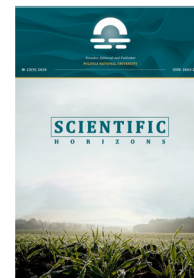


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## Anti-Crisis Stability of Break-Even Development Potential and its Resource Support in Agribusiness

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**Abstract.** The article considers the anti-crisis stability of the potential of break-even development and its resource support in agribusiness. The necessity of a synergetic approach to estimating the dynamic flow of resources capable of generating own sources of financing to activate the target parameters of crisis stability of break-even development potential and the development of an alternative scenario of self-financing of the production and financial cycle to stimulate economic growth of agribusiness is proved. The reproductive process of resource support of anti-crisis stability of the potential for safe development of agribusiness enterprises is substantiated. The model of estimation of target parameters of anti-crisis stability of potential of unprofitable development of agrarian business and a matrix of its point estimation at a choice of the alternative scenario of self-financing is presented. Scenarios of the flow of resource support of anti-crisis stability of the potential of unprofitable development of the agribusiness enterprise are developed. An indicator of the level of anti-crisis stability of the break-even development potential according to the determined target parameters of self-financing is offered. The dynamics of anti-crisis factor load on the stability of the potential of break-even development of agribusiness enterprises on average in one region of the Steppe zone of Ukraine by its territorial location is analyzed. Cluster analysis was used to assess the elements of the qualitative system-resource component of anti-crisis stability of the potential of break-even development with the separation of types of agribusiness enterprises in the regions of the Steppe zone of Ukraine with different structure of current assets. The forecast level of resource support according to the quantitative component of anti-crisis stability of the potential of break-even development on average in the regions of the Steppe zone of Ukraine and per one agribusiness enterprise of the region is determined. The forecast range of limits of target parameters of self-financing and their influence on the level of anti-crisis stability of potential of unprofitable development of agribusiness enterprises on the average on one region of the Steppe zone is presented

**Keywords:** anti-crisis stability, resource support, solvency, profitability, self-financing, break-even development



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## INTRODUCTION

Expanding the capabilities of agribusiness enterprises in the new paradigm of anti-crisis system of their operation, with increasing impact on the state of reorganization in conditions of uncertainty and risk, allows distributing the available resource component in a continuous stream of expanded reproduction of agricultural production, directing own and involved sources on improvement of the growth rates of profitability. However, along with the objective reasons for this phenomenon, recently there are unfavorable global trends in the agricultural sector of the economy, which are associated with the crisis financial condition of economic entities, the basic principles of which are purposefulness, systematization and participatory anti-crisis stability.

Reforming agriculture in the world makes this problem relevant and necessitates the identification of effective scientifically sound models of the reproduction process of resource provision on the basis of systematization of indicators of crisis stability potential of break-even development of agribusiness enterprises adapted to exogenous economic factors. This requires diagnosing the economic security of agricultural enterprises, which should be based on a program-targeted approach to the reproduction of stable economic growth, balancing the production and financial cycle, accumulation of own resources through additional capitalized reserves and effective cash flow management with limited external sources. Objectively, this is due to the emergence of a multi-stage movement of cash flows of enterprises, as a result of which their connection with the material basis becomes more noticeable. The impact of the resource component on material production is justified, but at the same time, its irrational involvement in the operational and financial cycle can lead to unstable development of agricultural production as a whole. This leads to the search for ways to improve structural changes in the internal business environment, which enhances the anti-crisis stability of the potential of break-even development, reconciling the proportionality of material, financial and cost processes of reproduction of agricultural production.

The starting point of anti-crisis stability of the potential of break-even development of agribusiness should understand its rational structure, basic parameters, priority functions that can withstand the changing factors of the external business environment, guarantee solvency and investment attractiveness of businesses in the long run. At the same time, the agricultural sector lacks clear tools for preventive protection of agribusiness enterprises, which would unite their functional subsystems, eliminate threats to economic security and systematize the structural components of anti-crisis stability of break-even development potential at different stages of its life cycle.

Recently, the attention of scientists has been focused on the prevention of deep and prolonged crises, in particular: issues of the formation and development of bankruptcy prevention systems – V. Bdzhola [1],

A. Belikov, G. Davyidova [2], L. Dovhan [3], Ya. Dropa [4], H. Ostrovska, O. Kvasovskiy [5], O. Raievnieva, M. Berest [6]; identification of non-financial factors of crisis development – M. Berdar [7], S. Borozdin, A. Maksimov [8], J. Bundy, M. Pfarrer, C. Short, W. Coombs [9; 10], B. Fogue [11], N. Hrapko [12], O. Komelina, A. Chaikina [13], V. Kovalenko, M. Suhaniaka, V. Fuchedzhy [14], O. Raievnieva, O. Horokhova [15]; ensuring the economic security of agribusiness enterprises – L. Havatiuk, N. Perehyniak [16], I. Kreidych, A. Haharin [17], N. Plakhotna [18], as well as the functioning of agricultural enterprises in the system of sustainable safe development – N. Kovalenko, N. Hontova [19], S. Mushnykova [20], D. Naipak [21], A. Pushkar, A. Trided, A. Kolos [22]. The theory and methodology of crisis management, which aims to increase the sustainability of business entities, have been studied by such scientists as: A. Azarova, O. Ruzakova [23], I. Blank [24], T. Hovorushko, N. Klymash [25], V. Makhovka [26], J. McTaggart, P. Kontes, M. Mankins [27], A. Rappaport [28], L. Starchenko, O. Starovoit, I. Semydotska [29], G. Stewart [30]; methodology aspects of the formation of anti-crisis stability of the potential for safe development of agricultural enterprises were studied by – G. Arnold, M. Davies [31], O. Honcharenko [32], L. Lihonenko [33], V. Mishchenko, O. Drougova, I. Domnina [34], V. Mishchenko, I. Sitak, I. Domnina [35]. However, the issue of complex interrelation of system-resource component of anti-crisis stability of potential of safe development of agribusiness enterprise on the basis of analytical-mathematical tools of estimation and diagnostics of researched processes remains insufficiently investigated.

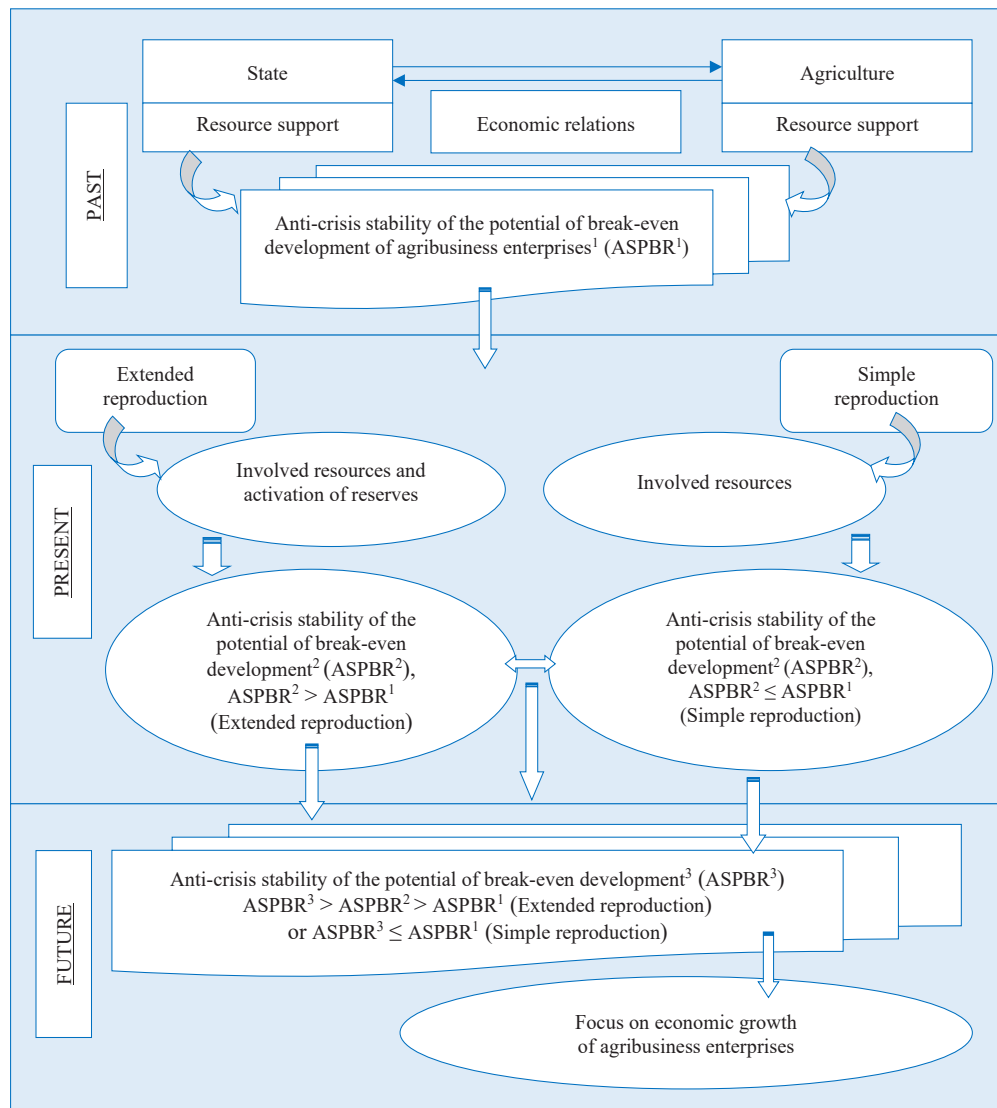
The priority of our study is to develop a synergetic approach to assess the dynamic flow of resources capable of generating own sources of funding to activate the target parameters of crisis stability of break-even potential and develop an alternative scenario of self-financing of the production and financial cycle to stimulate economic growth of agribusiness enterprises.

