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# THE CONCEPT OF RISK MANAGEMENT: AN INTEGRATED ANALYSIS BASED ON THE CRITERIA OF THE FINANCIAL CONDITION OF ENTERPRISES

## ABSTRACT

The article is a theoretical and methodological study of risks as an important concept of enterprise management, highlighting the methodology of comprehensive risk analysis based on the criteria of the enterprise's financial condition. The essence and tasks of enterprise risk management and the place and role of analysis as a priority, all-encompassing functional component are highlighted. Analysis and assessment of the level of risks in statics and dynamics, using the integral function of the financial state of a multidimensional dynamic object, makes it possible to track the zones of unacceptable risk in the development of the enterprise. The calculation of the integrated assessment of the impact of risks on financial stability is carried out with the help of definitions of the outlined financial coefficients that characterize the potential of the financial state, the deviation from the normative and calculated values of which characterizes a certain level of risks of economic entities. The quantitative assessment of risks and the calculation of the comprehensive assessment were carried out according to groups of financial condition criteria - financial stability, liquidity, business activity, and profitability. Deviation from the normative value indicates the risk of disruption of the efficiency and financial stability of the enterprise under the influence of a number of factors of direct and indirect action. Determining the integrated assessment of risks for the researched period made it possible to follow the dynamics, identify the risks of enterprises and draw a conclusion about changes in their comprehensive assessments for all groups of criteria that are in the critical risk zone. The applied methodology allows for the development of measures and reasonable management decisions, which are taken in the short and long term to preserve the financial stability and efficiency of the enterprise. It is important to predict the prevention of risks to financial and economic efficiency and financial condition.

**Keywords:** risks, management, analysis, financial analysis, financial condition, integrated assessment, indicators

**JEL Classification:** C13, C38, D81, G30, G32, H12

## INTRODUCTION

The conceptual foundations of the market economy are accompanied by specific difficulties characteristic of a modern, competitive, unstable economy. In the conditions of globalization, intensifying market competition, increasing the importance of innovative processes, and instability of the socio-economic and political situation, risks arise that are caused by factors affecting the financial stability and financial and economic efficiency of economic entities. For the effective management of business risks, it is necessary to use innovative methods and tools of the analytical function, that is, the analysis and assessment of the financial condition of business entities in order to ensure financial and economic stability in the market space. Special attention should be paid to the methodological basis for the definition, analysis and assessment of risks, a significant number of theoretical developments of which need to be tested in the practical activities of enterprises of different sizes and forms of management. In addition, the relevance of the research topic is justified by the fact that the methodology of risk analysis and assessment contributes to the development of strategies and tactics of

activity, taking into account existing and predicting potential risks, and allows the formation of measures to mitigate impacts or their conversion into additional opportunities in order to achieve the goals set by the owners or managers of business goals. Therefore, the analytical assessment of risks as an information base and the basis of risk-oriented management activity and management decision-making is gaining more and more relevance and requires scientific research.

## LITERATURE REVIEW

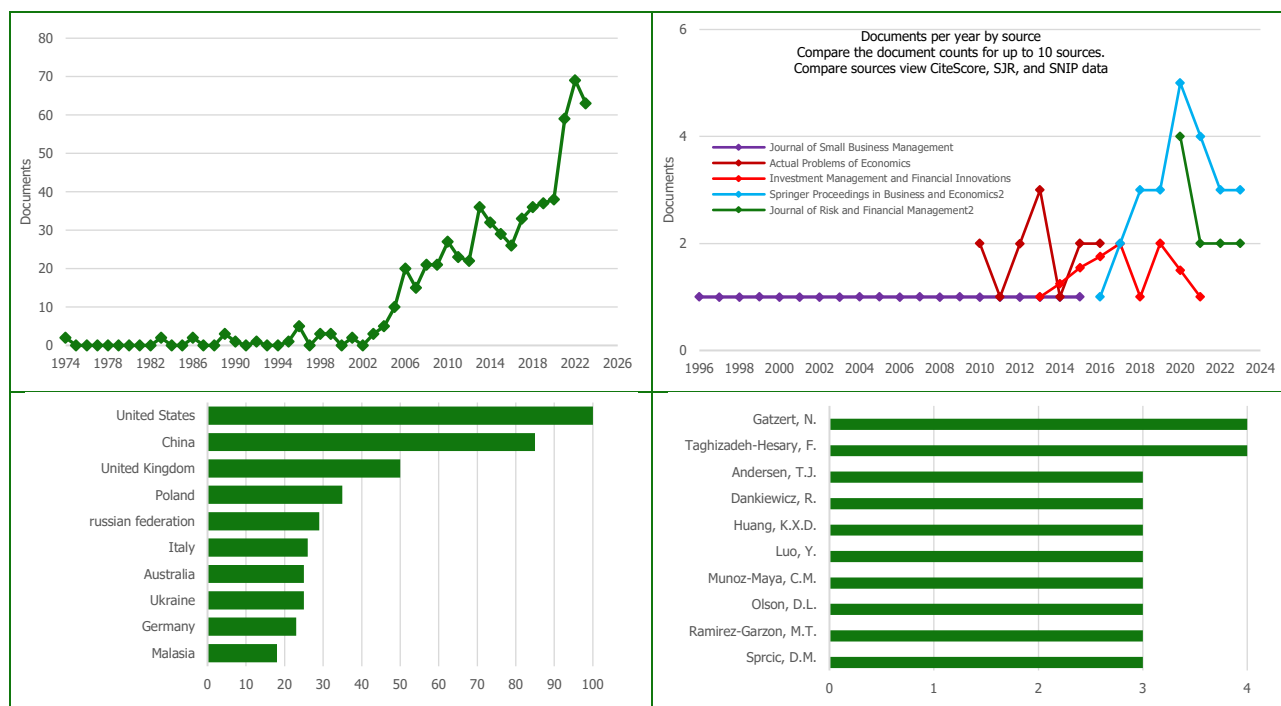
Financial and economic risks are gaining more and more attention and discussions on the part of scientists, practitioners, and managers. Such attention is due to the impact of risks on all spheres of economic activity of business entities, especially financial (T. N. D. Nguyen, T. C. Ha, M. C. Nguyen, T. T. H. Y. Bui, & T. T. L. Nguyen, 2023) [29]. Application Theoretical studies of risks have found application in various spheres of activity and business management. However, theoretical approaches, methods, and tools for determining financial and economic risks are quite diverse and have not yet reached a consensus.

