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## **THE DEVELOPMENT OF DIAGNOSTIC TOOLS FOR ASSESSING THE LEVEL OF FINANCIAL CORPORATIONS' STABILITY BY CASCADE APPROACH**

**Abstract.** The scientific article is devoted to the development of a methodology for assessing the financial stability of financial corporations using the technology of cascading approach to identify weak areas in their activities and prevent the development of threats to their stable operation. The root causes of their financial instability are selected as the object of financial corporations' financial stability assessment, and a chain of causal relationships is considered that turn the preconditions into real threats to financial stability or even signs of the corporation's financial fragility. At the same time, the source of prerequisites for the financial stability of financial corporations in the state and depth of imbalances, which are formed both in the internal and external environment of their operation.

It is proved that the tools for assessing internal imbalances in the activities of financial corporations should not be limited to financial imbalances, as their root causes can be concentrated in the organizational, managerial, institutional, conceptual component, in the field of personnel, information, technical support. Therefore, the structuring of imbalances in the activities of financial corporations is proposed to be carried out according to the theory of economic potentials and to identify the following content areas: opportunities, resources, tools, and abilities, the interaction of which forms the potential of financial corporations to operate.

A three-stage method for assessing the financial stability of financial corporations has been developed, using a cascading approach, which involves the consistent diagnosis of internal imbalances in the activities of financial corporations: 1) those that arise within each component (resources, means, and capabilities) and are the area of origin of internal threats to their financial stability; 2) imbalances that arise through inter-component interaction (resources-means; abilities-means; resources-abilities) and are the sphere of manifestations of imbalances; 3) those that arise through interaction with the external environment and maximally show the impact of their condition and depth on the level of financial stability.

For each of these areas, a set of indicators has been developed and an algorithm for calculating the integrated index of financial stability of a financial corporation has been constructed. The scientific and methodological approach was tested on the example of systemically important banks of Ukraine during 2017—2020, each of which is currently in a continuum of financial stability, and for most banks, there is a growing trend of quantitative measurement of its level.

In general, the paper reveals a comprehensive approach to assessing the financial stability of financial corporations, which allows you to systematize those key positions in which the imbalance increases the likelihood of their financial fragility and financial instability.

**Keywords:** financial corporations, financial stability, internal imbalances, economic potential, valuation, indicators, nonlinear rationing.

**JEL Classification** C13, C81, D53, G21, G23

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## **РОЗВИТОК ДІАГНОСТИЧНОГО ІНСТРУМЕНТАРІЮ ВИМІРУ РІВНЯ СТАБІЛЬНОСТІ ФІНАНСОВИХ КОРПОРАЦІЙ ЗА КАСКАДНИМ ПІДХОДОМ**

**Анотація.** Присвячено розвитку методології оцінки фінансової стабільності фінансових корпорацій за технологією каскадного підходу задля своєчасного виявлення слабких сфер у їхній діяльності та попередження розвитку загроз їхньому стабільному функціонуванню. Об'єктом оцінювання фінансової стабільності фінансових корпорацій обрано першопричини їхньої фінансової нестабільності, а також передбачено урахування ланцюжка причинно-наслідкових залежностей, які перетворюють передумови в реальні загрози фінансовій стабільності чи навіть ознаки фінансової крихкості корпорації. При цьому джерелом передумов фінансової стабільності фінансових корпорацій є стан і глибина дисбалансів, які утворюються як у внутрішньому, так і зовнішньому середовищі їх функціонування.

Доведено, що інструментарій оцінки внутрішніх дисбалансів у діяльності фінансових корпорацій не повинен обмежуватися лише фінансовими диспропорціями, оскільки їхні першопричини можуть бути зосереджені в організаційно-управлінській, інституційній, концептуальній складових, у сфері кадрового, інформаційного, технічного їх забезпечення. Тому структурування дисбалансів у діяльності фінансових корпорацій запропоновано здійснювати за теорією економічних потенціалів і виокремлювати такі змістові напрями: можливості, ресурси, засоби та здатності, взаємодія яких і формує потенціал фінансових корпорацій до стабільного функціонування. Розроблено трьохетапний метод оцінювання фінансової стабільності фінансових корпорацій, застосовуючи каскадний підхід, який передбачає послідовну діагностику внутрішніх дисбалансів у діяльності фінансових корпорацій: 1) тих, що виникають у межах кожної окремої компоненти (ресурси, засоби

