

FORMATION OF THE SYSTEM OF IMPLEMENTATION OF THE CRISIS MANAGEMENT MECHANISM BASED ON THE EXAMPLE OF MINING ENTERPRISES

Stanislav Stovpnik

National technical University of Ukraine «Kyiv Polytechnic Institute named after Igor Sikorsky», Ukraine

Oleksandr Temchenko

Kryvyi Rih Economic Institute of SHEE «Kyiv National Economic University named after Vadym Hetman», Ukraine

ZHanna Breher

Kryvyi Rih Economic Institute of SHEE «Kyiv National Economic University named after Vadym Hetman», Ukraine

Abstract. *In conditions of economic instability, the problem of implementation of the crisis management mechanism in modern industrial enterprises is of particular importance. The problem of the research is to develop recommendations as a result of the analysis of the financial condition of industrial enterprises of Ukraine in an unstable economy. The paper discusses the features of the implementation of anti-crisis programs in modern mining and processing enterprises with the determination of the share of equity for the difficult conditions of production and economic activity. The aim of the research is to analyze the financial condition of industrial companies and develop recommendations to overcome the crisis. Taking into account the specifics of mining and processing enterprises, in order to overcome the crisis and solve the problems of production for the effective use of raw materials, the paper identified logistics and financial opportunities, made a forecast of the financial condition in the near future and determined the probability of termination of their activities, as well as developed sound recommendations in the context of the implementation of the crisis management mechanism at iron ore plants. The main methods used in the study: analysis, synthesis, comparison, models for assessing the probability of bankruptcy.*

Keywords: *crisis management, financial instability, models of bankruptcy, iron ore plants.*

Introduction

In conditions of economic instability, the problem of implementation of the crisis management mechanism in modern industrial enterprises is of particular importance. The problem of the research is to develop recommendations as a result of the analysis of the financial condition of industrial enterprises of Ukraine

in an unstable economy. The paper discusses the features of the implementation of anti-crisis programs in modern mining and processing enterprises with the determination of the share of equity for the difficult conditions of production and economic activity. The aim of the research is to analyze the financial condition of industrial companies and develop recommendations to overcome the crisis.

The relevance of the research. In an unstable economy, the probability of crisis phenomena even in powerful industrial companies and their further cessation of activity is particularly high. Therefore, it is necessary first to prevent a significant deterioration in the financial condition of a particular enterprise through comprehensive monitoring. Assuming, however, the identification and impossibility of avoiding a crisis in order to prevent potential bankruptcy, the primary priority is to develop a system and mechanism for crisis management and effective subsequent implementation of the developed measures in a separate enterprise.

Research methods: quantitative and qualitative data analysis, comparison and measurement, methods of deduction and induction, modelling and forecasting, analysis and synthesis, visual-graphical methods, a combined method of similarity and difference, abstraction. The research also used the models of assessing the probability of bankruptcy for modern industrial companies, in particular, mining enterprises.

Scientific novelty. The paper considers the peculiarities of implementation of anti-crisis programmes at modern mining and processing enterprises with determination of the share of equity in difficult conditions of industrial and economic activity. It was proved that the amount of equity seriously affects the indicators of assessment of the probability of bankruptcy of industrial enterprises according to certain models and also causes their financial condition in the near future. The optimal ratio of borrowed funds to the assets of the balance sheet, the economically grounded amount of working capital and the peculiarities of its formation in conditions of economic instability were determined for mining and processing enterprises, which were investigated.

