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DEVELOPMENT OF METHODS FOR RISK-ORIENTED ANALYTICAL ASSESSMENT OF FINANCIAL PERFORMANCE OF WINE-PRODUCING ENTERPRISES

The object of research is the process of forming a comprehensive risk-oriented system for analyzing the financial performance of wine-producing enterprises. The development of this methodology will ensure systematic identification, quantitative assessment and integration of risks at all stages of the value chain. Existing approaches limit the ability to form a risk profile for operations and justify effective management decisions in conditions of instability. Traditional methods of analytical assessment do not allow for the multidimensionality of risk factors and the complex nature of their impact on changes in efficiency to be reflected. The use of an integrated risk criterion ensures more accurate forecasting of financial performance trends, increasing the effectiveness of the management control system. The developed methodology for assessing the financial performance risk of viticulture and winemaking enterprises based on normalized indicators and integral criteria made it possible to outline the risk dynamics and key parameters of uncertainty. The assessment was carried out in terms of grape varieties and enterprises on a five-level scale, with 2019 identified as the most critical year. The highest risk is in Cabernet 2024 and Rkatsiteli 2024: Alibernet 2024 has the lowest risk; Merlot 2024 has an average risk. The integrated assessment of average risk forms a unified information model that supports strategic decisions and enhances competitiveness. The applied nature of the study is determined by its focus on supporting management decisions in the financial and economic management of grape and wine-producing enterprises. The integrated risk assessment methodology ensures the identification and quantitative measurement of risks at all stages of the value chain, which allows identifying critical factors of financial performance and justifying the optimization of production and cost parameters.

Keywords: *analytical assessment, management accounting, grape production, wineries, risks assessment, financial results.*

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1. Introduction

The current conditions of the functioning of the Ukrainian wine industry are characterized by high volatility of the market environment, increasing production costs, fluctuations in the quality and cost of wine materials, as well as the increased influence of natural and climatic and economic risks.

In their studies, scientists [1] noted that the wine industry has faced a number of challenges, changes and new dynamics in recent years, which have had a significant impact on the strategies and results of companies. These moments arise as a result of globalization, the adoption of new legislation on production, bottling and labeling, changes in customer preferences or the emergence of new business models that require constant adaptation and optimization of winegrowers' practices to increase business competitiveness [2, 3].

Under such conditions, traditional approaches to assessing financial performance are insufficient, since they do not take into account the degree of uncertainty inherent in all stages of wine production – from grape growing to processing and sales of finished products.

The need to form an effective risk management system necessitates the use of a risk-based analytical approach that allows not only to record actual financial results, but also to determine their sensitivity to key risk factors.

Risk management in wine production is of increasing interest [4], since the wine market is exposed to many risks arising from a number of factors: from human behavior, climate, political, economic and financial risks [5].

For wine-making enterprises, which activities are associated with long operating cycles, seasonality and significant investments in biological assets, the development of a methodology for integral assessment of financial performance risk is critically necessary.

In [6], a classification of financial risks of an enterprise and their assessment in enterprise management are presented. In other works [7], financial risk is defined as an uncertain event that occurs in the process of achieving the set goals by a business entity, which has a negative impact on its activities.

The introduction of a risk-based analytical assessment methodology provides the opportunity to increase the validity of management decisions, optimize the cost structure, minimize potential financial losses and strengthen the competitiveness of enterprises in the national and international market space. Under such conditions, traditional management analysis methods, focused mainly on retrospective

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assessment of profits and expenses, are insufficient for timely identification of weaknesses, risk forecasting and assessment of potential threats to financial stability.

The analysis of scientific research shows that the issue of risk-based management in the agricultural sector is considered in general through the assessment of economic risks. In work [8], the role of such financial indicators as capitalization, liquidity and profitability in explaining the dynamics of investment in the wine industry is assessed. In work [9], theoretical and methodological aspects of the organization of risk management are presented, and a risk assessment model is developed. Recommendations for managers and other stakeholders regarding the risk management mechanism that can be applied to improve the efficiency of enterprises and states are also summarized.

In [5] it is noted that fluctuations in wine prices can be significant and have wide economic and financial consequences. Wine price risk management is studied in more detail in [10] in terms of international diversification and the use of derivatives.

