METHODICAL APPROACH TO BANKRUPTCY PREDICTION MODEL DEVELOPMENT

ENFOQUE METÓDICO PARA EL DESARROLLO DEL MODELO DE PREDICCIÓN DE QUIEBRA

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ABSTRACT

There stands a possibility of crises in organizations, which are defined by objective elements, including unforeseen fluctuations in market circumstances, periodic technological modernizations, alterations in the production's organization, staff change or external circumstances, and oftentimes political conditions. Bankruptcy is regarded as a crucial factor of crisis notion at enterprises. In fact, bankruptcy is a substantial factor in the structure of the market system, and its primary aim is to preserve social-economic procedures from the outcomes of inefficient actions of their participants and the failure to meet their tasks. As a result, this article mainly intends to analyze the methodical means and techniques for bankruptcy prediction model development. To that aim, several methods, including synthesis, assessment, analysis, comparison, generalization method, and system analysis are utilized. Based on the results, it can be concluded that the international authors incorporate the indicators calculated utilizing the information on financial outcomes as the most crucial indicators. In contrast, Russian scholars and analysts are more concerned with the application of the enterprise property state.

Keywords: bankruptcy analysis; market system; bankruptcy prediction; bankruptcy analysis methods; political conditions.

RESUMEN

Existe la posibilidad de crisis en las organizaciones, las cuales están definidas por elementos objetivos, incluyendo fluctuaciones imprevistas en las circunstancias del mercado, modernizaciones tecnológicas periódicas, alteraciones en la organización de la producción, cambio de personal o circunstancias externas, y muchas veces condiciones políticas. La quiebra se considera un factor crucial de la noción de crisis en las empresas. De hecho, la quiebra es un factor sustancial en la estructura del sistema de mercado, y su principal objetivo es preservar los procedimientos socioeconómicos de los resultados de las acciones ineficientes de sus participantes y el incumplimiento de sus tareas. Como resultado, este artículo pretende principalmente analizar los medios y técnicas metódicos para el desarrollo de modelos de predicción de quiebra. Con ese fin, se utilizan varios métodos, que incluyen síntesis, evaluación, análisis, comparación, método de generalización y análisis de sistemas. Con base en los resultados, se puede concluir que los autores internacionales incorporan los indicadores calculados utilizando la información sobre resultados financieros como los indicadores más cruciales. En contraste, los académicos y analistas rusos están más preocupados por la aplicación del estado de propiedad empresarial.

Palabras clave: análisis de quiebra; sistema de mercado; predicción de quiebra; métodos de análisis de quiebra; condiciones políticas.

INTRODUCTION

The matter of declaring bankruptcy in organizations are applicable to other related matters, for instance, the enterprises' liquidation generated by the founders implies the property loss contributed as an assistance to the authorized capitals. The stakeholders who purchased the portions of the enterprise so as to earn a profit won't gain income, and furthermore, lose invested money. Plus, the providers, one of the their products' consumers, and the customers lose the services and goods' suppliers, resulting in the disarrangement of the common functioning of those organizations (Neskorodieva et al., 2019; Terentyeva et al., 2019).

Not merely is the organization itself interested, but also its counterparty, and also the state to acquire a favorable image of the economic and financial circumstance of enterprises and the level of its steadiness. That is particularly significant for keeping a desirable state of individual industries and the nation's economy on the whole and for a comprehensive evaluation of enterprises, the forecasting and analysis of their bankruptcy likelihood is utilized (Taranova et al., 2021). Following examining the economic and financial actions of enterprises, it seems likely to anticipate and foresee the probability of bankruptcy, to explain the financial illness of the debtor, which supplies the manager with the chance to create and execute timely several anti-crisis steps to stop the enterprises' liquidation (Vasilenko & Titova, 2019; Lazareva & Nelyubov, 2018).

METHODS

Over the course of this study, several scientific approaches have been considered, such as non-formalized methods. The primary approaches are synthesis, analysis, assessment, comparison, system analysis and generalization method.

RESULT AND DISCUSSION

Indeed, bankruptcy is regarded as an essential factor of the structure of the market system, and its primary purpose is to protect social and economic procedures from the consequences of inefficient moves of their participants and the failure to gratify their obligations. Following bankruptcy, insolvent organizations are eliminated from the market economy, in other words, sources are distributed from ineffective owners to those who operate more effectively, meaning that bankruptcy is regarded as a means to enhance the nation's economy (Ames & Wellsfry, 1983; Lazareva & Nelyubov, 2018). Moreover, bankruptcy guarantees the security and sustainability of the asset use effectiveness by enterprises seeing financial hardships, preserving the creditors' interests, and satisfying their statements against the debtor. Through executing the latter function, bankruptcy helps cut costs and hence, raises the credit availability, which offers a desirable environment for the growth of entrepreneurships (Berle, 1989; Neskorodieva et al., 2019).