The beginning and active development of the theory of risks in managerial activity is observed in the middle of the 20th century by American researchers. The most widely used were such risk theories as the "modern portfolio theory" (H. M. Markowitz 1959, 1990 [23; 24]; J. Tobin 1969 [42]), "the model for estimating the value of financial assets" (W.F. Sharpe, 1964 [38]; J. Lintner, 1965 [21]; J. Mossin, 1966 [27]), "an alternative model of capital asset valuation - the APM arbitrage model" (S.A. Ross, 1976 [32]).

The emergence of risks is caused by significant world events (mostly crises) in the economic, banking, and financial spheres. O.M. Gerasimenko, 2013 defines "risks are the probability of losing part of the company's resources, not receiving the planned income or the appearance of additional costs" [15]. Ignorance, randomness, and resistance are factors that lead to the emergence of risks that are present at all levels of management activity (O.M. Gerasimenko, 2013) [15].

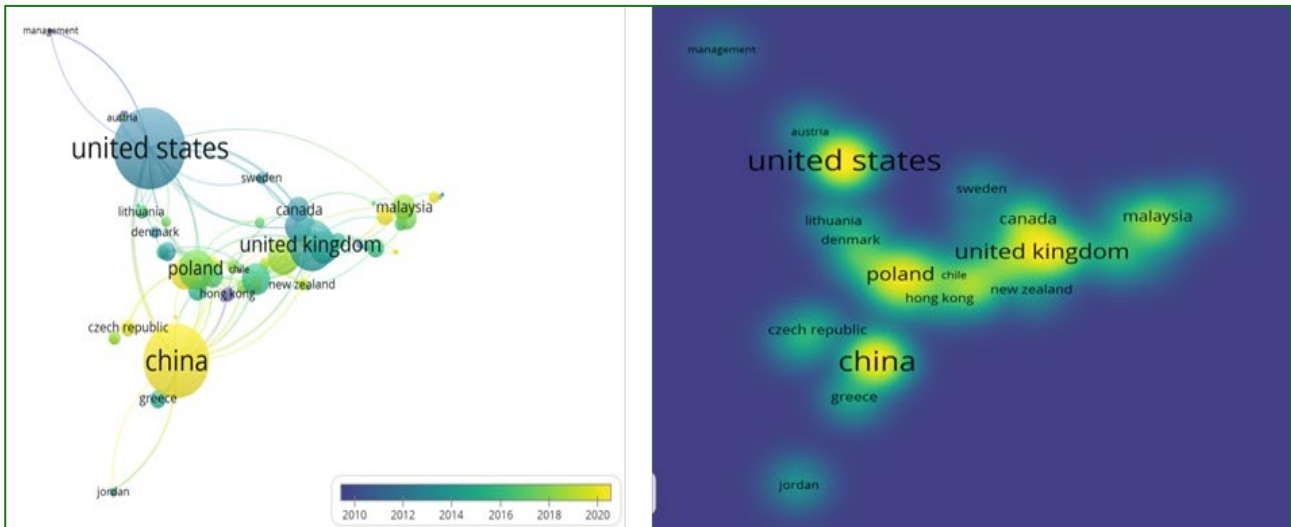
In addition, the source of threats and risks is the influence of information and economic globalization on business development, the prospective development of network technologies and big data (Zhang Yantai, 2022) [50].

Modern studies of risks as a management concept are aimed at highlighting various types of risk, their impact on business processes, and the peculiarities of impact in various sectors of the economy. The analysis of the publications of the researched problem in the bibliographic and reference database Scopus (articles, books, reports at the conference) made it possible to draw the following conclusions. One of the first was an article published in 1974. The revival of research took place in 2006 (Figure 1).



**Figure 1. Bibliographic analysis of publications in which the keywords are «risks», «risk analysis», and «risk management».** (Source: created on the basis of the Scopus bibliographic and abstract database: <https://www.scopus.com/search/form.uri?display=basic#basic>)

However, the largest number of publications of 68 units – is observed in 2022. At the time of the research (November 2023), there are 63 publications. The USA, China, and Great Britain are the top three countries in the study of risk issues. It is positive that Ukraine occupies the eighth place - 25 publications (Figure 2).



**Figure 2. Visualization of the network, the density of publications and their citations, the keywords of which are «risks», «risk analysis», and «risk management».** (Source: formed on the basis of the bibliographic and abstract database Scopus)

In the conditions of modern complexity (the last three years), threats have become more violent and unpredictable, the danger is rapidly spreading on a global scale. Characterizing such conditions, A. Capocchi, 2023 states that "a microscopic virus around the world managed to undermine the stability of entire complex systems: social, economic, financial and cultural" [8]. According to Shirui Zhang, 2023 "for many years, financial risks have seriously affected the healthy development of enterprises, credit institutions, investors in securities and even the whole country" [8].

Describing the conditions of economic activity, S. Bai, I. Fedulova, Yu. Drozdova, 2023 note their "high level of aggressiveness and unpredictability in the behaviour of all market participants. This is due to the fact that it is impossible to predict everything that affects the course of events in the future. Sometimes there is no understanding of what can affect business situations and management decisions. These are typical conditions for the existence of all mankind, not just the economy" [5]. Characterizing the categories and phenomena of "uncertainty" and "risk", the authors outline their differences, considering uncertainty as "the lack of complete information regarding the understanding of the factors influencing the problem, cause-and-effect relationships, actions, consequences, and the adequacy of personnel competencies in solving problems. This is the type, level of trust and interest in obtaining the desired result" [5]. In addition, scientists identify "causes of uncertainty: spontaneity, chance, conflict or contradiction, non-linearity of scientific and technical progress, impossibility of knowledge, ambiguity in perception of real phenomena and events, incompleteness and mistrust of information, limited resources. Uncertainty is the cause of risks, and understanding the listed reasons and characteristics of uncertainty will allow the company's management to better understand and identify uncertain parameters and form various development scenarios in conditions of uncertainty" [5].

The components of risk systems differ from the branch affiliation of business entities. In particular, Pensri Jaroenwanita, Pongsutti Phuensaneb, Aicha Sekharic and Claudine Gayc (2023) investigate risks and threats in agriculture and support the hypothesis that "the introduction of intelligent agriculture and risk management models by combining technology adoption methods (TAM) and innovation diffusion theory (IDT) will help farmers effectively and sustainably manage potential threats and risks faced by traditional farmers, such as product quality, increased production costs, the environment, climate change, natural disasters, pests, and substandard goods" [16].

