COMPLEX ANALYSIS OF COMPANY BANKRUPTCY FORECASTING: THEORETICAL INSIGHT

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Abstract. *In modern conditions for dynamic and competitive businesses, more and more companies face financial problems and eventually go bankrupt. A noteworthy trend: not only new companies that have not yet managed to establish themselves in the market go bankrupt but also large companies operating for years and maintaining good traditions. Bankruptcies of companies cause many problems not only for the companies themselves but also for the state and many members of society. Thus, it is crucial to evaluate the financial state of a company and its activity results as accurately and early as possible when forecasting the possibility of a bankruptcy. The paper recommends a complex analysis methodology for forecasting company bankruptcies. It consists of the following elements: 1) study of the external and internal environments; 2) evaluation of changes of absolute financial indicators; 3) calculation and evaluation of financial ratios; 4) application of bankruptcy prediction models; 5) research of bankruptcy causes and 6) application of operational and prospective measures to avoid bankruptcy. By carrying out a thorough analysis of each of these elements, it is possible to obtain detailed and objective information about the company's financial status, activity results and cash flows as early as possible and anticipate the possibilities of the company's business continuity.*
Keywords: absolute and relative financial indicators, bankruptcy, bankruptcy causes, bankruptcy prediction models, measures to avoid bankruptcies.

Introduction

One of the most important conditions determining successful activity of a company is solvency, i.e. ability to settle long-term and short-term liabilities with available payment instruments (cash, securities, accounts receivable, stocks). All the subjects related to the company (investors, customers, suppliers, banks, financial institutions, shareholders) have an interest to maintain business contacts only with a successful and financially stable, i.e. solvent company. However, in modern dynamic and competitive businesses conditions, more and more companies face insolvency problems and thus go bankrupt. Bankruptcies of

companies become a constant phenomenon of global crisis resulting in many negative consequences not only for the company but also for the state and many members of society: the company that is going bankrupt usually does not settle with creditors, the employees are left unemployed, and the process often demands taxpayers' money.

Not only new companies go bankrupt but also large companies operating for years and having good traditions as well as international acceptance. The largest bankruptcies in the history of the U.S.A., that took place in 2008-2009, when such companies as Lehman Brothers (bank), Washington Mutual (bank), General Motors (car manufacturer), Chrysler (car manufacturer), Thornburg Mortgage (bank) and others went bankrupt. Their assets worth hundreds of billions of dollars exacerbated the crisis not only in the U.S.A. but also in many other countries.

Lithuania started to record bankruptcies of companies in 1993. 20,933 companies and 16 banks went bankrupt in Lithuania from 1993 to 2017. It is a rather high number for the small Republic of Lithuania with less than 3 million of inhabitants. The last decade has seen an especially large increase in bankruptcies: more than 1700 companies go bankrupt every year. An especially negative feature of the Lithuanian economy is noteworthy – companies of almost all industries go bankrupt. Wholesale and retail trade, motor vehicle and motorcycle repair companies and construction companies go bankrupt the most, which account for 30 % and 15 %, respectively, of the total companies that went bankrupt.

Thus, in order to avoid bankruptcies of companies and their consequences, it is necessary to determine, evaluate and solve the financial problems of a company before it becomes clear that the company is insolvent and the insolvency procedures have to be started. Therefore it is important that every company would have its methodology for activity stability and continuity analysis, which would help not only to determine the bankruptcy possibility beforehand as well as other possible dangers and various risks but to take strategic actions to improve the company's performance.

Various aspects of companies' bankruptcies – bankruptcy signs, factors, causes, consequences, prediction models, variation of numbers of companies that went bankrupt, bankruptcy procedures – have been studied by many authors. The works that have been written in the last decade are noteworthy: Agarwal & Taffler (2008), Aziz & Dar (2006), Bivainis & Garškaitė (2010), Budrikienė & Paliulytė (2012), Burkšaitienė & Mažintienė (2011), Charitonovas (2004), Cybinski (2001), Genriha, Petere, & Voronova (2011); Genriha & Voronova (2010); Grigaravičius (2003); Haber (2005), Jones & Hensher (2004), Juchno & Tvaronavičienė (2004), Mackevičius (2010), Mackevičius & Šneidere (2004), Prasad & Puri (2005), Pompe & Bilderbeek (2005), Purvinis, Šukys, & Virbickaitė (2005), Sakalas, & Virbickaitė (2003), Stoškus, Beržinskienė, & Virbickaitė (2007), Stundžienė & Boguslauskas (2006), Šneidere (2005, 2007,

2009), Tvaronavičienė (2001), Савицкая (2005), Ковалев (2013), Фомин (2003) and others. However, these and other authors analyse company bankruptcy issues in only certain aspects without paying much attention to a complex analysis of bankruptcy forecasting.

