Diagnosis of financial risks in the activities of agro-industrial enterprises within the enterprise risk management system as a tool of financial engineering

Maryna Berest

PhD in Economics, Associate Professor
Simon Kuznets Kharkov National University of Economics
61166, 9A Nauky Ave., Kharkiv, Ukraine
https://orcid.org/0000-0002-2410-3210

Nataliia Sablina*

PhD in Economics, Associate Professor
Simon Kuznets Kharkov National University of Economics
61166, 9A Nauky Ave., Kharkiv, Ukraine
https://orcid.org/0000-0002-1931-2851

Abstract. Given the volatility of market conditions and the specific nature of the agro-industrial complex, timely diagnosis of financial risks not only enables loss minimisation but also ensures adaptability to external changes, optimises capital structure, and enhances solvency. This is particularly relevant for attracting investment and financing, as investors are guided by the enterprise's risk profile. The aim of the study was to improve methodological approaches to the diagnosis of financial risks as an important tool of financial engineering within the risk management system of agro-industrial enterprises. The study employed methods of scientific inquiry, namely: the systems approach, analysis, synthesis, scientific abstraction, and generalisation. To diagnose the level of financial risks using agro-industrial enterprises as examples, the method of calculating financial ratios and the method of taxonomic analysis were applied, along with tabular and graphical methods for presenting the research findings. The integral indicator (IFR) was constructed based on the main areas of risk assessment: liquidity, financial stability, solvency, profitability, and settlement efficiency. The study assessed the level of financial risk of agro-industrial enterprises during the period 2021-2023. The lowest risk was observed in EFI "Viterra Ukraine" (IFR = 0.114), while LLC "TAS Agro Center" demonstrated negative dynamics: the IFR increased from 0.022 to 0.572. Consistently high risk was identified in LLC "Agrotrade-Production" (IFR = 0.620 in 2023), with the highest level observed in LLC TC "Vitagro" (IFR = 0.688). The practical value of the study lies in the proposed approach to diagnosing the level of financial risks, which can be used to justify and make current and future management decisions in the risk management system of a business entity

Keywords: solvency; financial stability; profitability; financial performance; financial leverage

● INTRODUCTION

The relevance of the research topic is driven by the need for comprehensive diagnosis of financial risks and the development of an effective risk management system in the agro-industrial sector. This will contribute not only to the financial security of individual enterprises but also to the overall stability of the agricultural sector. Under conditions of globalisation and intensified competition, effective financial risk management has become a crucial element of the development strategy for agro-industrial enterprises. Insufficient attention to the identification and mitigation of risks may lead to loss of liquidity, increased credit burden, and even bankruptcy of enterprises. Financial

*Corresponding author

engineering as a risk management tool enables agro-industrial enterprises to develop and implement modern financial strategies aimed at enhancing their resilience. The use of hedging, insurance, capital structure optimisation, and other financial mechanisms makes it possible to reduce the level of financial uncertainty and ensure stable development.

As financial risks faced by modern enterprises are among the most dangerous and destructive, there is an urgent need for their further study, analysis of their nature, classification, and the development of effective management methods. A significant number of scholars in the field of financial management and analysis have paid attention to the issue of diagnosing financial risks in the activities of enterprises. The authors N.S. Zgadova *et al.* (2025) paid attention to the theoretical aspects of financial risk management and studied their impact on the financial security of the enterprise. In the work by A. Nechiporenko (2023), approaches to defining the concept of "financial risk" were analysed, and the factors influencing financial risks of an enterprise are systematised. The necessity of financial risk management under transformational changes is substantiated, the specifics and main stages of the financial risk management process are examined, and conceptual foundations for financial risk management are proposed in the context of the enterprise's financial security. The authors S. Zhukevych *et al.* (2023) emphasised the risk analysis system as an important component of the risk management mechanism. However, the issues related to the diagnosis of financial risks in enterprise activities were left unaddressed in the aforementioned works.

In the work by V.P. Ilchuk & O.V. Shishkina (2020), the necessity of using financial indicators as tools for identifying financial risks in industrial enterprises was substantiated. The authors V.M. Butenko & M.V. Baidatskyi (2023) emphasised that the risk management system must be holistic and identify the main stages of risk management, namely: risk identification, analysis, assessment, modification, and monitoring of key risk indicators. However, the authors did not address the issues related to organising a risk management system within the enterprise, nor did they substantiate the use of financial engineering as a means of creating competitive advantages through effective risk management. One example of a modern analytical approach is bibliometric analysis, which was conducted by J.R. Jena *et al.* (2023) as part of a study using data from the Scopus database covering the years 2007-2022. A total of 343 scientific publications were analysed using the tools VOSviewer and Biblioshiny (R Studio). A distinctive feature of this approach is the methodological generalisation of research in the field of financial engineering, which made it possible to identify potential directions for future studies.

The historical aspects of the essential characteristics of the stages in the evolution of financial engineering were explored by A. Panteleimonenko & A. Karnaushenko (2024), where the authors demonstrated that at each stage of its development, financial engineering was associated with the creation of innovative financial instruments (approaches) tailored to the interests of specific market participants. The study by S.M. Khalatur (2024a) focused on examining the latest trends in financial engineering that facilitate the transition to a digital economy. Particular attention is given to analysing the impact of digital financial instruments on global markets and the role of financial institutions in the new digital environment. However, the mentioned work lacks research on the use of financial engineering tools within enterprise-level risk management systems and does not sufficiently reveal how historical trends have influenced current financial engineering practices in the corporate sector.

The study by P. Fu *et al.* (2025) highlighted the importance of combining financial knowledge with quantitative methods, whereby financial engineering provides a deeper understanding of market mechanisms, contributing to improved risk management and decision-making through analytics and mathematical modelling. The use of financial engineering in conjunction with forecasting technologies confirms its effectiveness as a tool for enhancing the accuracy of financial predictions and fostering innovation in modern finance. In the work by O.M. Parubets & M.M. Zabashtanskyi (2021), financial engineering is considered a theoretical and practical foundation for developing and implementing strategies for the financial support of territorial community development, strengthening the financial autonomy of local self-government bodies, and ensuring the financial independence of local budgets. The article by S.M. Khalatur *et al.* (2024b) explored the essence of financial engineering and analyses its significance and role in the development and optimisation of the banking system, particularly in the context of managing the active operations of commercial banks. The study by V.A. Zamlynskyi (2018) is devoted to the development of an organisational and economic mechanism for implementing financial engineering and identifying key trends in the development of the banking market and the derivatives market in Ukraine. However, the reviewed works do not sufficiently address the application of financial engineering in the context of individual enterprises. Therefore, there is a need for further research focused on specific aspects of applying financial engineering at the enterprise level, taking into account its unique characteristics and needs. Financial engineering is a crucial process within the risk management system of agribusiness enterprises, as it enables effective financial risk management, enhances business resilience, and optimises financial flows.

Thus, in a competitive-oriented economy, financial engineering is an integral part of modern risk management in agribusiness enterprises, contributing to the reduction of financial threats, the preservation of market positions, and the assurance of long-term business resilience. Through modelling and analysis of financial risks, enterprises can develop more accurate financial strategies that support their stable growth. The analysis of literature on the implementation of financial engineering and the diagnosis of financial risks in enterprise activities has shown that, despite the high quality of current research, issues related to the improvement and integration of financial risk assessment tools into the risk management systems of business entities remain underexplored. The aim of this study was to improve the methodological foundations for diagnosing financial risks, which is considered a key instrument of financial engineering within the risk management system of agribusiness enterprises.

● MATERIALS AND METHODS

To achieve the stated objective, based on the analysis of scholarly contributions in the fields of financial engineering and financial management, the role of financial engineering within the business system and its areas of application was identified. The concept of "financial engineering of an economic entity" was clarified; the relevance of diagnosing financial risks within the risk management system of economic entities was substantiated; and the level of financial risks in the activities of agribusiness enterprises in Ukraine was diagnosed using the method of taxonomic analysis.