і здатності) та є сферою зародження внутрішніх загроз їхній фінансовій стабільності; 2) дисбаланси, які виникають через міжкомпонентну взаємодію (ресурси-засоби; здатності-засоби; ресурси-здатності) і є сферою проявів дисбалансів; 3) тих, що виникають через взаємодію із зовнішнім середовищем і максимально проявляють вплив їхнього стану та глибини на рівень фінансової стабільності. За кожним з цих напрямів розроблено сукупність індикаторів і сконструйовано алгоритм розрахунку інтегрального індексу фінансової стабільності фінансової корпорації. Апробацію науково-методичного підходу проведено на прикладі системно важливих банків України протягом 2017—2020 років, кожен з яких наразі перебуває в континуумі станів фінансової стабільності, а також для більшості банків спостерігається зростаючий тренд кількісного виміру її рівня.

Загалом, розкрито комплексний підхід до оцінки фінансової стабільності фінансових корпорацій, який дозволяє систематизувати ті ключові позиції, дисбаланс у яких підвищує ймовірність їхньої фінансової крихкості та фінансової нестабільності.

**Ключові слова:** фінансові корпорації, фінансова стабільність, внутрішні дисбаланси, економічний потенціал, оцінка, індикатори, нелінійне нормування.

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**Introduction.** The concept of financial stability was actively included in the terminology of financial science in the early 2000s, which was caused by the formation of the institution of financial stability, implementing its functionality through the Financial Stability Board and gradually giving central banks a macro prudential mandate. The latter is considered a highly effective mechanism due to the objectively strong relationship between the real and financial sectors of the economy, as their quantitative indicators are influenced by long-term trends, which have their nature and often depend on world economic and financial trends and internal problems. which, as a rule, have a predictable nature [1].

At the same time, the methodology for ensuring financial stability at the micro-level, in particular at the level of financial corporations, is still in its infancy. We completely agree with the thesis of T. E. Unkovskaya on the «existence of a methodological gap between the understanding of macro-financial stability and financial stability at the micro-level (at the level of financial corporations, enterprises, etc.)» [2]. This, in turn, is reflected in the method of assessing the level of financial stability of the corporation, which is often reduced to a coefficient retrospective analysis of its financial condition. In this case, the complex internal nature of such an economic phenomenon as financial stability, the substantive features of which are predictability, countercyclicality, functionality, and coherence [3, p. 72—73]. With this in mind, we are convinced that the object of diagnosis should be the root causes of financial instability of financial corporations, both internal and external.

**Research analysis and problem statement.** It should be noted that currently the scientific achievements of the methodology for assessing the financial stability of financial corporations are characterized by a wide variety, which is primarily determined by its theoretical basis. Thus, B. Eichengreen [4], C. Wyplosz [5], L. Laeven [6] studied this issue from the standpoint of banking crisis theory, and there fore propose to assess financial stability only at the macro level based on the diagnosis of macroeconomic indicators. Of course, the defining feature of financial institutions is their high sensitivity to the external economic environment. At the same time, they are active “creators” of the state of macroeconomic indicators, so neglecting to assess the specifics of their activities significantly weakens prevention in identifying threats to financial stability at both the macro and micro levels.

G. Kaminsky [7], J. Corsetti [8], D. Diamond [9] consider the issue of diagnosing financial stability from the standpoint of the theory of economic expectations and build diagnostic tools from the standpoint of investors' expectations, including in the event of moral hazard of the surveyed corporations. We consider such an approach valuable, as it is based on the classical laws of market economy development. At the same time, it is devoid of complexity from the standpoint of both the set of studied factors and the types of stakeholders.

It should be noted that the latter is to some extent solved in the works of F. Mishkin [10], L. Kodres [11], E. Davis [12], who rely on the provisions of agency theory and focus on assessing the imbalances resulting from information asymmetry. in the financial relationships of the respective counterparties. We are impressed by such a methodological approach, but it requires its development in a pragmatic plane and indicative formalization.