One of the ways to solve the problem is digitalization, which in times of crisis contributes to increasing the level of resistance of business entities to economic downturns and bankruptcy risks. Therefore, the global level of information technology (IT) financing by companies of various sizes has been increasing since the beginning of 2020 during the pandemic (D. Kabachenko, O. Korolenko, N. Kutova, O. Churikanova and R. Shchokin, 2023). Although the integration of information technology management creates various complexities, it allows companies to specialize in their field of work and focus on innovation, taking advantage of modern technologies, without worrying about maintaining the technological infrastructure at their enterprises. This hypothesis is proved by a group of authors (R. A. More Valencia, J. M. Tume Ruiz, A. Rangel

Vega, T. R. Correa Calle, & J. E. Jaramillo Atoche, (2023) investigating the relationship between enterprise resource management and their planning for the implementation of a "risk management system (ERP) based on Cloud Computing architecture and the risks associated with the use of cloud technologies" [28].

In turn, digitalization has contributed to the emergence and spread of cyber risks, the study of which is a relevant subject of modern research in the field of risks, at the same time limited due to the lack of reliable data. D. Zängerle, and D. Schiereck, 2023 analyzed and estimated the financial impact of cyber incidents at the business entity level using rare historical data. The results of the analysis suggest that "the probability of a cyber incident correlates with the sub-industry, and cyber risks are severe and threaten business operations and profitability" [47]. In particular, operationally critical assessment of threats, assets and vulnerabilities (OCTAVE) became one of the first platforms for identifying and managing information system security risks by analyzing the company's assets, threats and vulnerabilities. Therefore, effective cyber risk management cannot be isolated and carried out exclusively in IT departments. It should be comprehensively included in the enterprise risk management (ERM) strategy (D. Zängerle, D. Schiereck, 2023) [47].

Enterprise risk management (ERM) is a very fast-growing field. Conceptual global risk management is based on ISO 31000:2018 and COSO ERM 2017 standards. Although they were produced by different organizations, they share common characteristics. Namely: risk management is not limited to negative risks, but also encourages risk-taking; the standards have a recommendatory nature, are optional for practical application and correspond to the needs and culture of the organization; is an updated version - the COSO standard was updated in 2017, and ISO 31000 was updated in 2018; risk management, as the process of producing management decisions regarding risks on the basis of taking the "right" risks in the required amount (I. Gaishuk, 2019) [14].

According to R. Trisnawati, S. Mustikawati and N. Sasongko (2023), ERM is an integrated and rigorous risk assessment strategy of a company. This procedure creates a risk-aware company culture. ERM's improved reporting, structure and risk analysis will help senior authorities make better decisions to mitigate risk. This strategy improves risk and perspective focus, resource efficiency and regulatory compliance, and minimizes financial, operational and strategic risks (R. Trisnawati, S. Mustikawati and N. Sasongko, 2023) [42]. Integrated risk management reduces potential threats, helps businesses stay ahead of competitors, achieve their goals, reduce revenue fluctuations, stabilize productivity, motivate their employees and maximize their value. O. J. Oniovosa & O. E. Godsdan, 2023 investigated "the relationship between risk management and firm value (Tobin's Q)" [31]. The analysis was carried out using economic and statistical methods, and the authors confirmed the hypothesis that the independence and professionalism of risk management have a significant impact on the value of the firm.

Ricardianto, Prasadja & Lembang et al. (2023) state that risk management can be defined as a design and implementation procedure for managing business risks; it is an integrated management of all the risks of the organization, which is combined with corporate governance and strategy. ERM is "a comprehensive approach to enterprise risk management and a modern trend that has become relevant and necessary" [3]. T. Alsalami, L. Soo-Wah, S. M. Nor, & A. H. Alsheikh, 2023 examine "operational and strategic risks that affect a company's business objectives and success and draw empirical conclusions about the impact of ERM on financial performance and value accounting and control, as an information base for risk management" [3].

Statistical results of the study Al-Qudah, L. A. A.-Q. (2023) confirmed "the significant impact of the enterprise risk management (ERM) model with its various dimensions (internal environment, goal setting, event identification, risk assessment, risk response, control activities, information and communication, monitoring) on reducing business risks in commercial banks of Jordan" [2]. The authors empirically prove that "the internal environment dimension of the enterprise risk management (ERM) model has not made a significant contribution to reducing business risks, which requires the development of a time-bound action plan that clarifies roles and responsibilities related to risk management enterprise, i.e. development of a business strategy" [2].

Therefore, risks require management and development of the company's strategy, the formation and implementation of which involves mitigating and minimizing the impact of risks, in order to survive in competitive market conditions. Enterprise risk management with the development of a business strategy forms a significant competitive advantage in the market space. However, a low level of enterprise risk management negatively affects efficiency and reduces the competitive advantage of the company (Ricardianto, Prasadja & Lembang et al., 2023) [33]. Therefore, companies that want to be competitive in the market and productive should properly implement risk management practices, a key aspect of which is the formation and implementation of a business strategy.

The strategic nature of risks is confirmed by a study by Kedarya, T., Elalouf, A. & Cohen, R.S. (2023), according to whom "strategic risk is one of the most critical factors affecting the profitability, financial strength and commercial success of a

business entity" [18]. It has been proven that "the impact of risk on profit is insignificant in the short term, but can become very noticeable in the medium and long term, with the potential to cause significant financial losses and impair the stability of the bank" [18]. Thanks to the mathematical analysis of the probability of occurrence and influence of various factors of strategic risk on the activity of the enterprise, the authors proposed a methodology for calculating strategic risks, the probability of their occurrence and the influence of various factors on them, integrating the adequacy ratio into the methodological algorithm for calculating capital.

According to Belas, J., Gavurova, B., Kubak, M., & Novotna, A., 2023, achieving competitive advantage requires the creation and use of effective strategies of small and medium-sized enterprises, taking into account their characteristics (resource limitations and size) and risks, which affect them. Having studied the sectoral characteristics of small and medium-sized enterprises in V4 countries in risk management, the authors quantified their differences in terms of socio-economic components and confirmed: "the presence of differences in risk management, which are determined by the country in which a given company operates, the industry, gender and age of its manager or the owner of the company" [7].

The effectiveness of the formation and implementation of the risk management strategy depends significantly on the personal characteristics of the head of the enterprise. Trisnawati, R., Mustikawati, S., Sasongko, N. (2023), investigating the relationship between the characteristics of managers (gender, psychotype) and managerial decision-making, proved that the chief executive officer (CEO) plays a key role in the risk management process [43].

Reducing internal risks depends on innovative management solutions regarding business processes and functional components of management - organization and planning of enterprise activities, accounting with support of the internal SAP system, administration of services for the purpose of optimizing enterprise processes (Vaničková Radka, 2023) [44]; forecasting and control based on economic-mathematical and statistical analysis for the study of financial risks of economic entities (Shirui Zhang, 2023) [48].

The influence of factors on financial risks in the conditions of transitional or developing economies was carried out by Thi Nguyet Dung Nguyen, Thanh Cong et al. (2023). Obtaining empirical evidence as a result of applying a quantitative method based on the SGMM model showed that "profitability, current solvency, financial structure, cost management and firm size affect financial risk" [29]. The authors used a combined Z-score scale to measure financial risk and concluded that firms should restructure their capital and more effectively control costs to avoid the risk of financial difficulties.

