

Kharchuk T. V.

*Ph. D. of Economics, Associate Professor,
European University, Ukraine;
e-mail: dtv75@i.ua; ORCID ID: 0000-0001-5563-3268*

Kredisov V. A.

*Doctor of Economics, Professor,
European University, Ukraine;
e-mail: informail@i.ua; ORCID ID: 0000-0003-2140-375X*

Melnik V. V.

*Ph. D. of Economics, Associate Professor,
Kyiv National University of Trade and Economics, Ukraine;
e-mail: victoryetual@ukr.net; ORCID ID: 0000-0001-5512-536X*

Purdenko O. A.

*Ph. D. in Economics, Associate Professor,
Kyiv National University of Trade and Economics, Ukraine;
e-mail: elenaanr@ukr.net; ORCID ID: 0000-0002-8661-5561*

IMPROVED METHODS OF EVALUATION OF FINANCIAL SECURITY FOR COMPANIES IN UKRAINE

Abstract. In the article the main approaches to the estimation of the level of financial security of the companies (on the basis of the component of economic security, indicated, financially-oriented, resource-functional, minimizing-criterial, integral, on the basis of determining the probability of bankruptcy) are analyzed, summarized and detailed of the specifics of its level calculations according to the data of financial coefficients. The main indicators of the financial condition of the enterprises, for which normative values are established in accordance with official domestic methods are given. The leading methods of systems of financial security analysis of the enterprise are investigated, the advantages and disadvantages of their practical application for domestic enterprises are mentioned. The experience of the integrated estimation of the financial state according to the financial coefficients is described, on the basis of which the method of calculating the volatility of prices as a measure of the degree of financial risk is proposed. The suggestions of applied value for the use of general scientific methods of cognition are given. It is established that the analyzed methods and methods of protection will enable the management of the enterprise to choose the most suitable for them and economically justified in a particular situation model.

Keywords: financial security, assessment of financial security, level of financial security, enterprise, financial risk, volatility of prices.

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Харчук Т. В.

*кандидат економічних наук, доцент,
ПВНЗ «Європейський університет», Україна;
e-mail: dtv75@i.ua; ORCID ID: 0000-0001-5563-3268*

Кредісов В. А.

*доктор економічних наук, професор,
ПВНЗ «Європейський університет», Україна;
e-mail: informail@i.ua; ORCID ID: 0000-0003-2140-375X*

Мельник В. В.

*кандидат економічних наук, доцент,
Київський національний торговельно-економічний університет, Україна;
e-mail: victoryetual@ukr.net; ORCID ID: 0000-0001-5512-536X*

Пурденко О. А.
кандидат економічних наук, доцент,
Київський національний торговельно-економічний університет, Україна;
e-mail: elenaanr@ukr.net; ORCID ID: 0000-0002-8661-5561

УДОСКОНАЛЕННЯ МЕТОДІВ ОЦІНЮВАННЯ РІВНЯ ФІНАНСОВОЇ БЕЗПЕКИ ПІДПРИЄМСТВ В УКРАЇНІ

Анотація. Проаналізовано основні підходи до оцінювання фінансової безпеки підприємства, зокрема: підхід за складовою економічної безпеки, індикаторний підхід, фінансово орієнтований, ресурсно-функціональний, мінімізаційно-критеріальний, інтегральний і підхід на основі визначення ймовірності банкрутства. Узагальнено вищенаведені підходи до оцінювання рівня фінансової безпеки підприємства з описом специфіки методик, їхніх переваг і недоліків. Деталізовано показники фінансового стану підприємства, для яких встановлено нормативні значення згідно з офіційними вітчизняними методиками Міністерства економічного розвитку і торгівлі України та Міністерства фінансів України.

Узагальнено специфіку розрахунків оцінювання рівня фінансової безпеки підприємства за даними фінансових коефіцієнтів з урахуванням індикаторів, інтегральних показників та підходів.

Досліджено провідні методики аналізу фінансової безпеки підприємства, зазначені переваги і недоліки їхнього практичного застосування для вітчизняних підприємств.

