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FINANCIAL STABILITY IN THE MANAGEMENT SYSTEM OF ENTERPRISES: SYSTEM ANALYSIS AND FORMALIZATION OF ASSESSMENTS IN THE CONDITIONS OF SUSTAINABLE DEVELOPMENT

ABSTRACT

The idea of sustainable development entails the modernization of the financial mechanism and the development of financial activity models in the context of ensuring their stability at various levels of economic management. Financial stability refers to the state of financial resources where assets and liabilities are balanced in a fluctuating internal and external environment, maintaining financial solvency and appealing to investors, all while operating within a manageable risk threshold. The analysis of such indicators allows for assessing the enterprise's readiness to meet its debts, financial independence, and efficient management of own and borrowed funds.

The aim of this article is to explore theoretical and methodological approaches and methods of systemic analysis of the financial stability of enterprises under conditions of sustainable development. The theoretical foundations and methodological approaches to systemic analysis of financial stability were studied. The financial stability analysis of enterprises was conducted using a methodology for calculating the coverage of assets by their financing sources. The proposed financial stability calculation algorithm utilizes a balance model of financial equilibrium and involves computing a three-component indicator to determine the optimal coverage levels for financing sources using both absolute and relative metrics. This method enables the identification of weak areas within a company, which can serve as potential reserves for enhancing its financial standing. Analytical indicators that form part of the systemic financial stability analysis include the financial independence ratio (autonomy), the financial dependency ratio (equity multiplier), the loan capital concentration ratio, the financial risk ratio, the financial stability ratio, the long-term debt ratio, and the equity mobility ratio. The calculation of the proposed analytical indicators for assessing financial stability across enterprises of various organizational and legal forms and business sizes demonstrated the universality and broad applicability of this systemic analysis methodology.

Keywords: analysis, financial analysis, system analysis, financial stability, management, sustainable development

JEL Classification: G01, G21, G28, G32

INTRODUCTION

The adaptation of traditional approaches to security-oriented management activities under conditions of uncertainty necessitates the transformation of financial mechanisms across all levels of economic activity, from macro to micro levels. The new paradigm of financial relations must provide financial protection and risk mitigation against external threats, such as global pandemics, the spread of Industry 5.0 trends, and the BANI realities affecting the corporate resource potential of enterprises. Effective operation of economic entities is ensured by a high level of financial security, which is determined by the stability of their financial position, liquidity, financial performance, and the ability to counteract adverse external and internal factors.

Since financial stability of an enterprise, as a measure of financial protection, is defined by a system of quantitative and qualitative parameters of its financial condition, it is a priority and critical characteristic of the financial state and is utilized in the analytical support of enterprise management.

Financial stability becomes especially important when implementing the paradigm of sustainable development, which serves as a design for enterprise management based on the threefold concept of sustainable development involves the balanced integration of environmental, social, and economic factors. From an environmental perspective, this guarantees the preservation and sustainability of the natural environment, overcoming ecological crises, preventing ecological risks, and safeguarding citizens' constitutional rights to a safe environment. Furthermore, it prevents actions that disrupt ecosystems' self-regulation and restoration capabilities. The natural resource potential of a state forms the foundation of life, and its preservation is essential for the functioning of the socio-economic system.

The social aspect emphasizes the importance of sustaining the stability of current social systems while ensuring a fair distribution of resources and opportunities for all members of society. It aims to secure a decent quality of life for each individual and protect these rights for future generations. The economic aspect encompasses the efficient utilization of scarce resources and the production of sustainable, eco-friendly products, waste minimization, recycling, and the application of eco-friendly, resource- and energy-saving technologies. This approach allows for increased financial and economic efficiency while considering resource conservation, which is crucial for modern enterprises to maintain competitiveness in the market economy. In the current context, where global transformational challenges shift the competitiveness of global markets, this issue is particularly relevant.

In recent years, the idea of sustainable development has been incorporated into various forms of development across all sectors and economies. As a multi-tiered and interconnected structure, the system develops by creating intricate strategies for establishing new management mechanisms at every level, while considering the impacts of meso-, macro-, and micro-level indicators.

The implementation of sustainable development and the achievement of financial stability are closely linked to its support across different management levels: economic entities (enterprises), regions, and the state. Thus, the stable functioning of individual economic entities is the foundation of sustainable societal development.

The points mentioned above underscore the importance of identifying and examining financial stability issues at the primary economic level – enterprises within the context of market competition and sustainable development. This focus is essential for ensuring the financial stability and resilience of the state.

LITERATURE REVIEW

The concept of sustainable development

A key contemporary challenge is the integration of the sustainable development concept across different levels of economic activity. This requires a fundamental shift in the traditional economic system and the exploration of new management strategies that harmonize the interests of the economic, social, and environmental domains.

The phrase "sustainable development" was articulated during the 1992 Rio de Janeiro Conference as part "Agenda 21", described as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [7]. Later definitions of this concept have expanded upon this foundational understanding of sustainable development.

The term is also understood as "viable development", which implies "self-sustaining development" [4]. Sometimes it is interpreted as a "comprehensively balanced development" [6]. "According to the UN Commission on Sustainable Development, its goal is to meet the needs of modern society without jeopardizing the ability of future generations to satisfy their own needs" [7]. "Sustainable development is a goal that requires specific conditions to be met, calculated and illustrated through various indicators" [26].

"Sustainable development refers to the development of countries and regions where economic growth, material production, consumption, and other societal activities occur within the limits defined by the capacity of ecosystems to regenerate, absorb pollution, and sustain the livelihoods of current and future generations" [10]. The theory of sustainable development offers an alternative to the traditional economic growth paradigm, which often overlooks the ecological risks linked to development driven by an extensive model.

"At the UN Conference, the key characteristics of sustainable development were identified as transitioning from extensive to intensive development while maintaining qualitative growth and dynamic development; considering the economic activities at individual, local, regional, national, and global levels; and increasing ecological awareness, which fosters responsible behaviour by humans as bio-entities" [7].

"Researchers regard sustainable development as an interconnected framework of coordinated managerial, economic, social, and environmental strategies designed to create a self-enhancing system of social relationships. This system is founded on principles of trust, collaboration, solidarity, ethical standards, a secure environment, and consistent economic growth. Achieving sustainable development at the levels of the national economy, specific sectors, and individual businesses can be facilitated through effective crisis management practices" (Doisan-Korovionkova N.V. [8]).

According to Drastichová Magdalena, the concept of sustainable development is regarded as both a fundamental notion and a basic philosophy against which other concepts are analyzed [9]. Conducting a SWOT analysis, the author highlights the strengths and weaknesses of the sustainable development concept as a core philosophy. She identifies significant opportunities stemming from the use of strengths to move toward the goals of sustainable development (quality of life and well-being) and outlines practical applications and measurement methods, including the development of sustainability science.

The foundation of sustainable development is the parity of relations within the triad "human – economy – nature". Sustainable development encompasses the processes of survival and reproduction of the nation's gene pool, the activation of each individual's role in society, the preservation of the natural environment, the creation of conditions for biosphere restoration and local ecosystems, the reduction of anthropogenic impact on nature, and the harmonization of human development within the natural world [14].

Sustainable development of the enterprise

The complete execution of the sustainable development concept is fundamentally connected to its proper application across various management levels. Each element must ensure total coherence to enhance the effectiveness of managing the components of socio-ecological and economic development. Thus, the implementation of the concept of sustainable development can be represented in the form of a chain: individual - business entity (enterprise) - region - state -planet (Figure 1).

