Analysis of foreign and domestic models for assessing the level of insolvency (bankruptcy) for organizations in the Russian Federation

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Abstract. In modern economic conditions, the main goal of managing an organization is to provide an effective management model, the main characteristic of which is the construction of a strategy for the development of an organization that will ensure the achievement of the indicators specified in it, the production efficiency of the resources used, financial stability, competitiveness and effective management of the organization's personnel. One of the main elements of building this system is the timely identification of existing risks that directly affect the assessment of the likelihood of insolvency (bankruptcy) of the organization. This article presents the calculations of nine operating models for assessing the level of bankruptcy of an organization, made on the basis of financial statements of a large Russian company engaged in the sale of goods.

1 Introduction

The economic system of the Russian Federation, like most countries in the world, today is characterized by a high level of instability, primarily due to the spread of the new coronavirus infection COVID-19. In accordance with the prevailing conditions for the development of the pandemic, the main goal of most organizations was not the further development and strengthening of the business, but the preservation of the current position in the market, avoidance of a crisis, and, accordingly, bankruptcy.

In accordance with the data of the Unified Federal Register of Bankruptcy Information, the number of bankruptcies of companies in Russia in the first half of 2020 increased by 47.2% compared to the same period in 2019 and amounted to 42,718 court decisions on bankruptcy of citizens, including individual entrepreneurs. In the second quarter of 2020, 20,362 citizens became insolvent, while the increase in the number of court decisions decreased to 29.6% compared to the data for the same period in 2019, which indicates that state programs aimed at supporting citizens, as well as small and medium-sized entities businesses proved to be quite effective and allowed many organizations to continue their activities.

With regard to companies - in the second quarter of 2020 there was a decrease by 39.8% to 1895, significantly more than in the first quarter - by 11.2% to 2607. In June 2020, there

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was a surge in the number of definitions. The courts declared 11,483 citizens bankrupt, 2.18 times more than in the same month of last year (5,279 units), and 1,257 companies (+ 30.5%, 963 units).

According to research by the Center for Macroeconomic Analysis and Short-Term Forecasting (CMASP), the assessment of bankruptcy of Russian organizations in the sectoral context showed that an increase in the number of bankruptcies was recorded in the food industry and the machine-building complex, while in other sectors such as trade, construction, transport and communications. , agriculture - no significant changes were identified for the first quarter of 2020 [1-2].

It is important to understand that the absence of a rapid increase in the number of bankrupt companies is also due to the fact that the courts worked in a restricted mode, and some of the procedures were postponed due to the moratorium on the initiation of procedures by creditors, which has already been applied to more than 2 million individual entrepreneurs and companies. Accordingly, it is possible that, based on the results of the second half of the year, we will see continued growth in bankruptcy indicators in the Russian Federation [3-5].

In accordance with the prevailing economic conditions, the urgent problem of the economies of many countries today is the creation of an effective mechanism for anti-crisis management of an organization that can flexibly respond to changes in the external environment. As the data of statistical reports show, none of the economic systems of different states was resistant to a sharp decline in consumer demand, the lack of additional financial flows and unforeseen costs associated with the pandemic. And, despite the fact that in developed countries, the government quickly took measures to support business, nevertheless, many organizations were unable to maintain their positions in the market [6].

Of course, no country was ready for the spread of a new coronavirus infection, but it is also undeniable that many managers are of the opinion that the organization's anti-crisis management should be introduced only when the enterprise has financial problems, or it becomes insolvent. In fact, anti-crisis management should function not sporadically, but regularly, while not stopping its action even in situations of a stably functioning organization. Any organization must always assess all the existing risks of its activities and consider possible solutions to problems that have not yet occurred, only in this way the company will be able to respond flexibly and less painlessly to any economic, political or social changes [7-8].

2 Materials and methods

The main purpose of this article is to assess the existing foreign and domestic methods for determining the likelihood of insolvency (bankruptcy) of an organization, as one of the key parameters for building an effective model for the development of an organization. O'KEY LLC was taken as an example of an organization, according to the financial statements of which the calculations were made [9-10].