Охарактеризовано досвід використання інтегральної оцінки фінансового стану за даними фінансових коефіцієнтів. Ураховуючи сучасні тенденції економічної науки, виокремлено при розрахунку показників фінансового стану підприємств використання матричних моделей, що дозволяє виявити тенденції у динаміці фінансового стану підприємства. Запропоновано окремо враховувати коефіцієнт волатильності цін кожного підприємства окремо в порівнянні його з коефіцієнтами волатильності цін на ринку. Наведено методику розрахунку коефіцієнта волатильності цін як показника ступеня фінансового ризику. Проаналізовано методи і способи захисту фінансової безпеки, що нададуть можливість керівництву підприємства обирати найбільш прийнятну для них та економічно обґрунтовану в конкретній ситуації модель.

Ключові слова: оцінка фінансової безпеки, підприємство, фінансовий ризик, коефіцієнт волатильності цін.

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Харчук Т. В.
кандидат економічних наук, доцент,
ЧВУЗ «Європейський університет», Україна;
e-mail: dtv75@i.ua; ORCID ID: 0000-0001-5563-3268

Кредисов В. А.
доктор економічних наук, професор,
ЧВУЗ «Європейський університет», Україна;
e-mail: informail@i.ua; ORCID ID: 0000-0003-2140-375X

Мельник В.В.
кандидат економічних наук, доцент,
Київський національний торговельно-економічний університет, Україна;
e-mail: victoryetual@ukr.net; ORCID ID: 0000-0001-5512-536X

Пурденко Е. А.
кандидат економічних наук, доцент,
Київський національний торговельно-економічний університет, Україна;
e-mail: elenaanr@ukr.net; ORCID ID: 0000-0002-8661-5561

СОВЕРШЕНСТВОВАНИЕ МЕТОДОВ ОЦЕНКИ УРОВНЯ ФИНАНСОВОЙ БЕЗОПАСНОСТИ ПРЕДПРИЯТИЙ В УКРАИНЕ

Аннотация. Проанализированы основные подходы к оценке финансовой безопасности предприятия, в частности: подход по составляющей экономической безопасности, индикаторный подход, финансово ориентированный, ресурсно-функциональный, минимизационно-критериальный, интегральный и подход на основе определения вероятности банкротства. Обобщены вышеприведенные подходы к оценке уровня финансовой безопасности предприятия с описанием специфики методики, ее преимуществ и недостатков.

Детализировано показатели финансового состояния предприятия, для которых установлены нормативные значения согласно официальным отечественными методиками: Министерства экономического развития и торговли Украины и Министерства финансов Украины.

Обобщено специфику расчетов оценки уровня финансовой безопасности предприятия по данным финансовых коэффициентов с учетом индикаторов, интегральных показателей и подходов.

Исследованы ведущие методики анализа финансовой безопасности, предприятия, указаны преимущества и недостатки их практического применения для отечественных предприятий.

Охарактеризован опыт использования интегральной оценки финансового состояния по данным финансовых коэффициентов. С учетом современных тенденций экономической науки выделены при расчете показателей финансового состояния предприятий матричные модели, что позволяет выявить тенденции в динамике финансового состояния предприятия.

Предложено отдельно учитывать коэффициент волатильности цен каждого предприятия в отдельности и в сравнении его с коэффициентами волатильности цен на рынке. Приведена методика расчета коэффициент волатильности цен как показателя степени финансового риска. Проанализированы методы и способы защиты финансовой безопасности предприятия, что предоставят возможность руководству выбирать наиболее приемлемые для них и экономически обоснованную в конкретной ситуации модель.

Ключевые слова: оценка финансовой безопасности, предприятие, финансовый риск, коэффициент волатильности цен.

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Introduction. In the context of the aggravation of the economic crisis, which set the limit of survival of a number of domestic enterprises, that until recently were considered successful and stable functioning, the issue of financial security has become very urgent. Increasing the aggressiveness of the external and internal environment has led to the emergence of new threats and increased their impact on the performance of domestic enterprises. Adoption of timely and rational management decisions in the aspect of providing financial security of enterprises requires solving a number of issues related to taking into account the current trends of establishing and expanding the strategic interaction of enterprises with the entities of the environment to ensure the realization of their own strategic objectives. That is why the choice of methodology for assessing the level of financial security of a domestic enterprise is strategically important not only for the enterprise but also for Ukraine.