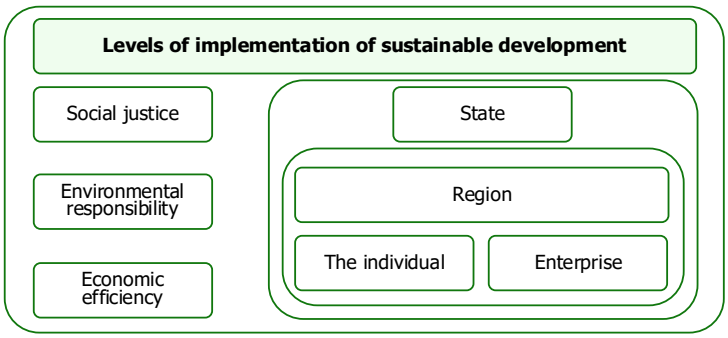

Figure 1. The place of the enterprise in the implementation of the concept of sustainable development.

At the individual level, it is particularly important to implement measures to improve the status of education, education in general, and environmental education in particular. It is designed to change the lifestyle and individual consciousness and attitude of each person to nature as the basis of the existence of civilization.

Researching the application of the sustainable development concept at the enterprise level is particularly noteworthy. The term "sustainable development of the enterprise" is subject to varied interpretations. According to Melnyk L.M., "sustainable development refers to the ability of a system comprising interconnected elements within the enterprise to maintain its viability and enhance economic efficiency while considering the impacts of different environmental factors" [18].

The sustainable development of an enterprise involves a continuous process of adaptation or maintaining all relevant sustainability metrics at an optimal level, enabling the organization to withstand adverse external influences by leveraging its internal capabilities while preserving its core attributes and integrity. In other words, it can be asserted that sustainable development within an enterprise relies on acknowledging the impacts of the external environment and enhancing strategic management practices to boost operational efficiency and foster ongoing progress.

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For enterprises, sustainable development means adopting business strategies and adopting activities that meet the needs of the market and stakeholders, support and strengthen human and natural resources.

Creating an effective management framework for the sustainable development of a business entity necessitates the integration of all functional components, including business planning, accounting, and analysis.

Financial stability of enterprises

Financial stability, as an economic category, is a relevant and sufficiently researched category. This is evidenced by the data of the Scopus scientometric network (Figure 2).

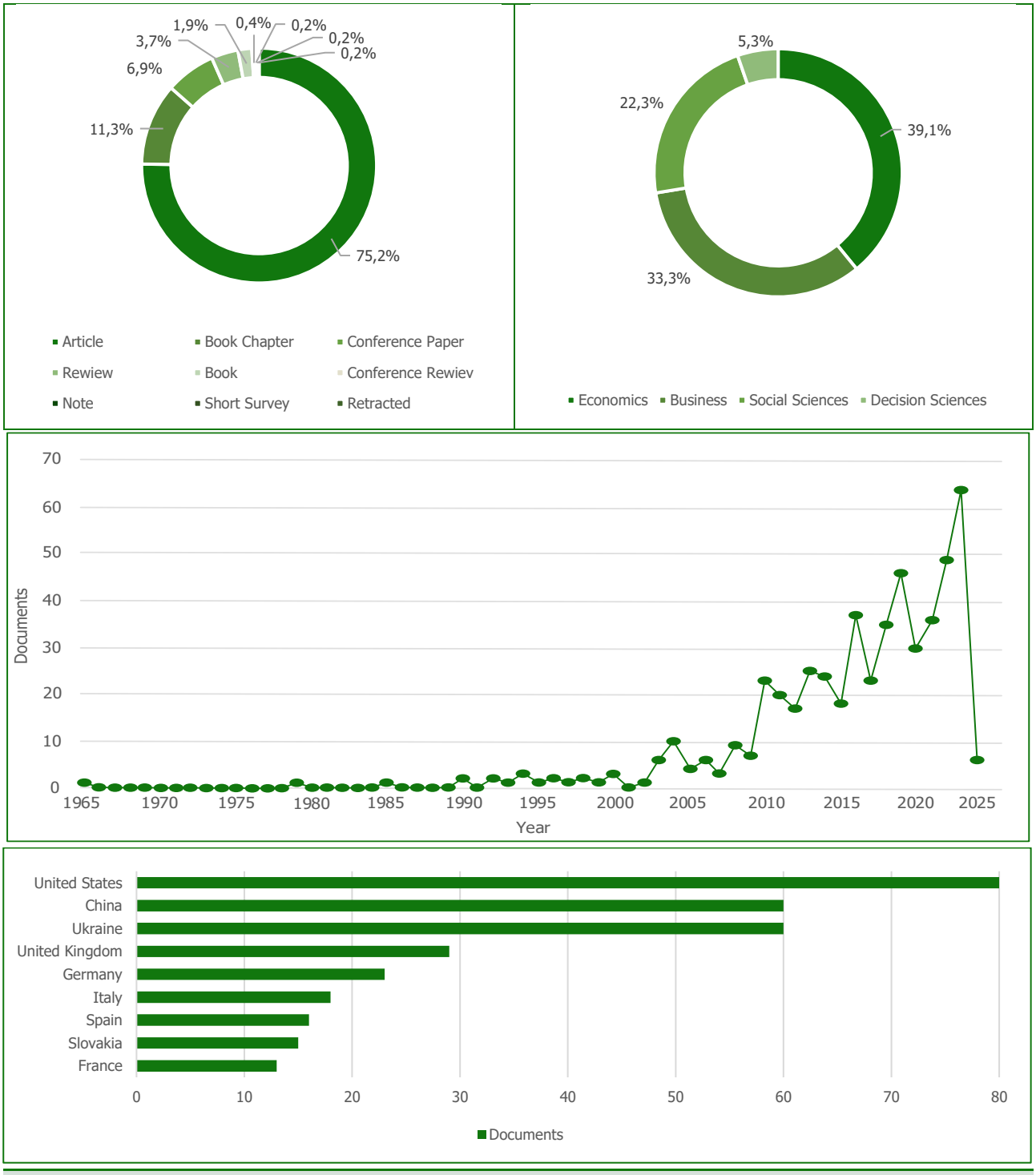

Figure 2. Bibliographic analysis of publications, the keywords of which are "financial stability", and "financial stability of enterprises".
(Source: created on the basis of the Scopus bibliographic and abstract database)

For some reason, the first study of the problems of financial stability dates back to 1965, but scientists showed the greatest activity on this issue in the last 2022-2024 years (Figure 3). This fact is logical and natural due to the prevailing circumstances: the protracted coronavirus lockdown, the war in Ukraine and the instability of the socio-political and, accordingly, economic situation in the world. Of all publications, 75.2% belong to articles on economics (39.1%) and business and management (33.3%). As for the countries in which research is carried out, the most active are the United States of America, China and Ukraine.