Capocchi A. (2023) recommends prevention, that is, prevention rather than risk management. "Prevention of risks, like what happens to people, is not about expanding monitoring systems or methods or methodologies for early diagnosis, as they say in the medical field. Prevention is something much deeper that has to happen in companies and complex socio-economic systems with constant politics over many years. Prevention, like anything that happens to people, is based on education, knowledge, awareness and the ability to change one's behaviour to reduce exposure to risk factors. The factors cannot be eliminated, but they can be significantly disabled if they are addressed in time with a serious policy designed for the long term... Prevention does not start with risk: risk is an external variable to the company and the socio-economic system... Prevention follows from the level of vulnerability of the company and the socio-economic system. Vulnerability refers to an internal, not an external, dimension. The vulnerability of a company or a socio-economic system is related to the health and well-being of which they are carriers" [8].

One of the conditions for preventing the impact of risks is the maintenance of long-term economic balance and stability by the economic system, thanks to which it is socially oriented, has value in the market space and is less vulnerable to risks. Business sustainability is a strategic commitment that is achieved by optimizing business processes and formulating strategies based on a risk-based business management system.

Risk management ensures sustainable development of the national economy, spheres of economic activity and specific enterprises. Sarlin P. and Peltonen T. (2013) suggest using the methodology "Self-Organizing Financial Stability Map" (SOFSM) to "display the state of financial stability and visualize potential sources of systemic risks" [36].

The sustainable functioning of various business entities is determined by their financial stability, which is a constituent element of determining the financial condition of an economic agent and, accordingly, the subject of research by analytical scientists.

In particular, Zhukevych S., and Rozheliuk V. (2018) consider the basic provisions of the influence of the sustainable development of the enterprise in the conditions of sustainable development. In determining the connection between sustainable development and financial stability, the "importance of financial analysis as a supporting function of management decision-making and survival under the influence of aggressive risks" is emphasized [55].

The team of authors (Zhukevych S., Karpishyn N., Shehera O., 2022), defining the financial condition and the factors affecting it as an indicator of stability, to analyze the financial stability of business entities, use the "balance sheet model of financial equilibrium, the definition of a three-component indicator and sources financial support, calculation of absolute and relative indicators" [54].

Ensuring the appropriate level of financial status in today's changing realities of rapid development is of priority importance for the prevention (prevention) of financial risks [11]. Cheng Jinfeng, 2022 claims that "the formalization and algorithmization of the financial risk model using methods and models for quantifying and forecasting the financial condition can prevent the occurrence of financial risks" [9]. The same opinion is supported by other researchers who define "financial analysis as an information base for management decision-making, which integrates key theories, methods and technologies of default risk management, analysis of financial indices (coefficient analysis), intellectual analysis of big data using computer software products" [10; 47].

The study of theoretical aspects of risks in general and financial in particular as an economic category and phenomenon is necessary to develop the tendency of their influence on the economic processes of business entities, to determine their criteria, which is possible by applying a special toolkit of analysis (Karpishyn N., Zhukevych S., 2017) [17]. Quantitative methods of deterministic analysis of the risk of enterprise bankruptcy (Altman E., 1968, 1996, 2012 [1]; Beaver W., 1966 [6]; Taffler R., 1983 [39]; Tereshchenko O., 2008 [40]; Matviychuk A., 2010 [25]) are of particular importance for predicting the onset of crisis phenomena, and "affect the level of financial security of economic entities" [56].

Zadorozhny, Z.-M., Zhukevich, S., Portovaras, T., Rozheliuk, V., Zhuk, N., & Nazarova, I. (2023) justify the need for analysis in the financial security management system of the enterprise. The authors propose a method of "risk analysis and assessment, which involves the following stages: preparatory stage; construction of an algorithm for quantitative assessment of risk in the financial security system; interpretation of the results of an integrated risk assessment in the financial security system; determining the priorities of risk management in the system" [47].

Outlining the importance and necessity of risk management, researchers in this area pay insufficient attention to its analytical justification. Particularly debatable and in need of more and more study and, especially, practical approval, are the issues of methodological support of analysis for the identification and integral assessment of risks, and delineation of factors influencing the financial stability of economic entities.

## AIMS AND OBJECTIVES

The purpose of the article is a theoretical study of risks as an important concept of enterprise management, highlighting the methodology of integral risk analysis based on the criteria of financial stability of the enterprise.

The hypothesis of the study is to determine the place and role of analysis as a priority, all-encompassing functional component of management activity, the application of the methodological basis of which contributes to the achievement of financial stability, which is the basis of safe, effective implementation of business activities in unstable, changing market conditions under the influence of aggressive risks and threats. The application and combination of methods of financial analysis, economic-statistical modelling and forecasting of component risks allow qualitative assessment and quantitative measurement of their impact on business conduct. The results of the performed analysis provide an opportunity to adjust, implement and control the business strategy of the enterprise, as well as to produce a system of actions for prediction, prevention or soft acceptance of risks for the implementation of financial and economic activities.

Achieving the set goal requires researching existing approaches to researching the concept of risk as a component of management activity, highlighting the essence and tasks of enterprise risk management (ERM), justifying financial stability as a priority indicator of effective financial and economic activity and as an object of risk influence, applying the method of integral analysis for assessment, quantitative measurement of risks to the stability of economic entities, to develop a system of indicators-indicators, the change in reference values of which indicates the risk of disruption of the efficiency or financial stability of the enterprise under the influence of a number of factors.

## METHODS

The analysis and assessment of risks affecting the financial and economic activity of enterprises is carried out using various research methods, including qualitative (surveys, heuristic methods, Delphi, collective notebook) and quantitative methods (methods of financial analysis, economic and statistical, deterministic analysis). In particular, the use of financial analysis methods to identify and assess risks is a relevant and effective tool, which is substantiated in the research of scientists

Zadorozhny, Z.-M., Zhukevich, S., Portovaras, T., Rozheliuk, V., Zhuk, N., & Nazarova, I., 2023 [46]; Rozheliuk V., Zhuk N., 2018 [35]; Karpishyn N., Zhukevych S., 2017 [17]; Zhukevych S., Karpishyn N., Shehera O., 2022 [54]. In addition, there are effective methods of determining the risks of the probability of bankruptcy of business entities, which are proven in practice and are available in terms of their application (Zhukevych S., Zhuk N., 2023 [56]; Nguyen T. N. D., 2023 [29]).

