METHODOLOGY FOR ANALYSIS OF THE FINANCIAL CONDITION OF AGRICULTURAL ENTERPRISES AND WAYS OF ITS ENHANCEMENT

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Abstract. The *purpose* of the article is to form the main directions of improving the financial condition of the business entity in modern conditions. *Methodology*. Methods of theoretical generalization and concretization, Internet resources have been used in this study. *Results*. Groups of users of information concerning the financial condition of the enterprise are selected. The first group includes creditors, investors, competitors, regulators, and other users, and the second – the company's management, economic and other interested internal services, shareholders, etc. For each of these users, certain selected metrics are important. A technique for determining the significance of indicators for a particular group of users, which involves the use of economic and mathematical methods and models, is developed. In order to make certain management decisions, the analysis should be carried out according to the indicators required by the management and, accordingly, will be implemented in the management practice of Khmilnytske LLC. The sequence of assessment of the financial condition by economic and mathematical methods is determined. Having chosen the direction of research of indicators and having carried out their corresponding calculations, it is possible to carry out the analysis of factors of influence on the financial position of the investigated business entity and to calculate reserves of its improvement. To do this, it is advisable to use the procedures of correlation and regression analysis. The content of these procedures is to determine the impact on the financial condition of each of the elements of the formulas of coefficients or other indicators. A set of factors influencing the formation of economic strategy of agricultural enterprises is divided into two groups, namely exogenous and endogenous. The leading system ensuring the enterprise solvency has been developed. Software for the financial condition analysis at the enterprise is proved. *Practical implications*. The developed system takes into account the available initial data (financial statements and software) and significantly reduces the cost of working time for analysis, which speeds up the management decision-making process and allows you to respond quickly to changes in asset structure to improve efficiency and improve business subject efficiency. *Value/originality*. The developed model of the analysis of a financial condition with the use of economic and mathematical methods which is sufficiently adapted for automation will provide, provided its introduction in analytical practice, a high level of optimality of operative administrative decisions, and also will increase the efficiency of agricultural enterprises.

Key words: analysis, financial condition, agricultural enterprises, information users, indicators, economic and mathematical methods.

JEL Classification: C15, C50, C88

1. Introduction

In today's market economy, the relevance and ffectiveness of management decisions at the micro and macro levels mainly depends on the results of the analysis of the financial condition of the entity, which calculates not only individual ratios and studies a set of indicators, but also reflects various aspects of financial activity. The not very stable development of the economy creates a need for every business entity to be in constant search of ways to improve and increase the efficiency of its activities. So the study of financial activities of economic entities is becoming especially popular.

The instability of the market economy necessitates a high-quality and timely assessment of the financial condition of the entity, its liquidity, solvency, business activity. This will help to determine the competitive advantages and production potential, which will

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contribute to the formation of an effective set of measures aimed at consolidating the leading position of the business entity in the market and ensuring its financial stability. At the same time, there is a need for objective information on these issues, the provision of which is impossible without a perfect method of analysis and quality information base. After all, the financial condition is the most important generalizing characteristic of the efficiency of the enterprise, the quality of management, placement, and use of financial, material, and labor resources. Therefore, the study and systematization of scientific and practical methods of stabilizing the financial condition of agricultural enterprises is an important issue of modern theory and practice.

2. Research results

In domestic and foreign economic literature, economic and mathematical methods of analysis of economic activity are widely considered. The justification of their use is also the statement of the founders of the theory of economic analysis M. Bakanova and A. Sheremet, who believe that the widespread use of mathematical methods is an important way to improve economic analysis (Bakanov, Sheremet, 1993) because their use reduces the time of analysis, more full coverage of the impact of factors on business results, replacement of approximate or simplified calculations with accurate calculations, formulation and solution of new multidimensional analysis problems, which is almost unattainable when performing traditional manual methods. To determine the methodology that best meets the requirements of the modern functioning of agricultural enterprises, it is necessary to consider its stages (Figure 1).

From Figure 1 it is seen that at the first stage the classification of indicators of assessment of financial condition depending on users is carried out. It is important to determine the circle of these users and to group them accordingly. In our opinion, all users can be divided into two main groups: external and internal.

The first group includes creditors, investors, competitors, regulators, and other users, and the second – the company's management, economic and other interested internal services, shareholders, etc. (Figure 2).

For each of these users, certain selected metrics are important.

For example, creditors need to consider the following objective indicators to assess the financial condition of the borrower:
– sales volume;
– profits and losses;
– profitability;
– turnover on accounts;
– solvency;
– liquidity;
– financial stability;
– the dynamics of repayment of the borrower's credit debt in the past.

To determine the significance (weight) of indicators for a particular group of users, it is advisable to use our methodology.

Its essence is as follows:
– in order to make certain management decisions, the analysis should be carried out according to the indicators required by the management and, accordingly, will be implemented in the management practice of Khmilnytske LLC. The following groups of evaluations by thematic subdivisions were selected by the specified users:
– balance sheet asset analysis (inventory turnover ratio, receivables turnover ratio);
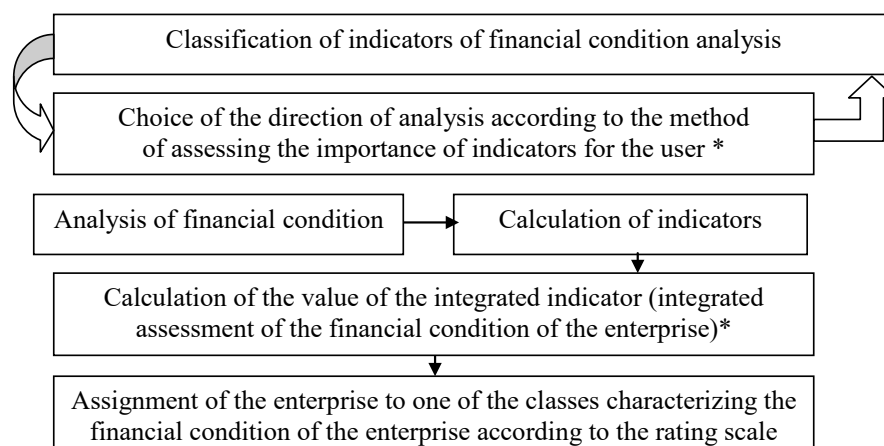– analysis of liabilities of the balance sheet (turnover ratio of accounts payable);