## MATERIALS AND METHODS

In a market economy, the stability of the potential of break-even development of the enterprise must ensure internal harmony, as well as compliance with the economic system, an element of which it is. The system is considered as a means that enables the functioning of an individual entity with the help and under the influence of environmental factors, which evolves and acquires new qualities, transforming the structure of the system [36]. Defining the economic aspects of the system, it should be noted that it changes over time only its status and not its essence, allowing a certain ordering of the components of the system that form a set that operates, functions, i.e. is viable. Depending on the connections that exist between the structural elements of the integrity, the resource content of the system is formed. The system can be represented by an element-resource

component on the basis of functioning of anti-crisis stability of break-even development potential, which makes it possible to comply with certain rules that play the role of limiting factors [37], turning the relationship of aggregate elements into an effective system. Given that each stage of economic growth of agribusiness is a stable system, which is determined by the potential interconnection of sources of financing of the entity, then the crisis stability of the potential of break-even development in its environment causes a constant exchange of system resources. The value of a particular type of resource in different systems varies, but an indisputable feature of the development of the system, both hierarchically and in time, is to ensure the sustainability of economic entities. Therefore, the anti-crisis stability of the potential of break-even development of agricultural enterprises must be considered taking into account the possibility of forming their own and borrowed resources from the external surroundings of the business environment.

From the standpoint of the structure of anti-crisis stability of the potential of break-even development of agribusiness enterprises, a set of internally interconnected parts is distinguished, the main elements of which are objects: production, marketing, finance, information, human resources. Hence, the subsystem objects of anti-crisis stability of break-even development potential are proposed to be defined as a set of resources that determine the relationship between the procedures of anti-crisis decisions to generate financial resources under constant changes in external and internal business environment. The reproductive process of resource support of anti-crisis stability of the potential of break-even development is inherently dynamic-cyclical in nature, the duration of which is at least a year. That is, depending on the anti-crisis development programs of agricultural sectors, the process of long-term (continuous) reproduction of the resource support of economic entities in space and time is provided (Fig. 1).



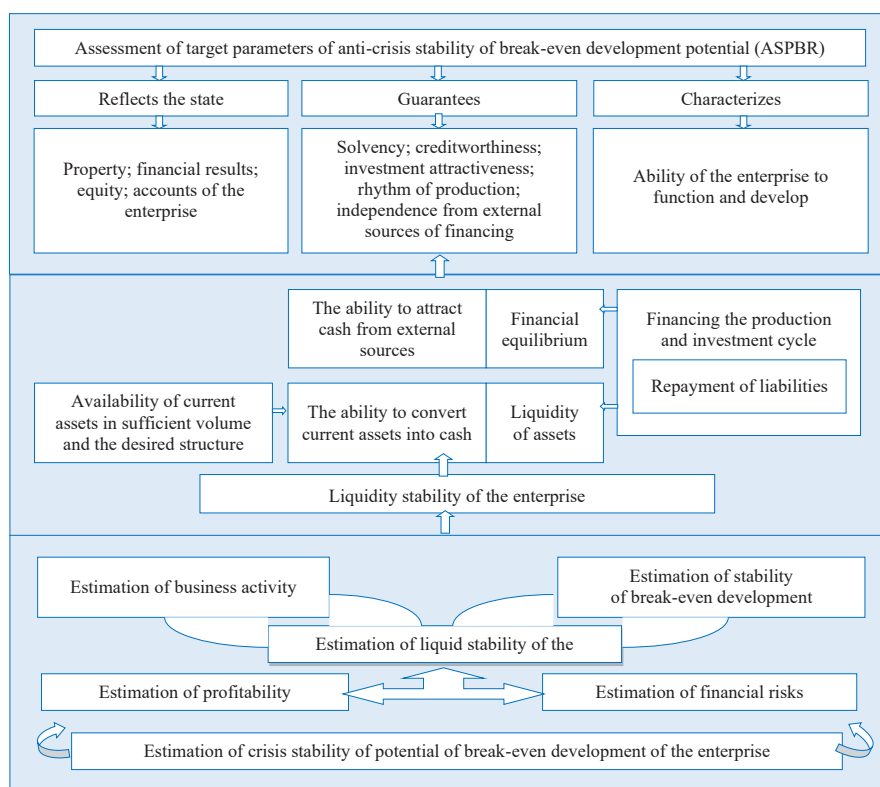
**Figure 1.** Reproductive process of resource support of anti-crisis stability of potential of safe development of agribusiness enterprises

**Source:** developed by the authors

Thus, from the point of view of the past, the level of anti-crisis stability of the potential of break-even development is determined by the set of resources mobilized by agribusiness enterprises and is characterized as achieved ( $ASPBR^1$ ). Depending on the areas of the use of anti-crisis sustainable potential, namely: simple or extended reproduction of its resource support, it is possible to allocate, exchange and use resources; the resources used in the past activate the reserves to determine the current level of crisis stability of the break-even potential ( $ASPBR^2$ ). Thus, the current level of crisis stability of the break-even potential can be reproduced both at the stage already reached or below it ( $ASPBR^2 \leq ASPBR^1$ ), and at a higher stage of growth ( $ASPBR^2 > ASPBR^1$ ).

Thus, the restoration of quantitative and qualitative system-resource component of anti-crisis stability of break-even potential, based on the implementation of the amplitude of resource support, activates existing reserves by choosing anti-crisis areas of enterprise development in the business environment, allowing to stimulate capital investment growth, accumulation of productive capital in the objects of investment reproduction in order to make a profit and (or) achieve a positive effect. At the same time, the state regulation of resource support of anti-crisis stability of break-even development potential will allow to reproduce the expanded reproduction by providing state guarantors with time limitation of budget financing in the investment activity of economic entities and to determine their potential state of economic growth in order to eliminate the shortcomings of the current procedure for selecting alternative innovative development and obtaining the

expected effect, without losing the interest of enterprises in the reproduction of fixed capital. Therefore, the future state of anti-crisis stability of the break-even potential should be defined as promising ( $ASPBR^3 > ASPBR^2 > ASPBR^1$ ), i.e. one that is focused on achieving a higher level. However, as already mentioned, depending on the conditions and results of the agribusiness in previous periods, its future state may be characterized by a simple reproduction of resource support ( $ASPBR^3 \leq ASPBR^1$ ). The authors assume that break-even is the initial factor of the critical value of the financial balance between own and borrowed resources, which reflects the level of stability of the break-even potential of the enterprise. Prolonged stay of the company in the loss zone leads to the loss of a significant amount of equity, resulting in a reduction in current assets (a qualitative component of sustainable break-even potential), and as a consequence of working capital required for production activities. Accordingly, this situation leads to an increase in borrowed resources and characterizes the crisis environment of the enterprise. In this case, it is necessary to convert the lost capital from a negative value to zero to balance the resource support of property and anti-crisis development of the enterprise. With the advent of profits, equity is gradually formed, which is used to finance assets, ensuring anti-crisis stability of the potential of the entity. We believe that break-even is a financial platform for anti-crisis stability of the development potential of the enterprise by covering the loss of assets with equity, and balancing the liquidity limit as a value capable of exchanging and maintaining the value of accumulated assets, their transaction through increasing solvency (Fig. 2).