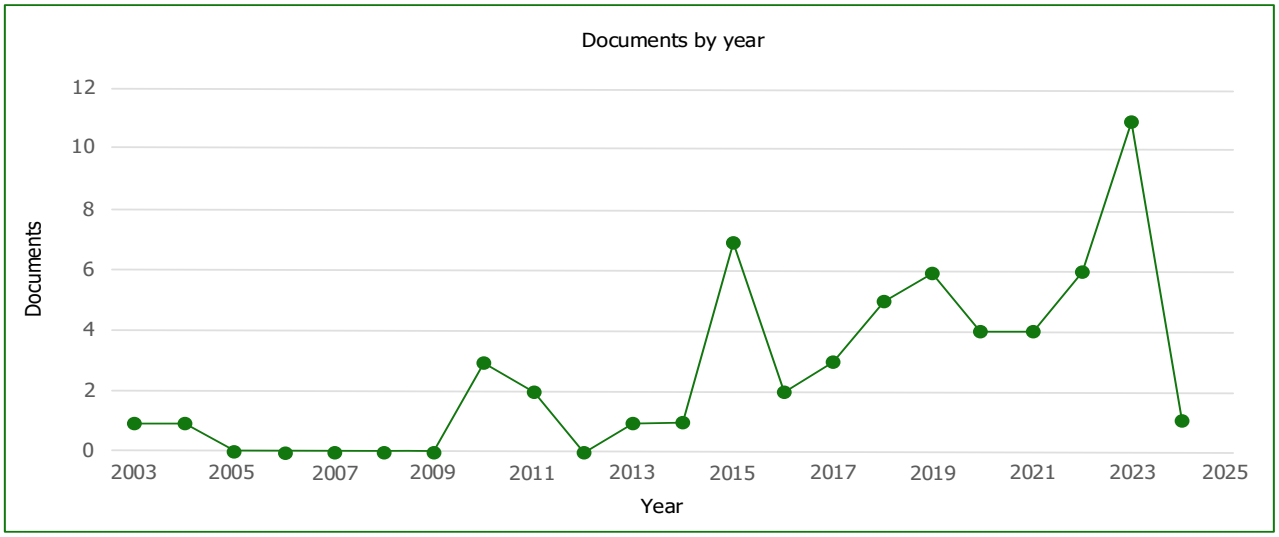

Figure 3. Bibliographic activity of research on financial sustainability for 2003-2024 in the Scopus scientometric database. *(Source: created on the basis of the Scopus bibliographic and abstract database)*

Domestic studies on financial stability are examined within the context of systemic financial analysis. Analytical scholars consider financial stability to be a primary determinant of the financial condition and financial-economic activities of economic entities. Specifically, researchers investigate various aspects of financial stability in connection with the systemic analysis of sustainable development, including: Ibrahim Abubakar, Aiyedogbon John, Obumneke Ezie - the impact of financial innovation on financial sustainability [12]; Chaikovskyi Yaroslav and Chaikovskyi Yevhen – dependence of the banking system on the financial stability of the economy [5]; Ganesh Anjali, Mandadi Ranadheer, Frank Reema – developed financial inclusion on the way to financial stability [11]; Mahesh Shreyas et al. – the importance of cross-border banking services for financial stability [17]; Taylor Charlotte – financial regulation for the financial stability of enterprises [25]; Santoso Joseph, Wibowo Agus, Sulartopo Sulartopo – pandemic changes in the financial stability of enterprises [22]; Kapinos Hennadii, Larionova Kateryna – negative changes in financial stability in conditions of full-scale war [14]; Li Wenjing – the place of financial technologies in ensuring the financial stability of enterprises [16]; Iornenge Jeremiah – the role of international financial institutions in supporting the financial stability of companies [13], etc. Numerous scholars have attempted to outline financial stability, its criteria, and methods of determination for specific economic sectors. In particular, Zhukevich S., Karpishin N., and Shegerou O. have studied the financial stability analysis of healthcare institutions under sustainable development conditions and proposed a methodology for determining financial stability for these economic entities by matching funding sources with their reserves. "The authors have presented an algorithm for determining financial stability, which encompasses the use of a balance model of financial equilibrium, a three-component indicator, the determination of optimal coverage levels of financial support sources for healthcare institutions, and the calculation of absolute and relative indicators" [30].

"Modern studies on financial stability under sustainable development conditions, such as those by Vasilakakis K., Tabouratzi E., Sdrali D., focus on defining criteria for economic stability in hotel enterprises" [27]. "To guarantee continuous operations and attain long-term stability, new criteria for economic stability have been proposed, such as a healthy profitability ratio, financial stability ratio, room occupancy rate, and revenue per guest. Furthermore, it is recommended to adopt a systemic approach that considers external factors affecting the financial stability of enterprises" [27].

Alkhodary D., "investigating the integration of sustainable development into the strategic management practices of banks, increasingly emphasizes the professionalism of management in the banking sector" [2]. "The conceptual framework of his research identifies strategic management as the independent variable, encompassing formulation, implementation, monitoring, evaluation, and leadership. In contrast, the dependent variable is defined as stability, with an emphasis on social and environmental objectives" [2].

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"The strategic focus on financial stability is emphasized by scholars Abuselidze G., Nekhoda Yu., and Bilyak Yu., who elaborate on the methodological aspects and provide practical recommendations for establishing strategic approaches to ensure the financial stability of a transport enterprise. "The authors define financial analysis as a collection of methods employed during this research process" [1]. However, they believe that current methodological approaches to determining an enterprise's financial condition are insufficiently addressed.

Analysis of the works of the aforementioned authors reveals conflicting approaches. Developing a system of sustainable development indicators is a complex scientific problem that remains contentious and not yet fully resolved. Mindrinos Leonidas & Panagiotopoulos Panagiotis attempted to classify 96 United Nations sustainable development indicators according to Maslow's hierarchy of needs and Bossel's indicator categories [19]. "This integration led to the creation of a sustainable development pyramid, where specific indicators are arranged]. "The purpose of this categorization was to analyze how particular economic facets of human life contribute to sustainable development according to individual indicators and to assess their significance within the various categories of the pyramid" [19].

Kim S. and Mehrotra A. explored the "possibilities of compromise between the objectives of price stability and financial stability" [15]. Utilizing structural vector autoregressions that incorporate shocks from monetary and macroprudential policies aimed at controlling inflation across four economies in the Asia-Pacific region, the authors examined how each policy shock contributes to deviations from the goal of maintaining financial stability. "Additionally, Sarlin Peter and Tuomas A. Pelttonen described the methodology of the "Self-Organizing Financial Stability Map" (SOFSM), which can be employed to illustrate the state of financial stability and visualize potential sources of systemic risks" [23].

In recent years, Ukraine has proposed numerous approaches to implementing the sustainable development concept in enterprises. However, their practical mechanisms are imperfect, resulting in the transition to sustainable development largely remaining overlooked and contentious.

When developing practical mechanisms for implementing the sustainable development concept in enterprises and ensuring their financial stability in managerial activities, certain problems arise, including:

- lack of clear criteria for such development (the definition of sustainable development and financial stability can be subjective, and the absence of clear criteria complicates their assessment);
- diversity of enterprise needs (different enterprises have varying needs and may rely on different strategies to achieve sustainable development);
- variability of economic conditions (the stability of economic conditions is a key factor, and even the best practices may require adjustments according to external conditions);
- impact of force majeure situations and crisis events (force majeure situations and crisis events can severely undermine the financial stability of enterprises, and they are difficult to predict or account for in planning).

To address these issues, more flexible and adaptive analysis methods are needed that take into account the specifics of each enterprise and its operating conditions. This may include developing individualized strategies, utilizing a broader range of stability indicators, and employing more flexible evaluation methods. Additionally, there is a need for continuous adaptation to changes in the external environment and risk management.

AIMS AND OBJECTIVES

The purpose of the article is to determine the financial stability of economic entities, as a component of ensuring sustainable development, using methods and models of system analysis to formalize assessments for enterprise management. The research hypothesis assumes the suitability of using the proposed method of system analysis for enterprises of various organizational and legal forms and sizes.

METHODS

To achieve the research objectives, general scientific and specialized methods were applied. Specifically, methods of analysis and synthesis, comparison, and generalization were utilized in the examination of financial stability and its management criteria. Structural-logical, econometric, and tabular methods, along with specialized system methods and models of financial analysis, including structural-dynamic and ratio analysis, as well as financial management analysis, were employed in the testing of the methodology for analyzing the financial stability of enterprises.