Figure 1. The structure of the method of analysis of the financial condition

Source: stages of analysis carried out according to the method developed by the author
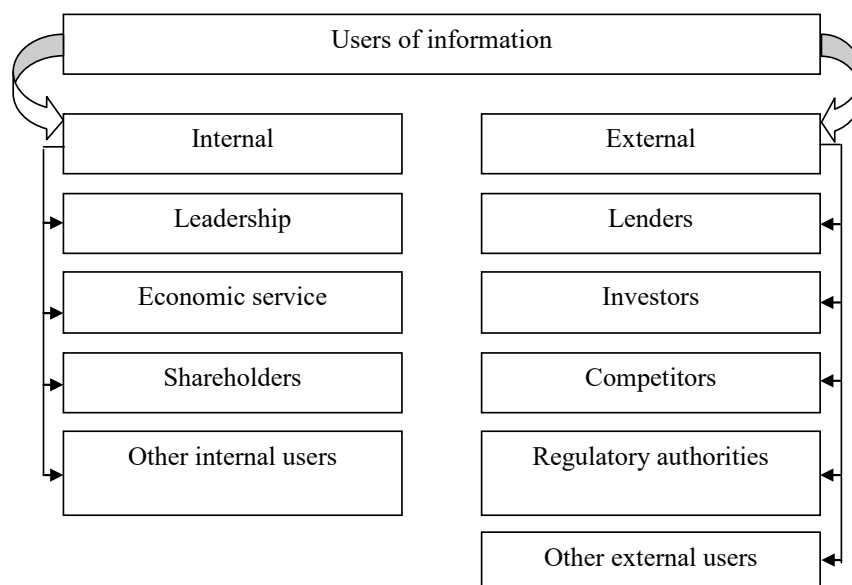
Figure 2. Groups of users of information about the financial condition of the enterprise

Source: (Bagatska, Govorushko, Sheremet, 2013; Mazur, Tomchuk, Branitsky, 2017)

– assessment of the liquidity of the enterprise (coverage ratio, quick liquidity ratio, absolute liquidity ratio);
– assessment of long-term solvency (equity concentration ratio, loan capital concentration ratio, loan-to-equity ratio, loan security ratio);
– assessment of profitability (return on sales, asset turnover ratio, return on assets, return on capital, profitability).

For clarity, we summarize these indicators in the auxiliary table, indicating their theoretical and weight values (Table 1).

Table 1
The system of indicators and their theoretical and weight value

Indicators	Theoretical significance	Weight value
Inventory turnover ratio	unlimited	1
Receivables turnover ratio	unlimited	1
Accounts payable turnover ratio	unlimited	1
Coverage ratio	1-2	1
Rapid liquidity ratio	not less than 0.5	1
Absolute liquidity ratio	not less than 0,2	1
Equity concentration ratio	more than 0-1	2
Debt capital concentration ratio	more than 0-1	2
Loan collateral ratio	more than 1,5	1
Profitability of sales	more than 0,03	3
Asset turnover ratio	more than 0,01	3
Return on assets	more than 0,03	2
Return on capital	more than 0,04	2
Profitability	more than 0,04	2

Source: suggested by the author

It should be noted that in Ukraine there is no single approach to the theoretical values of these coefficients and their weight values. That is why the author's establishment of their limits (Table 1) is quite debatable, because these values of coefficients can be changed depending on the general level of economic development, and for critical (marginal) values, then here scientists must reach unquestionable consistency.

In this case, there is a balanced and sound approach developed by domestic economists, which is usually quite well adapted and easily transformed in accordance with modern forms of reporting, as it was developed taking into account the international experience of financial reporting analysis.

The calculation of coefficients, in our opinion, logically fits into the model of economic and mathematical analysis proposed by us for application in the analytical practice of domestic enterprises, because by establishing weight values based on them you can calculate the integrated indicator of financial condition and assign a research enterprise to a certain group (class: A, B, C, D, E – according to the following method).

The proposed method of assessing the significance of analytical indicators of the

financial condition of agricultural enterprises depending on the users of analytical information involves the use of economic and mathematical methods and models. Since, in our opinion, it is not enough to limit oneself to the simplest and least reliable methods and techniques to solve the problems of improving the financial condition, it is more expedient to use more accurate and reliable results

of financial condition assessment and its elements determined by the above methods.

The methodology of traditional expert-analytical assessment of financial condition, its elements and factors influencing it can be significantly supplemented and improved through the use of statistical material collected for previous periods, and appropriate mathematical models to analyze the objectivity and accuracy of expert assessments, to give additional information concerning the factors influencing the determination of the level of financial condition.

To ensure the correct choice of the direction of analytical calculations required for a particular group of users, from a number of indicators grouped by user needs, it is necessary to form an analytical table on alternative grounds and use Chuprov's coefficient for calculations (C_{ch}). The method of filling in the tables and calculating Chuprov's coefficients is covered in detail in the scientific literature, but the most suitable for use in the analysis of the financial condition, in particular, to our proposed method is the method described by V. Horkavyi (Horkavyi, 2012).

The Chuprov's mutual coupling coefficient is calculated by the following formula:

$$C_{ch} = \sqrt{\frac{F^2}{\sqrt{(N_1-1)(N_2-1)}}} \qquad (1)$$

where F is the indicator of mutual connection;
N_1 – the number of selected indicators;
N_2 – number of assessment levels.

Scientists recommend that if the value is $C_{ch} > 0,3$ the relationship of indicators can be considered close. However, in the case of financial analysis, when the number of indicators recommended for calculation is extremely large, this critical value is overestimated. In our opinion, even the result of 0,05-0,1 can be considered as indicating a close relationship between the studied indicators.

The next step in the analysis of financial condition in accordance with the proposed method is to determine the adequacy of expert assessments of the importance of calculated indicators for a particular user by applying the rank correlation coefficient (C_c), which in the scientific literature is also called Spearman's coefficient. To this end, it is recommended to set the following pairs of numeric series:

1. A number of ratios selected in accordance with the needs of the user of information about the financial condition of the studied entity (according to a specially developed classification).

2. A number of coefficients arranged in descending order user interest in calculating this particular ratio.

Thus for calculation of the coefficient of a mutual combination of indicators, it is expedient to use the possibility of carrying out such calculations in an automated way, forming the special initial table that will give the chance to estimate really weight of the analyzed indicators on the basis of practical material.

To calculate Spearman's rank correlation coefficient, a number of selected coefficients should be arranged in the order corresponding to the classification, or in other words, in the order of decreasing their significance for the user. Each coefficient, which is in the numerical series in the i-th place, corresponds to the rank of $X_i=i$. In the second column of the developed analytical table, the same indicators are arranged in descending order user interest in their calculation. Each value in this series is assigned the rank Y_i (the index is equal to the ordinal number of the corresponding coefficient sorted in the first row of numbers).

The next step in the study is to determine the sum of the squares of the differences between the respective ranks X_i and Y_i.

After that, you can calculate the Spearman's rank correlation coefficient, which is done using the following formula:

$$C_c = 1 - \frac{6\sum D_i^2}{n(n^2-n)}, \qquad (2)$$

where D_i is the square of the differences between the respective ranks X_i and Y_i;
n – the number of indicators of the numerical series.