A study by Zadorozhny, Z.-M., Zhukevich, S., Portovaras, T., Rozheliuk, V., Zhuk, N., & Nazarova, I. (2023) proposed "quantitative analysis and assessment of risks using financial analysis methods enterprises (small and medium) of the food industry of various organizational and legal formations" [46].

The indisputability of the application of the above-mentioned research approaches and methods is beyond doubt and is important in the market space. However, the complexity of economic conditions requires new approaches to methodological, informational and technical support of analytical activities. Considering the enterprise as a complex cybernetic system, it is expedient to apply elements of economic and statistical calculations with elements of systemic quantitative analysis and risk assessment, which is based on the definition of an integral function. The application of this technique has been tested at small and medium-sized enterprises [52] and requires practical application at large enterprises - corporations.

The method proposed in the article allows to minimize the subjective factors influencing the obtained results and to adapt the method proposed for the study to the characteristic features of large enterprises, in particular, the confectionery corporation "Roshen" [30].

The integral function for risk research is represented by formula 1:

$$\sum_{j=1}^n \alpha_j P_{ij} = \sum_{j=1}^n \alpha_j P_{ij}^* \text{ або } \sum_{j=1}^n \alpha_j \frac{x_{ij}}{\sigma_j} = \sum_{j=1}^n \alpha_j \frac{x_{ij}^*}{\sigma_j}, \quad (1)$$

where  $\alpha_j$  – is the significance of unified criteria  $x_i$ ;  $x_{ij}$  – is the content of the  $j$ -th criterion in the  $t_i$  time period;  $\sigma_j$  – root mean square deviation of the  $j$ th criterion;  $x_{ij}^*$  – reference content of the  $j$ -th criterion;  $P$  and  $P^*$  – are the unified contents of actual and reference criteria  $x_i$  and  $x_{ij}$ .

With the help of the quantitative measurement of risks and their analysis and evaluation in statistics and dynamics, it is possible to follow the development of the enterprise and determine areas of possible risk that affect and determine financial stability. In turn, financial stability is determined by the efficiency of the enterprise, and the presence of financial and economic potential and is a criterion for ensuring the proper financial condition of the enterprise. Therefore, it is important in the proposed methodology to outline the factors, i.e., indicators, which characterize the financial state of the enterprise and are grouped as follows: 1st group - financial stability, 2nd group - liquidity, 3rd group - business activity, 4th group - profitability. The algorithm for calculating indicators and conventional notations for use in calculations is contained in Table 1. The proposed criteria, which materialize the quantitative characteristics of the financial state, is in the risk zone of non-compliance with regulatory values and violation of stability.

**Table 1. Factor indicators of the financial stability of the enterprise.** (Source: compiled on the basis of Luchko R., Zhukevich S., Farion A., 2016 [22]; Zhuk N., 2022 [54])

№	Indicators	Conventional notation	Calculation algorithm
I. Liquidity indicators			
1	Absolute liquidity ratio	X11	Cash assets / Current liabilities
2	Quick liquidity ratio	X12	Current assets - stocks / Current liabilities
3	Coverage ratio	X13	Current assets / Current liabilities
II. Indicators of financial stability			
4	Coefficient of financial independence	X21	Equity / Total capital:
5	Financial risk factor	X22	Long-term + current liabilities / Equity
6	Coefficient of maneuvering	X23	Current assets (CA) / Equity
III. Indicators of business activity (turnover)			
7	Asset turnover ratio	X31	Net Income / Average Assets
8	Inventory turnover ratio	X32	Net income / Average inventories or Cost of goods sold / Average inventories
9	Receivables turnover ratio	X33	Net Income / Average Accounts Receivable
10	Accounts payable turnover ratio	X34	Net income / Average accounts payable

(continued on next page)

**Table 1.** Continued

№	Indicators	Conventional notation	Calculation algorithm
IV. Profitability indicators			
11	Return on assets	X41	Earnings before interest and taxes / average value of assets
12	Return on equity	X42	Net financial result / invested equity
13	Net return on sales	X43	Net profit/net income

Therefore, the state of financial activity of the economic entity, as the basis of stability, is described by the system of indicators  $X_1, X_2, \dots, X_n$ , and is observed in the dynamics for the period  $[t_1 - t_n]$ . The components of the proposed information model-matrix "time signature" are  $x_{ij}$ , which means the value of  $j$  - the criterion at the moment of observation  $t_i$ .

The company's achievement of the reference (best) value  $X^* = (X_1^*, X_2^*, \dots, X_n^*)$  characterizes the level of development of the financial condition, which is limited by conditional 1, then:

$$y_i = y_i^* = \sum_{j=1}^n \alpha_j \frac{x_{ij}^*}{\sigma_j} = \sum_{j=1}^n \alpha_j P_{ij}^* \tag{2}$$

The procedure for calculating the integral evaluation of indicators is carried out according to the algorithm, which is shown in Table 2.

<b>Table 2. Algorithm for forming an integral indicator and identifying risk.</b> (Source: compiled on the basis of Zhuk N., 2023 [53])	
<b>Stage I</b>	<b>Calculation of a comprehensive assessment by a group</b>
1	$x_{jk}$ – the value of the $j$ -th indicators of the $k$ -th block in the $t_i$ year of the studied period
2	Calculation of the mean square deviation of the $j$ -th indicator of the $k$ -th block $\sigma_{jk} = \sqrt{\frac{\sum (x_{ijk} - \bar{x}_{jk})^2}{N}}$
3	Calculation of unified criteria values $P_{ijk} = \frac{x_{ijk}}{\sigma_{jk}}$
4	Evaluation of the content of reference criteria $x_{jk}^*$
5	Calculation of unified benchmark values $P_{jk}^* = \frac{x_{jk}^*}{\sigma_{jk}}$
6	Calculation of weight of criteria in comprehensive assessment $\alpha_{jk} = \frac{P_{jk}^*}{\sqrt{\sum_{j=1}^n (P_{jk}^*)^2}}$
7	Calculation of the content of the potential function by years $y_{ik} = \sum_{j=1}^n \alpha_{jk} P_{ijk}$
8	Calculation of the reference content of the potential function $y_k^* = \sum_{j=1}^n \alpha_{jk} P_{jk}^*$
9	Determination of comprehensive assessment of financial potential $C_{ik} = \frac{y_{ik}}{y_k^*}$
<b>Stage II</b>	<b>Calculation of the integrated risk assessment</b>
1	Calculating the significance of groups $\tilde{\alpha}_k = \frac{y_k^*}{\sqrt{\sum_{k=1}^m (y_k^*)^2}}$
2	Calculation of the content of the potential function by years $\tilde{y}_i = \sum_{k=1}^m \tilde{\alpha}_k y_{ik}$
3	Calculation of the reference content of the potential function $\tilde{y}^* = \sum_{k=1}^m \tilde{\alpha}_k y_k^*$
4	Calculation of integral assessment of financial potential $\tilde{c}_i = \frac{\tilde{y}_i}{\tilde{y}^*}$
5	The level of financial risk is determined $R_i = 1 - C_i$
↓	
<b>Stage III</b>	<b>Identification of risks</b>
0.75-1 – Catastrophic level of risk	
0.5-0.74 – Critical level of risk	
0.25-0.49 – Acceptable level of risk	
0 – 0.24 – Risk-free activity	

## RESULTS

For approbation of the methodology of financial risk assessment, the actual data of a large enterprise - confectionery corporation "Roshen" for three years was used. However, we note that in order to respond to a dangerous situation in a timely manner and make management decisions regarding measures to maintain proper financial stability, it is necessary to apply such a methodology in an operational mode - monthly, quarterly.