It is believed that the notions of bankruptcy and insolvency have to be recognized. Insolvency shall be defined by particular outcomes of enterprises' financial activity, in other words, based on its financial indices, while bankruptcy - by the existence of particular legal realities, namely by the arbitration court's decision, thereby:

- insolvency must be perceived as a particular phase of an organization crisis, related to an entire loss of liquidity, financial stability, and solvency;

- bankruptcy shall be perceived as the incapability of a debtor to meet the claims of creditors totally distinguished by the arbitration courts (Terentyeva et al., 2019; Razumovskaia et al., 2020).

Regarding contemporary economic circumstances, the bankruptcy hazard for entities and companies is somewhat prevalent. Historically shaped characteristics - the shortage of an efficient plan for the growth of the economy in the frame of a market economy, inflated costs for the resources of energy, rent and transport, innovations' low rates , lack of economic bonds with the previous Soviet republics, intense competition from exotic counterparts - indirectly or directly impact the institutions' bankruptcy in the Russian Federation (Taranova et al., 2021).

Researchers across the globe recognize the most probable reasons for bankruptcy from their perspectives. For instance, Burleigh mentions competition and low sales (Ustinovich, 2019; Gerasimenko, 2020). Torkanovsky (2000) recognized 4 major arenas that can act as the cause of the financial deterioration in organizations: the organizations' resources, strategy, regulations of activity, quality and marketing level. Moreover, the most prevalent is regarded the categorization by Ames, provided as (Ames & Wellsfry, 1983):

- lack of capital;
- unfavorable business location;
- experience lack;
- inefficient management of working capital;
- non-optimal credits' policies;
- fixed assets' overinvestment;
- irrational usage of company budgets for personal requirements;

The bankruptcies' dynamics amongst legal organizations in the Russian Federation from 2008 to 2019 is depicted in Figure 1.
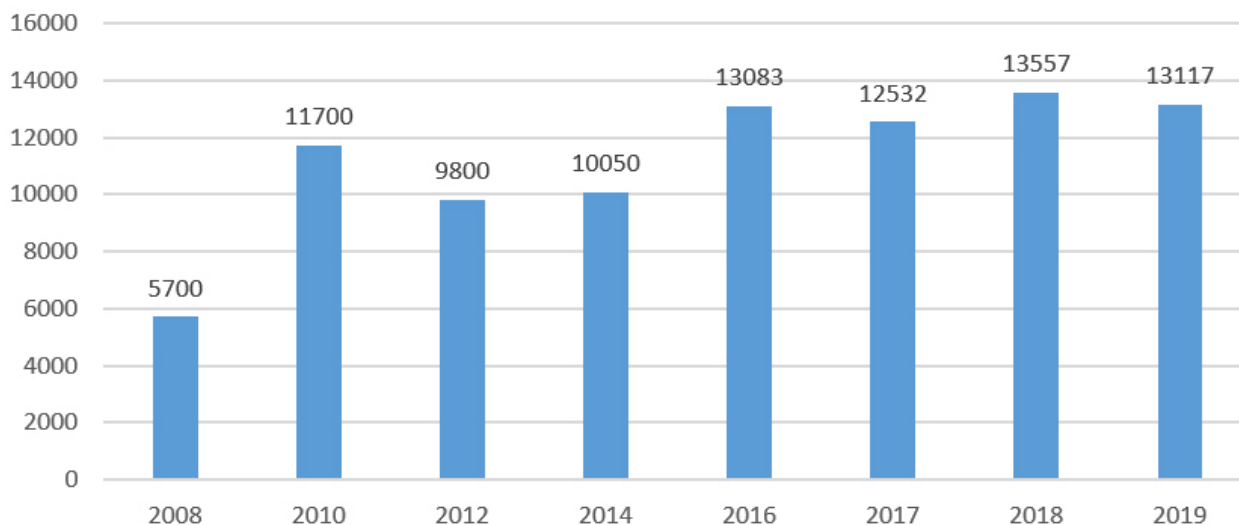

Figure 1. The real data of bankruptcies in the economy of Russia

Similar industries as trade construction, and real estates are the most impacted by the notion of bankruptcy. The bankruptcies number dropped in all 3 industries throughout the year 2019: by nearly 3.4% in trade, up to roughly 3,701 organizations, by 3.5% in construction, up to 2,670, by roughly 4.1% in real estate transactions, up to 1 405. The enterprises' recognition as bankrupt took place as the outcome of those organizations and unprofitability. That condition has expanded because of the belated rection of enterprises' management to alterations in the outside business climate. Hence, maintaining production afloat, keeping key technologies and fixed assets, labor resources, in other words, balancing the position in businesses at least at the pre-crisis level (Ushanova, 2017; Lazareva & Nelyubov, 2018; Sergi et al., 2019), has gotten a serious worldwide obligation.