One of the most widely used indicative approaches to assessing financial stability is the International Monetary Fund, which since 2004 has been recognized as a significant central bank in all countries. At the same time, this method involves the compilation of 40 multifaceted indicators, and of these, first, only 14 indicators are directly related to financial corporations. Secondly, this method does not provide an integrated assessment of the level of financial stability, as well as taking into account the inter-dependence between indicators.

Inturn, L. Lepetit [13], E. Altman [14], F. Strobel [15], I. R. Badea [16] develop an integrated approach to assessing the financial stability of economic entities, including financial corporations. First of all, we are talking about the Z-score, scientific approaches to the calculation of which differ in both structure and technology.

A special place among the methods of assessing the financial stability of financial corporations is usually a balance sheet approach. In this context, its development based on the use of a set of market indicators of their activity, which is found in the work of L. Mörntinen [17], deserves special attention.

Along with all the above, we consider very valuable a comprehensive approach to assessing financial stability, presented in the work of O. Kolodiziev, I. Chmutova, and V. Lesik [18]. Scholar stake into account the following aspects: the importance of central bank stabilization measures; efficiency of banks' performance of basic functions; structural changes in the banking sector and features of systemically important institutions.

Note that each of these approaches to valuation can find its place in the system of comprehensive financial stability of financial corporations, however, as noted above, it is necessary that the object of evaluation were the root causes of financial instability of financial corporations. Another, no less important, is the consideration of a chain of causal relationships that turn the preconditions into real threats to financial stability, or even signs of the financial fragility of the corporation. This is what determined **the purpose of the article**, which is to develop a methodology for assessing the financial stability of financial corporations using the technology of cascading approach to identify weaknesses in their activities and prevent the development of threats to their stable operation.

**Results of the research.** First of all, we will formulate a theoretical core, which will be placed in the diagnostic tools of financial stability of financial corporations.

First, in our opinion, the source of prerequisites for the financial stability of financial corporations in the state and depth of imbalances that arise in both internal and external environment of their operation. At the same time, we are convinced that internal balance is the primary ability of an individual financial corporation to maintain the target level of financial stability, even in conditions of deep imbalance in the external economic environment. Note that the concept of «imbalance» is seen as a dialectically interconnected opposite of equilibrium, moreover, as an organic, objective component of the triad of dependencies «equilibrium — imbalance — crisis». At the same time, studying the issue of financial stability in the paradigm of synergetics, we note that the latter proceeds from the postulate that the dominant source of socio-economic transformations and development, in general, is an imbalance, while equilibrium systems are not capable of development and self-organization. That is, imbalances are both a factor of violation and a fundamental factor in ensuring the development of the system. Thus, *the imbalance in the functioning of a financial corporation is: 1) an objective permanent form of manifestation of its interaction with the external environment; 2) the reason for the violation of its equilibrium state; 3) the driving force of the new stage of development of the corporation after passing the bifurcation point.*

Secondly, financial stability is an economic phenomenon, the state of which is determined by a complex of various factors and not only the financial nature. That is, we firmly believe that building tools for assessing internal imbalances in the activities of financial corporations should not be limited to financial imbalances, as their root causes can be concentrated in organizational, managerial, institutional, conceptual components, in the field of staffing, information, technical support. In turn, ignoring such multichannel influence turns the process of ensuring the financial stability of financial corporations into continuous adaptation, the current response to actual challenges of external or internal environment, is only a reactive approach will be used, which is ineffective for long-term and continuous maintenance of financial stability.

Third, we believe that the structuring of imbalances in the activities of financial corporations should be carried out on the theory of economic potentials and identify the following areas: opportunities, resources, tools, and capabilities, the interaction of which forms the potential of financial corporations to operate stably. At the same time, by the resources of financial corporations, we mean their finances; the means include methodological, technological, and informational support of their internal processes; abilities are interpreted as knowledge and value support of their activities; Under the capabilities of financial corporations we understand the conditions of their activities, the on set of which synthesizes all the characteristics of their resources, abilities, and capabilities and as a result forms their potential to ensure stable and continuous operation overtime.

Fourth, it is the choice of technology for processing quantitative indicators of imbalances of financial corporations. Based on the logic that internal imbalances first arise within each component (resources, resources, and capabilities), which we define as the area of origin of internal threats to the financial stability of financial corporations. In the future, the existing one-component imbalances enter into inter-component interaction, thereby deepening the imbalance of financial corporations. This determines the scope of manifestations of imbalances.