Since the rank correlation coefficient varies from -1 (full inverse correlation of ranks) to +1 (full correspondence or full direct correlation), by dividing (grouping) the boundaries, it is possible to identify the necessary areas of financial performance for a certain range of users.

Having chosen the direction of research of indicators and having carried out their corresponding calculations, it is possible to carry out the analysis of factors of influence on the financial position of the investigated business entity and to calculate reserves of its improvement.

To do this, it is advisable to use the procedures of correlation and regression analysis. The content of these procedures is to determine the impact on the financial condition of each of the elements of the formulas of coefficients or other indicators.

To simplify the calculations, it is advisable to use an integrated indicator of financial condition, calculated taking into account the absolute actual estimate of each i-th value of the weight of the corresponding coefficient. In order to obtain preliminary actual estimates of the value for the user by the information of each specific coefficient, it is necessary to compile special tables in which to group the estimates according to the previously established limit values.

For example, to divide (classify) enterprises depending on the value of the integrated indicator of financial condition (Table 2).

We tend to think that experience is useful in this case the banking classification system, namely:

Table 2
Rating scale

The value of the integrated indicator	Enterprise class
more than 40,07	A
from 30,55 to 40,06	B
from 20,65 to 30,54	C
from 10,59 to 20,64	D
less than 10,58	E

Source: suggested by the author

– class A – an enterprise with an extremely stable financial condition;
– class B – an enterprise with a stable financial condition;
– class B – an enterprise with signs of financial stress;
– class D – high-risk enterprise;
– class E – an enterprise with unsatisfactory financial condition.

The weight values of the coefficients are determined taking into account the importance of the factors that affect the overall assessment of the financial condition, and to determine the value of the integrated assessment of the values of the coefficients should be multiplied by their weight value.

The level of the integrated indicator should be calculated by the following formula:

$$I_n = \sum_{i=1}^{n} AE(i) \times C_f(i) \qquad (3)$$

where $AE(i)$ – is the absolute actual estimate of the *i*-th indicator (coefficient) of financial condition;

$C_f(i)$ – weight value of the *i*-th indicator (coefficient) of financial condition;

n – the number of indicators to assess the financial condition.

It should be noted that in this case, we abstract from many other subjective factors, but their impact can be significant and therefore in the analysis of financial condition can be used an additional factor to overcome the error of undiscovered factors, which can be established only experimentally.

The application of mathematical methods in the analysis of financial conditions will have a particularly high effect, provided the following conditions.

First, it is important to ensure a systematic, consistent approach to the study and assessment of financial condition, taking into account the relationship between the studied indicators, as well as the subjective factors of its formation.

Second, from the methods recommended by various scientists, it is necessary to choose one that would reflect the quantitative characteristics of economic processes and meet the objectives of the analysis of the financial condition.

Third, the modern information base, adapted to international standards, despite a number of advantages, requires further improvement.

Fourth, the availability of computer technology is a necessary condition for economic and mathematical calculations. And the last condition, which is an objective result of all the previous ones, is the need to ensure the appropriate professional level of analysts, specialists in economic and mathematical modeling, programmers, etc.

In modern conditions, when approaching the organization of economic analysis in general, it is necessary to skillfully use modern economic and mathematical research methods.

S. Shkaraban notes in this regard that at the present stage economic management is impossible without the implementation of economic methods, the effectiveness of which is possible only with a deep and comprehensive analysis of the use of all available resources of production, condition, and changes in property, identification of causal links and patterns of economic development (Shkaraban, 1997).

In our opinion, the methods of financial condition analysis recommended by various authors, which are based on the use of economic and mathematical methods, should not focus on evaluation functions, as it was in the conditions of centralized management, but on strengthening the diagnostic and search value of calculated indicators. Accordingly, the methodology of financial condition analysis should be refocused on a deep and comprehensive study of new phenomena and factors, as well as their interaction and impact on the end result.

The method described by the author in practice is manifested in the form of an algorithm that can be attributed to economic and mathematical methods of analysis of the financial condition, and the use of actual data LLC "Khmilnytske" will illustrate the application of the method in dynamics.

The first stage of the study according to the proposed algorithm is to choose the direction of the study (choice of indicators) according to user requirements.

It is possible in two ways: the first concerns the manual method of analysis, and the second – automated. In the first case, the user is asked from the general list of calculation indicators (classification of indicators of financial condition depending on their value for the user) to select those that are most interesting to the customer analysis (specific user) and calculate them (note that this option is easy to automate). The second solution of the analytical problem is much more difficult because it involves the use of economic and mathematical method to determine both the direction of the study and all subsequent calculations.

In this case, the solution of the analytical problem allows you to take into account the relationship between indicators, to track their dynamics, as well as changes in the requirements of the same user over the years.

We think that the method of assessing the financial condition by economic and mathematical methods,

taking into account estimates of the importance (value) of indicators that affect its integrated indicator, can be illustrated in the following sequence:

1. Collection and systematization of data (including statistical) on the results of integrated assessment of the financial condition and its elements (the period is chosen either by the customer of the analysis or by the analyst independently depending on the needs of management).

2. Calculation of Chuprov's ratios (C_{ch}) for each factor of influence on the overall integrated assessment of the financial condition.

3. Calculation of Spearman's rank correlation coefficient (Cc).

4. Carrying out of repeated expert-analytical research of the factors of influence chosen by the user on an integrated estimation of a financial condition.

5. Development of working tables for estimating the value of the integrated assessment of financial condition for further use and formation of analytical conclusions and proposals (Figure 3).

It should be noted that the solution to this analytical problem is possible in two ways: in the traditional order of calculations and in an abbreviated form, which includes a specific approach and opinion of the author on these issues. The choice of path depends on the user's requirements for the efficiency of obtaining settlement data on the assessment of the financial condition.

The list of financial condition ratios can be constantly adjusted, excluding those whose weight is not confirmed by calculations. The list of coefficients can include new ones that are considered significant.

Thus, the proposed method allows to improve the working model of financial condition assessment and increase the accuracy of the results, to choose the most successful direction of calculations in order to obtain an adequate integrated assessment of the financial condition of the enterprise.

In an unstable economy, bankruptcy is a fairly common phenomenon, which is characteristic of agricultural enterprises. In order to avoid it, restore solvency and a sufficient level of financial stability of enterprises, it is necessary to timely diagnose and predict the possibility of a situation close to bankruptcy.

This requires a periodic study of the financial condition of the enterprise, determining the scale of the crisis and studying the main factors that caused it.