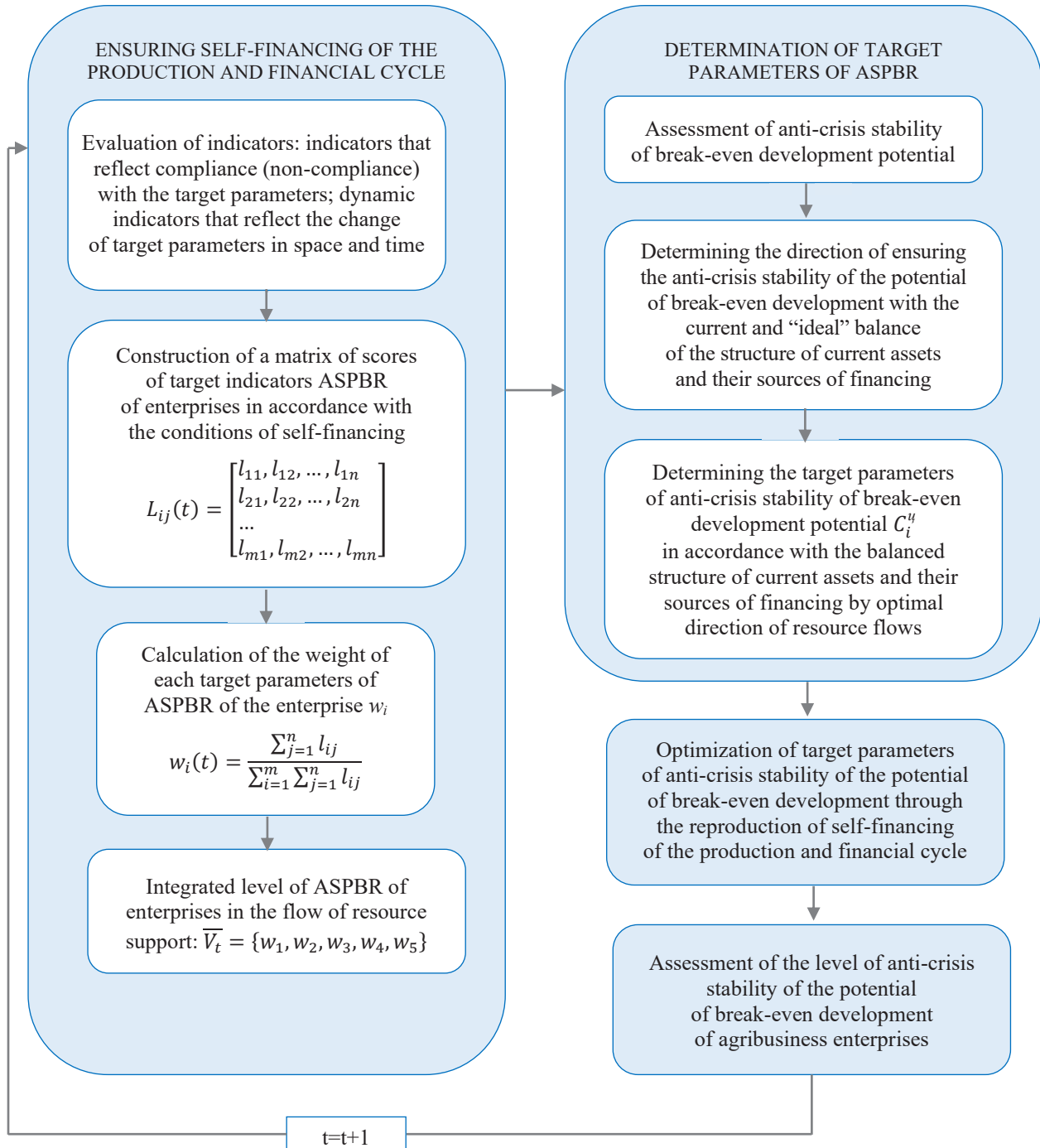
**Figure 2.** The model of estimation of target parameters of anti-crisis stability of potential of break-even development of the enterprise of agrarian business

Source: developed by the authors

The target indicators of anti-crisis stability of break-even development potential, under the influence of external and internal business environment allow determining a sufficient level of resource support of production activities and long-term expansion of investment opportunities of the enterprise with increasing profit

and equity, maintaining the regulatory value of solvency and creditworthiness with a minimum level of financial risk [38; 39].

This leads to the change in the parameters of the basic flows of resource support and their impact on the solvency of economic entities (Fig. 3).

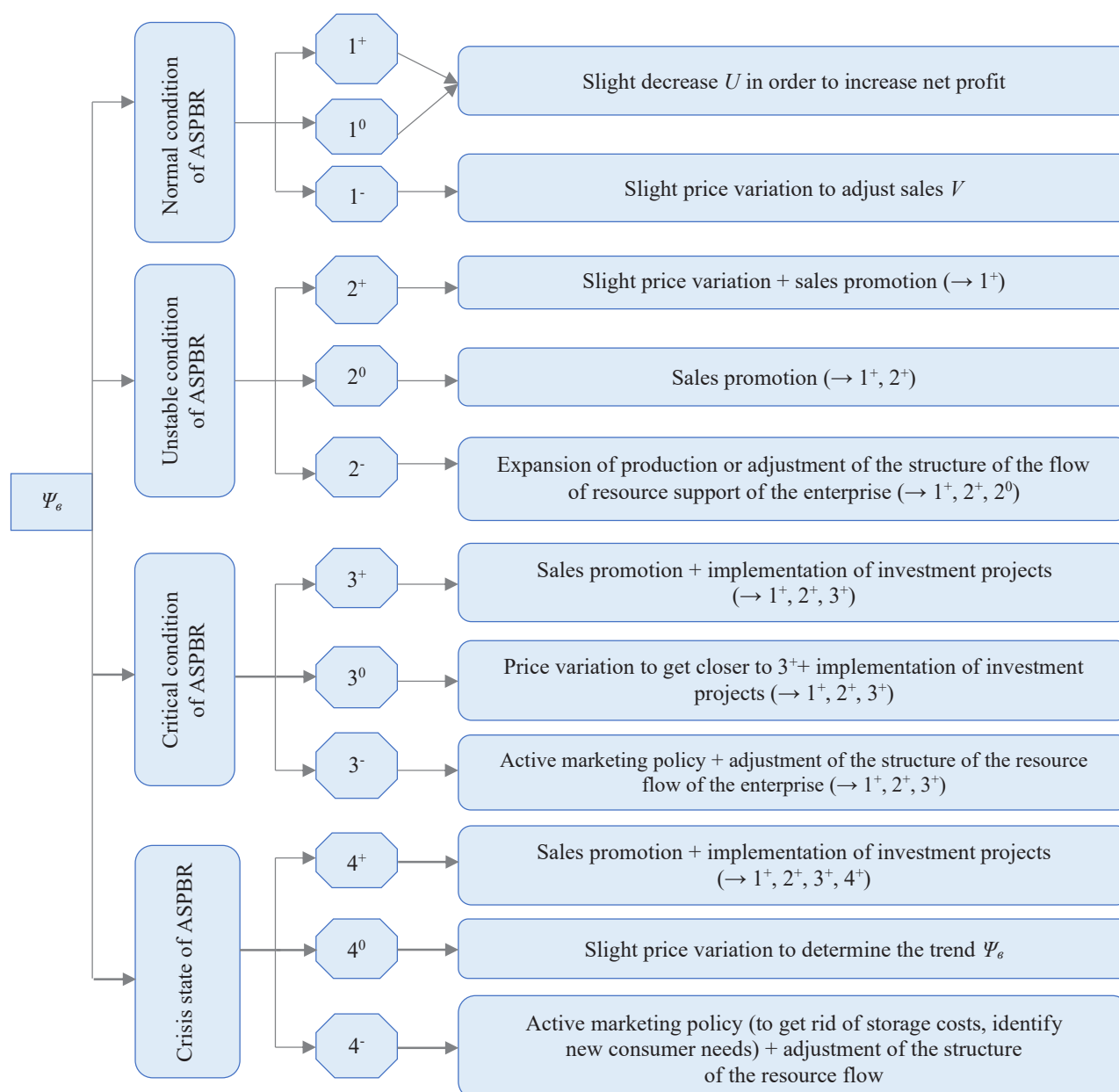


**Figure 3.** Algorithm of systematic estimation of target parameters of anti-crisis stability of potential of break-even development of the agribusiness enterprise

**Source:** developed by the authors

The embodies an effective matrix of possible scores of target parameters of anti-crisis stability of break-even potential in agribusiness through the reproduction

of the vector of self-financing of the production and financial cycle (Fig. 4).



**Figure 4.** Tree of scenarios of the flow of resource support of anti-crisis stability of the potential of break-even development of the agribusiness enterprise

**Source:** developed by the authors

To establish a quantitative characterization of the relationship between a balanced structure of assets and sources of funding, it is necessary to determine the optimal (target) parameters of the ASPBR of the agribusiness enterprise. To do this, the current structure of assets is compared with the "ideal" one, and on the basis of certain parameters of the resource flow and its quantitative system component determines the optimal (effective) flow of resources to increase the level of anti-crisis stability of the potential of break-even development of the enterprise and its economic growth in the market.

Thus, the direction to the "ideal" prototype of anti-crisis stability of the potential of break-even development of agribusiness is possible by achieving financial equilibrium, which indicates the efficient use of

the resource flow of the entity from its own sources of funding.