The aim of the paper is to prepare a complex analysis methodology for forecasting company bankruptcies, which could be applied to more accurately evaluate the possibility of bankruptcy and further activity continuity.

The research methods: analysis of scientific literature by various authors, methods of information comparison, systematization, elaboration and generalization.

A recommended complex analysis methodology for forecasting company bankruptcies

Company bankruptcy forecasting is a very difficult process because it is necessary to evaluate various business operations and economic events as objectively as possible, to disclose the factors that have the greatest influence on the financial situation and the results of the company's activity. It is possible to achieve this only by performing a complex analysis of bankruptcy forecasting.
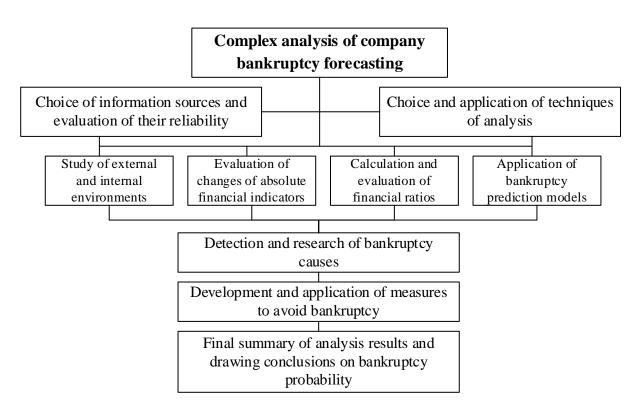

Figure 1. **A complex analysis methodology for forecasting company bankruptcies** (source: compiled by the authors based on Mackevičius, 2010: 127)

This methodology consists of six main elements:
1) study of the external and internal environments;
2) evaluation of changes of absolute financial indicators;
3) calculation and evaluation of financial ratios;
4) application of bankruptcy prediction models;
5) research of bankruptcy causes;
6) application of measures to avoid bankruptcy (see Figure 1).

It is appropriate to start the complex analysis of company bankruptcy forecasting by choosing technical methods and information sources. When carrying out a complex analysis of company bankruptcy, the main sources of information are companies' financial statements (a balance sheet, a profit and loss statement, a cash flow statement, a statement of changes in equity, explanatory notes, and an annual report). These statements describe the operating (productive, commercial), investing and financing activities during a certain period of time. They show the financial results, assets, equity, liabilities and provide other important information about a company. Various forms of statistical reports, prepared by Statistics Lithuania under the Government of the Republic of Lithuania, play a huge role in the complex analysis of company bankruptcy: 1) a report of the company's most important financial indicators; 2) an annual report of the company's industrial activities; 3) a report of a company's activities. It is appropriate to also include tax reports showing taxable financial indicators rather than the real ones. The financial and management accounting source documents and registers provide a lot of valuable information for carrying out a complex analysis of company bankruptcy prediction. Financial and management accounting information is especially important when looking for causes of certain financial indicator changes; it can help to predict the future revenues and expenses, evaluate the price of shares in the stock exchange and raise some capital. Non-accountant internal (meeting information, staff survey results, technical documents, contracts, claims etc.) and external (statistical publications, manuals, media information, and information provided by commercial banks, insurance companies, taxes inspectorates etc.) information sources can be applied when carrying out a complex analysis of bankruptcy.

Various research methods can be used to perform a complex analysis on company bankruptcies prediction. The methods can be divided into three categories: 1) common economic; 2) mathematical and 3) heuristic. The application of common economic methods (comparison, classification, average quantities, generalisation, indices etc.) helps to evaluate the financial situation of a company, clarify the causes of changes, and anticipate future prospects fairly objectively. Mathematical methods (linear programming, correlation analysis, regression analysis etc.) identify financial resource usage trends, quantitatively evaluate the effect of negative changes, and predict the effect of internal and

external factors. Heuristic methods (analogy, association, synectics, expert evaluation, group discussion, brainstorm etc.) set strategic aims of a company's financial status, rationalize cash flows, optimize management decisions on financial activity issues (Mackevičius, Giriūnas, & Valkauskas).