Finally, the whole spectrum of previously accumulated imbalances interacts with the external environment, maximizing its consequences and impact on the level of financial stability. In this case, we consider it important that the processing of quantitative data is consistent, and a subsequent stage, the results of the diagnosis at the previous one are taken into account. In addition, taking into account the chain of causal relationships between different sources of internal imbalances in the activities of financial corporations is proposed to take into account through the logic of building indicators to assess the financial stability of the studied institutions.

Given this multifaceted nature, we consider it appropriate to propose a three-stage method of assessing the financial stability of credit institutions, using a cascading approach. In more detail, the concept of the author's approach to assessing the financial stability of financial corporations is given in the Table. 1.

Table 1

**Objects for assessing the financial stability of financial corporations in terms of stages of diagnosis by cascading approach**

Stage number	Direction of assessment	Assessment objects
I	resources — resources	disproportions between the absolute volumes of the respective items of the FC* balance and the rates of their change
	abilities — abilities	compliance of professional competence of FC employees with the sphere of their activity, the level of their perception of corporate values, and awareness of the dependence of the general results of FC activity on the quality of performance of own functional duties
	tools — tools	the quality and completeness of the methodological description of the implementation of internal business processes, its compliance with legislation and current trends in financial intermediation; compliance of the methodological tools of risk management of FC with the chosen business model and their corporate values to the declared goals of activity; technological level of ensuring business processes of FC, their compliance with modern IT trends

Table 1 (continued)

Stage number	Direction of assessment	Assessment objects
II	resources — tools	the quality of methodological support of the FC riskmanagement system
	abilities — tools	losses from the implementation of operational risk
	resources — abilities	the relationship between the financial performance of the FC and the professional level of staff; consistency of the system of remuneration of senior management with the financial performance of FC
III	opportunities — resources	deviation of financial indicators (including financial results) of FC from the average market
	opportunities — abilities	compliance of internal standards of realization of separate business processes and conducting of business of FC with the value-oriented concept
	opportunities — tools	depth of penetration of technological financial innovations into FC business processes

\*FC — financial corporations.

Source: developed by the authors.

Note that the full list of indicators of the author's scientific and methodological approach to assessing the financial stability of financial corporations is presented in [3, p. 241—250].

It should be noted that the main practical purpose of the proposed approach is to assess the level of financial stability of an individual financial corporation, at the same time, it can also be used to assess the effectiveness of indicative regulation of financial institutions by its ability to detect the first signs of deteriorating financial stability. It is implied that the greater the number of indicators of indicative regulation of financial corporations can detect their internal imbalances at the stage of origin and manifestation (stages I and II of the proposed approach), the more effective the regulatory system in terms of preventive diagnosis of financial fragility. For example, the new short-term (LCR) and long-term liquidity (NSFR) standards introduced based on Basel III recommendations are referred to the stage of assessing the financial stability of financial corporations, as they can identify dangerous features of a financial institution's financial policy. In turn, oversight of financial corporations' compliance with regulatory values forces them to manage assets and liabilities in a balanced way during different phases and types of business activity.

Quantitative measurement of the level of financial stability of a financial corporation is proposed to be based on the calculation of the integrated index of financial stability. Its calculation should include the following methodological steps:

- 1) formation of a set of indicators at each stage of assessment;
- 2) substantiation of reference values of indicators;
- 3) rationing of actual values of indicators based on non linear function;
- 4) determination of weight coefficients of each indicator taking into account the Fishburne criterion;
- 5) determination of sub-indices of financial stability of the credit institution for each stage of assessment (formula 1):

$$SIFS_{ij} = \sum_{w=1}^3 (r_w \sum_{k=1}^s norm_{ki} \cdot r_k)_w, \tag{1}$$

where  $SIFS_{ij}$  — sub-indices of financial stability of the  $i$ -th financial corporation at the  $j$ -th stage of assessment;  $norm_{ki}$  — a normalized value of the  $k$ -th indicator of the  $i$ -th financial corporation;  $r_k$  — the weights of the  $k$ -th indicator, determined by the Fishburne criterion;  $r_w$  — weights for the  $w$ -th direction of evaluation;  $w$  — the number of a reas for assessing the financial stability of a financial corporation;  $j$  — the number of stages of assessing the financial stability of a financial corporation;

- 6) calculation of the integrated index of financial stability of a financial corporation (formula 2):

$$FSI_i = \sum_{j=1}^3 a_j SIFS_{ij}, \tag{2}$$

where  $FSI_i$  — integrated index of financial stability of the  $i$ -th financial corporation;  $a_j$  — weight coefficients of financial stability sub-indices determined by the Fishburne criterion;

7) building a scale according to the rule «3σ» and assigning a financial corporation one of the three levels of financial stability — high, satisfactory, low.