When determining the type of financial stability based on sources of stock financing, the method of generalized (absolute) indicators was applied. The financial stability of enterprises was analyzed using partial (relative) indicators.

To ensure a comprehensive analysis of financial reporting, all influencing factors were considered. These include external factors (market conditions, inflation, legal and regulatory framework, financing system, pricing levels, tax system) and internal factors (resource potential, enterprise management system).

The proposed methodologies for assessing the financial stability of enterprises are often one-sided and vary across different research projects. Practising managers require clear algorithms and comprehensible methodologies that outline criteria and their interpretations for explaining financial stability. Furthermore, when analyzing financial stability, factors influencing its level and determinants should be considered, along with the specific characteristics of enterprises, such as industry, size, and organizational-legal forms.

A commonly used method for analyzing a company's financial stability is the comparison of assets with their funding sources, through the calculation of relative and absolute indicators. In conjunction with this methodology, financial ratios for analyzing the financial condition of the company are also calculated, which enhances and provides more detailed insights.

By comparing the stock supply indicators of the company with the sources of their financing, we consider the optimal sources of stock financing to be equity and short-term bank loans, the determination algorithm for which is formalized in Table 1.

Table 1. Algorithm for determining sources of funding for stocks. *(Source: systematized by the authors based on [20])*

The name of the indicator	Definition algorithm
Availability of own funds (H_1)	Equity (VE) - non-current assets (NA) of the enterprise, purchased at the expense of own funds
Availability of own and long-term loan funds (H_2)	The availability of own funds (H_1) + the amount of long-term liabilities (LL) for the purchase of stocks
Availability of general funds (H_3)	The availability of own and long-term loan funds (H_2) + the amount of short-term bank loans (SL) and other short-term liabilities for purchased stocks
Reserves (H_4)	The sum of all stocks

The identified funding sources for stocks align with the indicators of stock supply in relation to their funding sources (Table 2).

Table 2. Indicators of supply of stocks with sources of their financing. *(Source: systematized by the authors based on [20])*

The name of the indicator	Definition algorithm
Surplus (+) or deficit (–) of own funds (E_1)	Availability of own funds (H_1) - reserves (H_4))
Surplus (+) or deficit (–) of own and long-term loan funds (E_2)	Availability of own and long-term loan funds (H_2) - reserves (H_4)
Surplus (+) or deficit (–) of total funds (E_3)	Availability of general funds (H_3) - reserves (H_4)
Stock of stability of financial condition, days (ZS)	Surplus (+) or deficit (–) of total funds (E_3) x 360) / net income from product sales
Surplus (+), shortage (–) of financing sources per USD 1 of reserves, USD (D_1)	Surplus (+) or deficit (–) of total funds (E_3)/ total amount of reserves (H_4)

"The type of financial stability of enterprises is determined by a three-component indicator" [20]:

$$\bar{FS} = \{FS_1(\pm E_1), FS_2(\pm E_2), FS_3(\pm E_3)\} \quad (1)$$

where the function is calculated as [20]:

$$FS(X)\begin{cases}1, if\ X \geq 0\\0, if\ X < 0\end{cases} \quad (2)$$

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After calculating the above indicators, we get a result, the comparison of which makes it possible to determine to which type of financial stability the enterprise should be classified: absolutely stable, normally stable, unstable, or crisis (Table 3).

Table 3. Characteristics of types of financial stability. *(Source: systematized by the authors)*

№	Type of resistance	Characteristic features
1.	Absolute	It is characterized by a sufficient amount of own working capital, the absence of external sources of financing and solvency
2.	Normal	It is characterized by a state of solvency, in which the enterprise, along with a sufficient amount of equity capital, has attracted long-term credits and loans
3.	Unstable (pre-crisis, critical)	It is characterized by a violation of solvency. If the amount of borrowed funds, including short-term loans, does not exceed the cost of materials, and services provided in general, then this state is considered acceptable. Restoring sustainability is possible by accelerating stock turnover, reducing or optimizing accounts receivable.
4.	Crisis	High probability of bankruptcy, in which overdue loans and payables are not covered by receivables, cash and short-term securities. Such a situation is typical when stocks are not covered by sources of their financing, and stock renewal is carried out thanks to the funds from the slowdown in the turnover of payables.

Along with optimizing the structure of liabilities in situations defined by the last two conditions, sustainability can be restored through a reasonable reduction in the level of inventories and costs. Each of the states is formalized by a certain set of inequalities, which are shown in Table 4.

Table 4. Financial stability type criteria. *(Source: systematized by the authors based on [20])*

Indicator	Type of financial stability			
	Absolute	Normal	Unstable	Crisis
E_1	$E_1 \geq 0$	$E_1 < 0$	$E_1 < 0$	$E_1 < 0$
E_2	$E_2 \geq 0$	$E_2 \geq 0$	$E_2 < 0$	$E_2 < 0$
E_3	$E_3 \geq 0$	$E_3 \geq 0$	$E_3 \geq 0$	$E_3 < 0$

A complex characteristic of each type of financial state of the enterprise is given by a set of indicators (Table 5): the coefficient of provision of reserves with sources of financing (CFS), surplus (shortage) of funds for the formation of reserves (+; -), margin of stability of the financial position (MS), surplus (shortage) sources of financing per UAH 1 of reserves (+; -) [27].

Table 5. Assessment of the stability of the company's financial condition. *(Source: systematized by the authors based on [21])*

№	Sustainability type	Absolute	Normal	Pre-Crisis	Crisis
1.	CFS	H4: H4 > 1	H2: H4 = 1	H3: H4 = 1	H3: H4 < 1
2.	(+; -), USD	E1 > 0	E2 > 0	E3 < 0	E4 < 0
3.	MS, days	(E1 × 360) : D_1 > 0	(E2 × 360): D_1 > 0	(E3 × 360): D_1 > 0	(E3 × 360): D_1 < 0
4.	(+; -), USD	E1: H4 > 0	E1: H4 > 0	E1: H4 > 0	E1: H4 < 0

To validate the proposed methodology for the systematic analysis of financial stability, companies of varying sizes and legal forms were selected. The financial stability analysis utilized data from the Public Joint-Stock Company "Tera" (large-sized), the Closed Joint-Stock Company "Zhytomyrski Lasoshchi" (medium-sized), and the Private Enterprise "Vatsak" (small-sized). Financial indicators were calculated for the period 2021–2023. Analytical calculations and result visualizations were performed using MS Excel software.

RESULTS

To achieve sustainable development across different levels of economic activity, it is essential to implement new management approaches that harmonize the interests of the social, economic, and environmental sectors. The stability of companys is determined by their sustainable development, which is achieved through effective management methods. The sustainable development of enterprises is characterized by the gradual improvement or maintenance of all key sustainability

indicators, enabling them to withstand negative external factors by leveraging internal potential while preserving the integrity and stability of operations.

Sustainable development requires considering external environmental influences and enhancing the strategic management of enterprises to ensure stable growth. It should be noted that financial solvency relies on management activities that encompass the creation, execution, and oversight of planned business initiatives. The analytical research data serves as the foundation for making management decisions related to future development, establishing priorities, and pinpointing internal resources to enhance operational efficiency. By leveraging existing reporting and accounting data along with contemporary analytical techniques, managers evaluate the financial and economic health of enterprises, regardless of their ownership structures and organizational-legal forms, and determine future development prospects.

An analysis of the financial stability of companies allows for the evaluation of their financial standing and performance both in static and dynamic terms, thereby identifying future trends. Financial stability is characterized as "a specific condition of financial resources, where rational management ensures a balance between assets and liabilities in a fluctuating external and internal environment, while also maintaining solvency and investment appeal within an acceptable risk level." Consequently, an analysis of financial stability aids in identifying existing and potential financing sources, justifying the amount and sources of new funding, evaluating debt repayment capacity, assessing financial independence, examining trends in that independence, ensuring the alignment of assets and liabilities with the primary objectives of business operations, and evaluating how effectively management has utilized both internal and external funds in previous periods.