We believe that self-financing cannot be reduced only to the hoarding of profits, because the deep foundations of understanding the essence of self-financing, its open and hidden forms can be obtained only in the context of capital movements in a simple and expanded reproduction. Open and hidden forms of self-financing function in a constant dialectical relationship, i.e. in the form of interaction and the transition from one form to another.

Based on the research, we propose to calculate the level of anti-crisis stability of the potential of break-even development, determining the target parameters of self-financing, according to the formula (1) [38; 39]:

$$I_{ASPBR} = P_{of} + P_{edsf} + P_{pe} + P_{cef} + P_{mofln} \quad (1)$$

where,  $I_{ASPBR}$  – is an indicator of the level of anti-crisis stability of the break-even potential;  $P_{of}$  – target parameters of own funds;  $P_{edsf}$  – target parameters of efficiency of distribution of sources of financing, USD.;  $P_{pe}$  – target parameters of profitability of the enterprise;  $P_{cef}$  – target parameters of capital efficiency;  $P_{ln}$  – target parameters of liquidity of the enterprise;  $P_{mofln}$  – target parameters of maneuverability of own funds.

Thus, we think it reasonable to consider the target parameters of self-financing as factors of direct influence on the level of anti-crisis stability of the potential of break-even development and effective activity of agribusiness enterprises. As a criterion of economic efficiency, which reflects the qualitative essence of anti-crisis stability of the potential is the maximum result (effect) at a certain level of costs, or as an equivalent – the minimization of costs for a certain result. At the same time, the level of anti-crisis stability of the potential embodies the range of limits of the target parameters of efficient use of enterprise resources: break-even – the initial level required for the transition to a qualitatively new state of effective activity – self-financing.

## RESULTS AND DISCUSSION

In the process of transformational changes in Ukraine, most agribusiness enterprises occur in a critical situation due to the imperfection of the system of organizational, economic and financial-credit mechanisms of management. Depending on the available resources, some agricultural enterprises have different conditions of production. This process involves influencing the anti-crisis stability of the enterprise development potential by forming factors that should have the following types of decomposition: 1) functional decomposition (taking into account the functions of the components of the anti-crisis potential of the enterprise development); 2) decomposition by life cycle (stages of movement of input and output flows of resource support are taken into account); 3) decomposition by physical process (description of the behavior of the stability of the potential of break-even development as a physical process), which in economic processes is analogous to decomposition by life cycle [40].

In addition, the process of anti-crisis stability of the potential of break-even development of agribusiness enterprises can be considered as a production cycle that characterizes the formation of performance indicators (profit, profitability) due to the circulation of value. From this point of view, this process can be represented as a process of transformation of resources into products, which have a certain set of advantages. At the same time, the decomposition of the functional features of the components of anti-crisis stability of the potential allows to systematize the advantages of the products, which are formed at the stages of resource support, production and sales. The authors used multidimensional methods, in particular, the methods of

principal components and taxonomic analysis, which involve the calculation of a generalized taxonomy coefficient, which is identified with the factor load of qualitative target parameters of direct impact on the stability potential of break-even development. The first stage of the assessment involves the consolidation of a set of factors in the areas of resource support, production, sales, by the method of the main components. Factors indirectly influencing the potential for break-even development include [18]:

1) factors in the field of resource support:  $x_1$  – employment, pers. per 100 hectares;  $x_2$  – the number of tractors per 100 hectares of arable land (as a modified analogue of the capital stock), units;  $x_3$  – energy supply (energy capacity per 100 ha of agricultural land), kW/ha;  $x_4$  – energy equipment (energy capacity per 1 average annual employee), kW/person;

2) factors of the sphere of production:  $x_5$  – the amount of costs per 1 ha of agricultural land, thousand USD;  $x_6$  – grain and legume yields (as crops for which more than 55% sown area of Ukraine) was allocated in 2020), c/ha;  $x_7$  – average annual milk yield per 1 cow, kg;  $x_8$  – average daily gain of cattle on pasture, fattening, cultivation, gram;  $x_9$  – the level of labor productivity, thousand USD;

3) factors of sales:  $x_{10}$  – the level of profitability of sales, %;  $x_{11}$  – mass of profit per 1 ha of agricultural land, thousand USD;  $x_{12}$  – mass of profit per average annual 1 employee, USD;  $x_{13}$  – the level of profitability of agricultural activity, %.

The study of assessing the state of resource support of anti-crisis stability of the potential of break-even development of agribusiness enterprises (within their territorial location in the regions of Ukraine) determines the impact of factors directly affecting its level, taking into account soil and climatic conditions.

In the second stage of application of the principal components method, the actual values of the selected indicators of factor load, which are standardized by the formula, are determined [15]:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{\sigma_j} \quad (2)$$

where,  $z_{ij}$  – standardized value of the  $j$ -th indicator for the  $i$ -th enterprise in the region;  $\bar{x}_j$  – the average value of the  $j$ -th indicator;  $\sigma_j$  – standard deviation of the  $j$ -th indicator.

The condition for the application of the principal components method is the existence of a close correlation between the factors of anti-crisis stability of the break-even potential. Therefore, the next stage is the construction of three correlation matrices for standardized values, calculated for three areas of the economic process of enterprises on average per region of the Steppe zone of Ukraine. According to the results of correlation analysis, it was found that there is a close correlation between a number of indicators (the values of some

coefficients exceed 0.8). This testifies to the validity of the assessment of the state of resource support of anti-crisis stability of the potential of break-even development by the method of main components. Thus, in 2013, within the sphere of resource support, the contribution of the first component to the variation of the selected four factors ( $x_1-x_4$ ) is 65.7%, the second component – 29.3%. In the subsequent assessment, the first component was used, as its anti-crisis factor loads are significantly higher than the load of the second component (Table 1) [41].

For marketing, the first main component describes 94.9% variances. For the following years, the first component was used in the same way for all spheres. In 2017, for resource support, it explains 67.6% of the general variation; for production – 57.8%; for sale – 91.3% variations of the total variance. In 2018, in the field of resource support, the main component was described, which describes 64.8% variations; in production – a component that characterizes 58.5% random fluctuations of the total variance; in implementation – a component that reflects 95.5% variations in the factors of anti-crisis stability of

the potential of break-even development. The same applies to 2019, when the first component of the supply sector describes 56.3% variations in variance, production – 49.8%, sales – 92.2%. In 2020, in terms of supply, the first component is determined 55.8% variations in variance, production – 57%, and sales – 93.4%.

Thus, based on the obtained anti-crisis factor loads and shares of total variances in all areas of the reproduction process of anti-crisis stability of the break-even potential of agribusiness enterprises on average per region of the Steppe zone of Ukraine, it can be argued that the values of the first principal components should be used for qualitative and quantitative target parameters. To calculate them, it is necessary to construct equations that formalize the dependence of the stability of the break-even potential on its factors. In generalized form, the formula of the latent index has the form [6]:

$$k = a_1z_1+a_2z_2+\dots+a_jz_j+\dots+a_nz_n \quad (3)$$

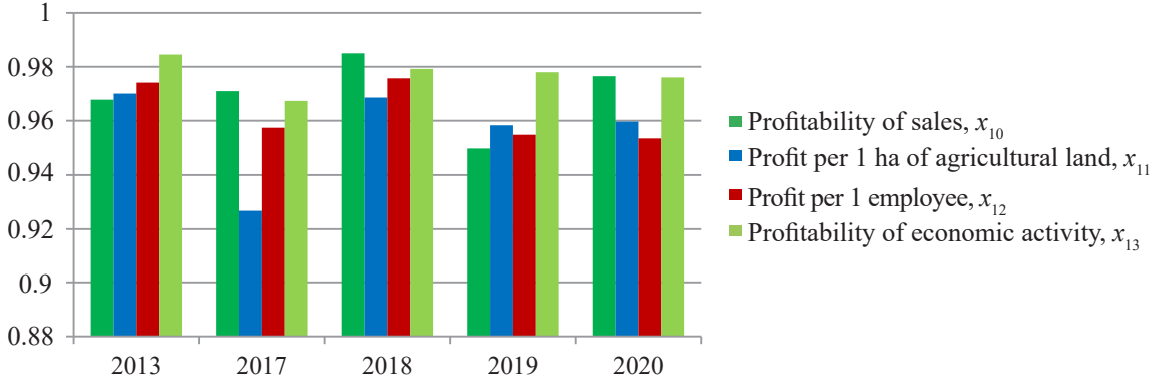
where,  $k$  – the main component;  $a_j$  – anti-crisis factor load for the  $j$ -th factor;  $z_j$  – standardized value of the  $j$ -th factor.