After choosing appropriate information sources and research methods, the study of the elements of the complex analysis of company bankruptcy forecasting is then consistently carried out.

2. The application of the elements of the complex analysis methodology for forecasting company bankruptcies

The study of a company's environmental factors. Environmental factors have a great influence on a company's financial status and activity results. They can be divided into two groups: external and internal. External factors can either encourage or aggravate establishment of new businesses, create favourable conditions for the expansion of an already established business not only inside the country but abroad as well and vice versa, hinder the business expansion or even halt it. Economic (the national monetary, fiscal, tax system, investment, foreign trade policy, the pricing system, inflation, loan and interest rate policy, competition, changes in exports and imports, development of banks and the capital market, economic infrastructure etc.) and political-legal (the quality of legislation, national regulation policy, help for small and medium-sized businesses, the stability of the economic and political system) factors can have a particularly strong influence on the activities of a certain company. Social and cultural (national social policy, the unemployment rate, the social security system, emigration and immigration etc.) and technological (promotion and support for the usage of advanced technologies and innovations, occupational safety, provision of conditions for the development of new products and services) factors can also have a strong impact. A negative influence of ecological factors (earthquakes, floods, fires etc.) regarding companies' activities has increased in recent years due to global warming. But generally, since Lithuania became an EU member, external environmental factors (especially economic and political-legal) have had a positive effect when dealing with a lot of company activity issues, especially in increasing efficiency and competitiveness.

Nevertheless, it is necessary to mention that along with external factors there are a lot of internal ones that determine the probability of bankruptcy. They are different in various companies and mostly depend on the size of a company, the complexity of production and provided services, the scale of operations carried out and other features of activities. However, when predicting a probability of bankruptcy, the focus should be drawn to a company's organisational management structure, managers' business philosophy, leadership style,

personnel management policy, the state of the accounting and internal control system.

The evaluation of changes in absolute financial indicators. More than a hundred absolute financial indicators are presented in the financial statements of a company. When predicting a probability of a company's bankruptcy, all the balance sheet, profit and loss statement, cash flow statement and changes in equity statement absolute indicators and explanatory notes must be revised. Such balance sheet items as tangible assets, intangible assets, financial assets, current assets, equity, long-term and short-term liabilities should especially be taken into account. Almost all experts of accounting and audit are unfavourable towards the decrease of tangible fixed assets, especially if they are sold in order to increase financial resources. The stability of a company's activity can be questioned if a part of active (plant and machinery, equipment, vehicles) tangible fixed assets had decreased during the financial year.

Special attention must be paid to the item of accounts receivable within one year. Its increase can mean that the company's customers are insolvent, that the payment policy is poor and other things. A decrease of the accounts receivable within one year should not be unambiguously considered as positive as well. Sometimes the customers pay their debts more quickly in order to avoid any future business with the company.

The items of long-term and short-term liabilities must be thoroughly analysed. If the amount of these items had increased during a financial year, it means that a company has serious financial problems showing that it is not capable of fulfilling its liabilities in time with its payment instruments.

When analysing the absolute indicators of profit and loss statements, special attention must be paid to the indicators of sales revenue and cost of sales. If sales revenue has fallen, it is most likely that the demand for the company's products has decreased or the sale process was organized poorly, there was no proper advertising. If the cost of sales or other expenses included in the profit and loss statement have increased, it can be said that the company resources are used inefficiently, the work is organized poorly, the general and administrative costs are high etc.

One can judge about the probability of bankruptcy based on the absolute indicators of a cash flow statement. The cash flows of the operating activity are especially noteworthy. The decrease of cash flows of this activity indicates the shortage of cash to carry out and develop the operating (productive, commercial, service) activity. Decline of cash flows from the financing activity indicates that the company is unable to use external financing sources or even that the relationships with third parties have worsened.

When analysing the absolute indicators of financial statements, it is not enough to state their values and changes, but also find out the reasons why one or another indicator has considerably increased or decreased.