To explore the theoretical and methodological aspects of the nature and application of financial engineering in the activities of business entities, methods of systems approach, analysis, synthesis, scientific abstraction, and generalisation were used. To test the developed methodological framework for diagnosing the level of financial risks in the activities of agribusiness enterprises, financial statements of agribusiness entities for the years 2021-2023 were used, as published on the official analytics and counterparty verification portal (Clarity Project, n.d.). The selection of enterprises for the study was justified by their affiliation with the agribusiness sector and their operations under NACE code 01 "Agriculture, hunting and related service activities" and NACE code 46.2 "Wholesale of agricultural raw materials and live animals" (Table 1).

Table 1. Indicators of the level of economic security of Ukraine by components (percentage of the optimum value)

Enterprise	NACE code	Primary activity
LLC "Agrotrade-Production" (n.d.)	01.61, 01.64, 01.63	Support activities in agriculture and post-harvest operations
PE "Zakhidnyi Buh" (n.d.)	01.11, 01.13, 01.30	Growing of cereals (excluding rice), leguminous crops, and oilseed crops
LLC AE "Nibulon" (n.d.)	46.21, 01.61, 01.63	Wholesale of grain, unprocessed tobacco, seeds, and animal feed
EFI "Viterra Ukraine" (n.d.)	46.21, 46.19, 46.33	Wholesale of grain, unprocessed tobacco, seeds, and animal feed
LLC "TAS Agro Center" (n.d.)	01.50, 01.61, 46.21	Mixed farming
LLC TC "Vitagro" (n.d.)	46.21, 46.19, 46.90	Wholesale of grain, unprocessed tobacco, seeds, and animal feed
LLC "Upi-Agro" (n.d.)	46.21, 46.36, 46.75	Wholesale of grain, unprocessed tobacco, seeds, and animal feed
LLC "Astarta-Kyiv" (n.d.)	01.11, 01.13, 46.21	Growing of cereals (excluding rice), leguminous crops, and oilseed crops
PE "Oliyar" (n.d.)	10.41, 46.21, 46.12	Production of oils and animal fats
LLC "Kernel-Trade" (n.d.)	10.41, 46.21, 46.12	Production of oils and animal fats

Source: compiled by the authors based on Clarity Project (n.d.)

To calculate partial indicators for assessing the financial risks of an enterprise, the coefficient analysis method was used, and the following indicators were calculated: the absolute liquidity ratio, which reflects the ratio of the most liquid assets (cash and current financial investments) to current liabilities. This ratio helps determine what portion of the enterprise's short-term debt can be immediately repaid if necessary. An increase in this ratio over time indicates a reduction in the risk of losing solvency, and vice versa. It is calculated using the following formula:

$$\text{Absolute Liquidity Ratio} = \text{Cash and Cash Equivalents} / \text{Current Liabilities}. \quad (1)$$

The current liquidity ratio (coverage ratio) is calculated as the ratio of current assets to the enterprise's short-term liabilities. It indicates how many monetary units of current assets correspond to each monetary unit of current liabilities and allows for assessing whether the total value of the enterprise's current assets is sufficient for timely repayment of short-term debts. From a risk assessment perspective, a decline in this ratio below one signals a high risk of the enterprise losing its ability to meet its obligations. It is calculated using the following formula:

$$\text{Current Liquidity Ratio} = \text{Current Assets} / \text{Current Liabilities}. \quad (2)$$

The financial risk ratio reflects the relationship between borrowed funds and equity, indicating how many monetary units of liabilities correspond to one unit of own capital. An increase in this ratio over time signals a growing dependence of the enterprise on external sources of financing, which implies a higher risk of losing financial autonomy and, consequently, a decline in financial stability – and vice versa. It is calculated using the following formula:

$$\text{Financial Risk Ratio} = \text{Borrowed Capital} / \text{Equity}. \quad (3)$$

The financial stability ratio determines the share of long-term liabilities within the total capital structure – that is, the sources of financing an enterprise can utilise over an extended period (at least more than one year). An increase in this ratio, under otherwise equal conditions, generally indicates a higher overall level of financial stability and, accordingly, a reduced risk of losing financial autonomy and independence. It is calculated using the following formula:

$$\text{Financial Stability Ratio} = (\text{Equity} + \text{Long-Term Liabilities}) / \text{Total Liabilities}. \quad (4)$$

The accounts receivable turnover ratio reflects the effectiveness of a company's credit policy toward buyers in terms of receiving payments for goods sold on credit. It characterises the level of commercial risk associated with such financial relationships. The higher the value of this indicator, the faster the settlements with buyers occur, and the more efficiently the company manages these relationships, thereby minimising payment risk. It is calculated using the following formula:

$$\text{Accounts Receivable Turnover Ratio} = \text{Net Revenue for the Period} / \text{Average Annual Accounts Receivable}. \quad (5)$$

The accounts payable turnover ratio indicates the speed at which a company settles its obligations with creditors. Accordingly, it allows for assessing the risk of delayed payments and the potential for financial penalties from creditors. This indicator is calculated using the following formula:

Accounts Payable Turnover Ratio = Net Revenue
for the Period / Average Annual Accounts Payable. (6)

The ratio of revenue growth rate to cost growth rate reflects the comparative dynamics of income and production expenses. It is calculated using the following formula:

Ratio of Revenue Growth to Cost Growth = Growth Rate
of Net Revenue / Growth Rate of Cost of Goods Sold. (7)

The sales profitability ratio reflects the efficiency level of a company's core operations and indicates its ability to generate profit from the sale of products, goods, or services, showing the proportion of net profit within the structure of net sales revenue. A high value of the ratio signifies effective cost management and a sound commercial strategy, whereas a decline may signal the need to optimise production and distribution processes. The sales profitability ratio is calculated using the following formula:

Sales Profitability Ratio Based on Net Profit = Net Profit
(Loss) / Net Revenue from Sales of Products. (8)

Return on Equity (ROE) characterises a company's profitability relative to the amount of equity invested and reflects the efficiency of its utilisation in generating net profit. The higher the value of this ratio, the more effectively the enterprise leverages its available resources to achieve financial results, which positively influences its investment appeal and market valuation. The ratio is calculated using the following formula:

ROE = Net Profit (Net Loss) / Average Annual Amount
of the Company's Equity. (9)

To diagnose the level of financial risks in the activities of agribusiness enterprises, the use of economic and mathematical tools has been proposed. This approach enables the transformation of multidimensional data into a consolidated integral assessment, which, on the one hand, allows for the formation of a generalised profile of financial risk based on a system of criteria for each individual enterprise, and on the other hand, facilitates comparison across the sector and, if necessary, ranking of enterprises by risk level. The authors proposed the application of the taxonomic analysis method, which enables the calculation of taxonomic indicators of financial risk levels for each enterprise over time. The taxonomic indicator may vary within the interval [0; 1], and is interpreted as follows: the closer the calculated value is to one, the higher the overall level of financial risk in the activity of the enterprise under study.

To construct the taxonomic indicators, the algorithm described by W. Pluta (1986) has been adopted. It involves the following steps: formation of an observation matrix based on the calculated partial indicators of financial risk for agribusiness enterprises; construction of a standardised matrix applied to the initial data; formation of a reference vector, i.e. determination of benchmark values for all indicators. This required the classification of indicators into stimulators and destimulators, depending on how they reflect the dynamics of financial risk in the enterprise's activity. In this context, stimulators are indicators whose increase over time signals a rise in financial risk, while destimulators are those whose growth indicates a reduction in risk exposure for the enterprise. For stimulators, the reference vector was defined as the maximum value among all standardised observations; for destimulators, it was the minimum. Subsequently, Euclidean distances were calculated between the indicators in the matrix and the reference vector, followed by the computation of the integral (taxonomic) indicator.