Forecasting bankruptcy is deemed as a complicated means for predefining the enterprises' bankruptcy; in world and Russian economics, bankruptcy evaluation patterns are mostly utilized, combining the evaluation of several methods and factors. The viability and efficiency of bankruptcy forecasting patterns is dependent not only merely the real efficiency of enterprises, but also on the particulars of the nation's economic growth, on the volume pace of legislation expansion, on the political circumstance in the world and the country . The conventional patterns created in the 90-ies of the 20-th century and way earlier have gotten universal, casting doubts on their efficiency in the contemporary circumstances of the economies (Savinkova , 2017; Taranova et al., 2021).

Generally speaking, the techniques for the investigation of the financial actions of the enterprises are illuminated in Table 1.

Table 1. Approaches for investigating the financial actions of organizations

Indicators	Analysis trends
1. Preliminary overview of the financial and economic circumstance of organizations	Definition of the general concentration of financial actions; Identification of "sick" reporting items.

2. Analysis and assessment of the organizations' economic capacity	2.1. Property evaluations. 2.1.1. Analytical net balance developments 2.1.2. Analysis of horizontal balance 2.1.3. Analysis of vertical balance 2.1.4. The qualitative shifts' analysis in property state 2.2. Financial evaluation 2.2.1. liquidity prediction 2.2.2. Evaluation of financial stability 2.2.3. Assessment of business activities
3. Analysis and assessment of the organizations' financial efficiency	3.1. Evaluation of production actions 3.2. Analysis of profitability
4. Evaluation of bankruptcy possibility	4.1 Prediction of diagnosis and bankruptcy
5. Creation of tendencies and tools for the financial recovery of the organizations	Anti-crisis plans' development

Anti-crisis managing isn't adequately generated in the Russian Federation: there stand few of those who possess good economic and financial technologies for business revival. Market mechanisms for acquiring extra financing aren't constantly available for small and medium businesses, and the heightened rate of debt depreciation doesn't permit long wait for their return, the process gets unprofitable for creditors (Silchenko, 2017; Sergi et al., 2019).

Comparative features of the most priority weight coefficients in the models of bankruptcy forecasting by Russian and foreign scholars are given in Table 2.

Table 2. Comparative features of the most priority weight coefficients in in the models of bankruptcy forecasting by Russian and foreign scholars

Factors	Beaver	Taffler	Lis	ISEA	Zaitseva
Core businesss profitability			0.0920		
The ratio of the salle profit to short-term liabilities	0.400	0.530			
Security coefficient by budgets					
Overall loss to the ratio of equity					0.250
Portion of current assets in properties				8.380	
Overall loss to sales ratio					0.250

Source: compiled by the authors

Table 2 demonstrates that based on the model of Lis, preference is provided to such an indices as the primary's activity profitability. Based on the patterns by Beaver and Taffler, the most substantial indices is the ratio of sales profit to short-term liabilities. Given the model of ISEA, the biggest weight is designated to the portion of circling assets in property. Zaitseva's model regards the ratio of net loss to equity and the ratio of net loss to sales to be equally important.

After analyzing the probabilities of exotic discriminant function application to evaluate the financial insolvency of the enterprises in Russia, it is worth mentioning that, in spite of several benefits of those patterns, affirmed experimentally, while utilizing them in domestic analytical practice, it seems vital to consider the variations in the elements of the external economic climate generating the hazard of bankruptcy of business organizations in the Russian federation (Luneev, 2013; 12. Terentyeva et al.,

2018; Razumovskaia et al., 2020): ignorance and instability of the sectoral characteristics of national organizations and organization actions, bias in accounting data on the amount of liabilities and assets and the variations in accounting and calculation of individual indices. Hence, suffice it to say that the utilization of Western patterns for detecting and predicting bankruptcy in organizations in Russia doesn't offer adequately objective estimations.

To remove the listed drawbacks, it appears crucial to adapt the weighting factors of the indices utilized in the discriminant functions above. Discussing the requirement to adjust exotic patterns to the particulars of the domestic practice of forecasting insolvency, it is noteworthy the primary issues arising in this arena are:

- shortage of thorough data regarding the empirical data base applied to define the weighting factors of the coefficients of the model;
- shortage of thorough data regarding the database utilized to determine the standards assessing the acquired values of the integral indicators;
- inadequate reliability of data demonstrated in the enterprises' reporting, also because of the utilization of several methodological means to reporting and accounting.