It is evident that analyzing the quantitative characteristics of financial stability is crucial in the unstable, competitive environment of a digital economy, particularly exacerbated by the impacts of military actions, as low financial stability can lead to insolvency or even bankruptcy.

By grouping the actual data of the examined enterprises and performing the necessary calculations using the proposed methodology (Table 6), it can be concluded that the financial stability of the company's is unsatisfactory due to the negative equity indicator.

Table 6. Determination of the type of financial stability of enterprises, 2019-2021*, USD. Note: *Calculated by the authors on the basis of official statistical data of the investigated enterprises.

№	Indicators	2021	2022	2023	Deviation +/-		Deviation, %	
					2023/2022	2023/2021	2023/2022	2023/2021
Public Joint-Stock Company "Tera" (large-sized)								
1	H_1	-5598.50	-7016.60	-7265.70	-249.10	-1667.20	1.04	1.30
2	H_2	-5598.50	-7016.60	-7265.70	-249.10	-1667.00	1.04	1.30
3	H_3	-5598.50	-7016.60	-7265.70	-249.10	-1667.00	1.04	1.30
4	H_4	43234.10	4752.60	7471.60	2719.00	-35763.50	1.57	0.17
5	E_1	-48832.20	-11768.10	-14736.30	-2968.20	34096.10	1.25	0.30
6	E_2	-48832.20	-11768.10	-14736.30	-2968.20	34096.10	1.25	0.30
7	E_3	-48832.20	-11768.10	-14736.30	-2968.20	34096.10	1.25	0.30
8	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	D_1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	CFS	0; 0; 0	0; 0; 0	0; 0; 0				
Closed Joint-Stock Company "Zhytomyrski Lasoshchi" (medium-sized)								
№	Indicators	2021	2022	2023	2023/2022	2023/2021	2023/2022	2023/2021
1	H_1	185347.00	157345.00	143231.00	-14114.00	-42116.00	0.91	0.77
2	H_2	185347.00	157345.00	143231.00	-14114.00	-42116.00	0.91	0.77
3	H_3	185347.00	157345.00	143231.00	-14114.00	-42116.00	0.91	0.77
4	H_4	38050.00	7759.00	9040.00	1281.00	-29010.00	1.17	0.24
5	E_1	147297.00	149586.00	134191.00	-15395.00	-13106.00	0.90	0.91
6	E_2	147297.00	149586.00	134191.00	-15395.00	-13106.00	0.90	0.91
7	E_3	147297.00	149586.00	134191.00	-15395.00	-13106.00	0.90	0.91
8	MS	173.0694	175.7589	157.6703	-18.09	-15.40	0.90	0.91
9	D_1	3.871143	19.27903	14.84414	-4.43	10.97	0.77	3.83

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10	CFS	1;1;1						

(continued on next page)

Table 6. Continued.

№	Indicators	2021	2022	2023	Deviation +/-		Deviation, %	
					2023/2022	2023/2021	2023/2022	2023/2021
Private Enterprise "Vatsak" (small-sized)								
	Indicators	2021	2022	2023	2023/2022	2023/2021	2023/2022	2023/2021
1	H_1	643.10	2121.20	4509.50	2388.30	3866.40	2.13	7.01
2	H_2	15383.80	10957.80	48744.70	37786.00	33360.70	4.45	3.17
3	H_3	15383.80	10957.80	48744.70	37786.00	33360.70	4.45	3.17
4	H_4	3300.80	16548.90	16641.80	92.90	13340.00	1.01	5.04
5	E_1	-2657.90	-14427.80	-12132.20	2295.30	-9474.40	0.84	4.56
6	E_2	12083.20	-5591.20	32102.80	37694.00	20019.60	-5.74	2.66
7	E_3	12083.20	-5591.20	32102.80	37694.00	20019.60	-5.74	2.66
8	MS	90.77	-42.00	241.15	283.15	150.39	-5.74	2.66
9	D_1	0.317558	-0.72061	3.551206	4.27	3.23	-4.93	11.18
10	CFS	0; 1; 1	0; 0; 0	0; 1; 1				

The financial stability of the small enterprise, based on the calculated data, is deemed normal, while the closed joint-stock company (medium-sized) demonstrates financial stability. However, all enterprises fund their inventories without relying on bank loans. On the one hand, the lack of external financing is positive, but on the other hand, these enterprises are not utilizing financial leverage, which could generate additional profits.

It is clear that when assessing a company's solvency, two directions of financial stability evaluation should be considered:

1. Evaluating financial stability by analyzing the extent to which funding sources cover inventory and expenses.
2. Evaluating financial stability by examining the extent to which funding sources cover fixed assets and other non-current assets.

Both assessment directions stem from the general formula for financial stability, which dictates that capital investments in fixed assets and material inventories should not exceed the amount of permanent capital.

However, analyzing financial stability levels solely through the evaluation of financing sources or by comparative analysis of the absolute figures of assets and liabilities may lead to distorted results. For example, during a crisis, liabilities in the balance sheet often lack borrowed funds due to a decline in creditworthiness. Despite this, financial ratios may indicate a high level of financial stability, which contradicts the company's actual condition.

Therefore, absolute indicators must be supplemented with financial ratios, which also reflect a company's financial stability. The methodology for calculating these ratios is provided in Table 7.

Table 7. Indicators-coefficients for determining the financial condition (financial stability).

№	Indicator	Calculation algorithm	Characteristics of the indicator
1	Coefficient of financial independence (equity)	Equity/Total capital	It characterizes the concentration of own capital.
2	Coefficient of financial dependence (equity multiplier)	Currency of balance sheet/equity	The equity multiplier is the inverse of the financial independence ratio.
3	Loan capital concentration ratio	Debt capital/balance currency or 1 - Coefficient of financial independence (equity)	Shows the share of the involved property in the company's assets and the degree of the company's dependence on creditors.
4	Financial risk factor	Long-term + current liabilities/Equity	It characterizes the amount of loan funds raised by the enterprise per 1 hryvnia of its own funds invested in assets.
5	Coefficient of financial stability	Equity / Long-term + current liabilities	It characterizes the coverage of debts with own capital

6	Long-term debt ratio	Long-term liabilities / Equity + Long-term liabilities	Shows the percentage of long-term liabilities in capitalized sources (the sum of long-term liabilities and equity).
7	Equity manoeuvrability ratio	Working capital/ Equity	Determines the share of equity invested in current assets.

The share of equity in the total amount of advanced funds, with a recommended ratio of 0.5-0.6, reflects the financial independence ratio, also known as the autonomy or solvency ratio. It is calculated as the ratio of equity to the total balance sheet of the business entity.

The calculation results indicate that the joint-stock company shows the best situation, with its equity share reaching 67% in 2021, though there is a downward trend, dropping to 35% in 2023 (a 51% decrease) (Figure 4). The small enterprise demonstrates a positive trend, with its equity share growing from 1.9% in 2019 to 3.5% in 2023, although this ratio remains significantly below the recommended level. The worst situation is observed in the public company, where equity has a negative value throughout the analyzed period.