Analysis of the financial condition is necessary for each company because its further effective operation is directly related to profitability and the ability to maintain solvency. Assessment of development prospects is necessary not only for the company but also for its business partners. Therefore, the priority is to forecast the future financial and economic condition of the enterprise and illustrate the possibility of predicting the negative impact of negative phenomena on its activities (Tomchuk, Levchuk, 2019).

In this case, information about the financial condition of the enterprise can be the basis for decision-making by various interested users:

1) creditors who are interested in the solvency of the enterprise;

2) the founders of the enterprise, interested in achieving high-end results and receiving the appropriate income by them personally;

3) employees of the enterprise, who are responsible for the efficient use of production resources and the sustainability of all types of enterprise income, etc.

Information on the financial condition is of some interest to foreign investors, tax officials, public administration, and control.
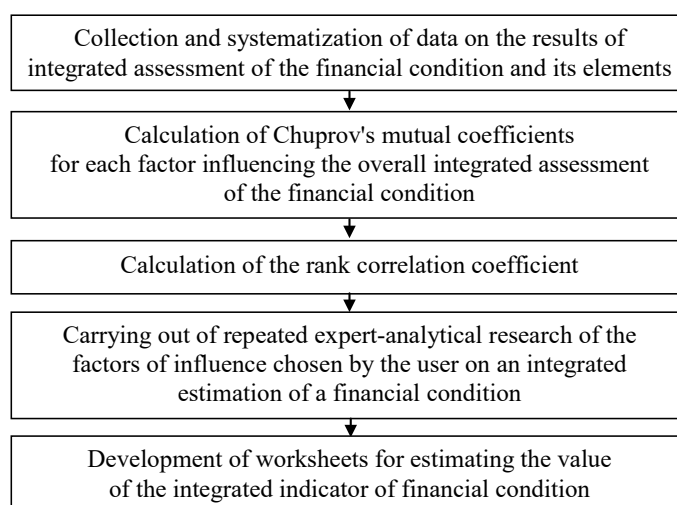

Figure 3. The sequence of assessment of financial condition by economic and mathematical methods

Source: suggested by the author

In our opinion, it is also important for analytical practice in assessing the financial condition of the enterprise to determine the relationship between the individual calculation factors. When identifying these relationships, one can conclude that there are factors that simultaneously affect the magnitude of both (or more) elements. This stage of the analysis is important in order to be able to exclude from the model those factors that duplicate each other and distort the overall integrated assessment of the financial condition.

The simplest and most convenient direction of further analysis, in our opinion, is to use the method of identifying reserves by comparing the best theoretical (or basic) values of the calculated coefficients with those achieved by a particular enterprise. The basis of comparison can be taken by industry averages, the best indicators of the enterprise, which were achieved in other periods, or indicators achieved by advanced agricultural enterprises.

The specified method of calculation of reserves of improvement of a financial condition is convenient and clear and also adapted to automation of analytical calculations that allow influencing quickly and operatively on a course of realization of financial and economic activity for the purpose of receiving the best final results.

Focusing on certain areas of improving the financial situation by improving the efficiency of management, we note that the whole set of factors influencing the formation of the economic strategy of agricultural enterprises can be reduced to two groups: exogenous and endogenous. The relationship between the factors of financial improvement and the mechanism of their management is presented in the form of a diagram (Figure 4) (Tiutiunnyk, Dorohan-Pysarenko, Tiutiunnyk, 2016).

Among the internal factors, an important role belongs to the technical base of production, technology improvement, marketing activities. At the same time, in modern conditions, such socio-economic factors as social competence of managers, professional qualification level of employees, working and health conditions, production ecology should not be neglected.

External factors include the levers of state regulation, tax policy, financial and credit policy, the mechanism of profit distribution. At the same time, in market conditions, the impact on tax policy, financial and credit policy, the mechanism of profit distribution is extremely important. At the same time, in market conditions, the impact on the financial condition and efficiency of management of such factors as market conditions, prices for economic resources, competition, the purchasing power of the population, etc. is extremely important.

Exogenous and endogenous factors together form the appropriate economic environment and indicate possible areas for improvement of the financial condition, and the mechanism of their management makes it possible to form optimal ratios that can affect the efficiency of management.

We believe that no less important reserve for improving the financial situation is the choice of method for assessing the state of solvency on the basis of the information obtained (Figure 5).

After all, only on the basis of the conducted analysis, it is possible to draw qualitative conclusions, to substantiate the efficiency and necessity of these or those administrative decisions.

The choice of valuation method depends on what type of analysis we conduct – financial or managerial. Financial analysis can be performed both internally and externally.

It is focused mainly on the analysis of financial activities and indicators of the financial condition of the enterprise.

Management analysis, in contrast to financial, can only be internal and carried out at a deeper level. It is characterized by full access to accounting and management reporting and provides a qualitative analysis of internal resources and potential of the enterprise, the study of the impact on its activities of certain internal or external factors and the consequences of their impact (Tomchuk, 2019).

The results of management analysis provide senior management with the necessary information to make a final decision.

Further analysis will depend on its main purpose – to identify the factors that led to insolvency, or to assess the consequences of their impact on the company. Depending on the set goal, we choose one of the methods of analysis of the causes and symptoms of insolvency or methods of assessing the depth of the financial crisis.

In order to effectively respond to the threats posed by the onset of insolvency, we have developed a leading system to ensure the solvency of the enterprise. The order of application of this system includes a certain set of management actions and decisions:
– search and processing of information on the state of solvency of the enterprise;
– choice of evaluation method;
– characteristics of the level of solvency and evaluation results;
– selection of measures to improve the level of solvency;
– restoration of lost solvency and further monitoring of solvency.

