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## **PECULIARITIES OF FUNCTIONING OF MODERN INDUSTRIAL COMPANIES CONSIDERING PROBABILITY OF TERMINATION OF THEIR ACTIVITY**

**Abstract.** This article highlights theoretical and practical aspects of financial stability of modern domestic and foreign industrial companies with full cycle of extraction and processing of minerals.

It was detected that nowadays there is no clearly developed system of quantitative and target indicators of management of sustainable and efficient development of modern domestic and foreign industrial companies in conditions of uncertainty, economic instability and aggressive business environment.

Basing on the usage of world's experience of usage of key models of multiple discriminatory analysis of assessment of probability of bankruptcy, we have developed relevant recommendations that disclose influence of negative trends on peculiarities of functioning of modern industrial leading companies and probability of termination of their activity in the nearest future.

Received scientific results and relevant financial and economic calculations must be used in context of making justified management decisions in modern industrial companies concerning provision of their successful functioning and increasing of the efficiency of their business activity with the possibility of strengthening of competitor positions on the external market of iron ore raw materials by means of implementation of programs of financial rehabilitation and anti-crisis measures in order to solve the priority tasks of updating energy-intensive and physically-worn technological complexes.

Basing on system research, the authors proposed scientific and methodical approach to substantiation of influence of key aspects of functioning of modern industrial domestic and foreign companies on the efficiency of their activity considering implementation of financial strategies of support and further effective usage of mineral deposits in difficult economic conditions.

**Keywords:** industrial companies, financial stability, bankruptcy, model, financial position, mining industry.

**JEL Classification** G33, G34, L72

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## **ОСОБЛИВОСТІ ФУНКЦІОНУВАННЯ СУЧАСНИХ ПРОМИСЛОВИХ КОМПАНІЙ З УРАХУВАННЯМ ІМОВІРНОСТІ ПРИПИНЕННЯ ЇХНЬОЇ ДІЯЛЬНОСТІ**

**Анотація.** Висвітлено теоретичні та практичні аспекти фінансової стійкості сучасних вітчизняних і зарубіжних промислових компаній із повним циклом видобутку і переробки корисної копалини.

Виявлено, що в теперішній час не існує чітко розробленої універсальної системи кількісних і цільових індикаторів управління успішним та ефективним функціонуванням сучасних вітчизняних і зарубіжних промислових компаній в умовах невизначеності, економічної нестабільності та агресивності бізнес-середовища.

На основі світового досвіду застосування ключових моделей множинного дискримінантного аналізу оцінки ймовірності банкрутства розроблено відповідні рекомендації, що відображають вплив негативних тенденцій на особливості функціонування сучасних промислових провідних компаній і вірогідність припинення їхньої діяльності в найближчій перспективі.

Отримані наукові результати та відповідні фінансово-економічні розрахунки доцільно використовувати в контексті ухвалення обґрунтованих управлінських заходів на сучасних вітчизняних і зарубіжних промислових компаніях щодо забезпечення успішного функціонування та підвищення ефективності їхньої виробничо-господарської діяльності з можливістю посилення конкурентних позицій на зовнішньому ринку залізорудної сировини шляхом упровадження програм фінансового оздоровлення та антикризових заходів з метою вирішення пріоритетних завдань оновлення енергомістких і фізично спрацьованих технологічних комплексів.

На основі системних досліджень запропоновано науково-методичний підхід до обґрунтування впливу ключових аспектів функціонування сучасних вітчизняних і зарубіжних промислових компаній на результативність їхньої діяльності з урахуванням упровадження фінансових стратегій підтримки і подальшої ефективною експлуатації родовищ корисних копалин у складних умовах господарювання.