However, generalized methods that could be used to assess and identify risk factors in the activities of a winemaking enterprise have practically not been developed. Existing studies only partially highlight individual types of risks [11], for example, production, market or financial, but without their analytical assessment. Accordingly, this moment reflects a scientific gap that requires systematization and methodological improvement in the areas of building a comprehensive model for assessing risks of financial performance of winemaking enterprises.

The use of a risk-oriented approach makes it possible to form such a system of management analysis that allows for a comprehensive assessment of probable deviations, identify risks at different stages of the production cycle and predict their impact on performance indicators. An important prerequisite for increasing the accuracy of analytical conclusions is the integration of accounting risk indicators into the methodology for assessing financial performance, which provides a deeper understanding of the enterprise's resilience to external and internal challenges.

The complexity of the methodology is ensured by the interpretation of analytical data from accounting, management accounting and controlling systems, which allows obtaining a holistic view of the riskiness of operational processes – from the viticultural cycle to the production and distribution of wine. The application of the methodology allows to form risk-oriented management decisions, optimize technological processes, increase the company's resilience to external and internal threats, and strengthen competitive positions in the market.

The object of research is the process of forming a comprehensive risk-oriented system for analyzing the financial performance of winemaking enterprises.

The aim of research is to develop a methodology for risk-oriented analysis of the financial performance of wine-making enterprises, which makes it possible to provide an integrated risk assessment, determine the risk profile of operations and increase the efficiency of management decisions.

To achieve the aim, the following objectives are envisaged:

– to substantiate the conceptual principles and structure of the methodology for risk-oriented analysis of the financial performance of grape growing by enterprises of Ukraine;

– to determine the risk criteria for financial performance in winemaking;

– to carry out an analytical assessment of the average risk of using wine materials in the production of grape wine by a winemaking enterprise.

The implementation of this methodology by winemaking enterprises will contribute to increasing management efficiency, reducing uncertainty and minimizing risks that directly affect their competitiveness and long-term development.

2. Materials and Methods

The research materials were official data from the State Statistics Service of Ukraine, financial statements of enterprises in the wine industry of Ukraine for the period 2017–2023, and information materials of industry think tanks. To determine approaches to risk assessment in agriculture and the food industry, scientific publications were studied.

The system of local risk indicators was formed on the basis of primary data of key accounting indicators, management reporting and information arrays.

The research methodology is based on the construction of a comprehensive criterion for assessing the risk of the dynamics of financial performance of wine enterprises. The construction of the enterprise's risk profile was carried out on the basis of algorithms for structural-dynamic comparison and scaling of integral criteria in accordance with methods for assessing the riskiness of economic processes.

General scientific and special methods were used in the research process. Comparative analysis was used when comparing changes in indicators. Factor analysis was used to determine the impact of key risk indicators on the overall level of performance. Elements of economic and mathematical modeling were used to integrate local indicators into a single indicator. This combination also allowed the application of methods of statistical grouping and structural-logical generalization.

The study also used economic analysis (comparative, trend), factor and correlation analysis to assess the participation of individual indicators in the formation of the overall risk, and other methods of logical modeling to substantiate the structure of the complex criterion. The combination of the aforementioned methods ensured the objectivity of the subsequent results, which are presented later in the article.

These methods were used at all stages of risk assessment: the formation of a system of local indicators, their normalization, formation into an integral criterion and subsequent classification by risk level.

3. Results and Discussion

3.1. Conceptual principles and structure of the formation of an integral risk criterion of the dynamics of financial performance of grape growing by enterprises of Ukraine

Grape growing in Ukraine is an important component of the grape and wine complex, which provides a significant contribution to the development of the agricultural sector, the formation of added value and support for export potential [12]. However, the current conditions of the industry are characterized by an increased level of uncertainty and a multifactorial risk environment. The financial performance of enterprises is significantly affected by climatic fluctuations, soil degradation, seasonality, investment duration of the biological cycle, fluctuations in energy prices, changes in market demand and competition. The combination of these factors leads to the instability of financial results and an increase in the need for scientifically sound methods of their forecasting, taking into account risk.