Analysis of the latest research and the problem statement. The development of models for assessing the probability of bankruptcy and the financial condition of industrial enterprises, as well as crisis management systems was carried out by Altman (1968), Lis (Yelisieva, 2007), Springate (1978), Zaitseva (Yelisieva, 2007). The works of many scientists are devoted to the improvement of the theoretical foundations of the evaluation of these phenomena, in particular, N. Kondratenko (2017), I. Zyatkovsky (2000), O. Yelisieva (2007), O. Temchenko (Temchenko & Kryshtopa, 2017), T. Dołęgowski, S. Hushko and V. Kulishov (2017), A. Klodane, I. Mietule, and I. Beinaroviča–Litvinova (2017), A. Mazaraki (2015) and N. Sagalakova (Mazaraki, 2015). However, modern scientists have not formed a consensus on the formation of the definition of

financial condition. In addition, the problem with most traditional methods is that they do not define how to interpret the results. Therefore, under such conditions, the importance of financial analysis was paid attention to by O. Yelisieva (2007) in assessing the financial condition of the enterprise and anti-crisis measures.

Based on the considered sources, it is possible to draw a conclusion concerning measures of anti-crisis management (Figure 1).

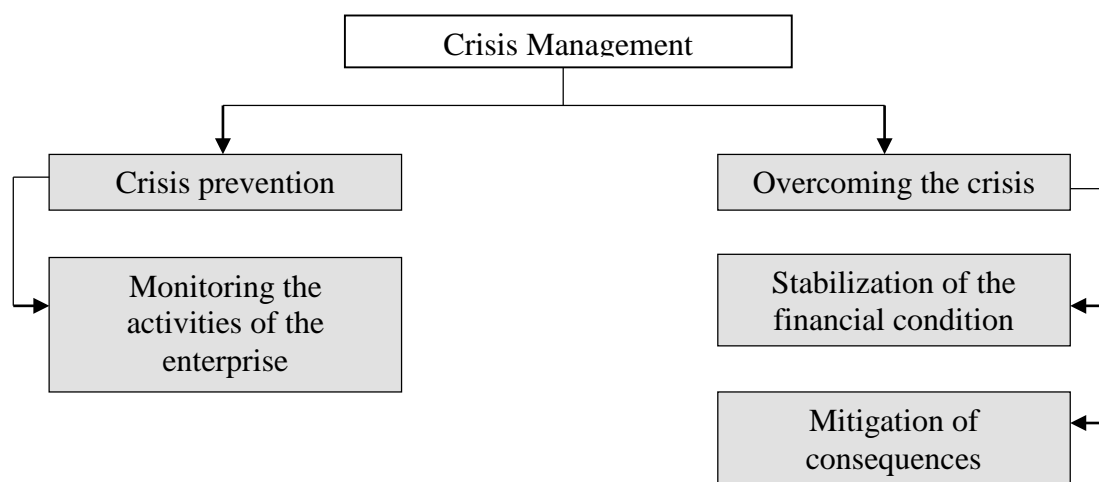


Figure 1 Stages and directions of crisis management (authors` version)

Research results

When assessing the financial condition and probability of bankruptcy of a manufacturing enterprise, it is possible and necessary to use the basic ratios for assessing the financial condition and the model of assessing the probability of bankruptcy of the enterprise. In addition, an important indicator in crisis management is Economic Value Added (hereinafter– EVA).

Before talking about the bankruptcy of the enterprise, it is necessary to assess its financial activities and financial condition. This assessment allows for a number of ratios:

- 1) the financial independence ratio (hereinafter – FIR) shows the share of the company's assets that are covered by equity and characterizes the share of equity in the balance sheet currency. The remaining share of assets is covered by borrowed funds. The FIR is the ratio of equity and reserves to the amount of assets of the enterprise;
- 2) the debt ratio (hereinafter – DR) characterizes the ratio between borrowed and own funds, that is, the share of assets formed as a result of borrowing. The DR is the ratio of the amount of liabilities to the amount of assets;