For further diagnostics and determination of the risk level in the activities of agribusiness enterprises, the use of the Harrington scale has been proposed. This scale enables effective measurement of the intensity of the criterial property of the phenomenon or process under investigation. The numerical boundary values of the Harrington scale were derived from the analysis and processing of a large dataset of statistical information, as presented in the work of O.G. Tyzhnenko (2021). Harrington scale application is justified by its universal nature and widespread use in the qualitative gradation of quantitative criteria when assessing economic processes, allowing for an adequate economic interpretation of the diagnostic results obtained.

● RESULTS
The essence and role of financial engineering in the business system and its areas of application
In the current conditions of economic development, characterised by the globalisation of financial markets and the digitalisation of the economy, financial engineering plays a pivotal role in ensuring the competitiveness and resilience of economic entities. It encompasses the development and implementation of innovative financial instruments, methods, and strategies aimed at effective risk management, optimisation of financial flows, and capital mobilisation. Globalisation opens up new opportunities for enterprises, while simultaneously intensifying competition and increasing financial risks. Financial engineering enables businesses and financial institutions to devise new mechanisms for capital management, adapt to change, and maintain financial stability.

Financial engineering is a relatively young scientific discipline that emerged as a distinct field in the 1990s. A significant milestone in its development was the awarding of the Nobel Prize in 1997 to researchers F. Black and M. Scholes (1999) for their work in the field of financial instruments. The proposed option pricing model (Black-Scholes option pricing model) became a widely recognised standard for the analysis of derivatives in international financial markets. The emergence of financial engineering was driven by several key factors: the inefficiency of traditional financial risk management methods under conditions of high market volatility; the rapid development of information technologies and the growing financial awareness of society; the transformation of financial markets from fragmented segments into a unified global system; the liberalisation and deregulation of financial markets, which led to increased instability; and tax disparities and regulatory constraints that stimulated the search for new financial solutions.

Financial engineering emerged as a response to the challenges of the modern economy, fostering the development of innovative financial instruments and risk management strategies. Although numerous interpretations of the concept exist, as of 2025, no unified systemic approach has been established regarding its definition, core functions, or

areas of application. Based on the analysis of approaches by I.M. Chmutova *et al.* (2018) in the field of financial management and engineering, several key domains have been identified where financial engineering is most actively employed: the derivatives market, the stock market, corporate finance, and banking. In the banking sector, financial engineering is aimed at creating conditions for the efficient movement of financial capital – both for banks themselves and for their clients. It facilitates the development of innovative banking products that enable additional profit generation, risk diversification, and the application of speculative strategies to achieve income with minimal risk.

In the stock market sector, financial engineering plays a significant role by creating non-standard financial instruments and securities tailored to the specific needs of investors and issuers. The primary objective of such instruments is to ensure an optimal balance between profitability, risk, and asset liquidity for business entities. In the derivatives market, financial engineering is employed to develop new financial derivatives through the combination or modification of existing instruments. Within the corporate sector, financial engineering facilitates the creation of effective financial tools that contribute to increasing the market value of enterprises, optimising cash flow, and implementing robust risk management strategies. Financial engineering is a versatile tool that can be applied across various areas of finance to address complex challenges and generate innovative solutions.

Researchers offer various interpretations of the role and functions of financial engineering within the context of enterprise activity. A. Kucherenko (2018) proposed a systemic approach, defining financial engineering as a set of interrelated financial innovations, technologies, and instruments integrated into a company's financial management to optimise business processes and harness its innovative potential. The authors A. Nurpeisova *et al.* (2022) viewed financial engineering as an Internet of Things (IoT) technology and explored its application in the field of transport and logistics to address a range of complex challenges within the transportation sector.

Based on the definitions provided, financial engineering within an enterprise is understood as a commercial process involving the development and implementation of synergistically functioning combinations of financial innovations, technologies, and instruments. These are aimed at maximising profit, increasing enterprise value, resolving financial challenges (ranging from liquidity crises to capital acquisition), and optimising business processes by unlocking innovative resource potential. At the same time, financial engineering for economic entities is defined as a system of strategic financial management that entails the use of modern financial instruments, methods, and technologies to optimise financial flows, minimise risks, and enhance the market value of the business.

Justification of the relevance and directions of financial risk diagnostics in enterprise activity

For financial engineering to function effectively, a clear understanding of the potential risks faced by an enterprise is essential. This is precisely where risk diagnostics gain critical relevance – as a systematic process of identifying, assessing, and analysing financial threats that may impact the company's operations. According to the authors, the necessity and appropriateness of applying financial risk diagnostics as a tool of financial engineering are justified by the following considerations: for an individual business entity, diagnostics serve as a means of comprehensive assessment of financial risk levels, identifying the parameters of financial activity within which specific types of financial risks arise and materialise. This enables the detection of "weak points" in the enterprise's financial relations system and, on this basis, the development of effective managerial decisions in the field of risk management aimed at preventing and minimising adverse consequences. For entities interacting with the enterprise under diagnosis – such as counterparties, investors, banks, and financial institutions – the results of diagnostics provide a foundation for the use of financial engineering tools in their dealings with the enterprise, thereby reducing their own financial risk exposure.

Thus, financial risk diagnostics constitute an integral part of financial engineering, as they enable informed decision-making regarding the selection and application of financial instruments; minimise potential losses; and ensure the financial stability of the enterprise. They also enhance the overall effectiveness of financial engineering and contribute to the achievement of strategic objectives. When referring to financial risk diagnostics as a tool of financial engineering within an enterprise, the authors understand it as a structured process of identifying, assessing, and analysing indicators of the presence and potential manifestation of financial risks that may adversely affect the company's financial stability and profitability. The ultimate aim is to apply financial engineering instruments to manage these risks effectively. Moreover, the results of such diagnostics may be employed to develop hedging mechanisms within the enterprise's risk management system, thereby reinforcing its capacity to mitigate financial threats.

Agribusiness is a strategic sector of the economy, yet it is characterised by a high level of risk. Among these, financial risks hold particular significance, as they can substantially affect the stability and profitability of enterprises. Effective diagnostics of such risks is a prerequisite for successful risk management, providing businesses with the means to minimise exposure and ensure the stability of financial flows. Based on a comparative analysis of literature on financial diagnostics and risk management in economic entities (Zhuravlyova *et al.*, 2017; Berest & Sablina, 2022; Zhukevych *et al.*, 2023), the following types of financial risks and corresponding evaluation coefficients have been proposed for constructing an integral indicator to assess the financial risk level of agribusiness enterprises (Table 2).

Since financial risk within an enterprise is inherently complex, it is essential from a risk management perspective to account for the most critical types of financial risks, as outlined above. The risk of losing solvency and liquidity is associated with the enterprise's inability to meet its financial obligations fully and on time due to a shortage of cash or difficulties in converting assets into liquid funds. The materialisation of this risk may lead to temporary or chronic insolvency, the onset of a financial crisis, and even bankruptcy. To assess this type of risk, the calculation of the absolute liquidity ratio and the current liquidity ratio has been selected.

Table 2. Indicators of the level of economic security of Ukraine by components (percentage of the optimum value)

Type of financial risk	Risk of loss of solvency and liquidity		Risk of loss of financial stability		Settlement risk		Risk of decline in financial performance		
Risk indicators	Absolute Liquidity Ratio(ALR)	Current Liquidity Ratio (CLR)	Financial Risk Ratio (FRR)	Financial Stability Ratio (FSR)	Accounts Receivable Turnover Ratio (ART)	Accounts Payable Turnover Ratio (APT)	Ratio of Net Revenue Growth to Cost Growth(RRCG)	Return on Sales Ratio (ROS)	Return on Equity Ratio (ROE)

Source: compiled by the authors

The risk of losing financial stability is associated with a disruption in the balance between equity and borrowed funds, which may lead to excessive dependence on creditors, increased debt burden, and, consequently, financial instability and loss of the enterprise's financial autonomy. To diagnose this type of financial risk, the financial risk ratio and the financial stability ratio have been selected. Settlement risk arises from potential issues in counterparties fulfilling their financial obligations, delays in payments, or fraudulent activities. Such occurrences may cause desynchronisation of cash flows within the enterprise, cash gaps, and, as a result, deterioration of its financial condition. To assess this type of risk, the accounts receivable turnover ratio and the accounts payable turnover ratio have been chosen.