We detail these positions. Regarding the set of indicators, as mentioned above, special attention was also paid to non-financial indicators. At the same time, the data needed to assess the financial stability of financial corporations in areas such as «means» and «capabilities» are mostly classified as trade secrets, so they can not be fully applied by external actors in the diagnostic process. Given this, to give the proposed scientific and methodological approach the ability to apply in practice to a wide range of stakeholders, it was decided to include in the set of indicators of financial stability of financial corporations only those that are characterized by open statistics. In general, the general list of indicators in terms of evaluation directions and their reference values are given in the *Table 2*.

Table 2

**Algorithm for calculation and reference values of financial stability indicators  
of financial corporations**

Indicator	Reference value	Indicator type
<b>ASSESSMENT DIRECTION «DIRECTION-RESOURCES»</b>		
$I_{11}^1 = \frac{\text{Equity}}{\text{Volume of net assets}}$	More than 15%	↑
$I_{12}^1 = \frac{\text{Equity}}{\text{Volume of net assets}} - \frac{\text{Equity}}{\text{Total assets}}$	Less than 5%	↓
$I_{13}^1 = \frac{\text{The rate of change in equity}}{\text{The rate of change in net income assets}}$	$95\% \leq I_{13}^1 < 150\%$	↓/↑
$I_{14}^1 = \frac{\text{Volume of net income assets}}{\text{The amount of paid liabilities}}$	More than 90%	↑
$I_{15}^1 = \frac{\text{Total income assets}}{\text{The amount of paid liabilities}} - \frac{\text{Volume of net income assets}}{\text{The amount of paid liabilities}}$	Less than 5%	↓
$I_{16}^1 = \frac{\text{Equity}}{\text{The amount of funds raised}}$	More than 15%	↑
$I_{17}^1 = \frac{\text{Assets with a maturity of more than 1}}{\text{-year liabilities with a term of more than 1 year}}$	$95\% \leq I_{17}^1 < 120\%$	↓/↑
$I_{18}^1 = \frac{\text{Liquid assets}}{\text{Short - term liabilities}}$	$40\% \leq I_{18}^1 < 60\%$	↓/↑
$I_{19}^1 = \frac{\text{Volume of customer deposits}}{\text{volume of customer loans}}$	More than 90%	↑
$I_{110}^1 = \frac{\text{The rate of change in loans to customers}}{\text{rate of change in customer deposits}}$	$80\% < I_{110}^1 < 100\%$	↓/↑
$I_{111}^1 = \frac{\text{Total loans} - \text{Volume of customer deposits}}{\text{the amount of equity}}$	Less than 50%	↓
$I_{112}^1 = \frac{\text{Volume of foreign currency loans}}{\text{Volume of foreign currency liabilities}}$	$90\% \leq I_{112}^1 < 100\%$	↓/↑
$I_{113}^1 = \frac{\text{The total amount of foreign currency loans}}{\text{Volume of foreign currency liabilities}} - \frac{\text{Volume of net foreign currency loans}}{\text{Volume of foreign currency liabilities}}$	Less than 5%	↓

Table 2 (continued)