- 3) the self-financing ratio (hereinafter – SFR) characterizes the ratio of the company's own investment capital (retained earnings, depreciation) to its total needs;
- 4) the ratio of self-working capital (hereinafter – RSWC) characterizes the share of own working capital (net working capital) in current assets;
- 5) the ratio of manoeuvrability (hereinafter – RM) characterizes the share of own working capital in equity. The RM is equal to the ratio of the difference between current assets and current liabilities to the balance sheet currency;
- 6) the ratio of financial stress (hereinafter – RFS) characterizes the share of borrowings in the balance sheet currency, which can be found as the difference between the unit and the financial independence ratio (FIR);
- 7) the ratio of mobile and immobilized assets (hereinafter – RMIA) indicates how much working capital of the enterprise falls on non-current assets. This ratio is the ratio of current assets to non-current assets;
- 8) the ratio of industrial property (hereinafter – RIP) characterizes the share of property in the assets of the enterprise. The ratio is the ratio of the amount of non-current assets and reserves to the balance sheet currency.

If the values of the considered ratios indicate financial instability and the existence of a crisis in the enterprise, then you need to apply models assessing the probability of bankruptcy of industrial enterprises. For industrial mining enterprises of iron ore specialization, it is appropriate to use the following models: the Altman modified five-factor model, the Altman model for private enterprises (Altman, 1968), the Lis model, the Zaitseva six-factor model, the Saifulin and Kadykov model (Yelisieva, 2007) and the Springate model (Springate, 1978).

Having considered the main indicators of financial activity of the enterprise, we apply the ratios of assessment of financial condition to PJSC "Central Iron Ore Enrichment Works" (hereinafter-PJSC "CGOK"), PJSC "Ferrexpo Poltava Mining- Poltava GOK" (hereinafter-PJSC "PGOK") and PJSC "Norther Iron Ore Enrichment Works" (hereinafter-PJSC "NGOK") (Table 1).

By analysing the data obtained in Table 1, we can make a general conclusion about the financial condition of enterprises and sources of financial resources. It is obvious that at most of the enterprises there is financial instability and a financial crisis at PJSC "Poltava GOK".

Table 1 Comparative characteristics of financial stability indicators for PJSC "CGOK", PJSC "PGOK", PJSC "NGOK", 2015-2017 years

(author's calculations based on data from Annual Financial Reports of PJSC "Central Iron Ore Enrichment Works" (2015.-2017); Annual Financial Reports of PJSC "Ferrexpo Poltava Mining - Poltava GOK" (2015.-2017; Annual Financial Reports of PJSC "Northern Iron Ore Enrichment Works" (2015.-2017))

Ratio	PJSC "CGOK"			PJSC "PGOK"			PJSC "NGOK"		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
FIR	0.844	0.473	0.501	-0.041	-0.039	0.14	0.81	0.79	0.5
DR	0.156	0.527	0.499	1.04	1.03	0.86	0.19	0.21	0.5
SFR	5.39	1.115	1.004	0.96	0.96	1.166	5.23	4.73	2.02
RSWC	0.77	-0.03	0.09	-1.26	-0.95	-0.58	0.52	0.57	0.19
RM	0.59	0.05	0.11	-0.53	-0.47	-0.28	0.87	0.34	0.16
RFS	0.156	0.527	0.499	1.53	1.47	1.28	0.19	0.21	0.5
RMIA	2.265	1.058	1.219	0.85	1.137	1.184	1.656	0.98	1.58
RIP	0.335	0.514	0.483	0.74	0.70	0.76	0.62	0.53	0.41

The share of the equity capital of enterprises in the structure of financial resources is relatively small. Industrial enterprises have certain features of the formation of equity. Given the value of the ratio of property for production purposes, it is obvious that enterprises have attracted additional funds to create a powerful material resources base. Thus, the ratio of equity to liabilities indicates financial instability. However, by lending businesses are trying to overcome the problems in the material security sector. For industrial enterprises and mining enterprises in particular, the issue of a strong raw material base is particularly important. However, despite the potential to overcome financial instability in the future, the company may go bankrupt due to changes in the market situation. Such a change may lead to a situation where the amount of operating expenses and financial expenses exceeds the financial result of the company. The long-term impact of this factor will certainly lead to bankruptcy.