**Ключові слова:** промислові компанії, фінансова стійкість, банкрутство, модель, фінансовий стан, гірничорудна галузь.

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## **ОСОБЕННОСТИ ФУНКЦИОНИРОВАНИЯ СОВРЕМЕННЫХ ПРОМЫШЛЕННЫХ КОМПАНИЙ С УЧЕТОМ ВЕРОЯТНОСТИ ПРЕКРАЩЕНИЯ ИХ ДЕЯТЕЛЬНОСТИ**

**Аннотация.** Освещены аспекты финансовой устойчивости промышленных компаний и рассчитаны ключевые показатели их деятельности по отдельным моделям оценки вероятности банкротства. Разработаны рекомендации по развитию в контексте определенных факторов и негативных тенденций возможности прекращения функционирования рассмотренных компаний. Результаты исследования целесообразно учитывать при внедрении антикризисных программ на горно-обогатительных предприятиях с учетом обеспечения рациональной доли и суммы собственного капитала в сложных условиях производственно-хозяйственной деятельности, которые вместе с поддержанием оптимального соотношения заемных средств к активу баланса и экономически обоснованной суммой оборотного капитала влияют на показатели оценки вероятности банкротства промышленных компаний по определенным моделям, а также обуславливают их финансовое состояние на ближайшую перспективу.

**Ключевые слова:** промышленные компании, финансовая устойчивость, банкротство, модель, финансовое состояние, горнорудная отрасль.

Формул: 0; рис.: 1; табл.: 3; библи.: 10.

**Introduction.** Analysis of scientific works and practice of modern industrial companies, which extract and process iron ore, shows that there is a number of characteristic problems, conditioned by a significant increase in costs for extraction of minerals in an open way considering the achievement by quarries of depths of 400 meters or more; limited opportunities in intensification of industrial processes because of shortening the scale of the work, including solving the problem of the formation of optimal quarry ore flows and ensuring the reliability of operation of mining transport complexes on the background of significant wear coefficients in the context of increasing the efficiency of iron ore production under adverse conditions; the reduction of grounded research on the prospects of further effective usage of open mining technology over the past 30 years, and, accordingly, the lack of proper practical experience in conducting mining at high depths; the lack of proven scientific and methodological recommendations for the design of further development of mining operations in deep quarries on the basis of the observance of optimal financial and economic indicators of management, which make it impossible to terminate the activity of industrial companies in the nearest future.

A significant part of these problems is the result of the deterioration of mining and geological conditions of production with the increase in the depth of mining, as well as the lack of a scientifically developed concept and strategy for the development of quarries for the entire life of iron ore deposits, taking into account strict compliance with environmental requirements. That is why the successful functioning of modern industrial companies must be ensured through the wide introduction of resource and energy-saving technologies, which involves solving such issues as drawing up a balance on mineral raw materials; creation of conditions for the attraction of all

mineral resources in economic turnover with maximum usage of their waste and utilization of inevitable residues; taking into account all possible sources of mineral raw material production, not only natural, but also man-made origin.

In order to win in the market struggle, it is necessary to deal with the improvement of production and economic and financial and economic activity constantly and persistently. Therefore, the problem is not only in the assessment, but also in the formation of an effective strategy for the further development of mineral deposits from the point of view of ensuring the competitiveness of commodity products and the possibility of increasing its competitive advantages in the European and world market of iron ore raw materials. This points to the priority of investigation of peculiarities of functioning of modern industrial companies, in particular their macro-environment and internal potential, substantiation of conduction of a well-balanced financial and economic policy to make it impossible to terminate their activity in the nearest future, using the application of bankruptcy probability forecasting models and methodology of PEST and SWOT analysis considering trends of sustainable development and instability of price characteristics in the foreign market of iron ore in recent years. Therefore, determining and analyzing bankruptcy risks is one of the most important tasks of business facilities while ensuring their financial stability. Thus, taking into account the current crisis tendencies in the mining industry of countries that produce iron-ore, the primary task is to search for and introduce some ways of stabilizing and successfully developing industrial companies that can be done by analyzing and optimizing finance management.