Research analysis and problem statement. The issue of assessing the level of financial security, taking into account various aspects and activities of enterprises, is devoted to scientific publications of well-known domestic scientists such as: I.O. Blank [1, 2], O.I. Baranovsky [3], V.O Tkach [4], T.G. Vasiltssev [5], O.S. Vlasik [6], O.V. Hryvkivska [7], M.M Yermoshenko [8], N.O. Shpak [9] and others. However, the current intensive changes in the economy of our country compel a search for new and improved existing methods of assessing the level of financial security of enterprises, because the instability of economic and political processes in the country, as a rule,

adversely affect the state of financial security, and therefore timely diagnosis and rational decision making on its basis is the precondition of the stability of existence.

The aim of the article is to generalize existing methods of assessing the level of financial security of enterprises, taking into account the advantages and disadvantages in the aspect of their application at domestic enterprises, and the provision of applications of applied value for the use of general scientific knowledge methods.

The results of research. Analysis of scientific literature suggests that the formation of a system of indicators for assessing the financial security of the enterprise is formed primarily to identify its financial condition.

Consider the classic approaches to the quantitative assessment of financial security. The main of them are shown on *Fig. 1*.

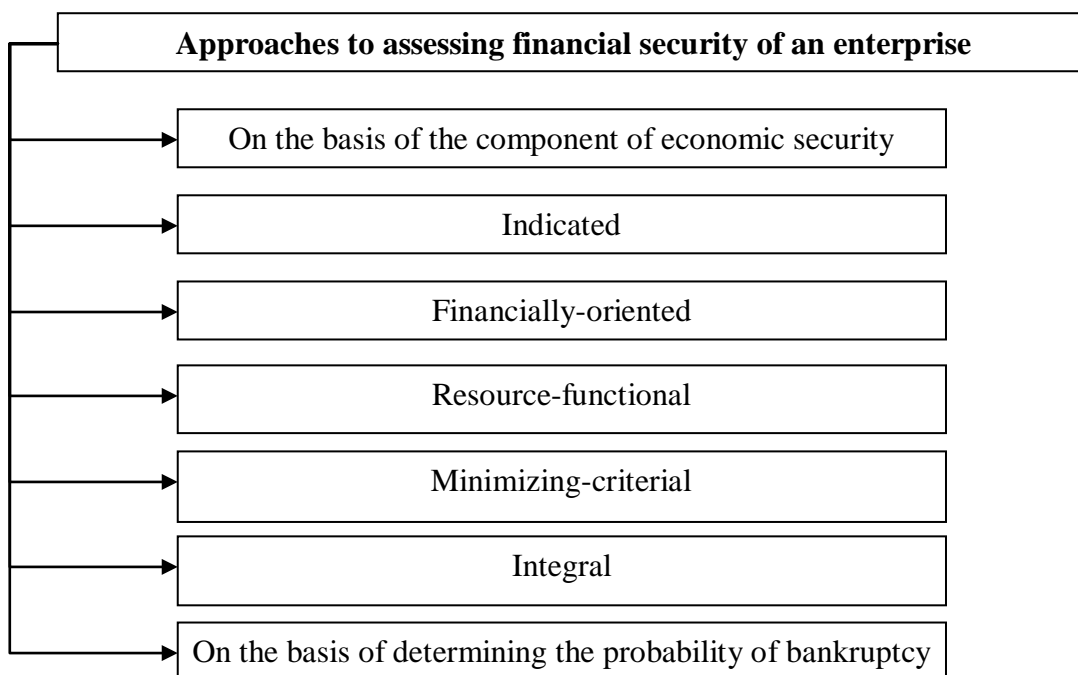


Fig. 1. Approaches to the assessment of financial security of an enterprise

Source: [10].