Table 1 uses the ratio of self-working capital. This indicator reflects the optimal ratio of equity to current assets. The calculation formula is as follows (Azitov, 2015):

$$RSWC = \frac{E - Anon}{Ac}, \quad (1)$$

where RSWC – ratio of self-working capital,
 E – equity,
 Anon – non-current assets,
 Ac – current assets.

Thus, enterprises need to focus on the formation of equity, through which you can increase the amount of non-current and current assets. Sources of equity formation of industrial enterprises can be invested capital, conversion of liabilities (for example, conversion of bonds into shares), as well as due to the increase in the value of assets associated with an increase in debt to creditors (for example, revaluation of non-current assets), retained earnings (Gomez, 2015).

For the analysis of expediency of introduction of anti-crisis programmes in the considered mining and processing enterprises, it is necessary to carry out an assessment of potential of each enterprise for which the indicators given in the following table will be calculated (Table 2).

As a result of the analysis and assessment of the potential of enterprises (see Table 2), it became obvious that PJSC "NGOK" was the closest to the normative values. The enterprise with the worst values of financial indicators of managing was PJSC "PGOK".

Table 2 Comparative analysis of indicators to assess the potential of PJSC "CGOK", PJSC "PGOK", PJSC "NGOK", 2015-2017 years

(author's calculations based on data from Annual Financial Reports of PJSC "Central Iron Ore Enrichment Works" (2015.-2017); Annual Financial Reports of PJSC "Ferrexpo Poltava Mining - Poltava GOK" (2015.-2017; Annual Financial Reports of PJSC "Northern Iron Ore Enrichment Works" (2015.-2017))

PJSC "CGOK"			PJSC "PGOK"			PJSC "NGOK"		
2015	2016	2017	2015	2016	2017	2015	2016	2017
Absolute liquidity ratio								
0.46	0.04	0.07	0.017	0.05	0.012	0.005	0.01	0.003
Term liquidity ratio								
6.57	1.04	1.18	0.26	0.3	0.3	2.99	3.06	1.31
Current liquidity ratio								
6.86	1.1	1.25	0.46	0.53	0.66	3.14	3.19	1.36
Asset turnover ratio (resource return)								
0.93	0.71	0.8	0.81	0.83	0.92	0.43	0.49	0.92
The ratio of stability of economic growth								
0.12	-0.443	0.22	6.77	-1.06	-0.49	0.03	0.17	-0.16
Return on assets								
0.098	0.22	0.2	-0.32	-0.002	0.19	-0.04	0.12	0.31

To determine the financial condition, the indicator of Economic Value Added (EVA) is used (Table 3).

From the review of Table 3, it was found out that in 2016 there was a crisis at PJSC "PGOK" and PJSC "NGOK" with the subsequent improvement of the situation. As for PJSC "CGOK", in 2015 there was a financial crisis with certain trends of improvement in the future financial years.

Table 3 Comparative analysis of the values of EVA for PJSC "CGOK", PJSC "PGOK", PJSC "NGOK", 2015-2017 years

(author's calculations based on data from Annual Financial Reports of PJSC "Central Iron Ore Enrichment Works" (2015.-2017); Annual Financial Reports of PJSC "Ferrexpo Poltava Mining - Poltava GOK" (2015.-2017; Annual Financial Reports of PJSC "Northern Iron Ore Enrichment Works" (2015.-2017))

	PJSC "CGOK "	PJSC "PGOK"	PJSC "NGOK"
EVA ₂₀₁₅	-86175.88379	-6978662.613	6782.780572
EVA ₂₀₁₆	704592.3585	-40421.42247	-433572.5732
EVA ₂₀₁₇	772442.559	3011881.596	2861723.31

As a result of the assessment of the financial condition of enterprises, it is necessary to assess the probability of bankruptcy of these enterprises. To do this, we use the above-mentioned models of bankruptcy assessment (Table 4).