**Literature review and the problem statement.** Bankruptcy risk indicators and their analysis as a financial stability aspect have been touched upon in the works by such economists as Taffler R., Tisshaw H. [1], Conan J., Holder M. [2], Altman E., Hotchkiss [3], Karamzadeh M. [4], Callejon A., Casado A., Fernandez M., Pelaez J. [5], Salim M. [6], Temchenko O., Kryshtopa I. [7].

Therefore, a well-grounded solution of the problem of an company's failure risk analysis while assessing its financial stability considering the specific activity of modern industrial companies under unstable economic conditions and indefinite prices for their iron-bearing products requires some additional research. The level and dynamics of integral indicators change should be considered taking into account Ukraine's mining industry development in accordance with the current negative trends on the iron ore market over the last five years.

Thus, the research aims at substantiating modern industrial companies' financial stability by analyzing integral indicators of their bankruptcy level.

**Research results.** The negative tendencies in the modern mining industry nowadays make us search for some new ways to stabilize and ensure sustainable development of leading industrial companies in global aspect. Market fluctuations, sudden changes in prices for input and raw materials as well as for end products have a negative impact not only on mining companies, but also on the complex of companies and industries technologically and financially related to them. One of the most modern and efficient ways to overcome negative tendencies and stabilize a leading mining company's activity is to introduce and implement some principles of sustainable development. Development and implementation of an company's sustainability strategy is a complex and structured process in terms of the input tasks and goals. Taking into account the negative tendencies of the last decade concerning the deterioration of indicators of the world's economy, the sustainability strategy development and ensuring is a decisive and innovative means of stabilizing of conditions of industrial and economic activity and efficient functioning of industrial companies. Thus, one of the main and most important elements in the overall strategic sustainability system of an industrial company is its stable financial sphere in the nearest prospect.

Thus, financial stability is the key element of the overall stability of business activity of industrial companies, the main indicator and a lever of managing the financial and other areas of functioning. In general, financial stability can be defined as industrial company's ability to perform basic and other types of activity continuously, despite the risks and changes in the functioning environment that may occur in the process of its economic activity. Accordingly, an industrial company achieves its financial stability in case of introducing a set of measures aimed at effective formation, distribution and use of available financial and other associated resources with a stable

level of solvency. Considering the current negative tendencies on the iron ore market and unstable economic conditions in the whole world, the analysis and assessment of industrial companies' financial sphere becomes the main task for ensuring their further sustainable development. The primary task in this is to evaluate an industrial company's economic security in terms of its possible failure, as in case of its bankruptcy the available and potential resources are not able to have a positive impact on its further restoration and operation. Analysis of scientific research on similar problems determined that the models of multiple discriminatory analysis of the assessment of the financial condition and the probability of termination of industrial companies' activity in the nearest future were thoroughly considered in economic literature [7]. Thus, using basic integral indicators for assessing bankruptcy risks of modern industrial companies of the mining industry, we can draw the conclusion about the effectiveness of their functioning and adequacy of usage of certain models for grounded analysis of perspectives of termination of activity in different regions of the world (*Table 1*).

Table 1

Comparative characteristics of bankruptcy risk assessment models for industrial companies of the mining industry