Calculation and evaluation of financial ratios. The application of financial ratios is one of the simplest and perhaps most accurate methods of calculating the probability of companies' bankruptcies. However, some questions arise when applying this method: which financial ratios should be applied, which of them are the most important, how they should be evaluated and so on. Various authors' opinions differ on this matter. Authors from different countries suggest different groups of ratios and the number of ratios included in them. The names and even the calculation formulas of the same ratios often differ. The differences usually occur because of different forms of financial statements in various countries.

To predict the bankruptcy as accurately as possible, it is appropriate to calculate and evaluate 7-10 ratios. The main ones are the solvency and profit ratios (see Table 1).

Table 1 **Financial ratios indicating the bankruptcy probability**
(source: authors' construction based on Įmonių finansinės būklės…, 2004)

Ratios	Calculation formula	Evaluation level	
		Unsatisfactory	Bad
1. Current ratio	$\dfrac{Current\ assets}{Current\ liabilities}$	<1.2	<1.0
2. Quick ratio	$\dfrac{Cash + Cash\ equivalents + Net\ receivables}{Current\ liabilities}$	<1.0	<0.5
3. Debt ratio	$\dfrac{Total\ liabilities}{Total\ assets}$	>0.7	>1.0
4. Profit margin (%)	$\dfrac{Net\ profit}{Sales}$	<5	negative
5. Return on assets (%)	$\dfrac{Net\ profit}{Total\ assets}$	<8	negative
6. Return on equity (%)	$\dfrac{Net\ profit}{Owners\ equity}$	<1	negative
7. Net working capital	$Current\ assets - Current\ liabilities$	Low or downward trend	negative
8. Net working capital turnover	$\dfrac{Sales}{Net\ working\ capital}$	Low or downward trend	negative

It is not enough to calculate all the ratios shown in Table 1 or additional ones, depending on the specifics of a company's activities; their value has to be evaluated as objectively as possible so they would not fall to an unsatisfactory or low level. The evaluation levels seen in Table 1 are based on the recommendations of Statistics Lithuania (*Įmonių finansinės būklės...*, 2004). These values of ratios are indicative, ratios of different industries may differ depending on the specifics of companies' activities. The analysts of companies can prepare their own company's indicative values of ratios based on these indicative values of ratios after examining the dynamics of ratios in the past few years.

Application of bankruptcy prediction models. In the most general sense, the bankruptcy prediction models may be described as the process of merging various relative financial ratios into one group and calculating them, thus attributing a certain value to them. A lot of bankruptcy prediction models can be found in economic literature. All of them can be divided into two main groups: 1) classic statistical and 2) artificial intelligence. Linear discriminant analysis (Altman, Springate, Taffler and Tisshaw, Lis, Fulmer, Dovydova, Belikov, etc.) and logistic regression (Zavgren, Chedder, Grigaravičius, etc.) models are attributed to the classic statistical models. Decision tree and neural network models are attributed to the artificial intelligence models.

The models most commonly tested in practice as well as examined and evaluated by scientists are the classic statistical models. Critical values of models suggested by various authors for determining a probability of bankruptcy play an important role in predicting bankruptcy (see Table 2).

Table 2 **Critical values of the most important classic statistical models for bankruptcy prediction** (source: authors' construction based on Šneidere, 2005; Савицкая, 2005; Mackevičius, 2007)

Models*	Critical value
1. Altman 1 (for companies listed in stock exchange markets)	$Z<1.8$
2. Altman 2 (for companies whose shares are not quoted in stock exchange markets)	$Z<1.23$
3. Altman 3 (for service and individual companies)	$Z<1.10$
4. Fulmer	$H>0$
5. Lis	$Z<0.037$
6. Springate	$Z<0.862$
7. Tafler and Tisshaw	$Z<0.2$

Note: the known formulae of calculations for the models are not presented in the table

Lithuanian authors mainly focused on the Altman model for predicting bankruptcies by companies listed in the stock exchange. Some authors (Tvaronavičienė, 2001; Stundžienė & Boguslauskas, 2006) determined that the Altman model is improper for predicting Lithuanian company bankruptcies, others (Mackevičius, Giriūnas, & Valkauskas, 2014; Garškaitė, 2008) proved that this model allows to approximately predict bankruptcy and nearly shows the real situation of the companies.