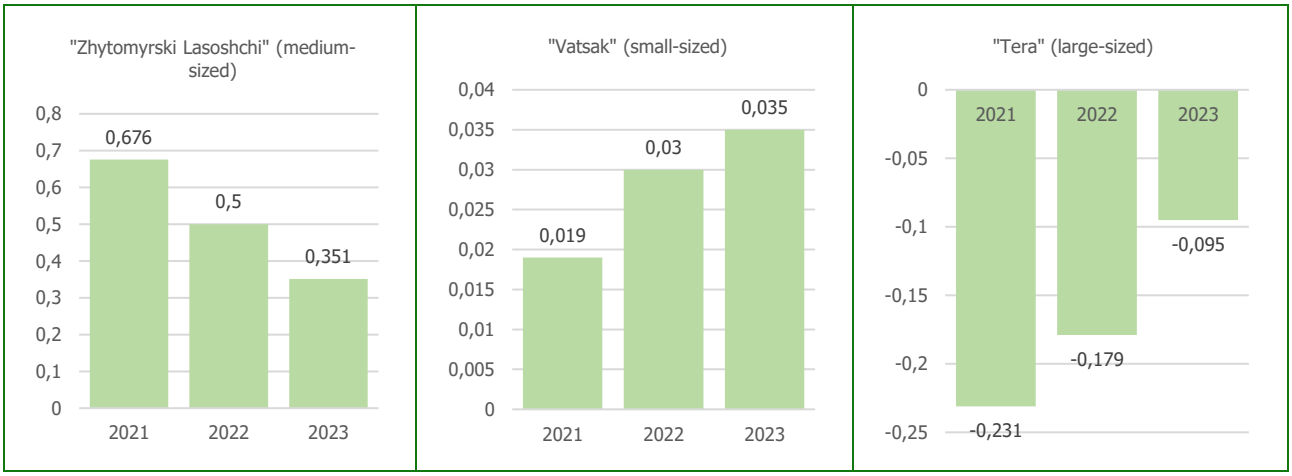

Figure 4. Dynamics of the Financial Independence Ratio of the Analyzed Food Industry Enterprises for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The reverse of the financial independence ratio is the financial dependency ratio (leverage multiplier), calculated as the ratio of total assets to equity. The recommended value should be less than 2 (i.e., 1/0.5).

As shown in Figure 5, the calculated financial dependency ratio does not meet the recommended standards in both small and public enterprises. Only in the joint-stock company did the financial dependency ratio fall within the acceptable range in 2021, at 1.48. However, in subsequent years, this ratio increased, which is a negative trend.

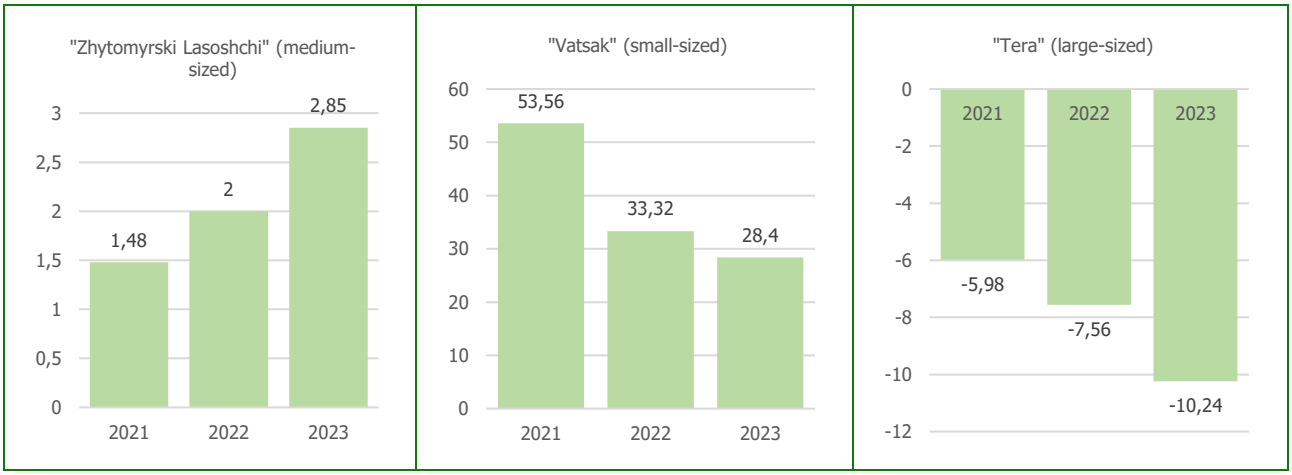

Figure 5. Dynamics of the Financial Dependency Ratio of the Analyzed Food Industry Enterprises for 2019-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The Debt Ratio measures a business entity's reliance on creditors. It indicates the share of borrowed assets in a company's total assets, calculated as the difference between 1 and the financial independence ratio, or as the ratio of borrowed

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capital to the total balance sheet. An increasing trend in this ratio is unfavourable, as it reflects a growing dependence on external financing sources.

In Figure 6, the calculated debt ratio values for the analyzed enterprises are shown, highlighting a downward trend in the public company and other enterprises. This reduction suggests decreasing dependency on external financing.

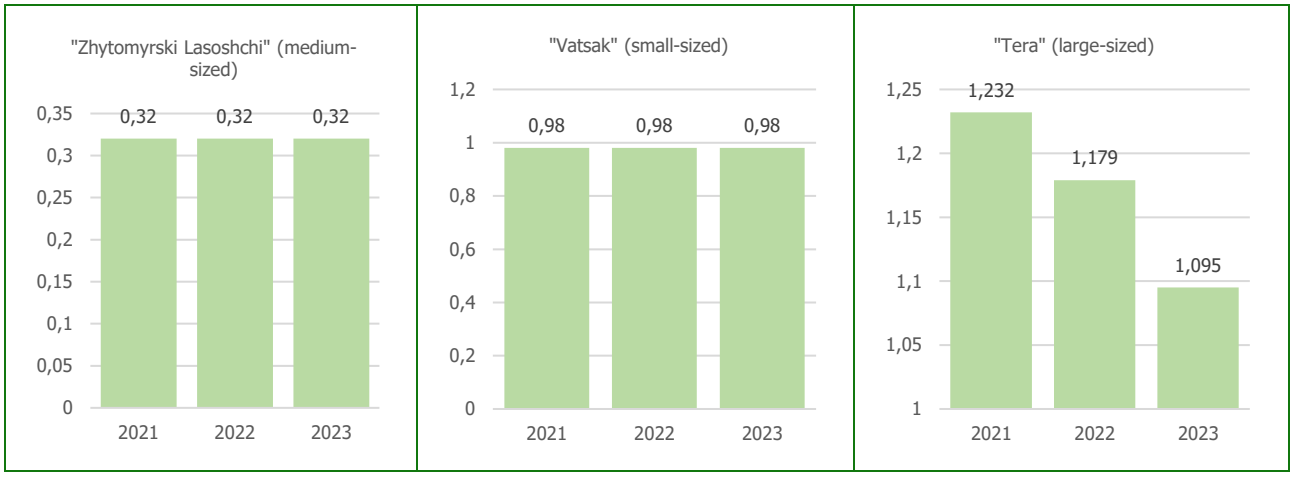

Figure 6. Dynamics of the Debt Ratio of the Analyzed Food Industry Enterprises for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The ratio of borrowed funds to equity, expressed as the financial risk ratio (leverage ratio), highlights the amount of borrowed funds per unit of equity invested in assets. The recommended value of this ratio is less than 1. An increase in the ratio elevates the risk of capital investment in the company's activities. However, if borrowed funds constitute one-third of the total financing (a 1:2 ratio), this is generally considered normal.

An increase in the financial risk ratio implies greater dependence on borrowed capital, which in turn reduces the company's financial independence and stability. Nonetheless, economic agents may still favour the use of borrowed capital. Analysts and researchers provide two key reasons for this: first, financial expenses reduce taxable profit, and second if financial costs are lower than the profit generated from using borrowed funds, this leads to higher return on equity [21]. The ratio of borrowed to equity capital varies by industry and depends on factors such as the country's mentality and capital turnover. The higher the turnover, the higher this ratio can be [21].