For the study of risks according to the above-described method, the data of the studied enterprises are summarized into groups: 1 – financial stability, 2 – liquidity, 3 – business activity, 4 – profitability, the method of calculation of which is contained in Table 1 and on the basis of which further calculations are made in Table 3.

**Table 3. Indicators of confectionery corporation "Roshen", 2021-2023.** (Source: formed on the basis of official data of confectionery corporation "Roshen" [30])

Groups	Indexes	Conditional definitions	2021	2022	2023	$\sigma_{1j}$	$\sigma_{1j}$
Financial stability	Coefficient of autonomy	X11	0.919	0.894	0.902	0.010	0.905
	Coefficient of financial stability	X12	11.272	8.427	9.228	1.198	9.642
	Coefficient of maneuvering	X13	0.104	0.095	0.157	0.027	0.118
Liquidity	Current asset coverage ratio	X21	0.102	0.094	0.176	0.037	0.124
	Coverage ratio	X22	1.286	1.394	1.760	0.202	1.480
	Quick liquidity ratio	X23	1.299	1.245	1.667	0.188	1.404
	Absolute liquidity ratio	X24	0.007	0.003	0.003	0.002	0.005
Business activity	Asset turnover ratio	X31	1.105	0.846	0.635	0.192	0.862
	Inventory turnover ratio	X32	8.052	34.775	29.095	11.495	23.974
	Accounts receivable turnover ratio	X33	7.086	1.698	0.994	2.721	3.259
	Accounts Payable Turnover Ratio	X34	3.410	1.693	0.979	1.020	2.027
Profitability	Return on assets	X41	0.042	0.040	0.002	0.018	0.028
	Return on equity	X42	0.000	0.077	0.005	0.035	0.027
	Net return on sales	X43	0.000	0.046	0.003	0.021	0.016

We unify the actual basis of the criteria by dividing them by the root mean square deviation (Table 4).

**Table 4. Unified content of the criteria of confectionery corporation "Roshen", 2021-2023.** (Source: formed on the basis of official data of confectionery corporation "Roshen" [30])

Groups	$P_{1ij}$	2021	2022	2023
Financial stability	P11	89.933	87.526	88.339
	P12	9.411	7.036	7.704
	P13	3.814	3.489	5.754
Liquidity	P21	2.757	2.553	4.769
	P22	6.353	6.884	8.690
	P23	6.926	6.634	8.886
	P24	3.668	1.652	1.456
Business activity	P31	5.753	4.407	3.308
	P32	0.701	3.025	2.531
	P33	2.604	0.624	0.365
	P34	3.342	1.659	0.959
Profitability	P41	2.277	2.155	0.097
	P42	0,000	2,184	0,132
	P43	0,000	2,180	0,124

The results of the calculation of the unified characteristics by assigning the weight values of the regulatory criteria according to the unified reference data of financial stability, liquidity, business activity and profitability are shown in Table 5.

**Table 5. Parameters for calculating a comprehensive assessment based on the criteria of confectionery corporation "Roshen", 2021-2023.** (Source: formed on the basis of official data of confectionery corporation "Roshen" [30])

Calculation parameters	The reference value of the indicator $X_{ij}^*$	Standardized reference value $P_{ij}^*$	$(P_{ij}^*)^2$	$\alpha_{ij}$	$\alpha_{ij}P_{ij}^*$
P11	0.5	48.956	2396.687	0.716	35.040
P12	1	0.835	0.697	0.012	0.010
P13	1.3	47.760	2281.034	0.698	33.349
$\Sigma$ financial stability			4678.418		68.399
P21	1	27.107	734.805	0.261	7.062
P22	2	9.877	97.563	0.095	0.938
P23	0.6	3.198	10.227	0.031	0.098
P24	0.2	99.919	9983.788	0.960	95.952
$\Sigma$ liquidity			10826.384		104.050
P31	1.1	5.730	32.830	0.756	4.335
P32	30	2.610	6.812	0.345	0.899
P33	7	2.572	6.617	0.340	0.874
P34	3.4	3.333	11.108	0.440	1.467
$\Sigma$ business activity			57.367		7.574
P41	0.04	2.178	4.744	0.621	1.353
P42	0.07	1.977	3.908	0.564	1.115
P43	0.04	1.907	3.637	0.544	1.037
$\Sigma$ profitability			12.288		3.505

Table 6 highlights the results of calculating the comprehensive assessment of the financial condition of the confectionery corporation "Roshen" by groups of indicators.

**Table 6. The value of the potential function of the confectionery corporation "Roshen", 2021-2023.** (Source: formed on the basis of official data of confectionery corporation "Roshen" [30])

Groups	the value of the potential function and the comprehensive assessment of financial potential	2021	2022	2023
Financial stability	$\alpha_{11}P_{11}$	64.369	62.646	63.228
	$\alpha_{12}P_{12}$	0.115	0.086	0.094
	$\alpha_{13}P_{13}$	2.664	2.436	4.018
	$\Sigma=y_1$	67.147	65.168	67.340
	C1	0.982	0.953	0.985
Liquidity	$\alpha_{21}P_{21}$	0.718	0.665	1.242
	$\alpha_{22}P_{22}$	0.603	0.654	0.825
	$\alpha_{23}P_{23}$	0.213	0.204	0.273
	$\alpha_{24}P_{24}$	3.522	1.586	1.398
	$\Sigma=y_2$	5.057	3.109	3.738
	C2	0.049	0.030	0.036
Business activity	$\alpha_{31}P_{31}$	4.353	3.334	2.503
	$\alpha_{32}P_{32}$	0.241	1.042	0.872
	$\alpha_{33}P_{33}$	0.884	0.212	0.124
	$\alpha_{34}P_{34}$	1.471	0.730	0.422
	$\Sigma=y_3$	6.949	5.318	3.921
	C3	0.917	0.702	0.518
Profitability	$\alpha_{41}P_{41}$	1.415	1.339	0.060
	$\alpha_{42}P_{42}$	0.000	1.232	0.075
	$\alpha_{43}P_{43}$	0.000	1.186	0.067
	$\Sigma=y_4$	1.415	3.757	0.202
	C4	0.404	1.072	0.058