The risk of declining financial performance is associated with reduced profitability, decreased revenues, or increased expenses, which may occur due to unfavourable market conditions, ineffective management, or rising production costs caused by resource price increases, among other factors. The consequences of this type of risk may include reduced operational efficiency, lower financial results, losses, and a lack of funds to meet obligations. To diagnose this risk in the study, the following indicators have been proposed: the ratio of net revenue growth to cost growth, the return on sales ratio, and the ROE of the enterprise.

Analysis of the level of financial risks in the activities of agribusiness entities in Ukraine

The dynamics of the above-described partial indicators, calculated based on the financial reporting data of the analysed agribusiness companies for the period 2021-2023, are presented in Table 3.

Table 3. Calculation of partial indicators for assessing financial risks of agribusiness enterprises for 2021-2023

Enterprises / Indicators	Year	ALR	CLR	FRR	FSR	ART	APT	RRCG	ROS	ROE
LLC "Agrotrade-Production"	2021	0.000	1.068	12.607	0.074	0.858	2.094	0.917	0.075	0.697
	2022	0.023	1.059	14.989	0.063	0.647	3.183	1.041	-0.007	-0.050
	2023	0.006	1.038	19.748	0.048	0.765	12.158	1.007	0.001	0.016
PE "Zakhidnyi Buh"	2021	0.080	3.264	0.929	0.837	2.908	25.366	1.057	0.419	0.491
	2022	0.021	2.664	0.910	0.780	3.403	15.875	1.095	0.261	0.315
	2023	0.049	1.762	1.218	0.727	3.668	8.480	1.095	0.007	0.010
LLC AE "Nibulon"	2021	0.001	0.708	1.815	0.488	17.622	4.927	0.996	0.032	0.099
	2022	0.011	0.302	7.719	0.194	7.194	2.011	0.838	-0.616	-1.111
	2023	0.057	0.322	14.867	0.134	26.858	4.792	0.838	-0.053	-0.501
EFI "Viterra Ukraine"	2021	0.102	1.054	11.129	0.086	14.373	5.199	0.992	0.029	1.093
	2022	0.138	1.519	1.624	0.385	8.738	3.668	1.127	0.077	0.947
	2023	0.461	4.447	0.259	0.794	9.735	9.473	1.127	0.081	0.409
LLC "TAS Agro Center"	2021	0.678	2.998	1.535	0.691	4.164	8.849	1.480	0.331	1.165
	2022	0.001	1.933	5.200	0.535	3.664	4.173	0.732	-0.022	-0.064
	2023	0.001	2.114	2.114	0.580	2.869	2.954	0.732	-0.088	-0.243
LLC TC "Vitagro"	2021	0.000	1.078	50.939	0.073	2.070	2.894	0.951	0.003	0.120
	2022	0.000	1.165	18.642	0.142	1.459	3.965	1.025	0.010	0.310
	2023	0.000	1.125	16.040	0.111	1.357	4.339	1.025	-0.013	-0.268
LLC "Upi-Agro"	2021	0.000	1.001	0.078	0.928	0.027	0.000	0.966	-0.033	0.000
	2022	0.000	1.000	1.114	0.473	0.004	36.482	0.963	-0.070	0.000
	2023	0.000	0.997	1.494	0.401	0.002	46.404	0.963	-0.227	-0.001
LLC "Astarta-Kyiv"	2021	0.007	0.238	1.167	0.588	1.104	3.735	0.940	-1.087	-0.269
	2022	0.042	0.404	0.721	0.734	1.772	4.337	1.278	-0.495	-0.144
	2023	0.001	0.260	1.304	0.571	3.225	5.500	1.278	0.392	0.216
PE "Oliyar"	2021	0.020	1.121	1.921	0.416	7.360	15.307	1.069	0.039	0.122
	2022	0.108	1.783	1.300	0.610	7.881	17.455	1.108	0.050	0.167
	2023	0.002	5.295	0.665	0.871	5.306	16.334	1.108	0.068	0.141
LLC "Kernel-Trade"	2021	0.098	1.155	3.149	0.241	6.051	9.365	0.902	-0.020	-0.154
	2022	0.085	1.273	2.395	0.295	3.122	5.992	1.257	0.076	0.399
	2023	0.317	1.912	0.855	0.539	2.015	7.271	1.257	0.070	0.204

Source: calculated by the authors

The results of the calculated partial indicators for assessing financial risks of agribusiness enterprises served as the input data for the standardisation procedure, which resulted in the construction of a standardised indicator matrix (Table 4). The results of constructing the reference vector for agribusiness enterprises are presented in Table 5.

Table 4. Standardised matrix of financial risk assessment indicators
for the agribusiness enterprise over the period 2021-2023

Enterprises / Indicators	ALR	CLR	FRR	FSR	ART	APT	RRCG	ROS	ROE
2021									
LLC "Agrotrade-Production"	-0.472	-0.309	0.263	-1.154	-0.804	-0.749	-0.653	0.238	0.716
PE "Zakhidnyi Buh"	-0.091	1.953	-0.489	1.236	-0.460	2.320	0.178	1.088	0.307
LLC AE "Nibulon"	-0.469	-0.681	-0.432	0.144	2.006	-0.375	-0.186	0.131	-0.470
EFI "Viterra Ukraine"	0.014	-0.324	0.168	-1.116	1.462	-0.340	-0.208	0.125	1.502
LLC "TAS Agro Center"	2.786	1.679	-0.450	0.779	-0.250	0.142	2.693	0.871	1.646
LLC TC "Vitagro"	-0.473	-0.299	2.730	-1.158	-0.601	-0.644	-0.450	0.059	-0.430
LLC "Upi-Agro"	-0.474	-0.378	-0.544	1.522	-0.943	-1.025	-0.365	-0.028	-0.668
LLC "Astarta-Kyiv"	-0.441	-1.165	-0.474	0.456	-0.763	-0.533	-0.517	-2.635	-1.203
PE "Oliyar"	-0.380	-0.255	-0.425	-0.080	0.286	0.994	0.248	0.148	-0.426
LLC "Kernel-Trade"	-0.472	-0.309	0.263	-1.154	-0.804	-0.749	-0.653	0.238	0.716
2022									
LLC "Agrotrade-Production"	-0.394	-0.355	1.480	-1.445	-1.010	-0.602	-0.030	0.248	-0.242
PE "Zakhidnyi Buh"	-0.441	1.913	-0.707	1.446	-0.124	0.568	0.287	1.238	0.454
LLC AE "Nibulon"	-0.650	-1.424	0.351	-0.917	1.095	-0.710	-1.226	-2.006	-2.262
EFI "Viterra Ukraine"	1.898	0.294	-0.596	-0.145	1.591	-0.557	0.472	0.555	1.657
LLC "TAS Agro Center"	-0.836	0.880	-0.041	0.460	-0.040	-0.511	-1.849	0.191	-0.268
LLC TC "Vitagro"	-0.856	-0.205	2.047	-1.126	-0.749	-0.530	-0.125	0.309	0.444
LLC "Upi-Agro"	-0.863	-0.438	-0.675	0.210	-1.216	2.467	-0.489	0.012	-0.147
LLC "Astarta-Kyiv"	-0.023	-1.281	-0.736	1.264	-0.648	-0.496	1.359	-1.558	-0.420
PE "Oliyar"	1.313	0.668	-0.646	0.761	1.315	0.713	0.362	0.458	0.172
LLC "Kernel-Trade"	0.852	-0.052	-0.476	-0.508	-0.214	-0.343	1.240	0.552	0.613
2023									
LLC "Agrotrade-Production"	-0.510	-0.529	1.799	-1.457	-0.604	0.030	-0.215	-0.143	0.065
PE "Zakhidnyi Buh"	-0.251	-0.098	-0.601	0.845	-0.240	-0.257	0.306	-0.105	0.042
LLC AE "Nibulon"	-0.198	-0.955	1.167	-1.164	2.670	-0.545	-1.203	-0.485	-1.847
EFI "Viterra Ukraine"	2.282	1.500	-0.725	1.073	0.521	-0.179	0.491	0.361	1.520
LLC "TAS Agro Center"	-0.542	0.111	-0.485	0.346	-0.340	-0.688	-1.823	-0.707	-0.893
LLC TC "Vitagro"	-0.547	-0.477	1.319	-1.243	-0.530	-0.580	-0.104	-0.233	-0.985
LLC "Upi-Agro"	-0.549	-0.554	-0.565	-0.260	-0.700	2.703	-0.467	-1.581	0.004
LLC "Astarta-Kyiv"	-0.543	-0.992	-0.590	0.318	-0.296	-0.489	1.376	2.320	0.807
PE "Oliyar"	-0.537	2.004	-0.672	1.334	-0.034	0.356	0.382	0.280	0.527
LLC "Kernel-Trade"	1.397	-0.009	-0.648	0.209	-0.447	-0.351	1.257	0.293	0.760