The calculation of this ratio for the analyzed enterprises is shown in Figure 7. A significant financial risk is observed in PJSC "Tera", caused by the negative value of equity.

Figure 7. Dynamics of the Financial Risk Ratio of the Analyzed Food Industry Enterprises for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The financial stability ratio reflects the ability to cover debts using equity capital. As the inverse of the financial risk ratio, it is calculated as the ratio of equity to borrowed capital. The value of this ratio varies widely depending on the industry, although the recommended level is greater than 1. Western analysts suggest an optimal range for this ratio between 0.5

and 0.7. A ratio between 4 and 6 indicates that a company operates independently, relying on its own resources for its production activities.

In the analyzed enterprises, the following trends are observed (Figure 8). The small enterprise shows a twofold increase in this ratio over the analyzed period, although its calculated value still does not meet the recommended standard. In the joint-stock company, the financial stability ratio decreases, with a value of 2.09 in 2021, dropping to 0.54 in 2023.

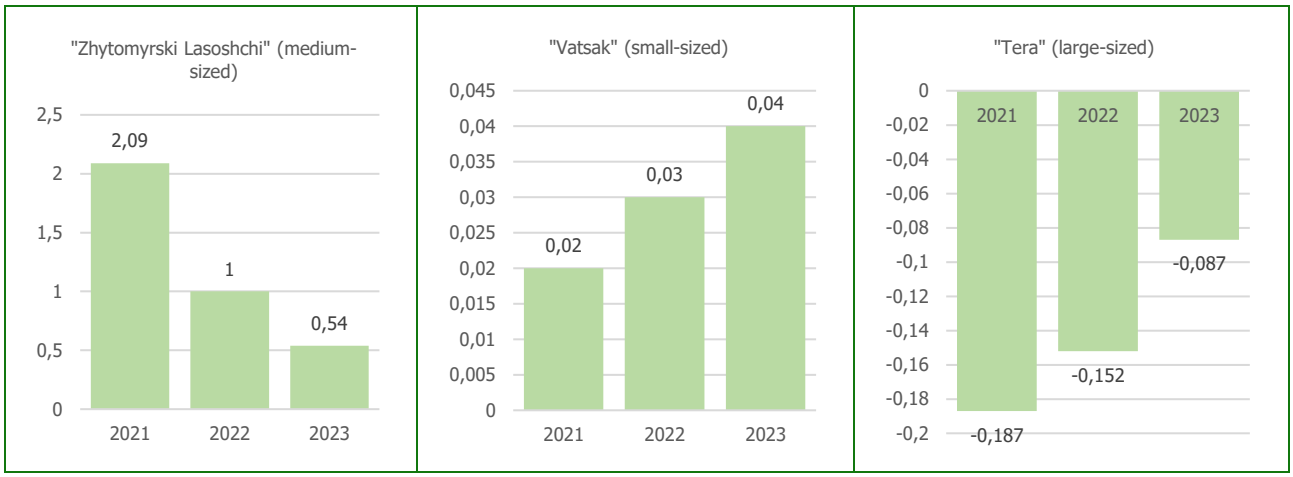

Figure 8. Dynamics of the Financial Stability Ratio of the Analyzed Food Industry Enterprises for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The long-term debt ratio (capitalization ratio) reflects the proportion of long-term liabilities in capitalized sources and provides insight into a company's overall capitalization. Total capitalization is understood as the sum of long-term liabilities and equity. An increase in this ratio suggests greater reliance on external creditors while simultaneously indicating confidence from banks and stakeholders in the company's financial stability.

Since only the small enterprise has long-term liabilities, the calculation of this ratio for the enterprise shows a significant percentage of long-term liabilities in capitalized sources – 90% (Figure 9).

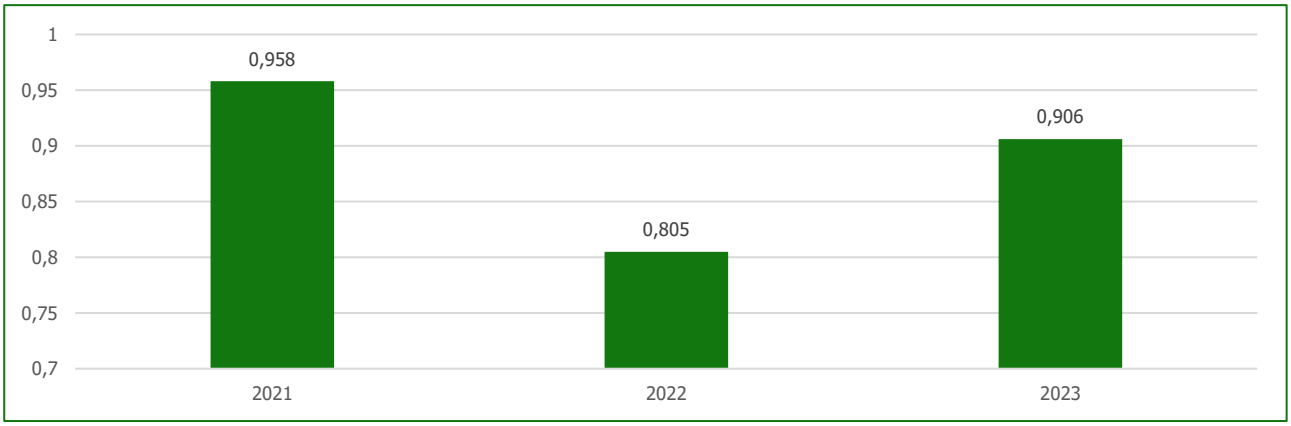

Figure 9. Dynamics of the Long-Term Debt Ratio of Smal Enterprise Vatsak for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The working capital manoeuvrability ratio is a key indicator of the mobility of a company's equity, demonstrating how much of the equity is available in circulating assets for financing current operations. This ratio is calculated as the ratio of working capital to equity, highlighting the proportion of equity invested in current assets. A higher value with positive growth in dynamics is favourable, as it ensures flexibility in the use of the company's own funds.

The calculation of this ratio for the analyzed enterprises reveals a positive value and upward trend in maneuverability for the public company. The joint-stock company shows a transition from negative to positive values, indicating improvement. While there is growth in the small enterprises as well, the ratio remains below zero throughout the analyzed period (Figure 10).