A comprehensive assessment of the potential of the financial state by groups of criteria and determination of the level of the reference value of the main components of the financial state, which are calculated in Table 5, make it possible to draw the following conclusions. For the years 2021-2023, the financial and economic activity of confectionery corporation "Roshen" has undergone negative changes in comprehensive assessments by a group of profitability indicators - from 4% in 2001 to 0.5% in 2023 and business activity - from 0.917 in 2021 to 0.518 in the 2023 year, which is determined not only by internal factors but also by the economic situation and the influence of negative external factors (crisis, war). However, it should be noted that the relative stability of the comprehensive assessment of financial stability and liquidity, which is determined by the size of enterprises, in contrast to other, smaller (small and medium-sized) economic entities, which are more sensitive to crisis situations, the study of which was carried out by Zhuk N.T., 2023 [53].

The second stage covers the definition of comprehensive assessments of the financial condition (Table 7), the calculation of the integrated assessment of financial risk in general (Table 8) and by year (Table 9).

**Table 7. Comprehensive assessment of the level of financial status by groups of criteria.**

Years	y1	y2	y3	y4
2021	67.147	5.057	6.949	1.415
2022	65.168	3.109	5.318	3.757
2023	67.340	3.738	3.921	0.202

**Table 8. Determination of the integral assessment of the financial condition of the confectionery corporation "Roshen".**

Calculation parameters	y1	y2	y3	y4	$\Sigma$
Reference value of the potential function $y_k^*$	68.399	104.050	7.574	3.505	
$(y_k^*)^2$	4678.418	10826.384	57.367	12.288	15574.457
$\bar{\alpha}_k = \frac{y_k^*}{\sqrt{\sum_{k=1}^m (y_k^*)^2}}$	0.548	0.834	0.061	0.028	
$\bar{\alpha}_k y_k^*$	37.488	86.751	0.460	0.098	124.798

**Table 9. Integrated assessment of financial and economic risks of confectionery corporation "Roshen", 2021-2023.**

Years	$\bar{\alpha}_1 y_1$	$\bar{\alpha}_2 y_2$	$\bar{\alpha}_3 y_3$	$\bar{\alpha}_4 y_4$	$\bar{y}_i$	$\bar{c}_i$	p
2021	36.802	4.216	0.422	0.040	41.480	0.637	0.363
2022	35.717	2.592	0.323	0.106	38.737	0.597	0.403
2023	36.907	3.117	0.238	0.006	40.268	0.601	0.399

The obtained data make it possible to determine the dynamics and identify the risks of the investigated enterprises (Table 10).

**Table 10. Dynamics of integrated risk assessment of confectionery corporation "Roshen".**

Years	2021	2022	2023
Integral assessment of financial stability potential	0.637	0.597	0.601
Chain rates of change, %		93.7	100.7
The level of risk of financial stability	0.363	0.403	0.399
Risk zone	critical	critical	critical

The results of the determination and assessment of financial and economic risks identify a critical risk zone for the confectionery corporation "Roshen". The quantitative measurement of risks for the studied period shows that the enterprise is in a critical zone, which threatens financial stability. Such a situation requires specific actions by managers to implement measures to achieve a stable financial condition and improve indicators of financial and economic activity. A significant

role in the resuscitation process is played by qualified management using analytical methods for identifying problem areas and substantiating activity opportunities.

Quantitative measurement of financial risks according to the proposed methodology for determining and evaluating the potential of a multidimensional dynamic object - Roshen Confectionery Corporation, makes it possible to make informed management decisions in the short and long term to maintain the stability and efficiency of operations in a competitive market space.

A detailed analysis of the actual data of the financial statements of the investigated enterprise with the use of special methods of analytical research makes it possible to quantitatively measure the existing risks, which are a problematic area of the management system and relative incompetence. This is one of the reasons for the inefficiency of conducting business activities and the disruption of stability.

Enterprises of various organizational and legal forms of business must develop a powerful management network using all types of analytical support with the use and combination of quantitative and qualitative methods since the complementarity (combination) and triangulation (control) of methods contribute to supplementing the limited capabilities of one method with another. We also note that the application of the methodological base depends on the competence and professionalism of the management staff, and the correct application of the methods. Their totality is determined by the purpose, tasks, and needs of analytical research and the capabilities of some of them. The introduction of strategic management, i.e. the development of a strategy of financial activity to ensure the sustainability of a business entity, is important for predicting and preventing the impact of risks on the efficiency of financial and economic activity.

Thus, the analytical function of risk management is universal, the effectiveness of which depends on a combination of economic-mathematical, statistical and other research methods. The relevance of the investigated issues is justified by the need to develop effective management decisions and the production of specific actions with the need for timely prediction, prevention or acceptance of risks. The priority of risk analysis and assessment as a management concept is determined by the variability, instability and aggressiveness of external business conditions, systemic and protracted crises, and socio-economic processes. These conditions affect the financial stability of enterprises, the criterion characteristics of which are: liquidity, financial stability, business activity, and profitability. Therefore, for business entities, an integrated assessment of risks using economic and mathematical methods and analysis models is effective and necessary to ensure competitiveness in the market space.

## DISCUSSION

Having studied the management concept of risks arising during the implementation of entrepreneurial activity, we note the insufficient amount of scientific research. Special limited attention is observed in the issues of analytical support of risk management at enterprises of various industries, sizes, and organizational and legal formations, taking into account their peculiarities. At the same time, aggressive, unstable economic conditions, crisis processes and force majeure circumstances require the application of more complex analytical methods of risk assessment using economic-mathematical, statistical models of prediction and assessment of existing risks with the possibility of forecasting the efficiency of activities and financial stability of economic entities. It has been proven that financial stability in the above conditions is an indicator of effective business activity in competitive market conditions. Therefore, the research proposed a method of integral assessment and analysis of risks, the criterion of which is defined as financial sustainability using methods of economic and mathematical calculation of the impact of risks on the conduct of business activities. The starting indicators were the coefficients that characterize and are the determining components of financial stability (financial stability, liquidity, profitability, business activity). Their dynamics, and deviations from the normative value characterize problematic aspects that affect and are risks of disruption of financial stability and efficiency of financial and economic activity in the modern realities of the market economy.