Indicator	Reference value	Indicator type
<b>ASSESSMENT DIRECTION «RESOURCES-TOOLS»</b>		
$I_{21}^2 = \frac{\text{The rate of change in loans to customers}}{\text{The rate of change in the number of reserves for their depreciation}}$	More than 105%	↑
$I_{22}^2 = \frac{\text{The amount of provisions for loan impairment}}{\text{The amount of credit risk}}$	Not less 100%	↑
$I_{23}^2 = \frac{\text{Volume of non – performing loans}}{\text{The total amount of loans granted to customers}}$	Less than 20%	↓
$I_{24}^2 = \frac{\text{The rate of change in the volume of non – performing loans}}{\text{The rate of change in the total amount of loans granted to customers}}$	Less than 50%	↓
$I_{25}^2 = \frac{\text{The amount of regulatory capital}}{\text{The volume of non – performing loans}}$	More than 130%	↑
$I_{26}^2 = \frac{\text{The rate of change in net operating income}}{\text{The rate of change in allocations to provisions for impairment of assets}}$	More than 150%	↑
$I_{28}^2 = \frac{\text{The amount of regulatory capital}}{\text{The amount of assets weighted by the level of credit risk}}$	More than 12%	↑
$I_{29}^2 = \frac{\text{The amount of fixed capital}}{\text{The amount of assets weighted by the level of credit risk}}$	More than 10%	↑
$I_{210}^2 = \frac{I_9^2}{I_8^2}$	$55\% \leq I_{210}^2 < 85\%$	↓/↑
$I_{211}^2 = \frac{\text{The rate of change in the regulatory capital}}{\text{The rate of change of assets weighted by the level of credit risk}}$	More than 100%	↑
$I_{212}^2 = \frac{\text{Total loans – Volume of customer deposits}}{\text{The amount of regulatory capital}}$	Less than 50%	↓
$I_{213}^2 = \frac{\text{The volume of open currency position}}{\text{The amount of regulatory capital}}$	Less than 10%	↓
$I_{214}^2 = \frac{\text{The rate of change in the regulatory capital}}{\text{The rate of change in income assets}}$	More than 100%	↑
$I_{215}^2 = \frac{\text{The amount of additional capital}}{\text{The amount of fixed capital}}$	$50\% \leq I_{215}^2 \leq 100\%$	↓/↑
<b>ASSESSMENT DIRECTION «ABILITIES-RESOURCES»</b>		
Deviation of FC ROE value from mid-cluster value ( $I_{21}^3$ )	More than 0%	↑
Deviation of the FC ROA value from the cluster mean value, % ( $I_{22}^3$ )	More than 0%	↑
The ratio between the volume of interest income and gross income, % ( $I_{23}^3$ )	$60\% \leq I_{23}^3 \leq 80\%$	↓/↑
Deviation of the value of the indicator «the ratio between the amount of commission income and gross income» FC from the average cluster value, % ( $I_{24}^3$ )	More than 0%	↑
Deviation of the value of the indicator «the ratio between the volume of non-interest expenses and total income» FC from the average cluster value, % ( $I_{25}^3$ )	Less than 0%	↓
Deviation of the value of the indicator «weighted average rate on customer funds» FC from the average cluster value, % ( $I_{26}^3$ )	Less than 0%	↓
Deviation of the value of the indicator «weighted average rate on loans» FC from the average cluster value, % ( $I_{27}^3$ )	More than 0%	↑
Deviation of the value of the percentage spread of FC from the average cluster value, % ( $I_{28}^3$ )	More than 0%	↑

Marking: ↑ — stimulator-indicator; ↓ — disincentive-indicator; ↓/↑ — mixed type indicator (stimulator-stimulator)

Source: developed by the authors

Of particular importance within the index, the approach is the technology of normalization of the actual values of indicators. Thus, a standard approach to the normalization of indicators by



taking into account the gap between the actual data from the minimum / maximum values of a certain sample of diagnostic objects is very common [19]. At the same time, its application to financial corporations is impractical for several reasons: 1) rather high heterogeneity of development of the financial corporation's sector, even among similar institutions; 2) the nonlinear nature of economic processes, which is reflected in the fact that several financial indicators of financial corporations in one range of their values are stimulators, and in another — disincentives. Another approach, in addition to the minimum / maximum values of indicators, also involves the use of a certain point optimal value, which is associated with the optimal state of the object under study [20]. However, for any economic agents, including financial corporations, point indicators can not be applied at all, especially to measure their financial stability, which inits economic content is a continuum (set) of states. This dilemma is solved by replacing the optimal value with a threshold and not taking into account the minimum / maximum values of indicators, which, in particular, is used by government institutions to rank the subjects of their supervision [21]. At the same time, under this approach, the normalized value can go beyond the range [0;1], which complicates the further such data within the index approach.