Relying only on the bankruptcy prediction models when seeking to determine a company's continuity of activities and bankruptcy probability is inappropriate and irrational. The problem is that the models were performed using different financial statements applied in different countries, in different periods of time, and for companies from different industries. Calculation of financial ratios shown in the financial statements is based on different accounting principles in different countries. That is why the same model can be appropriate in one country (and even for a particular industry) and have a completely opposite result in another country or industry. Different authors use different financial ratios in their models, although they usually do not present any particular arguments why a certain absolute or relative financial ratio was included. It is worth noting that the presented models do not estimate the influence of inflation or, more specifically, the different influence of the accounting of the inflation process as well as the specifics of capital structure in different industries. That is why we can agree with statements by some scientists that it is appropriate to create modified Altman bankruptcy prediction models, showing the specifics of each country or industry.

Study of bankruptcy causes. The causes of bankruptcy relate to the complex and constantly changing external and internal environments of a company. It can be said that every company goes bankrupt in a different way, the causes of bankruptcy are not the same. The causes differ depending on the size as well as the industry of a company. Some causes of bankruptcy are of seasonal nature. It is worth noting that very rarely a company goes bankrupt because of only one factor. All causes of bankruptcy can be divided into two groups: internal and external. They are often interdependent and conditioned by one another. Internal causes are the causes that depend on company managers' competence, insight, initiative, managerial skill, and ability to make decisions. External causes are not influenced by the company managers because they are beyond their control. However, the managers must try to identify them, foresee the dangers and, respectively, make some certain managerial decisions as quickly as possible. In scientific literature, various authors only mention certain internal and external causes that influence bankruptcy but do not produce a specific list. It is only worth noting that the influence of external causes of the critical situation of a company has a synergistic effect: the external conditions usually accelerate the internal causes. As we have mentioned, there are a lot of internal and external causes,

although it is not clear which of them are the most important. Mackevičius, Giriūnas, & Valkauskas (2013) carried out a study on bankruptcy causes and established that there were ten most important external and internal causes (see Table 3).

Table 3 **The most important external and internal causes of company bankruptcies**
(source: Mackevičius, Giriūnas, & Valkauskas, 2013)

No.	External causes	Internal causes
1.	Membership in international and regional organizations	Lack of aggression in finding new markets
2.	High rates of inflation or deflation	Large operating losses
3.	Unstable political situation in the country	Working capital deficiency
4.	Unstable national economic policy	Unqualified leadership
5.	Changes in foreign economic policy	Reckless credit taking
6.	Unstable legal system	Mismanagement of cash flow
7.	Amendments to laws and corruption	Mismanagement of the company
8.	Development of the bank capital market	Company's failure to adapt to changes in the market
9.	Procedure for obtaining a credit	Reduction in sales volumes and in the number of orders
10.	Changes in exports and imports	Low professional competence of the staff

But one thing is for sure: it is necessary to pay more attention to the analysis of bankruptcy causes and it is possible to formulate respective policies and strategies to avoid bankruptcy when specific causes are known.

Most important measures to avoid bankruptcy. In scientific literature and in practice, the measures to avoid bankruptcy are very different. It can relate to the specifics of a company's activities and the different approaches of managers to bankruptcy as a phenomenon of the market economy. It must be noted that some recommended measures can be very effective for one company while ineffective for another. However, it is important to be aware of as many measures as possible which can be applied to avoid bankruptcies or decrease their number.

After performing a scientific literature analysis of measures to avoid company bankruptcies, it is suggested to distinguish operational and prospective measures. Operational measures are the ones that are applied when a company reaches a critical situation and the signs that determine a possibility of bankruptcy show up. Prospective measures are the ones that are constantly applied in order to guarantee consistent continuity of the company's activity and to prevent bankruptcy taking into account any signs that may indicate it.

It is noteworthy that managers do not pay enough attention to the measures for forecasting and avoiding bankruptcy. However, if certain measures are actually applied in companies' practices, they tend to vary a lot and some of them are absolutely inefficient. Thus, the question is which measures to avoid bankruptcy are the most important and most appropriate for different companies.