An interesting approach to expanding variations in determining the degree of liquidity of the enterprise through the use of a modified aggregate approach is presented in the work of I. Oleksandrenko, who proposed five levels of solvency (although traditionally this approach is associated with determining the measure of liquidity) (table 3) (Oleksandrenko, 2014).
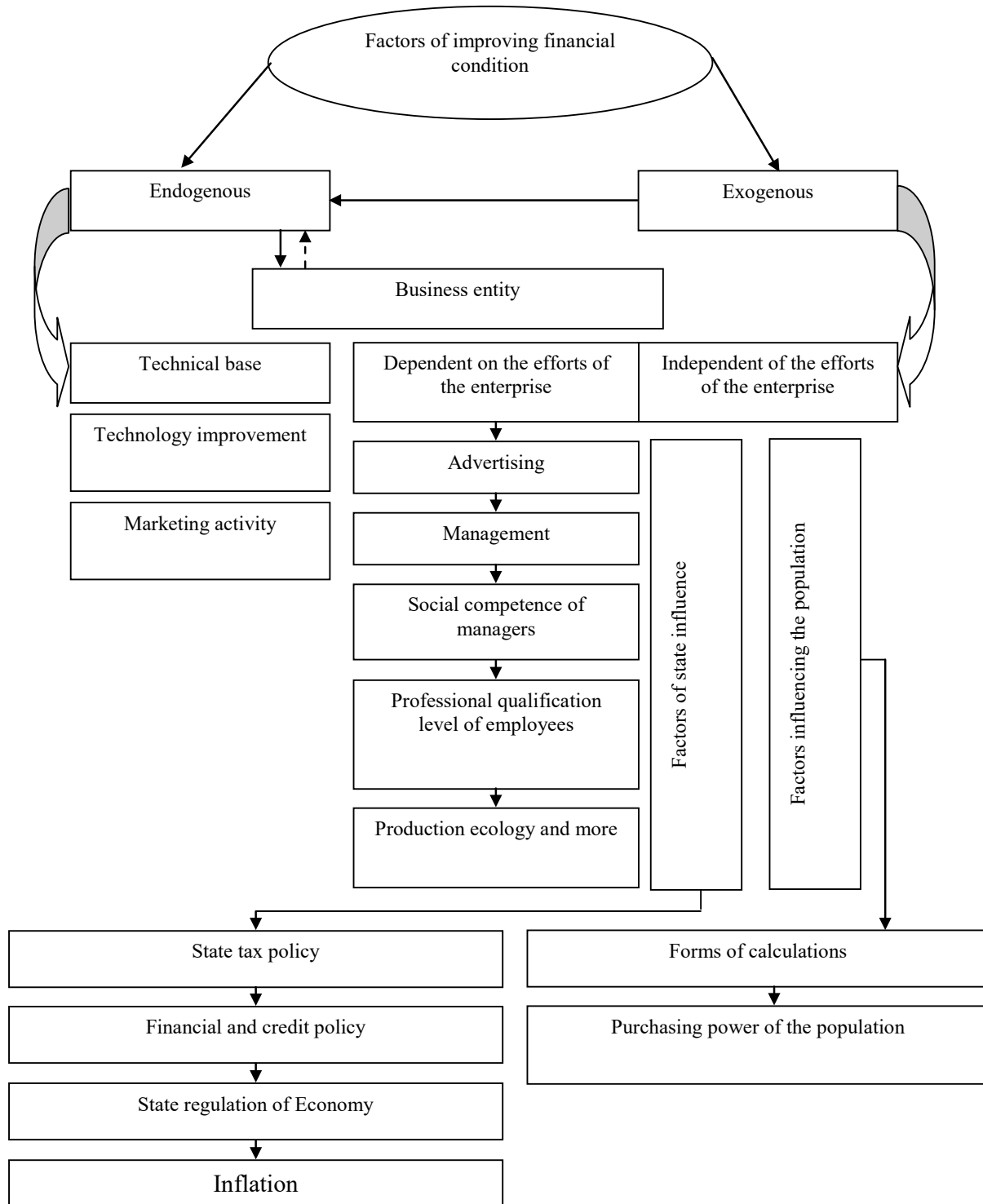
Figure 4. The relationship between the factors of financial improvement and the mechanism of their management

Source: (Tiutiunnyk, Dorohan-Pysarenko, Tiutiunnyk, 2016)

Without underestimating I. Oleksandrenko's contribution to the process of improving the methodological support for assessing the liquidity (solvency) of the enterprise, it should be noted that this method is not without certain shortcomings, and one of the most serious is the uncertainty with the attribution of assets or liabilities to certain groups.

At the same time, another significant disadvantage of this methodological approach is, in particular, the lack of opportunity to compare enterprises in different areas or those that differ in scope.

In view of the above, it can be concluded that each individual ratio, which is calculated to determine the liquidity and solvency of the enterprise, provides
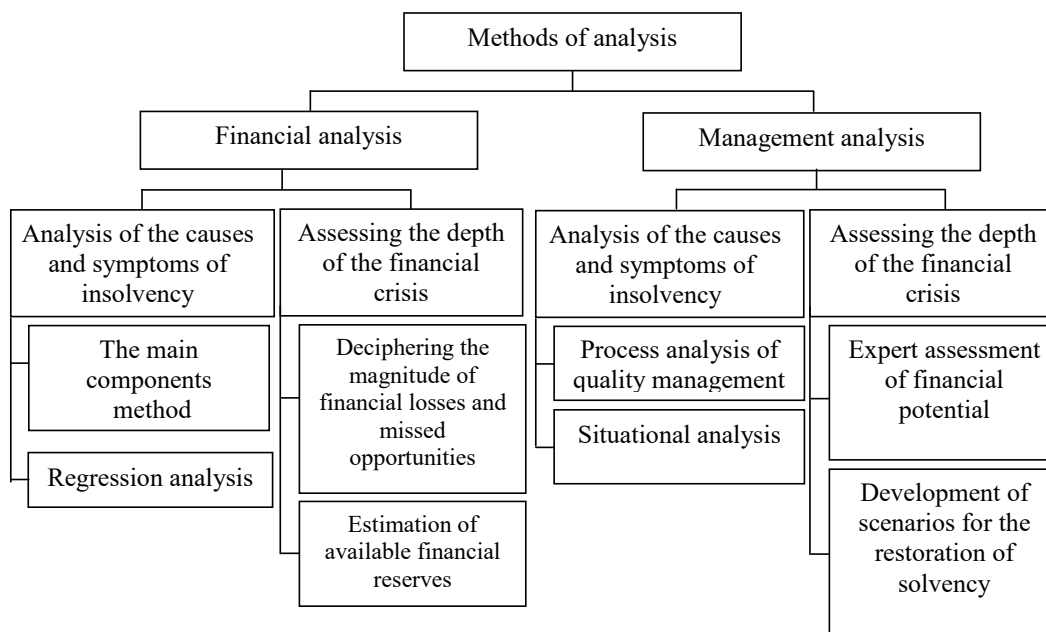
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Analysis of the causes and symptoms of insolvency	Assessing the depth of the financial crisis	Analysis of the causes and symptoms of insolvency	Assessing the depth of the financial crisis
The main components method	Deciphering the magnitude of financial losses and missed opportunities	Process analysis of quality management	Expert assessment of financial potential
Regression analysis		Situational analysis	
	Estimation of available financial reserves		Development of scenarios for the restoration of solvency

Figure 5. Choosing a method of assessing the state of solvency

Source: suggested by the author

only one-sided, limited information about the ability of the enterprise to repay its current liabilities. On the contrary, in combination, these ratios provide a complete picture of the company's ability to pay its current liabilities using different types of current assets.