The calculation of the level of financial security as a component of economic security involves determining its level on the basis of a number of financial ratios to determine the degree of sufficiency of own or borrowed working capital for the performance of production and sales activities [6, p. 167—169]. Moreover, it involves assess the level of financial component of the company’s economic security in the main areas of analysis, including financial reporting and financial position of the enterprise, the results of its economic activities and assess the financial security of the enterprise based on the calculation of a number of key indicators that reflect the performance of all subsystems of the enterprise and grouped according to the following areas: management, economics, finance, business activity [3, p. 251—253].

The obtained key indicators suggest the authors compare with the values of the developed diagnostic matrix, which will determine the level of financial component of the economic security of the enterprise [11, p. 84]. Another source [12] proposes to calculate the "partial functional criterion for the financial component of the enterprise’s economic security" in a such way:

$$PFC = Y_b / (G + V_o) \rightarrow \max, \tag{1}$$

where *PFC* — a partial functional criterion for ensuring the financial component of the enterprise’s economic security,

Y_b — the total prevented damage on the financial component of the economic security of the enterprise,

G — the general expenses incurred by the enterprise for the implementation of measures to secure the financial component of the economic security of the enterprise,

V_o – the total losses incurred by the enterprise as a financial component of the economic security of the enterprise.

It is argued that the calculated value of the partial functional criterion of the economic security's financial component of the company reflects the overall effectiveness of measures to secure the financial component, which are taken in order to prevent possible losses from negative influences. Moreover, it is thought that this indicator is an aggregate indicator of the «financial health» of the enterprise and the potential of its corporate growth.

The indicator approach for which the level of financial security is determined by the use of so-called indicators is sufficiently known [3, p. 184]. Indicators are considered as threshold values for indicators that characterize enterprise activities in a variety of functional areas and meet the definition of financial security level of an enterprise.

In the time of its using the normal values of the indicators limit the zone of the normal level of security of the enterprise, critical is a zone of critical level, critical plus delta is a pre-crisis zone (Tabl. 1).

Table 1

Indicators of the financial state of the enterprise, for which normative values are set according to official domestic methods

Name of metric	Calculation procedure	Normative value
<i>Methodology of the Ministry of Economic Development and Trade of Ukraine</i>		
1. The coefficient of current (general) liquidity	$\frac{CA}{LC}$	Increasing the value of the indicator is a favorable trend for the enterprise
2. Coefficient of coverage	$\frac{CA}{CL}$	-
3. Absolute liquidity ratio (solvency)	$\frac{C}{LC}$	0,2–0,35
4. Own current assets (OCA)	$OC - NA$	> 0
5. The share of own working capital in inventory coverage%	$\frac{OCA * 100}{F}$	> 50 %
6. Self-financing ratio	$\frac{OC + PFCP - NA}{CA}$	$\geq 0,1$
7. The coefficient of financial autonomy	$\frac{OC}{B}$	$\geq 0,5$
<i>Methodology of the Ministry of Finance of Ukraine</i>		
8. Coefficient of coverage	$\frac{CA}{CL}$	> 1
9. Quick Ratio	$\frac{CA - F}{CL}$	0,6–0,8
10. Absolute liquidity ratio	$\frac{C + CFI}{CL}$	> 0
11. Net working capital	$CA - CL$	> 0
12. Solvency ratio (autonomy)	$\frac{OC}{B}$	> 0,5
13. Financing factor	$\frac{PFCP + LL + CL}{OC}$	< 1
14. Coefficient of own working capital security	$\frac{CA - CL}{CA}$	> 0,1
15. The coefficient of maneuverability of equity	$\frac{CA - CL}{OC}$	> 0

Notation Keys: B — balance currency, NA — non-current assets, CA — current assets, F — Fund, C — cash and its equivalents, OCA - own current assets, CFI — current financial investments, OC — own capital, LC - loan capital, $PFCP$ — providing future costs and payments, LL — long-term liabilities, CL — current liabilities.

Rationing should be done in relation to the normal value of the indicator:

$$X_i = \left(\frac{R_{if}}{R_{in}}\right)^b \quad (2)$$

where R_{if} , R_{in} - are respectively, the actual and normal value of the i -th indicator;

b - is a degree indicator (for the indicator «minimum» is 1, for the indicator «maximum» is — 1).