O'KEY limited liability company today is one of the largest retail chains in our country, which specializes in retail trade. The organization opened its first hypermarket in St. Petersburg in 2002. Today they have more than 100 stores in the largest cities of Russia - in the North-West, South, Central, Ural and Siberian regions. To calculate the methods for determining the probability of bankruptcy, the data of the annual financial report of the issuer for 2016, which are publicly available on the official website of the organization, were used. Based on the initial analysis of the company's financial statements, which includes the balance sheet as of December 31, 2016, Statement of financial results for January-December 2016, Statement of changes in equity for January-December 2016. and the Cash Flow Statement for January-December 2016, it can be concluded that LLC

"O'KEY" is a financially stable organization, the aggregate financial result of the company in 2016. (2 152 225 thousand rubles) exceeded the data for 2015. (448,036 thousand rubles) 5 times., And the amount of short-term liabilities of the company according to data for 2016. decreased by 11.4%.

As the main methods, on the basis of which the indicators of the organization's insolvency were calculated, were used:

1. Two-factor Z - E. Altman's model (USA, 1968).

This model is one of the simplest and most intuitive techniques.

predicting the likelihood of bankruptcy, using which the impact of only two indicators is assessed: the current liquidity ratio and the share of borrowed funds in liabilities.

2. Four-factor Z - E. Altman's model (USA, 1968)

This model is used for non-manufacturing enterprises (which are not listed on the stock exchange). To calculate the Z indicator in this division, an assessment of four factors is used: X1 - working capital / total assets, X2 - retained earnings / total assets, X3 - operating income / total assets, X4 - book value of shares / borrowed capital.

3. Four-factor model for determining the probability of bankruptcy by R. Tafler and G. Tishaw (Great Britain, 1977).

The model is recommended for use for analysis if it is necessary to take into account current business trends and the impact of promising technologies on the structure of financial indicators.

4. Nine-factor model of D. Fulmer (USA, 1983).

This model was developed on the basis of E. Altman's model, but it was recognized as the most accurate in comparison with it, since the analysis is based on nine indicators.

5. Model G. Springgate (Canada, 1978).

G. Springgate's model is easier to use than D. Fulmer's model due to the small number of indicators. However, the data for calculating the indicators of these models are taken from different accounting documents (balance sheet, profit and loss statement, cash flow statement).

6. Model R. Fox (Great Britain, 1972).

Today, this model is still used by economists to analyze the diagnostics of bankruptcy of both foreign and Russian organizations. The calculation is based on four main factors.

7. Model A.Yu. Belikova-G.V. Davydova (Russia, 1998).

This model is based on four factors. The K1 ratio (Working capital / Assets) is taken from Altman's model, and the K3 (Revenue / Assets) financial ratio was used in the Tuffler bankruptcy model. The rest of the financial ratios have not been previously used by foreign authors. The first financial coefficient (K1) is of great importance in determining the bankruptcy of an enterprise according to the Belikov-Davydova model. This is due to the fact that it has a specific weight of 8.38, which is incomparably higher than the rest of the financial ratios in the model. The model was built on a sample of commercial enterprises that went bankrupt and remained financially stable.

8. Model OP Zaitseva (Russia, 1998).

The normative bankruptcy indicator for this model is calculated based on the recommended minimum values of six particular indicators.

9. Model R.S. Saifullina - G.G. Kadykova (Russia, 1998).

This model is based on the assessment of five main indicators. R.S. Saifullina - G.G. Kadykova, according to the developers, is universal and can be used for express-assessment of enterprises in various fields of activity and industries, as well as various production scales [11-13].

The summary data of the calculations carried out according to the data of O'KEY LLC are presented in Table 1.