An speculation was done concerning the formation of an author's pattern based on those indices. Too that end, a corresponding weight is allocated to each indices, on the basis of the observations in regards to the significance of its values to assess the hazard of bankruptcy. The total score of the suggested four-factor pattern has been determined as -1. The outcomes of the indicators' gradation are demonstrated in Table 3.

Table 3. Indicators' gradation based on their values importance's degree for predicting an enterprise's bankruptcy

Symbols	Indicators	Particular weight
K1	Financial independence's general ratio	0.4
K2	Ratio of general liquidity	0.3
K3	Ratio of financial stability	0.2
K4	Return on assets	0.1

The pattern suggested according to this gradation is as follows:

$$Z = 0,4K1 + 0,3K2 + 0,2K3 + 0,1K4 \qquad (1)$$

As a result, a conclusion is made on the basis of the indicator of Z:

- In case $Z \leq 0.8$, the bankruptcy probability is maximum;
- In case $Z \geq 0.8$, the bankruptcy probability is minimum.

It is worth mentioning that it seems likely to be assisted by those 4 indicators for a further objective evaluation of an enterprise's financial circumstances. Nonetheless, a thorough analysis of the financial circumstances of enterprises is usually not needed to recognize the emblems of a bankruptcy threat.

Let's investigate what value Z the study will acquire while determining the indices for energy company, when that enterprise isn't officially bankrupt. Meanwhile, the examination of the bankruptcy threat

based on the foreign and Russian approaches implies the coming insolvency of enterprises (Table 4).

Table 4. Choking the mathematical forecasting pattern of an enterprise's bankruptcy on the basis of important elements of the energy enterprise economic circumstances

Indicators	2018	2019
Financial independence's general ratio	0.670	0.670
The ratio of general liquidity	0.450	0.710
The ratio of financial stability	0.700	0.840
Return on assets	-7.440	2.260
Z1	0.540	0.870
Z2	-0.200	0.870

Table 4 demonstrates that the total ratio of financial independence is nearly 0.67 in the year 2017-2018, which is greater compared to the normal value of 0.5. as a result, the energy enterprise is financially independent from external sources of funding, in other words, over the course of the analyzed time, 67% of assets are covered by its own budgets. The rest of 33% of assets are secured from external sources of financing. The overall liquidity ratio rose to 0.45 in 2018 and rose to 0.71 by the end of 2019. The question comes up with the return on assets. In table 5, it is provided as the indices with a negative sign. That is because of the reality that profit before tax is provided as a loss in the financial results' statement of the energy enterprise for 2018. There exists no consensus in the economic literature on that circumstances - if to consider the zero value for that index or to determine the profitability with a minus sign, but oftentimes it gives the likelihood of examining the negative profitability. In case we utilize negative profitability in the calculation, then Z gets a negative value, in case we don't consider the negative profitability, Z gets the values below 1.

Based on the suggested model, the bankruptcy likelihood of the energy enterprise in 2018 is considerable, and it is low in 2019.

Making a comparison into the generated pattern with other methods, several benefits can be mentioned:

-On the basis of updated information;
-alleviation of the value interpretation;
-calculations' simplicity.
-the industry specificity of enterprise actions is considered;
In the meantime, the model holds several drawbacks:
-tint amount of statistical information;
-the likelihood of the final coefficient to surpass the common value;
-the organizational shape of the company isn't considered.

As a result, it may be perceived that further studies are required to enhance the suggesting model. Given the fact that the acquired value of Z is in the interval from 0.8 and reveals a low likelihood of bankruptcy of the enterprise in 2019, it seems crucial to take an anti-crisis plan for sustainable growth, the aim of which isn't to plunge into the zone of high possibility of bankruptcy, and also to reinforce their financial circumstances, proceeding to boost their actions.

CONCLUSION

On the basis of the analysis outcomes of the priority indexes of bankruptcy patterns by Russian and foreign researchers, it can be concluded that foreign researchers incorporate the indexes determined utilizing the information on financial outcomes as the most substantial indexes, whereas Russian ones are more concentrated upon utilizing the enterprise property state (balance sheet). The majority of publications on the investigation of the bankruptcy threat applying foreign and Russian patterns contain the perspectives regarding those patterns' inadequacy to prevailing Russian circumstances, because the growth of weight coefficients occurred in other economic circumstances. It is worth noting that currently there stands no universal pattern allowing any shareholder to foresee the possibility of an undesirable financial condition with a high level of reliability. Nonetheless, the variety of patterns permits each subject to select an approach that favors their interests and capabilities.

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