The study on companies of the Republic of Lithuania has shown that the most important operational measures to avoid bankruptcy are: 1) search of ways to reduce costs, 2) improvement of the internal control system and 3) changes in the organisational structure of a company (Mackevičius & Giriūnas, 2014: p. 132). Therefore, the companies facing the threat of bankruptcy must first find ways to reduce costs, improve internal control or reorganize their organisational management structures (merge certain departments, remove a department or establish a new one for solving operative problems etc.). Special attention must be paid to strengthening the internal control system because some of the employees might be dishonest. Acting alone or in agreement with others, they can take advantage of the situation and attempt to make a profit (organise unexpected transactions, damage and then write off valuable assets etc.)

The most important prospective measures for avoiding bankruptcy are these: 1) constant analysis of the competitive market, 2) planning of the company's activities and 3) employees' qualification training. So, the managers have to be constantly interested in the financial ratios of companies that engage in similar activities and look for ways to gain advantage against competitors, even though the company is profitable. It is necessary to take into consideration the influence of internal and external environmental factors, the economic and politic situation of the country and not bring into being random figures when planning the company's activities. The training of employees always contributes to better financial results and is more beneficial than the costs of this measure.

One important fact must not go unnoticed: some measures are of dualistic nature, i.e. are useful in achieving both operational and prospective goals. For example, the search of ways to reduce costs is not only important for the company when it faces the threat of bankruptcy but during all the years of its existence. The same can be said about the internal control system: it must always function to ensure good financial results and the continuity of the company's activities (Mackevičius & Giriūnas, 2014: p. 132). A long-term measure such as training of employees is important not only regarding the company's long-term plans but in solving operational activity problems as well. In the most difficult situations, only highly-qualified specialists can make the right decisions.

A complex analysis of company bankruptcy forecasting – if carried out properly and based on the recommended methodology – helps to gather a vast information fund. By using its data, one can objectively evaluate and determine: a) the company's financial situation and activity results; b) the most risky areas

and the ones that do no benefit or insufficient benefit the company; c) factors influencing changes of various ratios and the company's efficiency in general; d) the company's potential and advantages in the competitive market as well as in crisis situations; e) internal and external reserves to improve the company's activity, etc. This methodology may be successfully applied in all companies, regardless of their size, legal forms and type of industry. Besides, by using this methodology, it is possible to evaluate not only the efficiency of current decisions but the correctness and soundness of previous decisions and predict the future prospects of the company more accurately.

Conclusions

In modern conditions for a dynamic and competitive market economy, company bankruptcies become an inevitable phenomenon and a consequence of the global financial crisis. Not only new companies go bankrupt but also large companies operating for years and having good activity traditions as well as international acceptance. It is unlikely that the number of companies going bankrupt is going to decrease in the future.

In Lithuania, 20,928 companies went bankrupt from 1993 – when the bankruptcies were started to be recorded – to 1 January 2017. The last decade has seen an especially large increase in bankruptcies: more than 1,700 companies go bankrupt every year. An especially negative feature of the Lithuanian economy is noteworthy – companies of almost all industries go bankrupt. Wholesale and retail trade, motor vehicle and motorcycle repair companies and construction companies go bankrupt the most and account for 30 % and 15 %, respectively, of the total companies that went bankrupt.

In order to avoid bankruptcies of companies and their consequences, it is necessary to determine and solve the problems of a company before it becomes clear that the company is insolvent and the insolvency procedures have to be started. Therefore it is important that every company would have its methodology for bankruptcy forecasting which would help to determine possible insolvency beforehand and take strategic actions to improve the company's performance.

To determine the bankruptcy probability beforehand, a representative methodology for complex company bankruptcy forecasting is recommended. It consists of six main elements: 1) study of the company's external and internal environments; 2) evaluation of absolute financial indicator changes; 3) calculation and evaluation of financial ratios; 4) application of bankruptcy prediction models; 5) research of bankruptcy causes; 6) application of measures to avoid bankruptcy. A well prepared complex analysis for forecasting a company's bankruptcy helps to determine the company's possibilities in crisis situations, explain the most complex activity fields, expose the technical and organizational drawbacks of

activity as well as their causes, determine the particular measures to eliminate them and ascertain the reserves to improve the activity; all this is based on the recommended methodology. After evaluating some qualities of the companies' activity, this methodology might be successfully applied in all companies regardless of their size, legal form and industry.

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