However, we think that the problem is that the analysis of the solvency and liquidity of the company

Table 3
Criteria for the distribution of enterprises by level of solvency

Criteria	The level of solvency of the enterprise	Characteristic
A1 > L1 + L2 A1 + A2 > L1 + L2 A1 + A2 + A3 > L1 + L2 A1 + A2 + A3 + A4 > L1+ L2	High	The company is characterized by high liquidity potential and solvency, and all its assets are mainly formed at its own expense.
A1 < L1 + L2 A1 + A2 > L1 + L2 A1 + A2 + A3 > L1 + L2 A1 + A2 + A + A4 > L1 + L2	Average	There are not enough liquid assets in the company due to the presence of large amounts of receivables. In general, the company is liquid and can provide timely repayment of liabilities. In this situation, the company is recommended to take measures to restructure receivables.
A1 < L1 + L2 A1 + A2 < L1 + L2 A1 + A2 + A3 > L1 + L2 A1 + A2 + A3 + A4 > L1+ L2	Moderate	A significant share of the working capital of the company are stocks formed from borrowed funds. The presence of significant amounts of inventories indicates that the company is an inefficient use of working capital.
A1 < L1 + L2 A1 + A2 < L1 + L2 A1 + A2 + A3 < L1 + L2 A1 + A2 + A3 + A4 > L1+ L2	Low	Enterprises form their current assets only at the expense of borrowed funds for a short period of time (current obligations). In this case, the company has no own funds in circulation, but only borrowed and borrowed. Part of the current debts of the company is aimed at creating non-current assets.
A1 < L1 + L2 A1 + A2 < L1 + L2 A1 + A2 + A3 < L1 + L2 A1 + A2 + A3 + A4 < L1 + L2	The company is on the verge of bankruptcy	This situation indicates that the company is bankrupt because its property (assets) will not be enough to repay the current debt. This situation occurs when the company is operating at a loss, it has an uncovered loss that affects the reduction of equity (equity is negative)

Source: (Oleksandrenko, 2014)

does not take into account the maturity of current liabilities, which makes the results of the analysis not objective enough. Thus, if there are current liabilities for short-term loans, the maturity of which is expected, for example, in six months or more (within 12 months), when calculating the solvency ratio, the indicators of assets available at the reporting date are used. Such liabilities may also include current arrears on long-term liabilities.

The financial stability of the enterprise is a more generalized characteristic of the financial condition of the enterprise, which to some extent includes indicators of liquidity and solvency (Tomchuk, 2020).

Bazyliuk V. notes that a significant number of Ukrainian enterprises need measures for their financial recovery in order to ensure a sufficient level of solvency, strengthen financial stability and improve production activities. Therefore, the main ways to increase financial stability, the author identifies (Bazilyuk, 2015):

1. Improving the management of working capital, which is the most significant factor in increasing the financial stability of the enterprise. The strategic goals of such management should be: optimization of volumes, ensuring balance liquidity, accelerating turnover, ensuring inflation protection, reducing the cost of formation.

2. Development of an effective cash flow management policy, which to some extent depends on the organization of operational financial planning. A specific method of such a policy may be the development of a payment calendar and cash budget.

3. In order to increase the liquidity and solvency of the enterprise, it is proposed to introduce inventory management of the enterprise in order to optimize inventories of materials, work in progress, and finished products. Optimization of inventories should affect

the redistribution of working capital of the enterprise, resulting in an increase in the amount of liquid cash and a decrease in the number of illiquid inventories.

4. The company can reduce financial liabilities by reducing the number of fixed costs (including the cost of maintaining management staff); reducing of the level of conditionally variable costs; extending of accounts payable for commodity transactions (Bazilyuk, 2015).

Sidorova T. and Lysak H. emphasize that the currently used absolute and relative indicators of financial stability do not meet the requirements of reliability and, as a rule, allow to assess only the already formed picture of the financial situation, while in modern conditions of particular relevance methods of forwarding analysis to forecast financial stability of the organization taking into account the impact on its activities of external and internal factors (Sidorova, Lysak, 2021).

Therefore, the authors propose to develop retrospective and promising methods of management analysis of financial stability, allowing all interested users to conduct a qualitative analysis and on its basis to make timely optimal management decisions.

In this regard, Sidorova T. and Lysak H. proposed the following methodological approaches to the assessment and diagnosis of financial stability, indicating the sources of information needed for analysis (Table 4).

Thus, among the wide variety of techniques that allow for current retrospective management analysis by external users according to the financial statements, preference should be given to methods of a comprehensive assessment of financial stability, which combines a multi-criteria approach and takes into account the specifics of the organization.

Table 4
Methodical approaches to the assessment and diagnosis of financial stability in terms of types of management analysis

	Type of analysis	Methodical approaches	Sources
	1	2	3
Retrospective	Operative	Assessment of the organization's ability to pay its debts, ie analysis of its solvency in accordance with the scale of diagnosis of financial stability	Initial documents, analytical accounting data, balance sheet data, accounting data
	Current	Comprehensive assessment of the stability of the financial condition; assessment of compliance of assets with sources of financing	Accounting data
Promising	Short-term (from 1 month to 1 year)	Compilation of forecast balance sheets for the purpose of the general assessment of expected financial stability	Primary documents, analytical accounting data, balance sheets, accounting data, analytical research data
	Medium-term (1-3 years)	Forecasting the solvency of the organization depending on the expected sales volume in conditions of uncertainty	
	Long-term (strategic) (more than 3 years)	Evaluation of non-financial indicators in order to strengthen financial stability	

Source: (Sidorova, Lysak, 2021)

This will allow you to make the most effective management decisions based on the results of the analysis.

Taking into account foreign experience in determining the indicator of positive net capital (positive net worth) or the availability of net assets and its performance information, Lakhtionova L. considers it appropriate to introduce in the internal financial analysis an indicator – positive own sources of financing as the difference between total resources and total liabilities and to separate it as a part of the main absolute indicators of financial stability (Lakhtionova, 2011).

The author also proposes to include in the main absolute indicators of financial stability in the internal financial analysis the presence of own circulating sources of funding as the difference between own sources of financing, non-current resources, and future expenses.

This value will indeed indicate purely own circulating sources of financing, ie the part of own sources of financing that falls on the financing of working capital. The economic meaning of this indicator is that it determines the number of own sources of funding, which remains to finance really working capital.

In the current economic conditions in Ukraine, agricultural enterprises are increasingly faced with the problem of increasing business activity to ensure the efficient use of financial resources, accelerate their movement, as well as promoting the company in the product market, increasing competitiveness.

We fully share the proposal of Ye. Rudenko on improving business activity in agricultural enterprises (Table 5) (Rudenko, 2014).

The author notes that the problems identified as a result of the study of business activity of enterprises indicate the need for systemic changes in the financial and economic activities of economic entities. In particular, it is necessary to find internal levers of financial stabilization of the enterprise, increase net cash flow, take measures to optimize the capital structure, increase production efficiency, and more.