Model	Advantages	Disadvantages
Altman two-factor model	<ul style="list-style-type: none"> <li>- simple calculation;</li> <li>- a small amount of analyzed data</li> </ul>	<ul style="list-style-type: none"> <li>- incomplete reflection of an company's overall financial status;</li> <li>- low accuracy of the model predicted values</li> </ul>
Altman Z-score	<ul style="list-style-type: none"> <li>- a wide range of analyzed data;</li> <li>- more accurate prediction than of the previous Altman model.</li> </ul>	<ul style="list-style-type: none"> <li>- being precise enough for large-scale companies only;</li> <li>- the peculiarities of Ukraine's stock market are not taken into account</li> </ul>
Taffler and Tisshaw model	<ul style="list-style-type: none"> <li>- high accuracy of indicator prediction;</li> <li>- partial consideration of the peculiarities of Ukrainian companies including mining ones</li> </ul>	<ul style="list-style-type: none"> <li>- significant impact of profits on general trends of an company's activity according to the model;</li> <li>- the model can be used only for joint-stock companies, which allocate their shares on the stock market.</li> </ul>
J. Conan and M. Holder model	<ul style="list-style-type: none"> <li>- a wider range of an company's activity analysis;</li> <li>- highly accurate predicted values;</li> <li>- relative consideration of industrial companies' activity specific features</li> </ul>	<ul style="list-style-type: none"> <li>- requires some more input data to analyze; statistics, which is the basis of the model, does not have statistical homogeneity of the sample of events, in particular one does not consider specificity of activity of analyzed companies, their strategy and goals, phases of life cycle</li> </ul>
ISAE model	<ul style="list-style-type: none"> <li>- a relatively small amount of input data;</li> <li>- probability of determination of risk of bankruptcy of the company is approximately 80 % in short-term period that does not exceed three quarters</li> </ul>	<ul style="list-style-type: none"> <li>- the model's similarity to other analyzed indicators of bankruptcy prediction assessment;</li> <li>- lack of adaptability of the model to the type of activity and field of the company;</li> <li>- contradiction of weighting coefficients of the model to specific features of mining industry</li> </ul>
Myzykovsky and Sokolov model	<ul style="list-style-type: none"> <li>- the model is concise;</li> <li>- simple calculation</li> </ul>	<ul style="list-style-type: none"> <li>- a small covering range of analytical data;</li> <li>- neglect of many aspects of a mining company's financial state</li> </ul>
Saifulin and Kadykov model	<ul style="list-style-type: none"> <li>- relatively simple calculation and ability to use for any field and organizations of different scale;</li> <li>- informativeness of ratios of the model gives complete picture of financial stability of the company;</li> <li>- indicators in the model have the same direction</li> </ul>	<ul style="list-style-type: none"> <li>- consideration of many aspects of an company's financial situation and inability to assess the reasons of falling of the company into insolvency zone;</li> <li>- contradiction of weighting coefficient values to specific features of industrial companies</li> </ul>
Zaitseva six-factor model	<ul style="list-style-type: none"> <li>- a wide range of analyzed data</li> </ul>	<ul style="list-style-type: none"> <li>- covers only the most influential indicators without taking into account many other important ones;</li> <li>- relatively large amount of calculations</li> </ul>

*Source:* authors' version.

Thus, one can conclude that the Altman Z-score, the Conan and Holder model, the Taffler and Tisshaw model are most crucial for analyzing and predicting bankruptcy risks of Ukraine's industrial companies. Their dynamics and predicted values in 2016 for the analyzed OJSC «Poltavsky GOK» [8] are shown in *Fig.*