The concept of performance is associated with the final result, a set of objective monitoring consequences. The conclusion on performance is made after comparing the results of this period and previous periods [13].

A risk factor is a general concept for those factors that are not the direct cause of the final negative result, but increase the likelihood of certain risks and financial losses [14].

Traditional analytical approaches used to assess the financial performance of enterprises, for the most part, do not provide proper consideration of the multidimensional nature of risks and their integrated impact on the dynamics of performance indicators.

Today, there is no consistency in the assessment of financial risks, so the question arises of choosing a methodology that would allow for an optimal assessment of all factors that affect the magnitude of risks [15].

In this regard, there is a need to develop a methodology for forming an integral risk criterion, which will allow for a comprehensive assessment of the level of instability of financial results and will provide an opportunity to quantitatively compare the risk profiles of different enterprises and production cycles.

Analytical assessment of financial performance risks allows for timely identification of critical areas in the cost structure, production processes and use of wine materials, which directly affects the quality of the final product, employment stability and the ability of enterprises to invest in the development of wine-growing regions.

The creation of such a methodology is necessary in order to increase the validity of management decisions, optimize costs, improve the strategic planning system and form a sustainable model for the development of wine-growing enterprises. An integral risk criterion will provide the possibility of more accurate forecasting of the dynamics of financial performance, strengthening the management control system and the adaptability of the industry to external and internal challenges.

Quantitative risk assessment is a tool for transforming financial results into social effects, in particular, improving product quality and the level of satisfaction of consumer needs.

The risk assessment of the dynamics of financial performance of grape growing by enterprises of Ukraine was carried out on the basis of determining an integral complex criterion, which is a function of local indicators

$$Ivg\_risk = f(Iv(1), Iv(2), Iv(3), Iv(4), Iv(5), Iv(6), Iv(7)), \quad (1)$$

where *Iv(1)* – growth in the total area of vineyards, thousand hectares; *Iv(2)* – growth in gross harvest (from the total area), thousand tons; *Iv(3)* – share of short-term bank loans in current liabilities and collateral of grape growing enterprises; *Iv(4)* – share of current payables in current liabilities and collateral of grape growing enterprises; *Iv(5)* – ratio of financial result to equity of grape growing enterprises; *Iv(6)* – ratio of financial result to short-term bank loans of grape growing enterprises; *Iv(7)* – profitability of grape growing enterprises; *Ivg_risk* – integral risk criterion of the dynamics of financial performance of grape growing enterprises in Ukraine.

The dynamics of the total area under vineyards was estimated based on the growth indicator of the area size of the current period in relation to the area of the previous period. By analogy, the increase in the gross grape harvest is defined.

Wine companies develop their own strategies to maximize value creation, through which they can increase customer satisfaction and profit figures [16]. Value creation refers to the process of generating new and innovative ideas (e. g., wine tourism [17], tastings [18], etc.) that can help wine companies increase their revenue, reduce costs, and improve their reputation among customers, shareholders, or stakeholders [19, 20].

Value creation [21] can be challenging for wine companies, especially in today's fast-changing environment. Wine companies must balance short-term and long-term goals to focus on meeting their immediate needs while responding to the market and developing long-term strategies [22].

The share of short-term bank loans in current liabilities and collateral of enterprises shows the size of short-term debt to banks in the overall debt structure. If this indicator exceeds 0.5 (50% of debt), there is a liquidity risk and the need to renew credit funds. When assessed at a level of 0.2÷0.5 (from 20% to 50% of debt), the debt structure is balanced at an average level of credit use. At a level of less than 0.2, the enterprise has a low level of borrowing and mostly ensures financial stability with its own funds. With a high level of this indicator, it is necessary to control the risk of current solvency and the degree of dependence on bank loans. The share of current payables in current liabilities and collateral of enterprises is a characteristic of the degree of dependence of financing on creditors involved in operating activities (suppliers, customers, etc.). This indicator allows to control the level of current financing through deferred payments to creditors and, if it is excessive (more than 60%), it indicates the risk of dependence on creditors and the presence of violations in payment discipline.

The ratio of financial result to equity of enterprises is the efficiency of invested equity (*ROE*) and assesses the return on income per unit of invested equity. At a low level (below 0.05 or 5%), there is a risk of inefficient use of equity, at values more than 0.20 (20%) there is a high level of return on equity.