The imbalance of the "golden rule of the economy" also occurs at the level of individual enterprises.

We believe that it is possible to give some recommendations to agricultural enterprises to improve their business activity.

First, it should be borne in mind that in modern conditions, a significant impact on business activity is the dynamics of profitability of the enterprise, and therefore, it is necessary to seek reserves to increase profits such as cost reduction, resource savings, quality improvement, if the costs of these measures are reasonable, as well as market monitoring for changes in product prices, finding favorable sales conditions, working with partners, etc.

Secondly, domestic agricultural enterprises are characterized by a lack of working capital and to increase business activity it is necessary to accelerate the turnover of working capital by collecting receivables, providing various services, processing agricultural products, establishing close economic ties with partners for sales, etc.

Table 5

Directions for improving business activity and fulfilling the "golden rule of economics" of enterprises

Type of economic activity	Problem	The direction of its solution
1	2	3
Enterprises of all types of economic activity	The growth of financial dependence	Optimization of capital structure, increase of efficiency of use of available financial resources, competent attraction of borrowed resources
	The low growth rate of net income compared to the growth rate of assets and equity	Monitoring changes in agricultural sales prices, finding ways to use resources more efficiently
	Tendency to decrease profitability, in some years unprofitable, unstable dynamics of profit	Search for internal levers of financial stabilization of the enterprise, cost optimization, resource-saving, search for more profitable markets, intensification
Agriculture	The growth of financial dependence	Optimization of capital structure, increase of efficiency of use of available financial resources, competent attraction of borrowed resources
	Unstable dynamics of net income growth	One of the reasons for this is the dynamics of prices and inflation, and therefore, the solutions may be price monitoring, search more profitable markets, increase competitiveness. Reduction of production and sales costs, resource conservation
	Decrease in growth rates of net profit	Reducing the cost of production, introduction of resource-saving technologies, cost optimization, search for other reserves to increase profitability

Source: (Rudenko, 2014)

Third, the imbalance of the "golden rule of the economy" was observed in relation to the growth rate of equity and assets, so it is necessary to search for the optimal capital structure by developing economic and mathematical models to optimize the capital structure with profit maximization.

So, one of the main reasons for the low level of business activity of agricultural enterprises is the unstable dynamics of their profitability, in some years the loss due to rising prices for factors of production and price disparity. The financial crisis also has a negative impact on these processes. Lack of working capital enterprises lead to a further increase in the financial dependence of agricultural enterprises on borrowed funds.

At many agricultural enterprises there is a reduction in sales (especially in animal husbandry), the use of available resources is inefficient.

Failure to comply with the "golden rule of the economy" indicates a deep structural disparity in agricultural enterprises, the lack of stability of their development, and the need for change at the state level and at the level of individual businesses. Proposed by Ye. Rudenko directions of balancing the pace of change of the main indicators of enterprise development based on the analysis of compliance with the "golden rule of economics" will increase the business activity of agricultural enterprises and the industry as a whole (Rudenko, 2014).

The current state of the information base and the need to obtain operational data on the financial condition of the enterprise in order to improve the economic mechanism requires finding ways to accelerate the procedure for obtaining all necessary data. It is generally accepted that such acceleration can be achieved through the automation of analytical procedures. Automated processing of analytical information is based on the use of professional software products to convert the original accounting data into effective information suitable for management decisions.

It should be noted that the process of processing with the help of software products of the initial analytical information in modern conditions is somewhat simplified due to the automation of accounting and settlement procedures. In Khmilnytske LLC the accounting is carried out automatically, therefore actually all initial data for the analysis are already stored in the software product chosen by the enterprise. In this case, it is advisable to develop only such an algorithm (block diagram), which would logically fit into an existing automated system.

However, we must also take into account the fact that the situation with the use of automated software products, according to L. Volontyr, N. Potapova, I. Ushkalenko, there are many facets for solving any problem. Such versatility, in our opinion, is that (Volontyr, Potapova, Ushkalenko, 2020):

– the user solves only the task he needs;
– this task must contain input and output data;
– there are several methods for solving this problem;
– the method of using personal computers (PC) in solving the analytical problem requires the presence of verbal descriptiveness using various abstractions, as well as the provision of a system of definite boundaries of analysis;
– the most important step in creating an automated workplace analyst should be to take into account the gradual transformation of the problem from one form to another, ie to determine the algorithm for its solution.

It is important to take into account the fact that for certain categories of users of analytical information may be interesting result of the intermediate analysis, therefore, when developing a flowchart should provide for the formation of an intermediate result in the form of a complete analysis.

The possibility and necessity of taking into account the above versatility in creating an algorithm for solving problems of financial condition analysis have its objective prerequisite. In other words, we fully support the opinion of domestic scientists and practitioners that to use a PC in solving problems requires a method of modeling algorithms on a PC, and to model the analytical problem requires interpretation of the PC as a modeling mechanism, ie requires a language model of PC (Volontyr, Potapova, Ushkalenko, 2020). In addition, when developing an algorithm for solving the problem of analysis of financial condition on the basis of the method proposed by the author should pay attention to the method of the modeling process.

When developing an algorithm (block diagram) for solving an analytical problem should take into account not only the conclusion about the feasibility of automation of calculation procedures, but also the possibility of their application in practice, because the simulation results have no independent value, they should always be considered as a simulation program.

An important role in the automation of analysis, according to L. Mazurkevich and T. Shmatkovskaya, which we support, takes into account a number of important organizational, methodological and methodological aspects, including requirements for software, which, in our opinion, may include (Figure 6) (Shmatkovska, Mazurkevich, 2015):
– general-purpose application packages (used for data processing, choice of research direction depending on user requirements, calculation of financial ratios (indicators) to identify an integrated assessment of the financial condition);
– special programs of financial condition analysis (they can be developed by programmers according to the developed block diagram).