In this context, the nonlinear method of normalization proposed by V. Stepashko and R. Voloshchuk [22], which is based on the interval approach, distributing the continuum of states of a particular economic system according to the following criteria of limit (a negative characteristic of the state of the studied object) and optimal values (positive characteristic of the state of the studied object). At the same time, scientists propose to use the lower and upper values of optimal / limit values. This allows dividing the diagnostic indicators into three groups: stimulators, destimulators, and indicators of the combined type — stimulators-destimulators. The normalization process is based on the exponential function, namely:

1) the nonlinear normalizing function for the stimulator index has the form:

$$\tilde{x}_s = a \cdot (x - x_{lim}^H)^b \cdot e^{-c \cdot (x - x_{lim}^H)}, \tag{3}$$

$$a = \frac{1}{(x_{opt}^H - x_{lim}^H)^b \cdot e^{-b}}; b = \frac{(x_{opt}^H - x_{lim}^H)^2}{(x_{opt}^H - x_{thr}^H)^2}; c = \frac{x_{opt}^H - x_{lim}^H}{(x_{opt}^H - x_{thr}^H)^2}, \tag{4}$$

where  $\tilde{x}_s$  – a normalized value of the stimulator;  $x$  – the actual value of the indicator;  $x_{lim}^H$  – the limit value of the indicator (i.e. the value below which the value is considered invalid);  $x_{opt}^H$  – the optimal value of the indicator (i.e. the one above which the values of the indicator are considered the best);  $x_{thr}^H$  – threshold value of the indicator (i.e. one above which the value is considered acceptable);  $a, b, c$  – coefficients of the normalization function;

2) nonlinear normalizing function for the indicator-destimulator has the form:

$$\tilde{x}_d = 1 - a \cdot (x - x_{opt}^B)^b \cdot e^{-c \cdot (x - x_{opt}^B)}, \tag{5}$$

$$a = \frac{1}{(x_{lim}^B - x_{opt}^B)^b \cdot e^{-b}}; b = \frac{(x_{lim}^B - x_{opt}^B)^2}{(x_{lim}^B - x_{thr}^B)^2}; c = \frac{x_{lim}^B - x_{opt}^B}{(x_{lim}^B - x_{thr}^B)^2}, \tag{6}$$

where  $\tilde{x}_d$  – a normalized value of the destimulator indicator;  $x$  – the actual value of the indicator;  $x_{lim}^B$  – the limit value of the indicator (i.e. the one above which the value is considered unacceptable);  $x_{opt}^B$  – the optimal value of the indicator (i.e. the one below which the values of the indicator are considered the best);  $x_{thr}^B$  – threshold value of the indicator (i.e. below which the value is considered acceptable);  $a, b, c$  – coefficients of the normalization function;

3) nonlinear normalizing function for the indicator of the combined type, i.e. the stimulator-destimulator has the form:

$$\tilde{x} = \begin{cases} \tilde{x}_s, & x \in [x_{lim}^H; x_{opt}^H) \\ 1, & x \in [x_{opt}^H; x_{opt}^B] \\ \tilde{x}_d, & x \in (x_{opt}^B; x_{lim}^B] \end{cases} \tag{7}$$

Also, when calculating the integrated index of financial stability of a financial corporation, the weight of both individual indicators and directions and stages of evaluation is taken into account, which is implemented using the system of Fishburne weights:

$$a_i = \frac{2 \cdot (n-i+1)}{n \cdot (n+1)}, \tag{8}$$

where  $a_i$  – Fishburne weighting factor;  $n$  – number of sampling indicators;  $i$  – the rank of a particular indicator. It is proposed to determine the rank of the indicator based on the calculation of its coefficient of variation of normalized values for the studied sample at a certain time. This allows taking into account the dynamism of the economic environment and the objectivity of changes in the materiality of the factors of financial stability of financial corporations. We also note that when calculating the integrated index of financial stability of the  $i$ -th financial corporation ( $FSI_i$ ) subindexes ( $SIFS_{ij}$ ) also weighed according to Fishburne’s criterion by a similar logic. We are convinced that the fact of the variability of the values of weights allows us to more effectively take into account the complex and dynamic nature of financial stability and its provision in the current economic environment.