The degree of repayment of short-term debts of the bank characterizes the ratio of financial result to short-term loans of the bank. At a value close to 1, there is equality of profits and bank loans, which requires control over the receipt of profits and short-term loans. At a level <1, there is a risk of unplanned repayment of loan funds.

Local risk indicators are normalized in accordance with the strategy of reducing the aggregate risk: indicators are minimized if it is necessary to reduce their values; indicators are maximized if it is necessary to increase their values

$$Iv(i)_{j\ \min_{nor}} = \frac{Iv(i)_{\max} - Iv(i)_j}{Iv(i)_{\max} - Iv(i)_{\min}},\ Iv(i)_{j\ \max nor} =$$

$$= \frac{Iv(i)_j - Iv(i)_{\min}}{Iv(i)_{\max} - Iv(i)_{\min}}, \quad (2)$$

where $Iv(i)_{j\ \min_{nor}}$ – normalized value by the minimum level of the *i*-th local indicator by the *j*-th period; $Iv(i)_{j\ \max_{nor}}$ – normalized value by the maximum level of the *i*-th local indicator by the *j*-th period; $Iv(i)_{max}$ – maximum value of the *i*-th local indicator; $Iv(i)_{min}$ – minimum value of the *i*-th local indicator; $Iv(i)_j$ – current value of the *i*-th local indicator by the *j*-th period.

The integral risk criterion of the dynamics of financial performance of grape growing by enterprises of Ukraine (*Ivg_risk*) is determined by a 5-level scale: level 1 – minimum risk, level 2 – between average and minimum risk, level 3 – average risk, level 4 – between average and high risk, level 5 – risk. *Ivg_risk* is determined by formulas (3), (4) based on the intermediate evaluation criterion Ivg_j:

$$\mathrm{Ivg_j} = \sum_{\mathrm{j=1}}^{\mathrm{m}} \mathrm{Iv(i)}_{\mathrm{j\ max_{nor}/min_{nor}}}, \quad (3)$$

$$Ivg\_risk_j = 1 + \frac{4 \cdot \left(Ivg_{\max j} - Ivg_j\right)}{\left(Ivg_{\max j} - Ivg_{\min j}\right)}, \quad (4)$$

where Ivg_j – intermediate evaluation criterion, which is equal to the sum of the normalized values of local indicators maximized/minimized depending on the need to evaluate the indicator; $Iv(i)_{j\ \max_{nor}/\min_{nor}}$ – normalized value at the maximum/minimum level of the *i*-th local indicator for the *j*-th period; $Ivg_{max\,j}$ – maximum value of the *i*-th intermediate evaluation criterion; $Ivg_{min\,j}$ – minimum value of the *i*-th intermediate evaluation criterion; Ivg_risk_j – integral risk criterion of the dynamics of financial performance of grape growing enterprises in Ukraine for the *j*-th period.

3.2. Determination of risk criteria for financial performance in winemaking

The activities of an enterprise are always associated with various risks that have varying degrees of impact on the overall results of its work. Risks that accompany the financial activities of the enterprise

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and arise in the external and internal environments constitute a special group of financial risks and play the most key role in the overall risk portfolio of the enterprise [23].

Determining the risk criteria of financial performance is necessary for the formation of a risk-oriented management system that ensures increased stability of wine-making enterprises in a dynamic market environment. Clearly structured criteria allow:

– to assess the impact of individual risk groups on financial indicators;
– to form a system of early warning of negative changes;
– to optimize the production and marketing strategies of the enterprise;
– to increase the reliability of analytical models for predicting financial results;
– to ensure effective resource and investment policy based on quantitatively measured risk indicators.

Determining the risk criteria of financial performance in wine-making is a key prerequisite for the development of modern analytical methods and management systems aimed at reducing uncertainty and increasing the stability of the activities of wine-making enterprises.

The results of calculations and input data for calculating the risk profile of the dynamics of financial performance of grape growing enterprises in Ukraine are given in Table 1.