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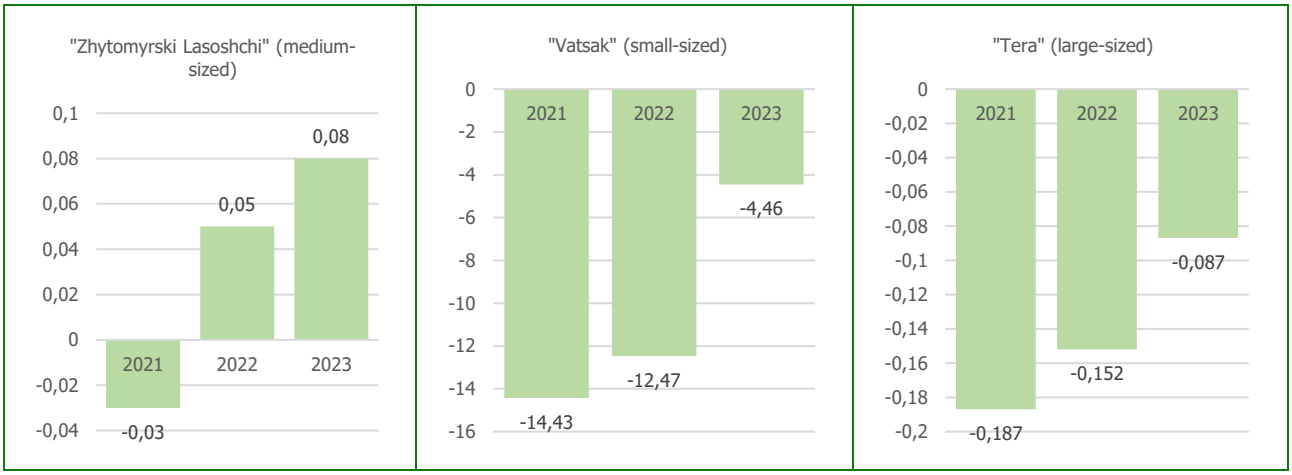

Figure 10. Dynamics of the coefficient of manoeuvrability of own capital at the investigated enterprises for 2021-2023. *(Source: calculated based on the data of the surveyed enterprises)*

The systematic analysis using the proposed methodology for assessing the financial stability of the studied enterprises confirmed the hypothesis of its broad applicability. The suggested financial stability indicators are relevant for various enterprises, regardless of their organizational and legal form or size. However, each enterprise must establish a corresponding set of criteria for evaluating its operational effectiveness and determine its stability based on these criteria, while also developing measures for managing sustainable development.

The selection of indicators and measures for sustainable development is contingent on the phase of the enterprise's life cycle. At different stages, the significance and behaviour of indicators from various groups change. Considering this factor will enable managers and financial analysts to focus on those indicators whose analysis is most crucial at a particular stage of the enterprise's operation and development. To account for several other factors and conduct a more detailed analysis, it will be necessary to employ additional research methods, specifically the calculation of relative indicators, which will be the subject of our further investigations.

DISCUSSION

The proposed system analysis methodology is subject to debate in certain economic scenarios. The primary functional limitation lies in the lack of publicly available analytical data. Specifically, small enterprises often submit simplified financial reports that do not include the indicators necessary for calculating the suggested financial stability ratios. As a result, while the methodology is applicable for businesses of various sizes, the necessary information resources are typically available only for medium and large companies.

Furthermore, the calculation of key ratios inadequately accounts for the impact of pandemic or wartime disruptions on business operations. The methodology relies on the sequential analysis of assets and liabilities over extended periods (quarterly or annually). However, the sudden onset of crises cannot be effectively captured in short-term assessments. The financial indicators derived from traditional financial statements are thus insufficient for real-time management purposes. To ensure sustainable development, it is advisable to rely on managerial reporting, which incorporates alternative financial stability indicators. This approach also enables consideration of management expertise, production quality, market reputation, employee satisfaction, and the adoption of innovative strategies for sourcing financial resources.

CONCLUSIONS

The financial stability of enterprises refers to the condition of financial resources within an economic entity, where effective management maintains a balance between assets and liabilities amid changing internal and external conditions, while also ensuring solvency and investment appeal within an acceptable risk threshold. An enterprise's financial condition hinges on how effectively it utilizes its financial resources, which is a vital task for managers engaged in rational and efficient management. A key aspect of this process is the systematic analysis of financial stability.

The objective of systematically analyzing the financial and economic activities of enterprises is to assess their financial condition and performance outcomes for the reporting period, as well as to project future levels of financial stability. To

evaluate the financial stability of an enterprise, it is recommended to employ the classic balance model of financial equilibrium, enhanced by calculating a three-component indicator that identifies optimal coverage levels for financial provision sources through both absolute and relative metrics. This proposed methodology for analyzing financial stability enables an assessment of the enterprise's capacity to fulfil its debt obligations, its financial independence, trends in changes to this independence, the alignment of assets and liabilities with the primary objectives of its business activities, and the efficient utilization of both internal and external funding.

Based on the obtained information regarding the financial stability of an enterprise, it is possible to calculate various indicators or coefficients (such as the financial independence coefficient (autonomy), financial dependence coefficient (equity multiplier), debt capital concentration coefficient, financial risk coefficient, financial stability coefficient, long-term debt coefficient, and equity manoeuvrability coefficient), which characterize the financial condition of the enterprise. Systematic analysis utilizing a set of coefficients allows for a comprehensive assessment of the financial stability of an enterprise, taking into account the influence of various factors. When calculating financial stability coefficients, it is essential to select those that best characterize the specific features of the operations of the particular economic entity.

The financial stability coefficients have been tested on enterprises within the food industry, encompassing various organizational and legal forms as well as sizes of businesses, confirming the universality and broad applicability of the proposed systematic analysis methodology.

However, the presented methodology for systematic analysis of financial stability has certain functional limitations, preventing its application to non-manufacturing sectors of the economy and not fully accounting for military threats in corporate management. Beyond the quantitatively calculated financial performance indicators, the financial stability of enterprises is greatly affected by qualitative factors, including the professionalism of management personnel, product quality, market reputation, employee and consumer satisfaction with their quality of life, the adoption of innovative strategies for attracting diverse financial resources, and the effects of pandemic and military risks, among others. To incorporate these and other aspects for a more comprehensive analysis, it will be necessary to utilize additional research methods, which will be explored in future studies.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ФІНАНСОВА СТІЙКІСТЬ В УПРАВЛІНСЬКІЙ СИСТЕМІ ПІДПРИЄМСТВ: СИСТЕМНИЙ АНАЛІЗ І ФОРМАЛІЗАЦІЯ ОЦІНОК В УМОВАХ СТАЛОГО РОЗВИТКУ

Концепція сталого розвитку передбачає модернізацію фінансового механізму, розробку моделей фінансової діяльності в контексті забезпечення їхньої стабільності на різних рівнях господарювання. Фінансова стійкість підприємств – це стан фінансових ресурсів, при якому забезпечується збалансованість активів і пасивів, забезпечується платоспроможність, інвестиційна привабливість у рамках допустимого рівня ризику. Аналіз таких показників дає змогу оцінити готовність підприємства до погашення його боргів, фінансову незалежність, раціональність розпорядження власними та позиковими коштами.

Метою дослідження є вивчення теоретико-методологічних підходів і методів системного аналізу фінансової стійкості підприємств в умовах сталого розвитку. Досліджено теоретичні основи та методичні підходи до системного аналізу фінансової стійкості. Аналіз фінансової стійкості підприємств проводили за методикою розрахунку покриття активів джерелами їх фінансування. Пропонований алгоритм обчислення фінансової стійкості, який передбачає застосування балансової моделі фінансової рівноваги та обчислення трикомпонентного показника для визначення оптимальних рівнів покриття джерел фінансового забезпечення за допомогою абсолютних і відносних показників, дозволяє визначити слабкі сторони підприємства, які є резервом покращення його фінансового стану. До аналітичних індикаторів, які є складовими системного аналізу фінансової стійкості, належать: коефіцієнт фінансової незалежності (автономії), коефіцієнт фінансової залежності (мультиплікатор власного капіталу), коефіцієнт концентрації позичкового капіталу, коефіцієнт фінансового ризику, коефіцієнт фінансової стабільності, коефіцієнт довгострокової заборгованості, коефіцієнт маневреності власного капіталу. Обчислення запропонованих аналітичних показників оцінки фінансової стійкості підприємств різних організаційно-правових форм і розміру бізнесу засвідчило універсальність і широку придатність до використання запропонованої методики системного аналізу.

Ключові слова: аналіз, фінансовий аналіз, системний аналіз, фінансова стійкість, менеджмент, сталий розвиток

JEL Класифікація: G01, G21, G28, G32

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