**Table 1.** Dynamics of anti-crisis factor load on the stability of the potential of break-even development of agribusiness enterprises on average per region of the Steppe zone of Ukraine in 2013-2020

Indicators	2013	2017	2018	2019	2020
Sphere of resource support					
Total variance	2.6283	2.7048	2.5914	2.2520	2.2312
The proportion of total variance	0.6571	0.6762	0.6479	0.5630	0.5578
Sphere of production					
Total variance	2.6421	2.8859	2.9270	2.4916	2.8857
The proportion of total variance	0.5284	0.5772	0.5854	0.4983	0.5771



Table 1, Continued

Indicators	2013	2017	2018	2019	2020
Sphere of sales					
					
Total variance	3.7964	3.6540	3.8195	3.6891	3.7366
The proportion of total variance	0.9491	0.9135	0.9549	0.9223	0.9342

**Source:** calculated by the authors according to data [41]

To move from the standardized values of  $z_j$  in equation (3) to the actual values of the factors  $x_j$ , the variables  $z_j$  should be replaced. Based on formula (2), in the expanded form the transformation equation will look like [6]:

$$k = \left[ \frac{a_1 x_1}{\sigma_1} - \frac{a_1 \bar{x}_1}{\sigma_1} \right] + \left[ \frac{a_2 x_2}{\sigma_2} - \frac{a_2 \bar{x}_2}{\sigma_2} \right] + \dots + \left[ \frac{a_n x_n}{\sigma_n} - \frac{a_n \bar{x}_n}{\sigma_n} \right] \quad (4)$$

In formula (4) we see that a free member appears in the transformed equation, which is calculated as the total value [6]:

$$\left[ -\sum_{j=1}^n \frac{a_j \bar{x}_j}{\sigma_j} = \frac{a_1 \bar{x}_1}{\sigma_1} - \frac{a_2 \bar{x}_2}{\sigma_2} - \dots - \frac{a_n \bar{x}_n}{\sigma_n} \right] \quad (5)$$

Then, the equation of the principal component, taking into account the actual rather than standardized

factors, has the form formula (6), [6]:

$$k = -\sum_{j=1}^n \frac{a_j \bar{x}_j}{\sigma_j} + \frac{a_1 x_1}{\sigma_1} + \frac{a_2 x_2}{\sigma_2} - \dots - \frac{a_n x_n}{\sigma_n} \quad (6)$$

The general state of anti-crisis stability of the potential of break-even development of agribusiness enterprises in one region of the Steppe zone of Ukraine by its territorial location is presented in a combination of areas of resource support, production and sales of reduction (Table 2) [41]. Agricultural producers with the best rating assessments of anti-crisis stability of the break-even potential are characterized by high productivity of farm animals (correlation coefficient for meat cattle breeding was  $-0.88$ , for dairy cattle breeding  $-0.67$ ) and by the level of grain and legume yields (the correlation coefficient is equal to  $-0.80$ ), (Table 3) [41].

**Table 2.** The level of stability of the break-even development potential within the crisis factor load and territorial location of agribusiness enterprises on average per one region of Ukraine, 2013-2020

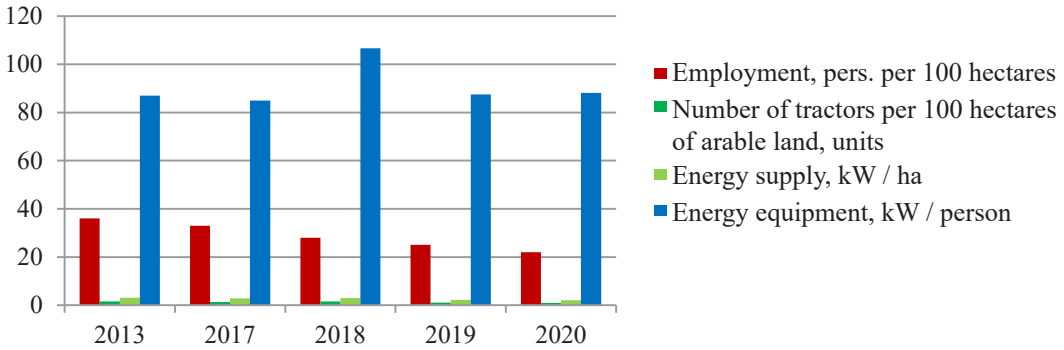
Anti-crisis factor load	2013	2017	2018	2019	2020
Sphere of resource support					
					
Average level of anti-crisis stability of the potential of break-even development in the field of resource support	3	4	3	3	3

Table 2, Continued

Anti-crisis factor load	2013	2017	2018	2019	2020
Sphere of production					
Anti-crisis factor load, Average level of anti-crisis stability of the potential of break-even development in the sphere of production	11	9	8	8	8
Sphere of sales					
Anti-crisis factor load, Average level of anti-crisis stability of the potential of break-even development in the sphere of sales	11	12	8	8	12

Source: calculated by the authors according to data [41]

**Table 3.** The influence of the factors of production sphere on the assessment of anti-crisis stability of the potential of break-even development on the territorial location of agribusiness enterprises in one region of the Steppe zone of Ukraine

Indicator	Group of enterprises by rating			Deviation between extreme groups, %	Correlation coefficient of the indicator and rating
	I – to 9	II – 10-16	III – above 17		
Yield of grains and legumes, c / ha	56.0	43.2	35.7	-36.2	-0.80
The average annual milk yield per 1 cow, kg	5306	5074	3644	-31.32	-0.68
Average daily gain of cattle, g	545	513	446	-18.23	-0.88
Costs per 1 ha of agricultural land, thousand USD	9.0	7.0	4.9	-45.24	-0.66
Level of labor productivity, thousand USD	251.7	241.2	180.5	-28.29	-0.59

Source: calculated by the authors according to data [41]

Based on the results of correlation analysis, it was determined that the higher the values of performance indicators of enterprises, the higher the rating of anti-crisis

stability of the potential of break-even development in the field of sales (Table 4).

**Table 4.** The influence of sales factors on the assessment of anti-crisis stability of the potential of break-even development on the territorial location of agribusiness enterprises in one region of the Steppe zone of Ukraine

Indicator	Group of enterprises by rating			Deviation between extreme groups, %	Correlation coefficient of the indicator and rating
	I – to 9	II – 10-16	III – above 17		
Profitability of sales, %	56.0	43.2	35.7	-36.2	-0.80
Profit per 1 ha of agricultural land, thousand USD	5306	5074	3644	-31.32	-0.68
Profit per 1 average annual employee, USD	545	513	446	-18.23	-0.88
Profitability of economic activity, %	9.0	7.0	4.9	-45.24	-0.66

**Source:** calculated by the authors according to data [41]

The generalized coefficient of taxonomy is calculated, which is defined as the integral level of anti-crisis stability of the break-even potential of the enterprise by factors of direct influence. The taxonomic distances from data points to the upper pole (with the coordinates of the standards) are calculated by formulas (7-8), [14]:

$$c_{ij} = z_{ij} - z_{j0}, d_i = \sqrt{\sum_{j=1}^n c_{ij}^2} \quad (7)$$

where,  $c_{ij}$  – taxonomic distance of the standardized value of the  $j$ -th indicator from the standard for the  $i$ -th enterprise in one region of the Steppe zone of Ukraine;  $d_i$  – distance from data points to the upper pole for the  $i$ -th object;  $z_{ij}$  – standardized value of the  $j$ -th indicator for the  $i$ -th enterprise in one region of the Steppe zone of Ukraine;  $z_{j0}$  – reference value of the  $j$ -th indicator;  $n$  – the number of direct indicators-factors influencing the crisis stability of the break-even potential.

The higher the absolute value of the rating, the less stable the state of the break-even potential of development of the enterprise is. Therefore, for each sphere of influence the standard corresponds to the minimum among all set of a rating (that is 1 place on a rating). After that, the calculation of the taxonomic indicator of anti-crisis stability of the break-even potential is made, which reflects the degree of similarity of the enterprise with the standard formula (8), [21]:

$$\mu_i = 1 - \frac{d_i}{\bar{d} + 2S} \quad (8)$$

where,  $\mu_i$  – indicator of anti-crisis stability of break-even development potential (taxonomy coefficient) for the  $i$ -th enterprise in one region of the Steppe zone of Ukraine;  $\bar{d}$  – arithmetic mean distance from the reference object, determined by the formula:  $\bar{d} = \frac{1}{m} \sum_{i=1}^m d_i$ , where,  $m$  – the number of surveyed enterprises;  $S$  – standard deviation of distances from the reference object, determined by the formula:  $S = \sqrt{\frac{1}{m} \sum_{i=1}^m (d_i - \bar{d})^2}$ .

The results of the assessment give grounds to assert that the enterprises of Kherson and Zaporizhzhia regions of the Steppe zone of Ukraine had the most stable anti-crisis state of the potential of break-even development in 2013-2020. The position of the producers of Mykolayiv region significantly worsened, from 7 place in the rating in 2013 they gradually decreased to 23 place in 2020. First, this is due to the deterioration of indicators-factors of sales. Stable positions of leaders of agricultural producers are not typical for any of the regions. Estimates of resource support of the anti-crisis state of the potential of break-even development by factors of direct impact are the most successful for agribusiness enterprises in Zaporizhzhia region of the Steppe zone of Ukraine. To do this, we have identified the factors that have the most significant impact on the effective functioning of economic entities in the area (Table 5) [41].