Source: calculated by the authors

Table 5. Formation of the reference vector

Indicator	Stimulator / Destimulator	2021	2022	2023
Allocation Coefficient	Destimulator	-0.474	-0.863	-0.549
SR	Destimulator	-1.165	-1.424	-0.992
ROCE	Destimulator	2.730	2.047	1.799
Financial Stability	Destimulator	-1.158	-1.445	-1.457
ITR	Destimulator	-0.943	-1.216	-0.700
CTR	Destimulator	-1.025	-0.710	-0.688
NPM	Destimulator	-0.740	-1.849	-1.823
ROA	Destimulator	-2.635	-2.006	-1.581
ROE	Destimulator	-1.203	-2.262	-1.847
Allocation Coefficient	Destimulator	-0.474	-0.863	-0.549

Source: calculated by the authors

Based on the calculations performed, taxonomic indicators of the financial risk level in the activities of agribusiness enterprises (IFR) were constructed, and the studied economic entities were ranked according to the level of risk in their operations on an annual basis for the period 2021-2023 (Table 6).

Table 6. Ranking results of agribusiness enterprises by financial risk level in their activities for the period 2021-2023

Rank	2021		2022		2023	
	Enterprise	IFR	Enterprise	IFR	Enterprise	IFR
1	LLC "TAS Agro Center"	0.022	EFI "Viterra Ukraine"	0.126	EFI "Viterra Ukraine"	0.114
2	PE "Zakhidnyi Buh"	0.117	PE "Zakhidnyi Buh"	0.141	LLC "Astarta-Kyiv"	0.186
3	LLC AE "Nibulon"	0.349	PE "Oliyar"	0.192	PE "Oliyar"	0.218
4	EFI "Viterra Ukraine"	0.355	LLC "Kernel-Trade"	0.274	LLC "Kernel-Trade"	0.269
5	PE "Oliyar"	0.379	LLC "Upi-Agro"	0.334	LLC "Upi-Agro"	0.382
6	LLC "Upi-Agro"	0.392	LLC "Astarta-Kyiv"	0.351	PE "Zakhidnyi Buh"	0.399
7	LLC "Kernel-Trade"	0.459	LLC "TAS Agro Center"	0.426	LLC AE "Nibulon"	0.535
8	LLC "Agrotrade-Production"	0.480	LLC TC "Vitagro"	0.505	LLC "TAS Agro Center"	0.572
9	LLC "Astarta-Kyiv"	0.565	LLC "Agrotrade-Production"	0.554	LLC "Agrotrade-Production"	0.620
10	LLC TC "Vitagro"	0.642	LLC AE "Nibulon"	0.646	LLC TC "Vitagro"	0.688

Source: calculated by the authors

Considering that the value of the taxonomic indicator used to assess the level of financial risks in the activities of agribusiness enterprises ranges from 0 to 1, and in accordance with the gradation values of Harrington's verbal-numerical scale, a scale of risk level ranges has been constructed (Table 7).

Table 7. Scale of financial risk level ranges

Range of variation of the integral financial risk indicator (IFR)	Risk level description
$0.00 \leqslant IFR \leqslant 0.36$	Low
$0.36 \leqslant IFR \leqslant 0.64$	Medium
$0.64 \leqslant IFR \leqslant 1$	High

Source: developed by the authors based on O.G. Tyzhnenko (2021)

Thus, based on the results of the diagnosis of the financial risk level in the activities of agribusiness enterprises, the following can be established. In 2021, the lowest level of financial risk was observed in the activities of LLC "TAS Agro Center", as confirmed by the minimum value of the taxonomic indicator IFR of 0.022. This indicates a stable financial condition of the studied enterprise, a high level of liquidity, solvency, financial stability, a fairly high speed of settlements, and a high level of profitability. A low level of financial risk according to Harrington's scale was also identified in PE "Zakhidnyi Buh" (IFR 0.117). A medium level of financial risk was observed in the activities of the majority of enterprises (7 out of 10 studied business entities), where the taxonomic indicator of financial risk ranged from 0.349 for LLC AE "Nibulon" to 0.565 for LLC "Astarta-Kyiv". In contrast, the highest level of financial risk was characteristic of LLC TC "Vitagro", whose IFR amounted to 0.642, indicating an unstable financial condition of this entity and a high level of risk in interactions with it.

In 2022, the lowest level of financial risk was observed in the activities of EFI "Viterra Ukraine", where the taxonomic indicator IFR amounted to 0.126. A low level of financial risk according to Harrington's scale was also observed in the activities of PE "Zakhidnyi Buh", PE "Oliyar", LLC "Kernel-Trade", LLC "Upi-Agro", and LLC "Astarta-Kyiv" (IFR range from 0.141 to 0.351). This dynamic indicates that despite 2022 being the year of the start of the full-scale invasion of Ukraine and the conduct of active hostilities, the mentioned enterprises managed to maintain a stable financial condition and improve their financial indicators. A medium level of financial risk was identified for LLC "TAS Agro Center" (IFR 0.426), LLC TC "Vitagro" (IFR 0.505), and LLC "Agrotrade-Production" (IFR 0.554). It can be seen that this dynamic is positive for LLC TC "Vitagro", which in the previous year was characterised by a high level of risk. Thus, the mentioned enterprise improved its financial condition and increased its reliability in interactions. In contrast, LLC "TAS Agro Center" demonstrated a negative dynamic in the level of risk, shifting from a low to a medium level, which indicates a deterioration in its financial condition. The highest level of financial risk, classified as high, was demonstrated by LLC AE "Nibulon", whose taxonomic indicator IFR significantly increased from 0.349 to 0.646. This dynamic is negative both for the enterprise itself and for its partners, counterparties, and creditors.