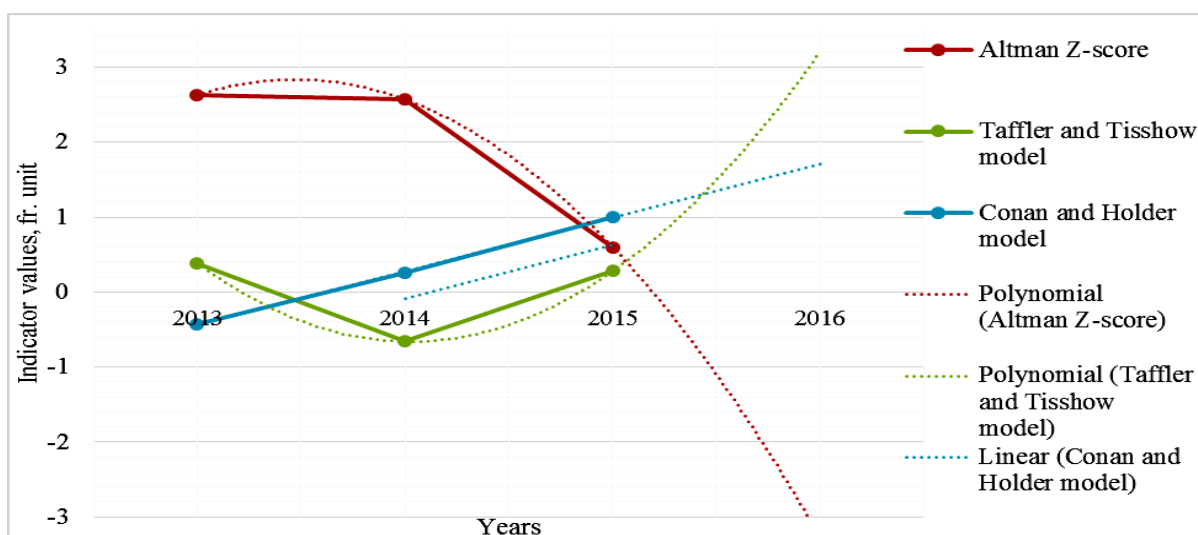


Fig. Dynamics of actual and predicted values of key models for assessing bankruptcy prediction of OJSC «Poltavsky GOK»

Source: authors' version.

According to the graphical display, the dynamics of the selected models and their predicted values, if the key activity conditions of OJSC «Poltavsky GOK» remain the same, in 2016 a negative tendency of value deterioration in the models will be observed. In particular, in the predicted period the Altman Z-score will make -3.1, which falls in the area of economic instability. The value decrease in the model also depicts some negative changes in OJSC «Poltavsky GOK» functioning. The predicted value in the Taffler and Tisshaw model will make 3.1 while the standard value is 0.2, indicating a low bankruptcy risk. Finally, the obtained prediction indicates that if the current tendencies remain, the Conan and Holder model value in 2016 will make 1.7, which is a potential threat for OJSC «Poltavsky GOK».

After analyzing the key models for assessing Ukrainian industrial companies' failure risks and taking OJSC «Poltavsky GOK» as an example, let us consider the activity of their key foreign competitors, the iron ore producers, OJSC «Stoilensky GOK» (Russia), which produced more than 18% of Russian iron ore products in 2016 and BHP BILLITON LTD (Australia), for the period of 2013—2015 (Table 2, 3). The data of the official site of OJSC «Stoilensky GOK» for the period of 2013—2015 shows that its activity was stable and effective and the calculated values of the bankruptcy risk evaluation confirm the company's stable financial position. Yet, in the analyzed period the majority of the models reveal a tendency toward deterioration by the end of 2015 [9]. It indicates negative changes in the company's further functioning, which will intensify in the nearest prospect according to the analyzed data.

Table 2

Indicators for evaluating the bankruptcy prediction of OJSC «Stoilensky GOK» (Russia) according to separate models

Indicators	2013	2014	2015	Absolute deviation 2015/2013
Altman two-factor model	-16,091	-3,4283	-4,8187	11,2718
Altman Z-score	13,4655	4,5	4,51092	-8,9546
R. Taffler and G. Tisshaw model	7,31592	1,34922	1,37781	-5,9381
J. Conan and M. Holder model	-1,7456	0,01944	0,83829	2,58388
ISAE model	6,60524	7,53054	5,11727	-1,488
E. Myzykovsky and I. Sokolov model	10,509	2,36819	3,23223	-7,2768
A. Saifulin and G. Kadykov model	4,18515	2,63796	2,53725	-1,6479
A. Zaitseva six-factor model	1,27717	7,81412	22,4461	21,1689

Source: authors' calculations.

As to the Australian industrial company BHP BILLITON LTD (*Table 3*) it must be mentioned that its overall economic activity as of the beginning of 2016 is absolutely liquid and stable [10]. That is why, as to the analysis data, most models confirm the company's stable financial position. Besides, the tendency towards changes of the four models is positive, and that of the six is negative. Only two models (the Conan and Holder model and the Zaitseva six-factor model) demonstrate a high failure risk of its further functioning. Thus, BHP BILLITON LTD can be characterized as the most financially stable and efficient of all the companies under analysis.