**Table 5.** Assessment of resource support of the anti-crisis state of the potential of break-even development of agribusiness enterprises in Zaporizhzhia region of the Steppe zone of Ukraine by indicators of direct impact

Factors of indirect influence	The coefficient of pair wise correlation between the quantitative assessment of the factor and the level of anti-crisis stability of the break-even potential					On average for 2013-2020
	2013	2017	2018	2019	2020	
Employment	0.39	0.28	0.30	0.44	0.49	0.38
Number of tractors per 100 hectares of arable land	0.02	0.17	0.11	0.18	0.43	0.18
Energy supply	0.20	0.18	0.24	0.37	0.31	0.26
Energy equipment	0.02	0.26	0.11	0.13	0.19	0.14

Table 5, Continued

Factors of indirect influence	The coefficient of pair wise correlation between the quantitative assessment of the factor and the level of anti-crisis stability of the break-even potential					On average for 2013-2020
	2013	2017	2018	2019	2020	
Costs per 1 ha of agricultural land	0.53	0.72	0.84	0.33	0.83	0.65
Yields of cereals and legumes	0.27	0.76	0.68	0.32	0.61	0.53
Average annual milk yield	0.54	0.72	0.43	0.54	0.54	0.55
Average daily gain of cattle	0.42	0.56	0.37	0.04	0.50	0.38
Level of labor productivity	0.07	0.61	0.72	0.51	0.67	0.52
Profitability of sales	0.66	0.58	0.80	0.65	0.83	0.70
Profit per 1 ha of agricultural land	0.86	0.88	0.80	0.56	0.90	0.80
per 1 average annual employee	0.61	0.64	0.78	0.61	0.81	0.69
Profitability of economic activity	0.85	0.55	0.79	0.63	0.94	0.69

**Source:** calculated by the authors according to data [41]

Authors used cluster analysis, the purpose of which is to select the object with its subsequent organization into relatively homogeneous groups of agribusiness enterprises by the share of individual elements of the qualitative system-resource component of anti-crisis stability

of the potential of break-even development in their total volume. This makes it possible to distinguish five types of economic entities in the regions of the Steppe zone of Ukraine with different structure of current assets (Table 6) [41].

**Table 6.** The results of cluster analysis of agribusiness enterprises in the regions of the Steppe zone of Ukraine on average for 2016-2020

Indicator	Groups of clusters					On average, in total
	1	2	3	4	5	
Number of enterprises	7	9	4	5	4	29
The share of current assets in the production cycle to the total value of current assets, %	80.9	77.3	46.3	84.3	39.9	65.7
– Production inventory	44.9	30.1	16.4	32.3	18.4	28.4
– Animals for breeding and fattening	2.6	3.0	1.1	1.9	0.9	6.6
– Unfinished production	33.2	44.1	28.7	48.9	20.6	35.1
– Future expenses	0.2	0.1	0.1	0.2	0.1	0.1
Share of current assets in the financial cycle to the total value of current assets, %	18.9	22.4	53.5	15.4	59.9	34.0
– Finished product	4.2	5.8	35.5	3.9	7.2	11.3
– Funds in calculations	13.9	10.0	12.1	10.9	51.8	19.7
– Cash	0.8	6.6	5.9	0.6	0.9	3.0
Other current assets	0.2	0.5	0.2	0.3	0.2	0.3
Material consumption	0.89	0.63	0.97	0.68	0.98	0.8
Duration of turnover of current assets, days	363	341	297	302	389	338
Profitability of self-financing of current assets, %	4.9	24.4	35.3	3.6	-2.9	13.1

**Source:** calculated by the authors according to data [41]

It is worth noting that in agribusiness enterprises of the third and fifth clusters, in which with a similar structure of current assets in the production cycle and a significant share (over 50%) of current assets in the financial cycle, there are different indicators of their efficiency. The reason for this trend is the excessive diversion of funds into receivables in the group of enterprises of the fifth cluster, where its size is 51.8% of the overall structure of current assets. In the general structure of current assets of the third and fifth clusters, the share of current assets in the financial cycle to their total value is 53.5% and 59.9% respectively. This led to an increase in the duration of their turnover (for the group of enterprises of the third cluster it is 297 days, for the group of the sixth cluster – 389 days). The enterprises of the first, second and fourth clusters are characterized by a significant share of inventories, unfinished production (especially for the fourth cluster) and funds in the calculations (for the first cluster). In addition, in the enterprises of the first two clusters animals for breeding and fattening occupy a significant share in the structure of current assets. We should note that the enterprises of the Steppe zone of Ukraine with an average share

of cash in the structure of current assets (second, third clusters), the profitability of their self-financing is significantly higher and is 24.4% and 35.3% respectively.

Thus, at the agribusiness enterprises of Zaporizhzhia region of the Steppe zone, as the profitability of self-financing of current assets increases, their share in the production cycle decreases. This is mainly due to a decrease in the share of unfinished production in the structure of current assets. At the same time, the increase in the profitability of self-financing of current assets is accompanied by an increase in the share of finished products and, especially, cash (Table 7) [41].

According to the principles of reliability, rationality of resource support, controllability and synergy, the quantitative component of anti-crisis stability of break-even potential is determined by the redistribution of sources of financing current assets, taking into account the synchronicity and rhythm of cash flows allowing to achieve the main purpose of its components – ensuring the stabilization of functioning and the formation of economic growth of agribusiness enterprises in the Steppe zone in the long run.

**Table 7.** The structure of current assets of agribusiness enterprises in Zaporizhzhia region of the Steppe zone of Ukraine by the level of profitability of self-financing of current assets, on average for 2016-2020

Indicator	Groups of enterprises on the profitability of self-financing of current assets					On average, in total
	Unprofitable above – 13.1	Unprofitable from 13.1 to 0	From 0.1 to 10.0	From 10.1 to 30.0	Above 30.1	
Number of enterprises	2	2	4	12	9	29
Profitability level, %	-21.4	-7.8	6.1	28.1	36.2	8.3
The share of current assets in the production cycle, total, %	67.1	68.2	67.7	61.8	63.3	65.6
– Production inventory	15.4	19.7	31.6	32.3	39.9	27.6
– Animals for breeding and fattening	2.4	3.1	1.9	2.3	2.0	2.5
– Unfinished production	49.4	45.8	34.1	27.0	21.3	35.5
– Future expenses	0.2	0.1	0.1	0.2	0.1	0.1
Share of current assets in the financial cycle, total, %	32.6	31.6	31.7	38.1	36.3	34.1
– Finished product	2.9	3.7	9.4	19.2	16.8	10.4
– Funds in calculations	29.5	27.4	18.9	10.2	11.4	19.5
– Cash	0.2	0.5	3.4	8.7	8.1	4.2
Other current assets, %	0.3	0.2	0.6	0.1	0.4	0.3

**Source:** calculated by the authors according to data [41]

Quantitative system-resource component of break-even development potential is assessed by qualitative or conditionally qualitative indicators and characterizes the degree of meeting the need for financing current assets by a set of own and borrowed resources, represented by the following indicators [42; 43]:

- indicators that reflect compliance (non-compliance) with the target parameters: the coefficient of synchronicity of incoming and outgoing cash flows by volume ( $x_1$ ); the coefficient of rhythmicity of incoming and outgoing cash flows in terms ( $x_2$ ); coefficient of uniformity of cash receipts during the period ( $x_3$ ); coefficient of uniformity of cash payments during the period ( $x_4$ ); the coefficient of synchronicity of incoming and outgoing cash flows during the period ( $x_5$ ); coefficient of balance of receivables and payables by volume ( $x_6$ ); coefficient of balance of receivables and payables by terms ( $x_7$ ); the ratio of total income and total costs of the enterprise ( $x_8$ ); the coefficient of conformity of the formed reserve of resources at the enterprise ( $x_9$ );

- dynamic indicators that reflect the change of target parameters in space and time: capital growth rates ( $x_{10}$ ); equity growth rates ( $x_{11}$ ); growth rates of current

- liabilities and collateral ( $x_{12}$ ); growth rates of long-term liabilities and collateral ( $x_{13}$ ); growth rates of accounts payable ( $x_{14}$ ); net profit growth rates ( $x_{15}$ ); gross profit growth rates ( $x_{16}$ ); growth rates of financial result from operating activities ( $x_{17}$ ); growth rates of pre-tax financial result ( $x_{18}$ ).