The normalized value of a critical indicator is determined by the formula:

$$X_{ikr} = \left(\frac{R_{ikr}}{R_{in}}\right)^b \quad (3)$$

where R_{ikr} - is the critical value of the output indicators.

Thus, as indicators of the level of financial security of an enterprise, the normalized values of indicators, calculated on the basis of normal (marginal) values of initial indicators, can act. For example, if the critical value of the absolute liquidity ratio is 0.2 and normal 0.5, then the values of the indicator, respectively, will be equal to $x_{kr} = 0.2 / 0.5 = 0.4$ and $x_n = 1$.

Graphic interpretation of the evaluations helps to better perceive and characterizes not only the current state of the enterprise, but also the state of security that should be sought.

In the course of the study, it was discovered that a number of scholars are assessing the level of financial security by the financially-oriented approach.

Thus, I.O Blank allocates the following systems of financial security analysis of the enterprise: horizontal analysis, vertical analysis, comparative analysis, integral analysis and analysis of coefficients. The author distinguishes the following groups of analytical financial ratios: coefficients of estimation of financial stability of the enterprise, solvency (liquidity), turnover of assets, turnover of capital, profitability [1; 2].

Noteworthy method is proposed by O.M. Stern, L.S. Yastrubetskaya. The authors propose to assess the level of financial security of economic entities on the basis of research of cash flows of enterprises, namely the indicator of net cash flow in terms of types of financial and economic activity of the enterprise [13]. For this purpose, researchers have developed a matrix of dynamic financial equilibrium. This approach is due to the fact that the net cash flow indicator is one of the indicators of the enterprise's performance and largely determines its financial status.

Resource-functional approach proposed by M.M Yermoshenko involves evaluating each functional component of financial security, and then defining an integral indicator in an expert way. At the same time, the functional structure of financial activity and, accordingly, financial security of an enterprise are determined by the following components: budget, monetary, currency, banking, investment, fund and insurance [8, p. 345].

World science also examines the experience of an integrated assessment of the financial condition of enterprises, which attributes the goals to each primary financial indicator a certain financial ratio. As a minimum criterion for the sustainability of the financial condition of an enterprise, as a rule, the probability of bankruptcy is used.

According to this method, the financial condition of an enterprise is estimated at six factors. The grouping of enterprises according to these criteria for assessing the financial condition is presented in *Table 2* [14].

The essence of this technique is to classify enterprises by degree of risk, based on the actual level of indicators of financial sustainability and the rating of each indicator, expressed in points. In this case, there are six classes of enterprises: 1st class is an enterprise with a good reserve of financial stability, which allows to be sure of the return of borrowed funds; 2nd class is enterprises showing a certain degree of debt risk, but not yet considered as risky; 3rd class includes problem companies; there is a risk of loss of fixed and circulating assets, but full interest is doubtful; 4th class includes enterprises with a high risk of bankruptcy, even after the implementation of financial recovery measures, in which creditors risk losing their interest and loan capital; 5th grade is enterprises of very high risk, practically insolvent, the 6th class is the highest-risk enterprise.

Table 2

Grouping companies according to the criteria for assessing the financial condition

Indicator	Boundaries of classes according to criteria (point)					
	first class	second class	third class	fourth class	fifth class	sixth class
Absolute liquidity ratio	More 0,25-20	0,2-16	0,15-12	0,1-8	0,05-4	0,05-0
Quick ratio	More 1,0-18	0,9-15	0,8-12	0,7-9	0,6-6	0,5-0
Current liquidity ratio	More 2,0-16,5	(1,9-1,7) — (15-12)	(1,6-1,4) — (10,5-7,5)	(1,3-1,1) — (6-3)	1,0-1,5	Less 1-0
The coefficient of financial independence	More 0,6-16	(0,59- 0,54) — (15-12)	(0,53 -0,43) — (11,4-7,4)	(0,42- 0,41) — (6,8- 1,8)	0,4-1	Less 0,4-0
Coefficient of own working capital security	More 0,5-15	0,4-12	0,3-9	0,2-6	0,1-3	Less 0,1-0
Coefficient of capital equity	More 1,0-15	0,9-12	0,8-9	0,7-6	0,6-3	Less 0,5-0
Minimum boundary value	100	85-64	63,9-56,9	41,6-28,3	18	0

The next approach is the so-called «minimization-criterion». It implies the use of the criterion of «the minimum total loss that is inflicted on security» [15]. The specification of such an approach is the acceptance in the form of a criterion of a special marginal feature as a sign of the critical or threshold state of a socio-economic system, outside of which there is a threat or even actually degradation and destruction of this system. This criterion is very difficult to calculate due to the lack of necessary accounting and statistical data for this.