In 2023, the enterprise with the lowest level of financial risk remained EFI "Viterra Ukraine", with the taxonomic indicator IFR showing the minimum value among all studied entities at 0.114. The number of enterprises that also demonstrated a low level of financial risk decreased compared to 2022 from six to four, including LLC "Astarta-Kyiv", PE "Oliyar", and LLC "Kernel-Trade". The financial risk level increased from low to medium for LLC "Upi-Agro" (IFR 0.382) and PE "Zakhidnyi Buh" (IFR 0.399). LLC "TAS Agro Center" (IFR 0.572) and LLC

"Agrotrade-Production" (IFR 0.620) remained within the medium risk range. A positive trend towards a shift from high to medium financial risk was demonstrated by LLC AE "Nibulon" (IFR 0.535). In contrast, an increase in financial risk to a high level was noted in the activities of LLC TC "Vitagro" (IFR 0.535). The dynamics of the taxonomic indicators of financial risk in the activities of the studied business entities are presented in Figure 1.
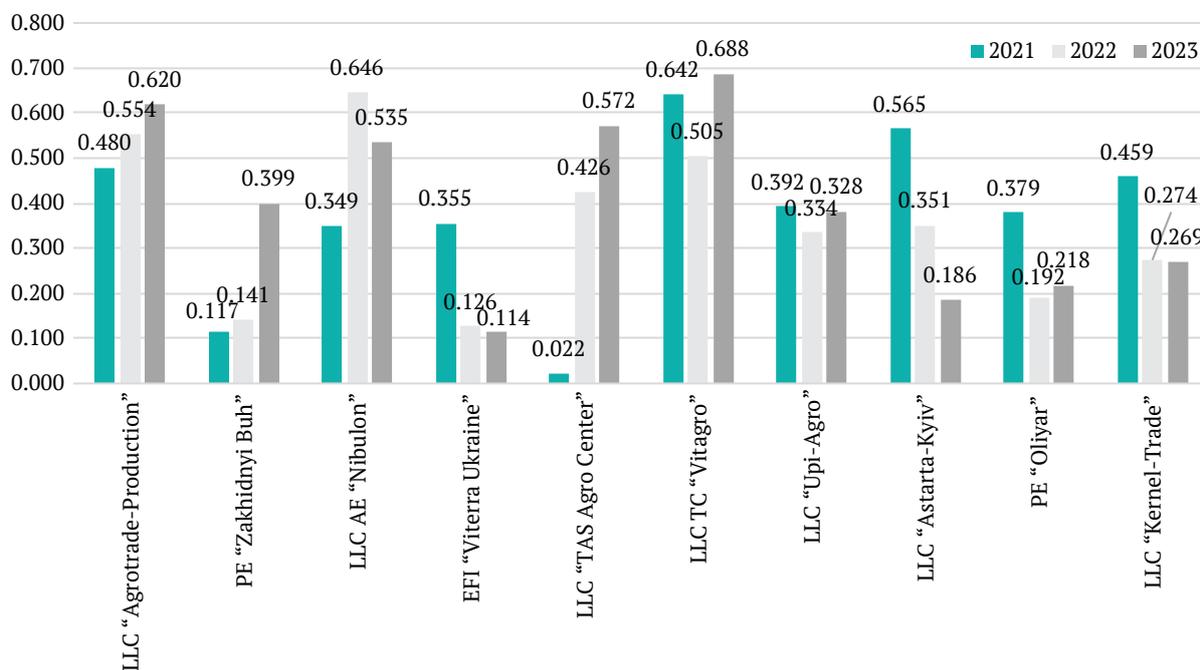

Figure 1. Dynamics of taxonomic indicators of the financial risk level of agribusiness enterprises
Source: compiled by the authors

Thus, by analysing the dynamics of financial risk levels according to the taxonomic indicator, it becomes evident that among the studied business entities, the most significant and consistent increase in risk levels was demonstrated by LLC "Agrotrade-Production" and LLC "TAS Agro Center". This serves as a negative signal not only for investors and counterparties, but also directly for the owners and shareholders of the enterprise. A clear trend towards the deterioration of their financial condition is observed, which may hinder further cooperation with these enterprises from external stakeholders and leads to a decline in their investment attractiveness. A negative trend towards an increase in risk levels has also been identified in PE "Zakhidnyi Buh"; however, it is not as rapid, and the financial risk level of this enterprise is assessed as moderate. An unstable trend in risk levels is observed in LLC AE "Nibulon", LLC TC "Vitagro", and LLC "Upi-Agro". At the same time, LLC TC "Vitagro" recorded the highest risk level among all analysed enterprises in both 2021 and 2023, indicating a high level of risk in engaging with it. A positive trend of consistent risk reduction was demonstrated by EFI "Viterra Ukraine", PE "Oliyar", LLC "Kernel-Trade", and LLC "Astarta-Kyiv", which serves as a favourable indicator for external stakeholders.

The results of the diagnostics may serve as a foundation for applying such financial engineering instruments as: development of a risk hedging strategy (currency, credit, price risks) through the use of derivatives (forwards, futures, options) or the conclusion of long-term contracts with fixed terms (e.g., for product supply or raw material procurement); securitisation of risky assets: restructuring the asset portfolio by forming an asset pool and issuing securities, which will help reduce risk and attract additional financing; financial restructuring of companies with increasing risk (LLC "Agrotrade-Production", LLC "TAS Agro Center") through changes in capital structure (reducing the share of borrowed funds) or optimising the level of financial leverage (the ratio of liabilities to equity); development of individual financial products depending on the level of risk, for example, the introduction of structured financial products to attract capital at a lower cost or to protect against specific risks.

● **DISCUSSION**
The obtained results complement the work of researchers in the field of financial risk management and diagnostics in the activities of business entities. The research team led by A. Shibani *et al.* (2024) identified financial and economic risks as the most significant in a study dedicated to the risks facing Lebanon's construction sector amid a prolonged economic crisis. Based on expert surveys, it was established that the main threats are linked to currency fluctuations, inflation, and lack of solvency. The study also emphasised the importance of implementing risk management in construction projects, despite existing organisational and economic barriers. However, it would be appropriate to further investigate the risk of losing financial stability and declining financial performance among construction enterprises.

In the study by Italian researchers F. Dainelli *et al.* (2024), an adaptive model for assessing default risk is

proposed, which accounts for the dynamic interaction of credit and market risk factors to evaluate the prospective probability of default (PD). This is achieved by establishing interest rate ranges based on the company's projected performance, changes in its financial structure, and anticipated trends in lending conditions. It can be agreed that such an approach holds potential for significantly enhancing financial intermediation and verifying forward-looking financial information in the process of default risk assessment. At the same time, the authors do not consider the complex nature of the financial risk system of business entities, which is particularly relevant in the context of transformational changes in the external environment and the evolving needs of external users of financial information.

The research team led by S. Zhukevych *et al*. (2023) examined a range of factors that comprehensively characterise the financial and economic activities of an enterprise, and developed a methodology for risk analysis and assessment that reflects the complexity of the concept of financial condition across the following dimensions: liquidity indicators, financial stability, business activity, and operational efficiency. It is worth noting that the primary objective of this study was to conduct a quantitative assessment of risk within the enterprise's financial security system. Acknowledging that the development of an effective risk management system and its universal functional component – risk analysis – are pressing issues of the present day, the study enables the formulation of a set of measures aimed at minimising threats and risks in the financial and economic activities of business entities. The outlined risk assessment dimensions were further expanded to include settlement risk, which arises from potential issues in counterparties fulfilling their financial obligations, payment delays, or fraud. This type of risk may lead to the desynchronisation of cash flows within the enterprise, cash gaps, and, consequently, a deterioration in the financial condition of the enterprise.

In the study by L. Ding *et al*. (2024), a sample of Chinese manufacturing companies listed on the A-shares market during the period 2012-2022 was analysed to explore the relationship between systemic risk, financial performance, and ESG indicators (environmental, social, and governance aspects). The findings revealed that a reduction in systemic risk contributes to the improvement of companies' ESG indicators with a lag of one to two reporting periods, with financial performance playing a key role in this process. However, the study did not devote sufficient attention to the detailed assessment of specific financial risks. In particular, it did not consider how individual types of financial risk – such as liquidity risk, financial stability risk, and settlement risk – respond to changes in financial performance in both the short and long term.