To establish the priority of the choice of indicators for assessing the system-resource component of the anti-crisis stability of the potential of break-even development, using the expert method, a forecast assessment of the quality of resource support of the structure of current assets is carried out. The reliability of the assessment ensures the representativeness of the results with probability 95%. Thus, according to the calculations, the relative importance of the indicators, which corresponds to the percentage of variance, is for the indicators  $x_{10}, x_{15}, x_{11}, x_8, x_7$  – 28.6%, 23.8%, 17.4%, 13.8%, 7.8% respectively. These values correspond to the weights in the integrated model of resource support for the quantitative component of anti-crisis stability of the break-even potential of agribusiness enterprises of the Steppe zone, which forms the structure of the qualitative component (current assets) and has the form:

$$I_{rs}^{ASPBR} = 0.286 \times x_{10} + 0.238 \times x_{15} + 0.174 \times x_1'' + 0.138 \times x_8 + 0.078 \times x_7 + \varepsilon \quad (9)$$

where,  $I_{rs}^{ASPBR}$  – an integrated indicator of resource support for the quantitative component of anti-crisis stability of the potential of break-even development of agribusiness enterprises;  $x_{10}$  – capital growth rates;  $x_{15}$  – growth rates of net profit;  $x_1$  – the coefficient of synchronicity of incoming and outgoing cash flows by volume (the ratio of incoming cash flows to outgoing for the period);  $x_1''$  – modified value of the indicator  $x_1$ ;  $x_7$  – coefficient of balance of receivables and payables by terms (calculated as the correlation coefficient between these indicators for the period with quarterly detailing);  $\varepsilon$  – the probability of error due to the influence of unaccounted factors. All indicators of the model are index values that have the same dimension and do not require standardization. The optimal value for the indicator  $x_1$  is 1. Deviation from it indicates a decrease in the quality of resource support in terms of the quantitative component of anti-crisis stability of break-even potential:  $x_1 > 1$  indicates an excess of incoming cash flow over outgoing and is a sign of inefficient use of funds as a result of their accumulation;  $x_1 < 1$  indicates an excess of outgoing cash flow over incoming, which leads to the accumulation of debt and reduced solvency. In view of the above, model (9) uses a modified value of the indicator  $x_1$ , which takes into account the negative impact of values of indicators other than 1, by reducing the integrated indicator. The modified value of the indicator  $x_1$  is proposed to be determined by formula (10) [23]:

$$x_1'' = \begin{cases} x_1, & \text{when } x_1 \leq 1 \\ \frac{1}{x_1}, & \text{when } x_1 \geq 1 \end{cases} \quad (10)$$

For the indicator of the balance of receivables and payables in terms of  $x_7$  the optimal value is also 1. If  $x_7 \neq 1$ , then there is an imbalance of receivables and payables in time, which leads to a violation of the solvency of the enterprise. This indicator is estimated by the correlation coefficient at the value of  $[-1; +1]$ . Under condition  $x_7 \neq 1$  there is a decrease in the integrated indicator, respectively, the greater the deviation from 1, the greater the decrease in the indicator  $I_{rs}^{ASPBR}$ .

The levels of the quality of resource support on a quantitative component of anti-crisis stability of potential of break-even development of the enterprises of agribusiness are defined on the basis of values of the integrated indicator formula (9) by Fibonacci rule formula (11) [23]:

$$\left\{ \begin{array}{l} I_{rs1}^{ASPBP} = I \\ I_{rs2}^{ASPBP} = I_{rsmin}^{ASPBP} \cdot I_{rsmax}^{ASPBP} \\ rSmax_{ASPBP} \\ rSmin_{ASPBP} \end{array} \right. \quad (11)$$

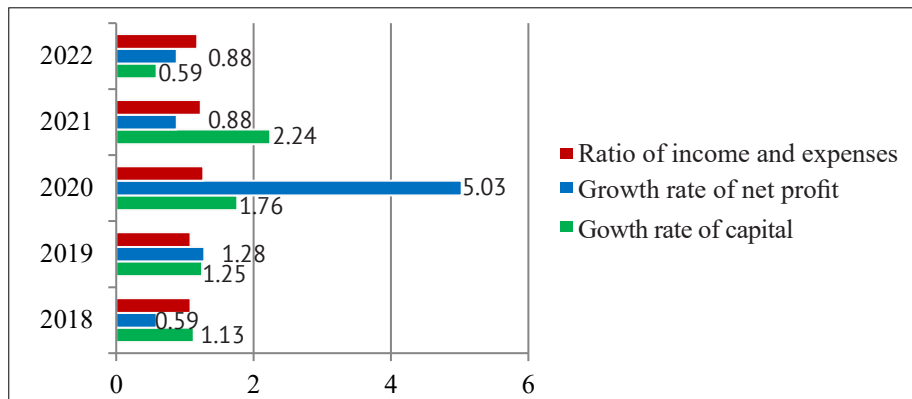
where,  $I_{rsmin}^{ASPBP}$  – the minimum possible value of the integrated indicator;  $I_{rsmax}^{ASPBP}$  – the maximum possible value of the integrated indicator;  $[I_{rsmin}^{ASPBP}, I_{rsmax}^{ASPBP}]$  – allow level of quality of resource provision in terms of the quantitative component of anti-crisis stability of the potential of break-even development of agribusiness enterprises;  $I_{rsmin}^{ASPBP}$  – the average level of quality of resource support in terms of the quantitative component of anti-crisis stability of break-even development potential;  $(I_{rs2}^{ASPBP}, I_{rsmax}^{ASPBP})$  – high level of quality of resource provision on the quantitative

component of anti-crisis stability of the potential of break-even development.

The calculated integrated indicator does not have a lower and upper measurement limit. The lower limit is taken as 0, in the absence of anti-crisis measures for the stability of the potential of break-even development of the enterprise (all indicators are equal 0); the upper limit (all coefficients are equal 1), formed according to the Main Department of Statistics of Ukraine (growth rates of resources (capital and net profit), balance of cash flows, receivables and payables, income and expenses) [44]. Thus, the average capital growth rate in 2020 in Ukraine was 1,006; average growth rate of net profit – 0.66 [35]. According to the value 0.8 is the level of the integrated

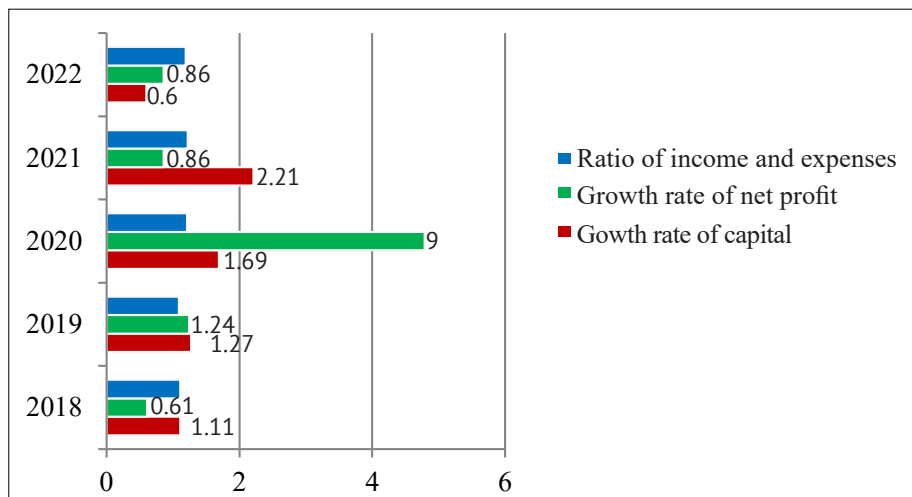
indicator in the range: low – [0; 0.3], medium – [0.3; 0.5], high – [0.5; 0.8]. However, taking into account all possible variants of the integrated indicator, the low level of quality of resource support in terms of the quantitative component of anti-crisis stability of the break-even potential is determined at  $I_{rs}^{ASBPB} \leq 0.3$ , high –  $I_{rs}^{ASBPB} \geq 0.5$ .

Within the framework of researches for forecast representativeness of assessment of the level of quality of resource support by quantitative component of anti-crisis stability of break-even development potential on average per one enterprise of the Steppe zone region and by Steppe zone regions as a whole the growth rates of capital, net profit, income and expense ratio are calculated, which are presented in (Fig. 5-6).



**Figure 5.** Forecast level of resource support by the quantitative component of anti-crisis stability of the break-even development potential on average in Zaporizhzhia region of the Steppe zone of Ukraine, 2021-2023

Source: calculated by the authors



**Figure 6.** Forecast level of resource support by the quantitative component of anti-crisis stability of the potential of break-even development on average per one agribusiness enterprise of Zaporizhzhia region of the Steppe zone of Ukraine, 2021-2023

Source: calculated by the authors

Thus, the deviation of the average indicators per enterprise of Zaporizhzhia region of the Steppe zone, from the average level in the region as a whole, does not exceed |5%|, which with probability 95% allows asserting the reliability of the calculation results. It is

important to emphasize that the structure of the resource component of self-financing of agribusiness enterprises is dominated by equity, the factor of change of which is the financial result, and its value is the most effective source of anti-crisis stability of break-even development

potential. In this connection the further task of our study is to forecast the target parameters of self-financing to determine the optimal level of stabilization of economic growth of economic entities of the Steppe zone. The grouped target parameters are formed into one factor, which characterizes the reproductive aspect of self-financing of anti-crisis stability of the potential of break-even development.