In domestic practice, the most widespread use is the coefficient method of determining the financial condition of the enterprise. The most successful indicator of current solvency (C_s) in the presence of overdue payables is the difference between the amount of cash available to the company, its equivalents and other highly liquid assets and its current liabilities, which is determined by the formula:

$$C_s = A(1030) + A(1035) + A(1165) - C(1695) \quad (4)$$

where $A(1030) + A(1035) + A(1165)$ — corresponding lines of asset balance;

$C(1695)$ — current liabilities and collateral.

A negative result of the algebraic sum of these items of balance indicates the current insolvency of the subject, and signs of critical insolvency that correspond to the financial condition of potential bankruptcy, occur if at the beginning and at the end of the reporting quarter, which preceded the filing of the application for instituting proceedings bankruptcy, there are signs of current insolvency, and the coverage ratios (C_r) and their own funds (C_{of}) at the end of the reporting quarter are lower than their normative values — 1.5 and 0.1, respectively. Coefficient of coverage is determined by the formula:

$$C_r = A(1195) / P(1695) \quad (5)$$

where $A(1195)$ summary of the 2nd section of the asset balance sheet,

and the coefficient of own funds has the following form:

$$C_{of} = (P(1495) - A(1095)) / A(1195) \quad (6)$$

where $P(1495)$ — summary of the 1st section of the liability balance;

$A(1195)$, $A(1095)$ — the results of the first and second sections of the asset balance, respectively.

In order to timely identify trends in the formation of an unsatisfactory balance structure in a profitable company, the Beaver coefficient, which is calculated by the formula, is used:

$$C_b = (F(235) - F(260)) / (P(1595) + P(1695)) \quad (7)$$

where $F(220)$, $F(260)$ — net profit and depreciation deductions are given in lines 220 and 260 forms №2, respectively;

$P(1595)$, $P(1695)$ are long-term and current liabilities.

The sign of unsatisfactory structure of the balance is the financial position of the enterprise, in which for a long time (1,5 - 2 years), $C_b < 0,2$. Under these conditions the unsatisfactory structure of the balance can be said early, but the negative tendency towards a structural imbalance of assets and capital of the enterprise is recorded, and as a consequence - a loss of financial stability and financial security.

An approach to assessing the financial security of an enterprise is based on an assessment of the probability of its bankruptcy.

Most of these techniques are the result of the development of scientists in a stable market economy and in the presence of long mass statistics (England, Germany, USA, etc.), where the notion of bankruptcy is historically formed. These models may be acceptable, but different rates of inflation, production cycle phases, differences in the labor intensity of production, labor productivity, insufficient development of Ukrainian enterprises as stock markets, different "tax climate" require clarification of the set and criteria values of indicators, their adaptation to modern conditions of development of the Ukrainian economy, since their size significantly influences the results of calculations and the correctness of the conclusions [16].

In other methods, the authors do not define the threshold values of the indicators or criteria used in the analysis of the level of financial security, nor does it take into account the research field, which may lead to inaccurate calculation of the level of financial security of the enterprise.

One of the most powerful mathematical tools for solving classifying problems in the economy in particular financial management are neural networks, fuzzy logic, threshold elements, genetic algorithms, etc. However, fuzzy logic is a powerful approximator and a means of solving classifications in the conditions of the need for processing qualitative and incomplete information, which is not a decisive feature of quantitative assessments of levels of financial security. Threshold elements are too cumbersome for this task and expensive as it requires significant time costs for experts to handle the rank values. Genetic algorithms are a powerful tool in the solution of optimization tasks, but for the purpose of setting up an optimization problem, it is first of all important to investigate the level of financial security in accordance with the current selected typical levels.