The developed system takes into account the available initial data (financial statements and software)
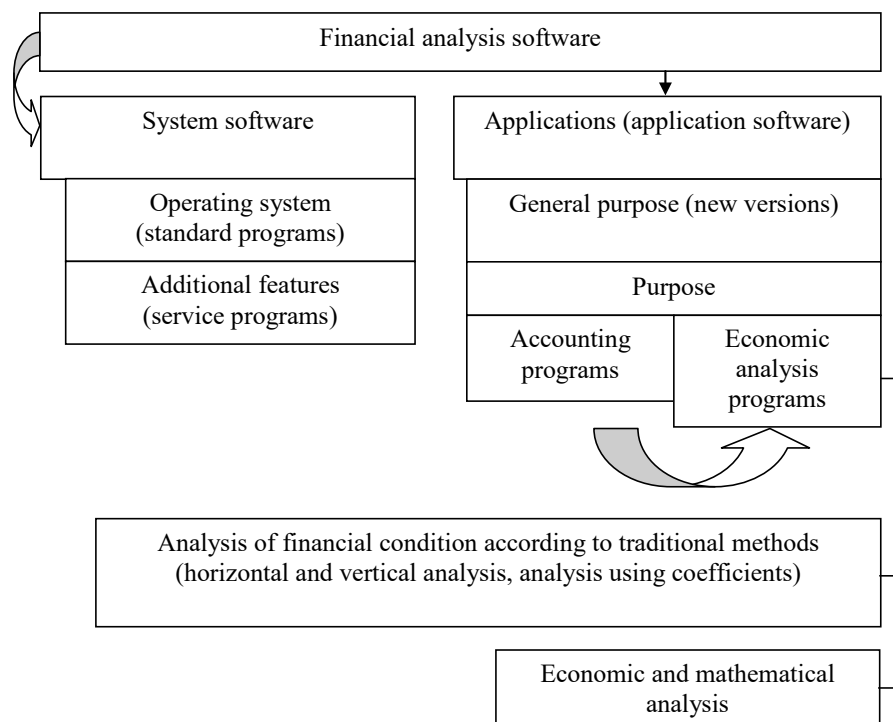
Figure 6. Elements of software analysis of the financial condition of the enterprise

Source: (Shmatkovska, Mazurkevich, 2015)

and significantly reduces the cost of working time for analysis, which speeds up the management decision-making process and allows you to respond quickly to changes in asset structure to improve efficiency and improve business subject efficiency.

3. Conclusions

Despite the impossibility of developing a universal, extremely accurate mathematical model of financial condition analysis, the use of economic and mathematical methods can significantly improve the quality of the analysis and form the most optimal conclusions for appropriate management decisions.

Combining such an analysis with the calculation of reserves to improve the financial condition of the enterprise, which can be done by comparative analysis of average calculated values of coefficients or taking into account the achievements of the most profitable enterprises, will provide an effective financial strategy.

The developed model of the analysis of a financial condition with the use of economic and mathematical methods which is sufficiently adapted for automation will provide, provided its introduction in analytical practice, a high level of optimality of operative administrative decisions, and also will increase the efficiency of agricultural enterprises.

References:

Bakanov, M. I., & Sheremet, A. D. (1993). *Teoryia ekonomycheskoho analyza* [The theory of economic analysis]. Moscow: Finance and statistics. (in Russian)

Bagatska, K. V., Govorushko, T. A., & Sheremet, O. O. (2013). *Finansovyi analiz* [Financial Analysis]. Kyiv: NUFT. (in Ukrainian)

Mazur, V. A., Tomchuk, O. F., & Branitsky, Yu. Yu. (2017). Metodyka analizu finansovoho stanu pidpryiemstva vidpovidno do vymoh vnutrishnikh i zovnishnikh korystuvachiv [Methods of analysis of the financial condition of the enterprise in accordance with the requirements of internal and external users]. *Economy. Finances. Management: current issues of science and practice*, 3(19), 7–20.

Horkavyi, V. K. (2012). *Statystyka* [Statistics]. Kyiv: Alert. (in Ukrainian)

Shkaraban, S. I. (1997). Ekonomichnyi analiz v umovakh rynkovoi ekonomiky [Economic analysis in a market economy]. *Methodology of economic and statistical research in market conditions.* Proceedings of the scientific-practical conference. *(Ukrainian, Ternopil)*, Ternopil: Economic opinion.

Tomchuk, O. F., & Levchuk, M. S. (2019). Kryterii otsiniuvannia i prohnozuvannia finansovoho stanu ta rezultativ diialnosti pidpryiemstva [Criteria for assessing and forecasting the financial condition and performance of the enterprise]. *Young scientist*, 9(73), 480–486.

Tiutiunnyk, Yu. M., Dorohan-Pysarenko, L. O., & Tiutiunnyk S. V. (2016). *Finansovyi analiz* [Financial analysis]. Poltava: PDAA. (in Ukrainian)

Tomchuk, O. F. (2019). Upravlinskyi analiz: poniattia, pryntsypy ta osnovni elementy [Management analysis: concepts, principles and basic elements]. *Problems of system approach in economy. Collection of scientific works of the National Aviation University*, issue 5(73), part 2, pp. 133–142.

Oleksandrenko, I. (2014). Diahnostyka likvidnosti ta platospromozhnosti pidpryiemstva [Diagnosis of liquidity and solvency of the enterprise]. *Current economic problems*, 6(156), 419–426.

Tomchuk, O. (2020). Rol finansovoi stiikosti v otsintsi ymovirnosti bankrutstva pidpryiemstva [The role of financial stability in the assessment of the enterprise bankruptcy]. *Slovak international scientific journal*, 38, 14–24.

Bazilyuk, V. Yu. (2015). Problemy otsinky finansovoi stiikosti pidpryiemstv ta napriamy yikh pokrashchennia [Problems of assessing the financial stability of enterprises and areas for improvement]. *Student Bulletin of the National University of Water Management and Environmental Sciences*, 2(4), 104–108.

Sidorova, T. O., & Lysak, H. H. (2014). Metodychni pidkhody do upravlinskoho analizu finansovoi stiikosti pidpryiemstv [Methodical approaches to management analysis of financial stability of enterprises]. *Economic strategy and prospects for trade and services (Ukrainian, Kharkiv)* (eds. Cherevko O. I.). Kharkiv: Kharkov State University of Food Technology and Trade.

Lakhtionova, L. A. (2011). *Analiz finansovoi stiikosti subiektiv pidpryiemnytskoi diialnosti* [Analysis of financial stability of business entities: monograph]. Kyiv: KNEU. (in Ukrainian)

Rudenko, Ye. M. (2014). Zastosuvannia «zolotoho pravyla ekonomiky» dlia otsinky dilovoi aktyvnosti silskohospodarskykh pidpryiemstv [Application of the «golden rule of economics» to assess the business activity of agricultural enterprises]. *Agrosvit*, 16, 42–49.

Volontyr, L. O., Potapova, N. A., Ushkalenko, I. M., & Chikov, I. A. (2020). *Optymizatsiini metody ta modeli v pidpryiemnytskii diialnosti* [Optimization methods and models in business]. Vinnytsia: VNAU. (in Ukrainian)

Shmatkovska, T. O., & Mazurkevich, L. E. (2015). Otsiniuvannia suchasnykh tendentsii ta shliakhy pokrashchennia avtomatyzatsii oblikovo-analitychnoho protsesu subiektiv hospodariuvannia [Assessment of current trends and ways to improve the automation of the accounting and analytical process of business entities]. *Bulletin of Zaporizhia National University*, 1(25), 88–97.