Accordingly, a representative integrated level of stability of break-even development potential by self-financing target parameters is determined by the "center of gravity" method based on minimizing the sum of Euclidean distances, which allows to determine indicators in the middle of the factor and maximize them between groups [45]:

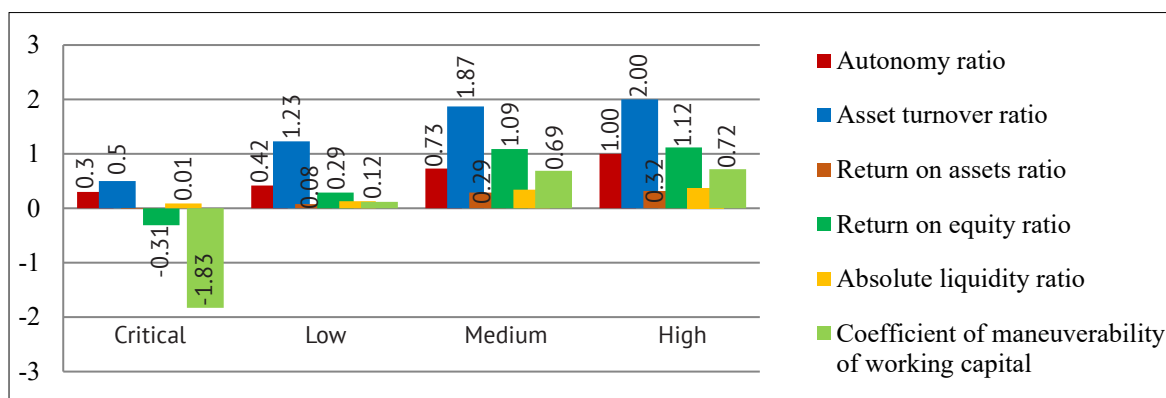
$$d_{ij} = \sqrt{\sum_{k=1}^n (x_{ik} - x_{jk})^2} \quad (12)$$

where,  $d_{ij}$  – Euclidean distance between objects (indicators)  $i$  and  $j$ ;  $x_{ik}$  – the value of the  $i$ -th indicator for the  $k$ -th agribusiness enterprise in the region;  $n$  – number of enterprises in the region ( $n=32$ ).

Based on the forecast, it is determined that the system of factors-representatives of anti-crisis stability

of the potential of break-even development of agribusiness enterprises in Zaporizhzhia region of the Steppe zone of Ukraine consists of: coefficient of autonomy (own funds factor), asset turnover ratio (profitability factor of the enterprise), the rate of return on equity (factor of capital efficiency), the ratio of absolute liquidity (liquidity factor of the enterprise), the coefficient of maneuverability of working capital (the factor of maneuverability of own funds). According to the results of the forecast for 2021-2023, agribusiness enterprises in Zaporizhzhia region of the Steppe Zone are divided into 4 clusters according to the levels of the range of limits of influence of target parameters of self-financing on the level of anti-crisis stability of break-even development potential. Since the degree of similarity between all clusters is zero, it means that the ranges of values of indicators attributed to different levels do not intersect and the levels of values of indicators are formed on the basis of actual values of indicators for enterprises included in the cluster.

The ranges of the limits of the impact of target parameters of self-financing on the level of anti-crisis stability of the potential of break-even development of agribusiness enterprises of Zaporizhzhia region of the Steppe zone are presented in (Fig. 7).



**Figure 7.** Forecast range of limits of target parameters of self-financing and their influence on the level of anti-crisis stability of the potential of break-even development of agribusiness enterprises in Zaporizhzhia region of the Steppe zone for 2021-2023

**Source:** calculated by the authors

Thus, the forecast level of the range of limits of the target parameters of self-financing, which provides the overall integrated level of anti-crisis stability of the break-even development potential, according to the selected indicators is sufficient. Because self-financing is characterized by the availability of sufficient equity to cover current liabilities, financial independence and the availability of self-sustaining sources of break-even development, all target parameters of self-financing are high.

## CONCLUSIONS

Thus, the attributes of strategic priorities to increase the anti-crisis stability of the potential of break-even development of agribusiness enterprises should be based on the principles of competitive advantage and target

parameters of self-financing in the context of their equivalent relations with other entities in their territory (i.e., in the domestic and foreign markets of raw materials and food), on the program-targeted approach to the reproduction of stable economic growth in the choice of effective tools for regulating the resource support of agricultural producers. Only on the basis of organic combination and complementarity of internal and external stabilization programs to reproduce self-financing and quality level of resource support or regulation of profits of agricultural producers it is possible to use methods of subsidizing, dating, stimulating resource-saving technologies, placing funds in startup projects of economic growth of enterprises, in conditions of cyclical downturns of break-even development. This requires identifying areas



for balancing the production and financial cycle, the accumulation of a significant amount of own resources through additional capitalized reserves, cash flow management with limited involvement of external resources. These areas can be addressed through the introduction of stabilization anti-crisis programs that take into account the stimulating levers of strategic priorities of resource support, which are necessary regulators of the reproductive mechanism to ensure anti-crisis stability of break-even development potential.

In this case, the variability of resource support through the flow of resources of economic entities should cover all possible changes in the structure of financing. First, each progressive movement of the flow of resources in the cycle of the reproduction process of the production and financial cycle causes changes in both the target parameters of self-financing and qualitative sources of resource support. Second, the total amount of funding changes when the flow of resources provides a regrouping of the structure of property assets. That is, this variability in operations is determined by the need to finance variable costs and costs associated with the replacement of machinery and equipment. Third, the balance between

financial resources and their sources must be maintained after any flow of resources. This equality arises when the redistribution of the balances of financial resources, i.e. with an increase or decrease in the level of anti-crisis stability of the potential of break-even development.

When choosing high-quality sources of resources for agricultural enterprises, it is necessary to take into account the specifics of production and the formation of cash flow in the financial cycle. The volume and structure of resource support should be formed on the basis of real opportunities for the development of financial resources, return on investment and ensuring profitable activities in the short and long term. The structure of resource support should be considered as the ratio of the cost of all own resources to the cost of borrowed ones, which are used in the reproductive process of stabilization of anti-crisis stability. It is necessary to understand and take into account these features when synchronizing and accelerating the process of resource inflow and capitalization of their temporarily free balances, carrying out investment operations, taking into account the possible terms of return and risk.

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## Антикризова стабільність потенціалу розвитку беззбитковості та його ресурсне забезпечення в агробізнесі

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**Анотація.** У статті розглядається антикризова стабільність потенціалу беззбиткового розвитку та його ресурсна підтримка в агробізнесі. Доведено необхідність синергетичного підходу до оцінки динамічного потоку ресурсів, здатних генерувати власні джерела фінансування для активації цільових параметрів кризової стабільності потенціалу розвитку беззбитковості та розробки альтернативного сценарію самофінансування виробничо-фінансового. Обґрунтовано відтворювальний процес ресурсного забезпечення антикризової стабільності потенціалу безпечного розвитку підприємств агробізнесу. Представлена модель оцінки цільових параметрів антикризової стабільності потенціалу збиткового розвитку аграрного бізнесу та матриця її точкової оцінки під час вибору альтернативного сценарію самофінансування. Розроблено сценарії потоку ресурсного забезпечення антикризової стабільності потенціалу збиткового розвитку підприємства агробізнесу. Запропоновано показник рівня антикризової стабільності потенціалу беззбитковості розвитку відповідно до визначених цільових параметрів самофінансування. Проаналізовано динаміку навантаження антикризового чинника на стабільність потенціалу розвитку беззбитковості підприємств агробізнесу в середньому в одному регіоні Степової зони України за територіальним розташуванням. Кластерний аналіз використано для оцінки елементів якісної системно-ресурсної складової антикризової стабільності потенціалу розвитку беззбитковості з відокремленням типів підприємств агробізнесу в регіонах Степової зони України з різною структурою активів. Визначено прогнозний рівень ресурсного забезпечення відповідно до кількісної складової антикризової стабільності потенціалу розвитку беззбитковості в середньому за регіонами Степової зони України та на одне підприємство агробізнесу регіону. Представлено діапазон прогнозів меж цільових параметрів самофінансування та їх вплив на рівень антикризової стабільності потенціалу збиткового розвитку підприємств агробізнесу в середньому за одним регіоном Степової зони

**Ключові слова:** антикризова стабільність, підтримка ресурсів, платоспроможність, рентабельність, самофінансування, беззбитковий розвиток