Using this methodology, an assessment of the risk profile of the dynamics of financial performance of grape wine production by Ukrainian enterprises was carried out. The main local assessment indicators were determined as:

I(1) – share of the volume of produced wine materials for champagne and sparkling wines in the total volume, %;

I(2) – share of the volume of produced wine materials for cognac drinks in the total volume, %;

I(3) – share of the volume of produced wine materials for table wines in the total volume, %;

I(4) – share of the volume of processed grapes for wine materials from own raw materials in the total volume of processed grapes, %;

I(5) – share of the volume of processed grapes for wine materials from purchased raw materials in the total volume of processed grapes, %;

I(6) – average mass concentration of sugars in grapes, g/dm^3;

I(7) – deviation of the purchase price for 1 ton from the average expected one, USD;

I(8) – ratio of the share of short-term bank loans in current liabilities and collateral of enterprises producing grape wines;

I(9) – ratio of the share of current payables in current liabilities and collateral of enterprises producing grape wines;

I(10) – ratio of the ratio of financial result to equity of enterprises producing grape wines;

I(11) – ratio of the ratio of financial result to short-term bank loans for the production of grape wines;

I(12) – profitability of enterprises producing grape wines;

Irisk_1 – integral risk criterion of the dynamics of financial performance of grape wine production by enterprises of Ukraine under the condition of minimizing the share of the volume of processed grapes for wine materials from purchased raw materials in the total volume of processed grapes;

Irisk_2 – integral risk criterion of the dynamics of financial performance of grape wine production by enterprises of Ukraine under the condition of maximizing the share of the volume of processed grapes for wine materials from purchased raw materials in the total volume of processed grapes.

Table 1

Data for calculating the risk profile of the dynamics of financial performance of grape growing enterprises in Ukraine

No	Indicator	On average across Ukrainian enterprises for the period 2017–2023	Min	Max	Max–Min
Data for calculating the risk profile of the dynamics of financial performance of grape growing enterprises in Ukraine					
1	Total area of vineyards, thousand hectares	37.4	27.5	43.5	16.0
2	Gross harvest (from total area), thousand tons	327.3	244.9	467.6	222.7
3	Costs for grape growing, thousand USD	37889	30848.7	47960.4	17111.6
4	Financial result (balance) before taxation of grape growing enterprises, thousand USD	3663	–3865.4	15458.0	19323.4
5	Equity of grape growing enterprises, thousand USD	77921	71976.5	94853.6	22877.1
6	Current liabilities and collateral of grape growing enterprises, thousand USD	42461	38711.3	47956.5	9245.2
7	Short-term bank loans of grape growing enterprises, thousand USD	3488.1	1340.2	4942.5	3602.3
8	Current accounts payable of grape growing enterprises, thousand USD	19293.0	14413.0	25010.2	10597.2
Local risk profile assessment indices of the dynamics of financial performance of grape growing enterprises in Ukraine					
9	Increase in total area of vineyards, thousand hectares *Iv(1)*	0.9	0.8	1.0	0.2
10	Increase in gross harvest (from total area), thousand tons *Iv(2)*	0.9	0.8	1.1	0.4
11	Share of short-term bank loans in current liabilities and collateral of grape growing enterprises *Iv(3)*	0.1	0.0	0.1	0.1
12	Share of current payables in current liabilities and collateral of grape growing enterprises *Iv(4)*	0.5	0.3	0.5	0.2
13	Ratio of financial result to equity of grape growing enterprises *Iv(5)*	0.0	–0.1	0.2	0.2
14	Ratio of financial result to short-term bank loans for grape growing enterprises *Iv(6)*	2.0	–0.8	11.5	12.3
15	Profitability of grape growing enterprises *Iv(7)*	0.1	–0.1	0.4	0.5

Note: conversion into USD was carried out at the weighted average annual exchange rate of hryvnia to USD, determined on the basis of official data of the National Bank of Ukraine, which ensures comparability of results for an international audience

This assessment provided for 2 main assessments taking into account the minimum level and maximum levels of the volumes of purchased wine materials. For both cases, the results are emphasized with the allocation of the raw material base of own production and through the formation of stable relations with suppliers of grapes from outside. The results of calculations of risk criteria for grape and grape wine production are given in Table 2.