Approbation of this author's approach is realized on an example of systemically important banks of Ukraine, and results of diagnostics are given in *Table 3*.

Table 3

**The results of assessing the financial stability of systemically important banks in Ukraine in a cascading approach**

The name of the criterion	Content							
Number of indicators studied	At the first stage — 13 indicators; at the second stage — 14 indicators; at the third stage — 8 indicators							
Objects of research	Financial imbalances of systemically important banks of Ukraine							
<b>Description of evaluation results</b> (integrated index of financial stability of the bank — FSI)								
Name of the bank	01.01. 2018	FClevel	01.01. 2019	FClevel	01.01. 2020	FClevel	01.01. 2021	FClevel
Privatbank	0,2399	L	0,3706	S	0,3748	S	0,3362	S
Alfa-Bank	0,2815	L	0,3117	S	0,3575	S	0,3623	S
PUMB (FUIB)	0,3114	S	0,3791	S	0,5282	S	0,4321	S
OTP Bank	0,4579	S	0,4963	S	0,5154	S	0,4814	S
Oschadbank	0,1744	L	0,1931	L	0,2762	L	0,2369	L
Raiffeisen Bank Aval	0,4201	S	0,5590	S	0,3804	S	0,4095	S
Ukrsibbank	0,5003	S	0,5794	S	0,5226	S	0,3551	S
Ukrgasbank	0,3032	L	0,3761	S	0,3661	S	0,4486	S
Universal Bank	0,5185	S	0,3461	S	0,3564	S	0,3603	S
Kredobank	0,4143	S	0,3624	S	0,5256	S	0,4584	S
Pivdennyi	0,3543	S	0,3873	S	0,3141	S	0,3915	S
Tascombank	0,4921	S	0,5589	S	0,5053	S	0,5206	S
Ukreximbank	0,2391	L	0,2648	L	0,3060	L	0,2819	L
A-bank	0,4948	S	0,4392	S	0,3589	S	0,4454	S

Marking: *H* — high, *S* — satisfactory, *L* — low levels of financial stability of the financial corporation.

Source: calculated by the authors.

As can be seen from the *Table 3* during the study 2017—2020, all systemically important banks of Ukraine were financially stable. At the same time, if as of January 1, 2018, five banks in the sample were characterized by a low level of financial stability, then according to the results of 2020, such banks include only Oschadbank and Ukreximbank. Other surveyed banks maintain a satisfactory level of financial stability, while for most banks there is a growing trend of its quantitative measurement. The absence of banks with a high level of financial stability is explained as follows: 1) there are still excessive amounts of non-performing loans in banks, primarily Privatbank, which significantly hinders the resumption of lending to economic agents of the real sector of the economy. In this context, it is important to note a steady decline in their volume (only

during 2021 in the banking sector, the share of non-performing loans decreased from 41% to 37.85%), however, this problem remains unresolved, which does not allow to consider the financial stability of Ukraine's banking sector; 2) in the second year of the «coronaeconomy» and quarantine measures of different levels of severity affects the state of domestic entrepreneurship, which potentially results in a potential increase in credit risks for banks; 3) the banking sector of Ukraine, in contrast to many countries around the world, is just beginning to implement the process of assessing the internal capital adequacy of the bank (ICAAP), namely in 2022 will begin its implementation in a test mode. At the same time, it is obvious that all Ukrainian banks are currently financially stable, as evidenced by the global pandemic, during which no Ukrainian bank was declared insolvent.

**Conclusions.** In general, the work allowed to form a comprehensive approach to assessing the financial stability of financial corporations, to systematize those key positions in which the imbalance increases the likelihood of their financial fragility and financial instability. At the same time, the use of the provisions of the theory of economic potential allowed to development indicators, the use of which allows identifying signs of significant internal threats to the financial stability of financial corporations at the stage of origin, manifestation, and consequences of the accumulation of heterogeneous imbalances stability. In turn, basing the data processing technology on a cascading approach allowed to development of a three-stage method of assessing the financial stability of financial corporations, which implements the principle of consistent refinement and logic of threats to financial stability based on existing causal relationships between financial corporations potential components time.

Further research will be aimed at developing methodological tools for assessing the financial stability of financial corporations by taking into account both financial and non-financial imbalances in their activities.

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