Table 1. Summary assessment of the probability of bankruptcy of O'KEY LLC

No	Model	Formula	Characteristics of coefficients and their meaning	Bankruptcy Probability Assessment
1	Altman's two-factor model	$Z2 = -0.3877 + ((-1.0736) \cdot Ktl) + 0.0579 \cdot Kfz$	Ktl - current liquidity ratio, $Ktl = 1.07$; Kfz is the value of the share of borrowed funds in the liabilities of a business entity, $Kfz = 4.06$.	$Z2 = -1.3$. $Z2$ less than 0 The probability of bankruptcy is less than 50%
2	Altman's four-factor model	$Z4 = 0.717 \cdot X1 + 0.847 \cdot X2 + 3.107 \cdot X3 + 0.995 \cdot X4$	X1 - working capital / total assets, $X1 = 0.027$; X2 - retained earnings / total assets, $X2 = 0.03$; X3 - operating profit / total assets, $X3 = 0.037$; X4 - book value of shares / equity capital, $X4 = 0.22$.	$Z4 = 0.38$. $Z4$ is more than 1.81, then the probability of bankruptcy is very high
3	Four-factor model for determining the probability of bankruptcy by R. Tafler and G. Tishaw	$Z = 0.53 \cdot X1 + 0.13 \cdot X2 + 0.18 \cdot X3 + 0.16 \cdot X4$	X1 is the ratio of profit from sales to short-term liabilities, $X1 = -0.15$; X2 - the ratio of current assets to the amount of liabilities, $X2 = 0.63$; X3 is the ratio of short-term liabilities to the amount of assets, $X3 = 0.48$; X4 is the ratio of revenue to the amount of assets, $X4 = 2.54$.	$Z4 = 0.495$ Z less than 0.3, the risk of bankruptcy is low
4	D. Fulmer's nine-factor model	$Z = 5,528 \cdot K1 + 0,212 \cdot K2 + 0,073 \cdot K3 + 1,270 \cdot K4 + 0,120 \cdot K5 + 2,335 \cdot K6 + 0,575 \cdot K7 + 1,083 \cdot K8 + 0,894 \cdot K9 - 6,075$	K1 - the ratio of retained earnings to assets, $K1 = 0.197$; K2 - the ratio of turnover to assets, $K2 = 2.54$; K3 - the ratio of profit before tax to the amount of equity, $K3 = 0.186$; K4 - the ratio of changes in the balance of funds to accounts payable, $K4 = 0.038$; K5 - the ratio of borrowed funds to assets, $K5 = 0.32$; K6 - the ratio of current liabilities to assets, $K6 = 0.48$; K7 - the ratio of tangible non-current assets to all assets, $K7 = 7.71$ K8 - the ratio of the amount of own working capital to debt, $K8 = 0.033$ K9 is the ratio of profit before interest and taxes to interest on debt, $K9 = 0$.	$Z9 = 1.24$ Z more than 0 the organization's position is stable
5	G. Springgate's model	$Z = 1.03 \cdot A + 3.07 \cdot B + 0.66 \cdot C + 0.4 \cdot D$	A - working capital / total assets, $A = 0.027$; B - (profit before tax + interest payable) / amount of assets, $B = 0.00059$; C - profit before tax / short-term liabilities, $C = 0.077$ D - sales proceeds / amount of assets, $D = 2.54$.	$Z = 1.1$ Z more than 0.862 The organization is not bankrupt
6	Model R. Fox	$Z = 0.063 \cdot X1 + 0.092 \cdot X2 +$	X1 - working capital / total assets, $X2 = 0.027$;	$Z = 0.013$

		$0,057 * X_3 + 0,0014 * X_4$	X2 - profit from sales / amount of assets, $X_2 = -0.07$; X3 - retained earnings / total assets, $X_3 = 0.03$; X4 = equity / borrowed capital, $X_4 = 0.25$.	Z4 less than 0.037 The probability of bankruptcy is high
7	Model A.Y. Belikova-G.V. Davydova	$Z = 8.38 * K_1 + 1 * K_2 + 0.054 * K_3 + 0.63 * K_4$	K1 - Working capital / Assets, $K_1 = 0.27$; K2 - Net profit / Equity, $K_2 = 0.153$; K3 - Revenue / Assets, $K_3 = 2.5411$; K4 - Net profit / Cost, $K_4 = 0.014$.	$Z = 0.51$ Z more than 0.42, the risk of bankruptcy is minimal (up to 10%).
8	Model O.P. Zaitseva	$K_{fact} = 0.25 * K_1 + 0.1 * K_2 + 0.2 * K_3 + 0.25 * K_4 + 0.1 * K_5 + 0.1 * K_6$ K standard = 1.57 + 0.1 * K6 of the last year	K1 - Profit (loss) before taxation / Equity, $K_1 = 0.19$; K2 - Accounts payable / Accounts receivable, $K_2 = 6.27$; K3 - Short-term liabilities / Most liquid assets, $K_4 = 11.15$; K4 - Profit before taxation / Revenues, $K_4 = 0.02$; K5 - Equity / Equity, $K_5 = 4.06$; K6 - Assets / Revenue, $K_6 = 0.39$.	$K_{fact} = 3.36$ K standard = 1.61 $K_{fact} > K$ standard High probability of bankruptcy
9	Model R.S. Saifullina - G.G. Kadykova	$R = 2 * K_1 + 0.1 * K_2 + 0.08 * K_3 + 0.45 * K_4 + K_5$	K1 - (Equity - Non-current assets) / Current assets, $K_1 = -0.58$; K2 - Current assets / Current liabilities, $K_2 = 1.08$; K3 - Sales proceeds / Average annual cost of assets and liabilities), $K_3 = 2.69$; K4 - Net profit / Revenue, $K_4 = 0.012$; K5 - Net profit / Equity, $K_5 = 0.15$.	$R = -0.68$ R less than 1, the financial condition of the enterprise is assessed as low