Within the framework of the assessment, it was found that 2019 was the most critical year in terms of the risk level, while 2023 was characterized by an approach to the average risk values with a tendency to increase. The risk analysis of wine production at the enterprise was carried out taking into account the sensitivity of the cost indicator and the cost structure for four subdivisions of the formation of wine materials of a certain variety, which made it possible to determine the average value of the integral risk for each stage of the technological process.

Quantitative assessment of financial performance risks is considered as a tool for ensuring a socially responsible model of the winemaking business, since the financial stability of enterprises is a necessary condition for employment stability, maintaining product quality and meeting consumer needs.

3.3. Analytical assessment of the average risk of using wine materials in the production of grape wine by a winemaking enterprise

Traditional methods of assessing financial risks are based on assumptions about the stability of market conditions and the rationality of market participants. Systematic deviations from rational behavior lead to inaccuracies in forecasting financial risks. Analytical models for assessing financial risks open up new opportunities for increasing the accuracy of forecasting and improving the quality of risk management [24].

Analytical assessment of the average risk of using wine materials is a key tool for ensuring financial stability and operational efficiency of a winemaking enterprise. Wine materials form the basis of the production process and are one of the most resource-intensive elements of the cost, and its qualitative and quantitative characteristics directly affect the economic results of the enterprise. Due to the significant dependence on natural and climatic conditions, technological parameters of processing and fluctuations in market prices for wine materials, the level of risk of their use is heterogeneous and requires a comprehensive analysis.

Assessment of the average risk allows to determine the degree of variability of the main indicators of the use of wine materials, in particular, product yield, cost, losses in the production process and wine quality. Such an assessment creates a basis for identifying the most vulnerable stages of the technological cycle, where risks can cause the greatest financial deviations. Determining the average risk value also provides the opportunity to compare different grape varieties, technological approaches and production batches, forming a more accurate cost management system and ensuring production profitability. At the micro level, the determination of the integral risk criterion is determined by the technological components of the production process, which takes place within 4 redistributions – stages of the internal supply chain from receiving raw materials to processing them into a finished product (grape wine). In this case, it is advisable to assess the risk of processing specific grape varieties with the appropriate level of costs. The calculation method is similar to the assessment of the integral risk criterion of the dynamics of financial performance of grape wine production. The source of risk in this case is the wine material of the corresponding variety at the appropriate stage (redistribution) of production. Taking risks at all stages according to the average criterion makes it possible to obtain an average risk indicator for the entire production process. The first redistribution is the stage of grape processing and the primary production process, where control over the level of cost and the quantity of processed products is crucial. The second subdivision covers the processes of storage, care and technological processing of wine materials. The third subdivision covers the processes of long-term aging of wine materials and their technological processing. The fourth subdivision covers the process of final production of finished wine for bottling. The main local risk assessment indicators selected are:

S_vg(ip) – cost price of 1 dal of grapes, USD, (*i*-th division);

Vip_vg(ip) – quantity of finished product output, dal, (*i*-th division);

AM_oz(ip) – fixed assets depreciation in the structure of general production costs, %, (*i*-th division);

Opl(ip) – labor costs in the structure of general production costs, %;

Vit_noa(ip) – costs of maintenance, operation of non-current assets of general production purpose in the structure of general production costs, %, (*i*-th division);

Zag_v(ip) – other general production costs in the structure of general production costs, %, (*i*-th division);

Zag_mat(ip) – direct material production costs except for returnable waste per 1 dal of output, USD, (*i*-th division);

$Irisk\_vin\_opt\_p(ip)_j$ – integral risk criterion of using the *j*-th variety of wine material in the process of producing grape wine of the *i*-th division at the winery;

$Irisk\_vin\_opt\_sr_j$ – average integral risk criterion of using the *j*-th variety of wine material in the process of producing grape wine at the winery.