The study conducted by C.A. Wolf & J. Karszes (2023) analysed the financial risks and resilience of 105 dairy farms in New York State based on data from 2010 to 2019. Key financial indicators were examined, including solvency (equity-to-asset ratio), liquidity (current ratio), debt servicing capacity (debt coverage ratio), and efficiency (operating expenses and net income). Financial risk was defined as uncertainty related to interest rates, financing, cash flows, and collateral value. Financial resilience was understood as the enterprise's ability to withstand adverse external factors. The results indicated that over the observation period, there were four average, two favourable, and four crisis financial years. During unfavourable years, the proportion of farms with critically low liquidity and debt servicing capacity increased significantly, while solvency remained relatively stable. The study leaves room for further exploration, particularly in examining the relationship between financial risks and investment activity. Specifically, it would be worthwhile to assess how the level of financial risk influences farmers' investment decisions.

The study conducted by I.V. Zhuravlyova *et al*. (2017) focused on identifying the components, factors, and consequences of financial risks at the macro-, meso-, and microeconomic levels in Ukraine, as well as methods for their assessment and analysis. The aim of the research was to develop an analytical toolkit for risk management based on an integrated system of financial risk indicators across different economic levels. The authors identified inflationary, credit, and investment risk components using statistical data. To assess the integral index of financial risks across all components, taxonomic analysis was applied. Financial risks at the micro level, which pose significant threats to the financial stability of enterprises, can be classified into two categories: those that lead to reduced profitability and operational efficiency of business entities, and those that negatively affect their financial condition. Based on the approach proposed by the authors, it is also advisable to expand and specify the list of such risks in the context of enterprise operations.

In the study by M. Fan *et al*. (2023), a financial risk assessment model tailored to the needs of the football industry was developed, based on a sample of 24 publicly listed clubs worldwide. The application of exploratory factor analysis enabled the identification and classification of key risk components. The results indicated that football clubs generally exhibit a high level of financial risk, reflected in low authorised capital, high levels of debt, low profitability, a significant number of loss-making clubs, and weak asset liquidity. The study also identified internal and external factors contributing to financial crises, highlighting the need to strengthen financial discipline and management practices to ensure the resilience of clubs. While the model may be applicable to entities in other industries, it would be advisable to supplement it with indicators of settlement risk, particularly turnover ratios of accounts receivable and accounts payable.

Thus, as a result of analysing contemporary developments in the research field, the need to improve the existing system of financial risk diagnostics has been identified, positioning it as a financial engineering tool within the risk management framework of business entities. The findings enable the formation of a system of financial ratios and the construction of taxonomic indicators for risk level assessment based on the financial statements of agribusiness enterprises. This provides an opportunity to apply these indicators in substantiating managerial decisions aimed at optimising the capital structure of business entities, enhancing solvency, and attracting investment.

● CONCLUSIONS

It has been established that in a competition-oriented economy, financial engineering plays a pivotal role in the modern risk management of agribusiness enterprises. It

contributes to the minimisation of financial threats, the preservation of market positions, and the long-term stability of business operations. In this context, the study clarifies the role of financial engineering within the business system and its areas of application, while also detailing the concept of "financial engineering of a business entity". The research substantiates the relevance of financial risk diagnostics within the risk management system of business entities, both from the perspective of the individual enterprise and from that of external counterparties interacting with it. A comprehensive list of financial risk types in business activities has been justified, and a system of ratios for their assessment has been developed.

Within the scope of the study, a comprehensive diagnosis of financial risk levels among agribusiness enterprises was conducted using the method of taxonomic analysis. Based on financial reporting data from 2021 to 2023, a system of nine financial ratios was developed, covering key areas of risk assessment: liquidity, financial stability, solvency, profitability, and settlement efficiency. The application of the integrated taxonomic indicator (IFR) enabled the ranking of enterprises by risk level and revealed both positive and negative trends in their dynamics. The lowest risk level over the three-year period was demonstrated by EFI "Viterra Ukraine", with an IFR of 0.114 in 2023, which corresponds to a low risk level according to the Harrington scale. In contrast, LLC "TAS Agro Center" showed a deterioration in its financial position, with its IFR rising from 0.022 in 2021 to 0.572 in 2023, indicating a shift from low to medium risk. LLC "Agrotrade-Production" maintained a consistently high risk level, with its IFR increasing from 0.480 (2021) to 0.620 (2023). The highest risk in 2023 was observed in LLC TC "Vitagro", with an IFR of 0.688, corresponding to a high risk level.

A steady increase in financial risk was observed in the operations of LLC "Agrotrade-Production" and LLC "TAS Agro Center". This trend serves as a negative signal for investors, counterparties, and directly for the owners or shareholders of the respective companies. A moderate rise in risk levels was recorded for PE "Zakhidnyi Buh"; however, its financial risk remains within the bounds of a medium level. An unstable risk dynamic was noted in LLC AE "Nibulon", LLC TC "Vitagro", and LLC "Upi-Agro". A consistent decline in financial risk levels was recorded for EFI "Viterra Ukraine", PE "Oliyar", LLC "Kernel-Trade", and LLC "Astarta-Kyiv", which is regarded as a favourable signal for investors and counterparties. The proposed approach enables the timely identification of threats to the financial stability of agribusiness enterprises, substantiation of managerial decisions, and determination of the need for implementing instruments such as hedging, restructuring, or financial planning. Further research should focus on improving the risk management system of agribusiness enterprises based on the application of financial engineering tools integrated with digital technologies.

● ACKNOWLEDGEMENTS

● FUNDING

● CONFLICT OF INTEREST
None.

● REFERENCES
[1] Berest, M., & Sablina, N. (2022). Diagnosis of capital structure as a tool for administering the financial activities of enterprises. *Economics of Development*, 21(2), 8-18. doi: 10.57111/econ.21(2).2022.8-18.

[2] Black, F., & Scholes, M.S. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3), 637-654. doi: 10.1086/260062.

[3] Butenko, V.M., & Baidatskyi, M.V. (2023). Theoretical basics of the formation of the risk management system at the enterprise. *Economy and Society*, 50. doi: 10.32782/2524-0072/2023-50-35.

[4] Chmutova, I.M., Azizova, K.M., & Bilyaeva, V.Yu. (2018). *Financial engineering tools in ensuring the financial stability of the bank*. Kharkiv: Simon Kuznets Kharkov National University of Economics.

[5] Clarity Project. (n.d.). Retrieved from https://clarity-project.info.

[6] Dainelli, F., Bet, G., & Fabrizi, E. (2024). The financial health of a company and the risk of its default: Back to the future. *International Review of Financial Analysis*, 95(B), article number 103449. doi: 10.1016/j.irfa.2024.103449.

[7] Ding, L., Cui, Z., & Li, J. (2024). Risk management and corporate ESG performance: The mediating effect of financial performance. *Finance Research Letters*, 69(B), article number 106274. doi: 10.1016/j.frl.2024.106274.

[8] EFI "Viterra Ukraine". (n.d.). Retrieved from https://clarity-project.info/edr/23393195.

[9] Fan, M., Chen, X., Liu, B., Zhou, F., Gong, B., & Tao, R. (2023). An analysis of financial risk assessment of globally listed football clubs. *Heliyon*, 9(12), article number e22886. doi: 10.1016/j.heliyon.2023.e22886.

[10] Fu, P., Yang, H., Qian, W., Mohamed, E.I., Almohri, W.A.J., & Alshanbari, H.M. (2025). Financial engineering and the digital economy: The implementations of machine learning algorithms. *Alexandria Engineering Journal*, 125(1), 311-319. doi: 10.1016/j.aej.2025.03.122.

[11] Ilchuk, V.P., & Shishkina, O.V. (2020). Financial ratios as indicators for identification of financial risks of industrial enterprises. *Business Inform*, 2, 413-421. doi: 10.32983/2222-4459-2020-2-413-421.