Table 3

Indicators for evaluating the bankruptcy prediction of BHP BILLITON LTD (Australia) according to separate models

Indicators	2013	2014	2015	Absolute deviation 2015/2013
Altman two-factor model	-1,3897	-1,7059	-1,749	-0,3593
Altman Z-score	3,23256	3,50134	3,60903	0,37647
R. Taffler and G. Tisshaw model	0,69727	0,79939	0,49087	-0,2064
J. Conan and M. Holder model	0,2895	0,2689	0,74259	0,45309
ISAE model	2,3992	2,65496	1,35144	-1,0478
E. Myzykovsky and I. Sokolov model	1,00949	1,21388	1,22391	0,21443
A. Saifulin and G. Kadykov model	1,83051	1,86709	1,70999	-0,1205
A. Zaitseva six-factor model	2,52551	2,91736	3,5962	1,07069

*Source:* authors' calculations.

Thus, by means of fulfillment of complex of calculations in the context of determination of probability of termination of functioning of modern industrial companies one can mention the most universal and accurate for mining industry is Altman Z-score, Conan and Holder model, Taffler and Tisshaw model. Their methodology of calculation gives the most trustworthy results for investigated companies. However, it must be mentioned that the most adequate one is Altman five-factor model — Z-score. This model takes into consideration dynamics of gross and undivided profit, pays a lot of attention to changes in total assets of the company, focuses on current assets and levels the influence of debt capital on financial condition of certain company.

**Conclusions.** Thus, the comprehensive analysis results make us conclude that in case of preservation of current negative tendencies of price decreasing for the iron ore raw materials causing the demand fall, one can observe the reduction of competitive advantages of leading industrial companies, especially Ukrainian ones, in conditions of ongoing destabilizing of the global economy and the world iron ore market (confirmed by the falling commodity prices for ore during 2016 at the iron ore market, in particular in May 2016 up to \$50, while in April it reached \$75). And although at the beginning of 2017 the price for 1 tone of the commodity ore increased to \$ 93 and, in accordance, for the steel — to \$470 (despite \$377 in 2016) there is no clear confidence considering preservation of similar trend in 2018, especially in conditions of decrease of demand at the markets of iron ore. Thus, in general one can make an assumption, that financial and economic condition of industrial companies on the example of analyzed OJSC «Poltavsky GOK», OJSC «Stoilensky GOK» and BHP BILLITON LTD (their main production is iron ore pellets) will also gradually deteriorate. The most likely manifestations of these negative tendencies are the decreased iron-bearing product profitability and production in general, the decreased personnel and equipment productivity against the background of increasing its wear coefficient, the reduction of a company's assets and market value, the increased demands for paying loan debts, liquidity and solvency decrease, minimization of business activity of industrial companies, foreign currency fluctuations at the world market, negative trends of inflation growth, which could result in a complete cessation of activity of some noncompetitive mining companies with limited financial capabilities in the nearest future.

Thus, basing on the performed calculations for 2013—2015 and taking into account the current trends at the iron ore market, the successful functioning of industrial companies in the context

of reducing the likelihood of their bankruptcy in the nearest future is possible only with respect to grounded financial and economic policy and operative decision-making in conditions of further strengthening of inflationary processes and changes in rates of leading foreign banks and especially the National Bank of Ukraine during determining investment receipts for supporting industry. Taking into account the world trends of the global economy and preserving the negative phenomena of economic instability and uncertainty in the foreign markets of iron ore over the past five years, the sustainable development of the above-discussed powerful industrial companies can be ensured through the introduction of programs of financial rehabilitation and anti-crisis measures in order to solve the priority tasks of updating technological complexes, formation of optimal schemes of equipment operation at promising and operational intervals of management; reduction of energy intensity of production and rational use of all kinds of resources on the basis of determining the energy efficiency criterion of mining production in accordance with increasing requirements of international environmental standards for environmental protection during extraction and processing of minerals and increasing competition in order to meet the demand of market consumers for the ironmonger products with better quality and price characteristics.

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