.y. tiksliau nustatytą bankroto rizikos įvertinimo modelį, tinkamą Lietuvos atvejui, norint įvertinti bankroto riziką bet kuriai naujai įmonei, užtenka jos rodiklius palyginti su išskirtais klasių tipiniais atstovais. Jų reikšmingiausių rodiklių reikšmės pateiktos lentelėje. Naujoji įmonė priskiriama tai klasei, su kurios tipiniu atstovu atstumas (Manhatano) yra mažiausias.

Raktažodžiai: *bankroto rizikos nustatymas; E. Altmano modelis; klasifikavimo metodas.*

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