Table 2

Results of calculations of risk criteria for grape and grape wine production of Ukrainian enterprises for the period 2017–2023

Year	*Ivg_risk*	Risk level	*Irisk_1*	Risk level	*Irisk_2*	Risk level
2017	1.00	minimum risk	2.90	average risk	1.00	minimum risk
2018	2.76	average risk	2.03	between minimum and average risk	2.28	average risk
2019	3.80	between average and maximum risk	5.00	maximum risk	5.00	maximum risk
2020	4.99	between average and maximum risk	3.05	average risk	3.35	average risk
2021	3.17	average risk	2.23	between minimum and average risk	3.84	between average and maximum risk
2022	5.00	between average and maximum risk	2.26	between minimum and average risk	2.71	average risk
2023	4.41	maximum risk	1.00	minimum risk	2.24	average risk

Note: ▭ – maximum value

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The assessment of the average integral risk criterion of using wine material in the process of producing grape wine at the winery is given in Fig. 1.

Fig. 1 presents the integral criterion of average risk of wine materials in terms of grape varieties. However, it is advisable to note that the obtained value for the enterprise 3.31 is an indicator of an average risk level, which requires targeted strengthening of control. It does not signal critical deviations, but indicates the need to optimize individual stages of production in order to reduce the likelihood of defects and ensure stable quality of wine materials.

The analysis of the levels of the integral criterion of average risk of using wine materials in the process of grape wine production at a winery is summarized in Table 3.

The analysis of risk levels showed that the following varieties of wine material have the greatest risk according to the main cost indicators (Table 3): Cabernet 2024 and Rkatsiteli 2024. The Alibernet 2024 wine material is characterized by minimal risk of the processing process. The Merlot 2024 wine material is at the average level of assessment. Other varieties of wine material are at intermediate risk assessments and can, with appropriate control adjustments, be moved to the average or minimal risk group.

Due to the high degree of dynamism and the process of globalization of the world economy, wineries are forced to intensify their efforts to withstand competition. Accordingly, they have an increasing emphasis on value creation, as consumers are becoming increasingly interested in quality wines, developing new products and services to attract a wider audience, taking into account risks and meeting the growing requirements for wineries.

The research is of an applied nature and can be used to make appropriate management decisions in the system of financial and economic management of wine and wine enterprises. The proposed methodology for forming an integral risk criterion for the dynamics of financial performance provides systematic identification and quantitative assessment of risks at all stages of the value chain – from grape growing to the use of wine materials in wine production.

The practical use of local risk indicators allows to:

– form a risk profile of the enterprise's activities in time dynamics;

– identify critical factors that cause deterioration in financial performance;

– compare the level of risk between individual types of products, production cycles and periods;

– support decision-making on optimizing the cost structure, volumes of wine material processing, production programs and behavior strategies under different market scenarios.

The scope of application of the methodology is not limited to wineries. It can be adapted for agricultural production with a long operating cycle and increased uncertainty of financial results, as well as for the purposes of internal audit, controlling, risk management and strategic planning.

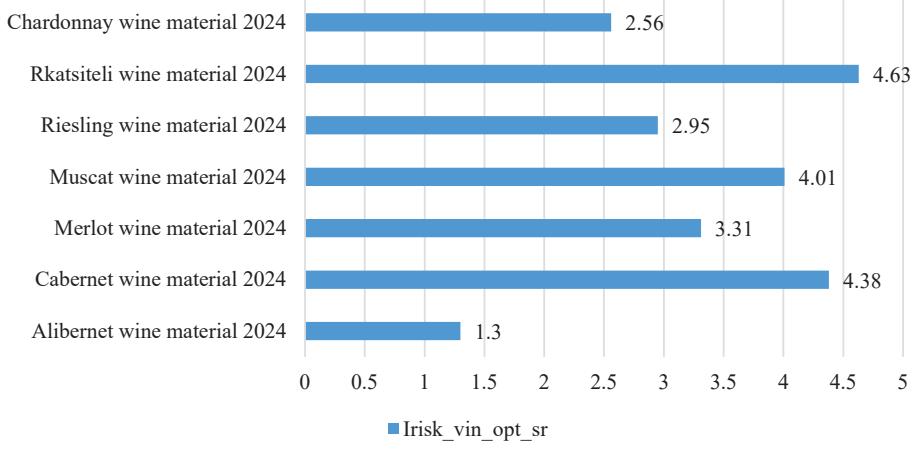

Fig. 1. Assessment of the integral criterion of average risk of using wine materials in the process of grape wine production at a winery (formed by the author based on the data of the studied enterprise)