[12] Jena, J.R., Biswal, S.K., Shrivastava, A.K., & Panigrahi, R.R. (2023). A bibliographic overview of financial engineering in the emerging financial market. *International Journal of System Assurance Engineering and Management*, 14(6), 2048-2065. doi: 10.1007/s13198-023-02123-8.

[13] Khalatur, S., Dovgal, O., Karamushka, O., Brovko, L., & Vodolazska, O. (2024a). Innovative trends on financial engineering to the way of digital economy. *Financial and Credit Activity Problems of Theory and Practice*, 6(59), 136-150. doi: 10.55643/fcaptp.6.59.2024.4508.

[14] Khalatur, S.M., Masiuk, Y.V., & Zaika, K.A. (2024b). Financial engineering in the process of managing active operations of a commercial bank. *Digital Economy and Economic Security*, 1(10), 14-18. doi: 10.32782/dees.10-3.

[15] Kucherenko, A. (2018). Institutional tools for stimulating financial engineering. *Bulletin of KNTEU*, 2, 88-99.

[16] LLC "Agrotrade-Production". (n.d.). Retrieved from https://clarity-project.info/edr/41810664.

[17] LLC "Astarta-Kyiv". (n.d.). Retrieved from https://clarity-project.info/edr/19371986.

[18] LLC "Kernel-Trade". (n.d.). Retrieved from https://clarity-project.info/edr/31454383.

[19] LLC "TAS Agro Center". (n.d.). Retrieved from https://clarity-project.info/edr/36432055.

[20] LLC "Upi-Agro". (n.d.). Retrieved from https://clarity-project.info/edr/31953808.

[21] LLC AE "Nibulon". (n.d.). Retrieved from https://clarity-project.info/edr/14291113.

[22] LLC TC "Vitagro". (n.d.). Retrieved from https://clarity-project.info/edr/39589064.

[23] Nechiporenko, A. (2023). Features of financial risk management of the enterprise in the conditions of transformational changes. *University Economic Bulletin*, 56, 200-206. doi: 10.31470/2306-546X-2023-56-200-206.

[24] Nurpeisova, A., Blokhina, T., Zueva, A., Kievskaya, S., & Varzin, V. (2022). Infrastructure, technology and financial engineering in the transport services market. *Transportation Research Procedia*, 63, 1396-1403. doi: 10.1016/j.trpro.2022.06.150.

[25] Panteleimonenko, A., & Karnaushenko, A. (2024). Financial engineering: Stages of evolution and their essential characteristics. *Taurida Scientific Herald. Series: Economics*, 19, 93-103. doi: 10.32782/2708-0366/2024.19.12.

[26] Parubets, O.M., & Zabashtanskyi, M.M. (2021). Use of financial engineering tools as a basis for the development of territorial communities. *Problems and Prospects of Economics and Management*, 48(28), 210-216. doi: 10.25140/2411-5215-2021-4(28)-210-216.

[27] PE "Oliyar". (n.d.). Retrieved from https://clarity-project.info/edr/32461721.

[28] PE "Zakhidnyi Buh". (n.d.). Retrieved from https://clarity-project.info/edr/32478033.

[29] Pluta, W. (1986). *Multivariate comparative analysis in econometric modeling*. Warsaw: Państwowe Wydawnictwo Naukowe (PWN).

[30] Shibani, A., Hasan, D., Jalal, S., Sabboubeh, H., Eltaip, M., Saidani, M., & Gherbal, N. (2024). Financial risk management in the construction projects. *Journal of King Saud University – Engineering Sciences*, 36(8(A)), 552-561. doi: 10.1016/j.jksues.2022.05.001.

[31] Tyzhnenko, O.G. (2021). Display of R-estimates of the level of financial condition of the enterprise on a verbal-numerical scale. *Business Inform*, 6, 100-107. doi: 10.32983/2222-4459-2021-6-100-107.

[32] Wolf, C.A., & Karszes, J. (2023). Financial risk and resiliency on US dairy farms: Measures, thresholds, and management implications. *Journal of Dairy Science*, 106(5), 3301-3311. doi: 10.3168/jds.2022-22711.

[33] Zamlynskyi, V.A. (2018). Financial engineering: Implementation mechanism. *Economics: Time Realities*, 6(40), 25-37. doi: 10.5281/zenodo.2598290.

[34] Zgadova, N.S., Kravchenko, Yu.I., & Tkachuk, O.M. (2025). Diagnostics of the influence of financial risks on the results of the activities of food industry enterprises. *Ukrainian Journal of Applied Economics and Technology*, 10(1), 55-60. doi: 10.36887/2415-8453-2025-1-9.

[35] Zhukevych, S., Portovaras, T., Rozelyuk, V., Zhuk, N., & Nazarova, I. (2023). Analysis of risks in the financial security management system of business entities. *Financial and Credit Activity Problems of Theory and Practice*, 6(53), 82-95. doi: 10.55643/fcaptp.6.53.2023.4242.

[36] Zhuravlyova, I.V., Berest, M.M., Poltinina, O.P., & Lelyuk, S.V. (2017). Detection of financial risks at macro-, mezzo and microlevels of economy. *Economic Annals – XXI*, 165(5-6), 31-35. doi: 10.21003/ea.V165-07.

Діагностика фінансових ризиків у діяльності підприємств агропромислового комплексу в системі ризик-менеджменту підприємства як інструмент фінансового інжинірингу

Марина Берест

Кандидат економічних наук, доцент

Харківський національний економічний університет імені Семена Кузнеця

61166, просп. Науки, 9А, Харків, Україна

https://orcid.org/0000-0002-2410-3210

Наталія Сабліна

Кандидат економічних наук, доцент

Харківський національний економічний університет імені Семена Кузнеця

61166, просп. Науки, 9А, Харків, Україна

https://orcid.org/0000-0002-1931-2851

Анотація. Зважаючи на мінливість ринкових умов та специфіку агропромислового комплексу, своєчасна діагностика фінансових ризиків дозволяє не тільки мінімізувати втрати, а й забезпечити адаптивність до зовнішніх змін, оптимізувати структуру капіталу та підвищити платоспроможність. Це особливо актуально для залучення інвестицій і фінансування, оскільки інвестори орієнтуються на ризик-профіль підприємства. Метою дослідження було удосконалити методичні підходи до діагностики фінансових ризиків як важливого інструменту фінансового інжинірингу в системі ризик-менеджменту підприємств агропромислового комплексу. У роботі використано методи наукового пізнання, а саме: системного підходу, аналізу, синтезу, наукової абстракції, узагальнення. Для проведення діагностики рівня фінансових ризиків на прикладі підприємств агропромислового комплексу було застосовано метод розрахунку фінансових коефіцієнтів та метод таксономічного аналізу, а також табличний і графічний методи представлення результатів дослідження. Інтегральний показник (ІФР) побудовано за основними напрямами оцінки ризиків: ліквідність, фінансова стійкість, платоспроможність, прибутковість та ефективність розрахунків. У дослідженні оцінено рівень фінансового ризику підприємств агропромислового комплексу у 2021-2023 рр. Найнижчий ризик спостерігався у ПІІ «Вайтерра Україна» (ІФР = 0,114), ТОВ «ТАС Агро Центр» показало негативну динаміку: ІФР зріс із 0,022 до 0,572. Стабільно високий ризик виявлено в ТОВ «Агротрейд-Виробництво» (ІФР = 0,620 у 2023 р.), найвищий – у ТОВ ТК «Вітагро» (ІФР = 0,688). Практична цінність дослідження полягає у запропонованому підході до діагностики рівня фінансових ризиків, який може бути використано для обґрунтування та прийняття поточних та перспективних управлінських рішень у системі ризик-менеджменту суб'єкта підприємництва

Ключові слова: платоспроможність; фінансова стійкість; рентабельність; фінансові результати; фінансовий леверидж