3 Results

Analyzing the above calculated data, we see that the indicators for assessing the bankruptcy of an enterprise are very different, 5 models (4 foreign, 1 domestic) out of 9 recognized the enterprise as financially stable and rated the level of bankruptcy as "below average", the rest (2 foreign, 2 domestic) models rated the probability of bankruptcy of O'KEY LLC as "high" and recognized the company as financially unstable.

The data for the calculations were taken for 2016 in order to assess the effectiveness and plausibility of the models used for the probability of bankruptcy. The fact is that starting from 2017, the profit of the organization in question began to decline at a galloping pace, compared with 2017, the total financial result decreased by 47% and amounted to 1,133,077 thousand rubles. compared to actual figures in 2016. In 2018, the financial stability of O'KEY LLC was under threat, since the total profit decreased 5 times compared to the financial statements for 2017 and 9 times compared to 2018 and amounted to 238 142 thousand rubles. In 2019, the organization managed to maintain its current position in the market, while the total profit continued to decline, but over this period only by 15.5%.

As follows from the reports, the main reason for the decline in the group's performance was hypermarkets, where sales fell by 13.4%. Comparable sales (LFL - allow tracking dynamics without taking into account network expansion) of the entire group decreased by 4%. At the same time, LFL revenue of hypermarkets fell by 5.4%, LFL traffic - by 4.8%, and the comparable average check decreased by 0.6%.

The company itself attributes such a rapid drop in profits primarily to the sale of supermarkets, as well as more negative than expected inflation dynamics and growing competitive pressure in key regions.

According to leading economists in Russia, the main reason that a company with billions of dollars in cash turnover is close to leaving the Russian market is the company's inability to find the right balance between product turnover, the size of the range and the level of trade margin.

In general, having analyzed the activities of O'KEY LLC on the basis of the annual accounting (financial) statements up to 2016, we can conclude that the company is not a potential bankrupt, and has no significant threats to terminate its activities. In addition, the data of the financial statements for the 1-3 quarters of 2017 showed that the company is not only financially stable, but every year is only able to strengthen its position in the market.

The results of the annual financial statements for 2017 were completely unexpected, showing a 2-fold decrease in the company's total financial income compared to 2016. The data of the annual financial statements for 2018 and 2019 only strengthened our opinion that the company is not at all financially stable, and, as a result, is unable to respond to changing economic conditions.

4 Conclusions

The analysis of the presented models for assessing the likelihood of insolvency (bankruptcy) in this case is of particular interest, since we already have information about the future development of the organization and can immediately assess the reliability of the models under study. The results of evaluating two of the six foreign models (E. Altman and R. Lis) became a high risk of bankruptcy of the enterprise according to the financial statements for 2016, while external indicators did not show us any signs of bankruptcy. Two of the three Russian models (O. P. Zaitseva and R.S. Sayfullina and G.G. Kadykova) also pointed to the financial instability of the organization. In general, only 4 of the studied 9 models indicated to us the assumed probability of bankruptcy of the organization, while 5 models gave positive results characterizing the studied organization solely as financially stable [14-15].

In general, the results of the analysis showed rather asymmetric estimates of the probability of bankruptcy for the nine selected models. We can conclude that there is no single methodology for all enterprises to determine the likelihood of bankruptcy, therefore, enterprise managers should not resort to only one model, but it is necessary to systematically carry out a volumetric analysis based on a variety of models, as well as make additional calculations of the performance indicators of the enterprise. (For example, the degree of solvency, debt ratio, current liabilities coverage ratio, autonomy ratio, and many others). Only comprehensive studies to assess the level of probability of bankruptcy of an enterprise and assess the effectiveness of its activities will be able to show the manager a real picture of the current state of the organization and will allow timely taking measures to prevent the risk of the enterprise being declared insolvent.

As the experience of the development of similar companies involved in the sale of products shows, the main success and stability lies primarily in the flexibility of the organization, which is expressed in the ability to quickly respond to rapidly changing economic conditions.

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