Table 4 Values of indicators of bankruptcy models for PJSC "CGOK", PJSC "PGOK", PJSC "NGOK"

(author's calculations based on data from Annual Financial Reports of PJSC "Central Iron Ore Enrichment Works" (2015.-2017); Annual Financial Reports of PJSC "Ferrexpo Poltava Mining - Poltava GOK" (2015.-2017; Annual Financial Reports of PJSC "Northern Iron Ore Enrichment Works" (2015.-2017))

<i>Model</i>	<i>The value of the index model</i>			<i>Normative value</i>
	PJSC "CGOK"	PJSC "PGOK"	PJSC "NGOK"	
Altman modified five-factor model	1.6	0.8	1.31	Z>2.9 – financial stability zone, 1.8<Z<2.9 – zone of uncertainty
Altman model for private enterprises	1.94	1.42	1.62	Z>2.9 – financial stability zone, 1.23<Z<2.9 –zone of uncertainty
Lis model	0.047	0.033	0.07	Z> 0.037
Zaitseva six-factor model	18.9	1.98	60.17	1.57+
Saifulin and Kadykov model	0.86	0.38	1.035	Z> 1
Springate model	1.34	0.85	1.16	Z> 0.862

According to Table 4, there is a high probability of bankruptcy, according to most of the models, for the enterprises under consideration.

Having found out that there is a high risk of bankruptcy at the enterprises, we will make a forecast for the near future. To do this, we apply the Altman seven-

factor model (Altman, 1993). The forecast accuracy of this model is 70% for the period of 3-5 years. The results of calculations are given in Table 5.

When carrying out a financial analysis and forecasting bankruptcy, it is necessary to take a critical approach to almost any estimate. However, the low value of the Z-score should be taken as a signal and indicator of potential danger. In this case, an in-depth analysis of the reasons for the decline in this indicator is necessary.

The negative value of the model for PJSC "PGOK" is caused by the negative value of working capital, which indicates a deep financial crisis. Recommendations on working capital formation are given in the paragraph Conclusions and suggestions.

Table 5 Comparison of the values of the Altman seven-factor model for PJSC "CGOK", PJSC "PGOK", PJSC "NGOK", 2017

(author's calculations based on data from Annual Financial Reports of PJSC "Central Iron Ore Enrichment Works" (2015.-2017); Annual Financial Reports of PJSC "Ferrexpo Poltava Mining - Poltava GOK" (2015.-2017; Annual Financial Reports of PJSC "Northern Iron Ore Enrichment Works" (2015.-2017, Altman, 1993)

<i>Enterprise name</i>	<i>The value of model</i>
PJSC "Central GOK"	6.76
PJSC "Poltava GOK"	-5.6
PJSC "Northern GOK"	7.09

With the data of Table 5, it is obvious that the deepest crisis and the greatest probability of bankruptcy is observed for PJSC "PGOK", the best financial condition is at PJSC "CGOK". Among the studied enterprises, the most stable is PJSC "NGOK", the value of which is the highest.

Conclusions and suggestions

As a result of the analysis, it can be concluded about the difficult financial condition and high probability of bankruptcy of industrial enterprises of the iron ore sector of Ukraine. According to the forecast based on the five-factor model of Altman, it is obvious that enterprises need to implement crisis management. The authors have developed a number of recommendations that can help businesses overcome the financial crisis.

To restore solvency, the company can sell part of the real estate, increase the authorized capital by issuing additional shares.

The next direction of improving the financial performance of the enterprise is to ensure the acceleration of the turnover of working capital of the enterprise, which will release funds from circulation, as well as increase the amount of

revenue and profit. The acceleration of turnover can be achieved by increasing the level of labour productivity, more complete use of production facilities of the enterprise, labour and material resources, improving the organization of logistics in order to ensure uninterrupted production of the necessary material resources and reduce the time spent on raising capital in stocks, accelerate the process of shipment of products and registration of settlement documents; reducing the time spent on collecting accounts receivable, increasing the level of marketing research aimed at accelerating the promotion of goods from manufacturers to consumers, the formation of the correct pricing policy, the organization of effective advertising.