Table 3

Table of analysis of levels of the integral criterion of average risk of using wine material in the process of grape wine production at a winery

No	Alibernet wine material 2024	*Irisk_vin_opt_1p*	*Irisk_vin_opt_2p*	*Irisk_vin_opt_3p*	*Irisk_vin_opt_4p*	*Irisk_vin_opt_sr*
1	Cabernet wine material 2024	minimum risk	minimum risk	between minimum and average risk	minimum risk	minimum risk
2	Merlot wine material 2024	average risk	maximum risk	maximum risk	maximum risk	maximum risk
3	Muscat wine material 2024	average risk	average risk	maximum risk	average risk	average risk
4	Riesling wine material 2024	average risk	between average and maximum risk	maximum risk	between average and maximum risk	between average and maximum risk
5	Rkatsiteli wine material 2024	average risk	between minimum and average risk	between average and maximum risk	between minimum and average risk	average risk
6	Chardonnay wine material 2024	maximum risk	maximum risk	between average and maximum risk	maximum risk	maximum risk
7	Alibernet wine material 2024	average risk	between average and maximum risk	minimum risk	average risk	between minimum and average risk

Notes: formed by the author based on research into the wine production process at a winery; ▮ – maximum value; ▮ – average value; ▮ – minimum value

The proposed methodology for risk-based analytical assessment is based on statistical data of Ukrainian enterprises for 2017–2023, which makes the results dependent on the completeness, quality and comparability of the information base. Another limitation is that this methodology primarily records the financial and economic risks of the production process and does not fully take into account non-financial factors. Non-financial factors include climate fluctuations, soil degradation, seasonality, investment duration of the biological cycle, fluctuations in energy prices, changes in market demand and competition. For practical implementation of the obtained results, enterprises need to adapt the model parameters to their own cost structure, technological features and internal risk management policies.

Further research should be directed at improving the methodology by testing it on a sample of enterprises from different regions and combining risk-based assessment with indicators of sustainability and long-term efficiency of winemaking enterprises. The development of the methodology in the direction of digital automation of calculations and visualization of the risk profile will create the prerequisites for its integration into corporate information and analytical systems and will improve the quality of management decision-making.

4. Conclusions

1. The conceptual principles and structure of the methodology for risk-oriented analysis of the financial performance of wine-making enterprises, based on a system of local normalized indicators and integral risk criteria, are substantiated. The proposed architecture of the methodology ensures the consistency of the formation of the information base, risk assessment and management decision-making within a single analytical space.

2. The system of risk criteria for the financial performance of wine-making enterprises, applied at the industry and micro levels, is defined.

The risk assessment was carried out at two levels: at the level of use of grape varieties in Ukraine, at the enterprise level. The information base of the assessment was accounting indicators – risk indicators, determined on the basis of financial reporting and results of the enterprises' activities in the relevant regulatory period of time (years).

3. An analytical assessment of the average risk of using wine material in the production of grape wine was carried out on the basis of an integral criterion formed by a five-level risk scale. It was established that the most critical year was 2019, while in 2023 there was an approach to the average risk level. The risk assessment of wine production at the level of an individual enterprise took into account the criticality of the cost indicator and the cost structure in the context of four subdivisions of the production of wine materials of a specific variety with the calculation of the average risk value.

It is proven that the proposed risk-oriented approach has a pronounced socio-economic effect, as it ensures the transformation of the results of analytical risk assessment into substantiated management decisions aimed at increasing the financial stability of enterprises, preserving the quality of wine products and reducing social risks in grape and wine-growing regions. Financial performance and risk control form the basis for implementing the principles of social responsibility of the wine business and improving the quality of life of consumers.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

Manuscript has no associated data.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current paper.

Authors' contributions

Uliana Marchuk: Conceptualization, Methodology, Formal analysis, Writing – original draft, Visualization, Supervision, Project administration; ***Liubov Gutsalenko:*** Methodology, Writing – review and editing, Formal analysis, Resources; ***Mykola Bondar:*** Validation, Formal analysis, Investigation; ***Mariia Gumenna-Derii:*** Writing – review and editing, Visualization, Supervision; ***Nataliia Tsaruk:*** Resources, Project administration, Methodology.

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