This makes it possible to assert the special role and place of analysis as a priority, all-encompassing functional component of risk management. The use of tools and technologies of analytical research allows to diagnose the financial condition of the enterprise and take a set of measures to achieve financial stability, which is the basis of safe, effective business activity in unstable, changing market conditions under the influence of aggressive risks and threats. The application and combination of methods of financial analysis, economic-statistical modelling and forecasting of component risks allows to qualitatively assess and quantitatively measure their impact on the economic and financial activity of a business entity. The positive thing is that the application of the methodology involves the use of an information base (financial reporting), which is freely available and can be studied by interested persons. The results of the performed analysis provide an opportunity to adjust, implement and control the business strategy of the enterprise, as well as to produce a system of

measures to prevent or mitigate the existing effects of risks on business activity. However, it should be noted that the consideration of industry specifics, the size of enterprises and external economic factors in such an analysis affects the criteria of financial stability and determines the range of indicators for research and analysis of risks in management.

## CONCLUSIONS

Conducting effective business activities and achieving set financial and economic tasks require forecasting, tracking and taking into account current and forecasting future risks. Today, risks have become a priority concept of management activity, underestimation of their influence and the inadequacy of the developed methodologies for their assessment and analysis can negatively affect the performance and financial condition of economic entities. Therefore, the production of analytical risk research methodologies and their practical implementation with systematic calculations allow avoiding crisis situations.

Risk management is the basis of the efficiency and financial stability of business structures, which is possible when applying methods and models of analysis as one of the functional components of management. Analytical research of risks is the study of the principles and factors that arise in the financial and economic activity of business entities and have an impact on its financial condition, determine the strengths and weaknesses of entrepreneurial activity and the risks that affect or may arise. This process allows you to systematically study potential threats and opportunities that may arise in the course of business activities and take timely measures to manage them.

The study outlines financial stability as a criterion for ensuring the effectiveness of entrepreneurial activity. The management and analysis of financial stability and its provision involves a comprehensive approach that includes groups of indicators that are components of the considered methodological approach and characterize profitability, financial stability, business activity, and liquidity. Since the interrelationship of these factors determines the overall financial condition and stability of the enterprise, changes in one aspect can cause a deficiency in the entire system of economic, and financial (business) activity of the entrepreneurial structure.

It is important to apply scientifically based, effective methods of identifying and assessing risks and assessing their impact on financial stability. Today, economic and mathematical methods and the definition of an integral function, which are used to analyze and assess the risks of financial stability of a multidimensional dynamic business entity, are of priority importance.

The proposed and tested methodological approach of integral assessment and measurement of the impact of risks based on the criterion of financial stability in the confectionery corporation "Roshen" proved and confirmed the effectiveness and necessity of its use in the management of enterprises of various forms and sizes of economic structures. The processing of the received results of the assessment of financial and economic risks showed that the enterprise is in a zone of critical risk, which violates financial stability and security and threatens the probability of being in a crisis situation. The way out of the situation can be seen in qualified risk-oriented management of the enterprise, the general function of which is analysis, the application of which is necessary to achieve significant results in the market space.

We note that risk management is a continuous process that requires constant improvement, taking into account the changing external conditions and internal factors of the enterprise and the application of adequate methods of its analytical justification. One of these methods is an integrated risk assessment based on the criteria of financial stability, which is advisable to apply in practice, as it is the informational basis for making optimal, well-founded management decisions. However, the considered technique, like others, must be improved and replenished with new ones adapted to realities and take into account the requirements of time and the innovativeness of scientific exploration.

## LIMITATIONS AND FUTURE RESEARCH

The application of the method of integral analysis and risk assessment of enterprises is a universal model for enterprises of various branches, therefore, for its calculation, financial reporting data are used, which are data open to interested parties. However, the unification of the actual basis of criteria may be different and depends on the purpose, tasks and criteria of the impact of risks and the subjective approach and competence of the analyst. It is also necessary to take into account industry specifics, sizes, and stage of the "life cycle" of economic structures. The methodological approach proposed for the analysis and assessment of the risks of the activities of enterprises of different sizes should be tested taking into account other determining components and factors, which will enable a deeper and more detailed study of the risks at various "life cycles" of conducting economic and financial activities of various organizational forms of management.

Since the issue of expanding the set of analytical methods, their combination and application for risk assessment and management in the context of developing a business strategy focused on their prevention or consideration in financial and economic activity is relevant and insufficiently researched, it will be the subject of further research.

## ADDITIONAL INFORMATION

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## КОНЦЕПЦІЯ УПРАВЛІННЯ РИЗИКАМИ: ІНТЕГРАЛЬНИЙ АНАЛІЗ ЗА КРИТЕРІЯМИ ФІНАНСОВОГО СТАНУ ПІДПРИЄМСТВ

Стаття є теоретико-методологічним дослідженням ризиків як важливого концепту управління підприємством, висвітлення методології комплексного аналізу ризиків на основі критеріїв фінансового стану підприємства. Висвітлено

сутність і завдання управління ризиками підприємства та місце й роль аналізу як пріоритетної, всеохоплюючої функціональної складової. Аналіз та оцінка рівня ризиків у статиці й динаміці з використанням інтегральної функції фінансового стану багатовимірного динамічного об'єкта дає змогу відстежити зони неприйнятної ризику в розвитку підприємства. Розрахунок інтегральної оцінки впливу ризиків на фінансову стійкість здійснюють із допомогою визначень окреслених фінансових коефіцієнтів, які характеризують потенціал фінансового стану, відхилення від нормативних і розрахункових значень яких характеризує певний рівень ризиків суб'єктів господарювання. Кількісну оцінку ризиків і розрахунок комплексної оцінки проводили за групами критеріїв фінансового стану – фінансова стійкість, ліквідність, ділова активність, прибутковість. Відхилення від нормативного значення свідчить про ризик порушення ефективності та фінансової стійкості підприємства під впливом ряду чинників прямої й непрямої дії. Визначення інтегральної оцінки ризиків за досліджуваний період дало змогу простежити динаміку та виявити ризики підприємств і зробити висновок про зміни їх комплексних оцінок за всіма групами критеріїв, які перебувають у зоні критичного ризику. Застосовувана методологія дозволяє розробляти заходи та обґрунтовані управлінські рішення, які ухвалюють у короткостроковій та довгостроковій перспективі для збереження фінансової стійкості й ефективності діяльності підприємства. Важливе значення для прогнозування попередження ризиків на фінансово-господарську ефективність і фінансовий стан має впровадження системи стратегічного управління із затосуванням комплексної оцінки ризиків за допомогою економіко-математичних методів і моделей аналізу, що забезпечує конкурентоспроможність у ринковому просторі.

**Ключові слова:** ризики, управління, аналіз, фінансовий аналіз, фінансовий стан, комплексна оцінка, індикатори

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