The main ways to accelerate capital turnover:

- 1) reducing the duration of the production cycle due to the intensification of production (the use of new technologies, mechanization and automation of production processes, increasing productivity, more complete use of production facilities, labour and material resources, etc.);
- 2) improving the organization of logistics in order to ensure uninterrupted production of the necessary material resources and reduce the time spent on raising capital in stocks;
- 3) acceleration of the process of shipment of products and registration of settlement documents;
- 4) reducing the time spent on collecting receivables.

Adaptation and use of the proposed approach to the assessment of the financial condition and the probability of bankruptcy of modern enterprises in the context of the implementation of the mechanism of crisis management are appropriate for similar research on other enterprises of Central and Eastern Europe, commodity iron products, which are represented in the international market.

References

- Altman, E. (September 1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance*, 189–209. DOI:10.1111/j.1540-6261.1968.tb00843.x.
- Altman, E. (1993). *Corporate financial distress and bankruptcy*. New York: John Wiley & Sons, Inc, 30(2)
- Annual Financial Reports of PJSC “Central Iron Ore Enrichment Works”. (2017, 2016, 2015). *Official site of PJSC “Central GOK”*. Retrieved from <https://cgok.metinvestholding.com>
- Annual Financial Reports of PJSC “Ferrexpo Poltava Mining - Poltava GOK” (2015.-2017.). *Official site of PJSC “Poltava GOK”*. Retrieved from <http://www.ferrexpo.ua>
- Annual Financial Reports of PJSC “Norther Iron Ore Enrichment Works” (2015.-2017.). *Official site of PJSC “Northern GOK”*. Retrieved from <https://sevgok.metinvestholding.com>

- Azitov, R.Sh. (2015). Investigation of bankruptcy forecasting models of enterprises. *Young Scientist*, 12, 1-5.
- Dolęgowski, T., Hushko, S., & Kulishov, V. (2017). Problems of Instability of the World Economy under Globalization. *Society. Integration. Education. Proceedings of the International Scientific Conference. Volume IV, May 26th-27th, 2017*. 213-222. DOI: <http://dx.doi.org/10.17770/sie2017vol4.2280>.
- Gomez, S. (2015). *How does exposure to civil conflict affect human capital accumulation? Evidence from standardized exit exams in Colombia*. Boekenplan, Maastricht.
- Klodane, A., Mietule, I., & Beinaroviča–Litvinova, I. (2017). Systems of Company's Financial Crisis Diagnostics, *Society. Integration. Education. Proceedings of the International Scientific Conference. Volume IV, May 26th-27th, 2017*, 246-256. DOI: <http://dx.doi.org/10.17770/sie2017vol4.2407>.
- Kondratenko, N. (2017). Modern approaches to the formation of an anti-crisis financial management system by the organization. *Ostrog: View of the NU "OA"*, 4(32), 51-54.
- Kovalev, A., & Privalov, P. (2001). *Analysis of the financial condition of the enterprise*. Moscow: Center of Economics and marketing.
- Mazaraki, A., & Sagalakova, N. (2015). Economics and Management of Enterprises. *Economic Annals-XXI*, 5(6), 174-179.
- Temchenko, O., & Kryshtopa, I. (2017). Substantiation for mining and concentrating enterprises' financial stability based on integral bankruptcy indicators. *Financial and credit activity: problems of theory and practice*, 2(23), 241 – 250.
- Springate, G. (1978). *Predicting the possibility of failure in a Canadian firm: A discriminant analysis*. Unpublished M.B.A. Research Project, Simon Fraser University.
- Yelisieva, O. (2007). *Methods and models of estimation and forecasting of financial condition of enterprises*. Kramatorsk: Donbaskadzh. machine-building academy.
- Zyatkovsky, I. (2000). *Financial support of enterprises activity*. Ternopil: Economic Thought.