Considering the authors' choice of the effectiveness of the financial decision to be taken, namely, increasing its accuracy and minimizing the time and money costs for such a procedure, the most appropriate is the device of neural networks. It allows for a limited number of standards, using the «non-teacher» neural network method, in particular the Hopfield network, to display the input image, which is coded values of financial security valuation parameters.

The expediency of using such a method is the fact that it allows you to retrain the network in accordance with the current market situation and expert evaluation. For analytical needs it is possible to allocate two, three or more security levels, to review the structure and number of reference states each year, to investigate the migration of financial security during the reporting year.

Let us consider the position of the discrete Hopfield model as associative memory.

Associative memory is a system that can restore the status stored in it for incomplete or noisy information.

Associative memory displays real images ξ^M into stable points of the dynamic system χ^M (Fig 2).

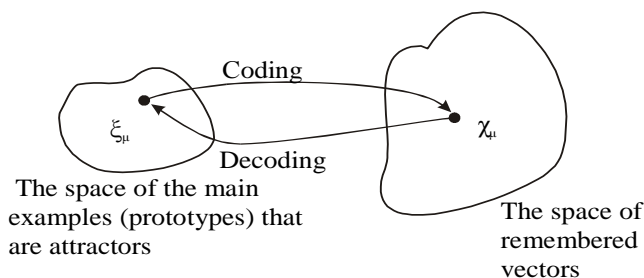


Fig. 2. Scheme of associative memory

Source: [14].

If submit incomplete or noisy image on the input of the system, then due to the dynamics of the neural network, the trajectory of the system will come to a stable state (attractor) — the network «recalls» the image.

The network state is determined by the vector

$$x = [x_1, \dots, x_N]^T, \quad x_i = \pm 1. \quad (8)$$

Post-synaptic potential is calculated by the formula

$$v_j = \sum_{i=1}^N \omega_{ji} x_i + b_j \quad (9)$$

Modify the status of the network:

$$x_j = \begin{cases} 1, & v_j > 0 \\ -1, & v_j < 0 \end{cases} \Leftrightarrow x_j = \text{sign}[v_j]. \quad (10)$$

If $v_j = 0$, then we can choose an arbitrary value x_j , however, it's best to leave the neuron in its previous state. Then the diagram of states will be symmetric.

Based on the results of the analysis of the most well-known approaches to assessing the financial security of the enterprise, it can be concluded that they are quite difficult to use to assess the level of financial security of an enterprise in the proposed treatment, and their practical application depends on the type of economic activity of the enterprise.

Conclusions. The current state of Ukraine's economy once again confirms the fact that the application of known methods is the result of the development of scientists in a stable market economy, which is unacceptable for Ukraine in the post-revolutionary period, and taking into account the shortcomings of domestic mass statistics, the use of these techniques becomes virtually impossible. That is why, given the current trends of economic science, we offer in calculating the indicators of the financial condition of enterprises based on the use of matrix models, which allows you to identify trends in the dynamics of the financial state of the enterprise, separately consider the coefficient of volatility of prices, each enterprise separately and compare it with the coefficient of volatility of prices the market. We believe that the delta difference between these indicators should be derived by a separate indicator of the degree of financial risk ($\Delta\sigma$). It will be calculated in such a way:

$$\Delta\sigma = \frac{\sigma SD}{\sqrt{P}} - \frac{\sigma i}{\sqrt{P}} \quad (11)$$

where σSD - standard indicator of volatility of market prices;

σi - volatility of enterprise prices;

P — period of time in years.

Speaking about the instability of the modern economy in Ukraine, this indicator will allow taking into account the adaptive state of enterprises and, accordingly, the relative indicator of financial risk.

After all, the current stage of economic development in Ukraine and in the world necessitates the adoption of rather complicated decisions on the part of the management on how to protect the company from the negative factors of the environment and the actions of competitors. The analyzed methods and methods of protection will enable the management of the enterprise to choose the most suitable for them and economically justified in a particular situation model.

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Мельник В. В., Пурденко О. А.

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Melnik V. V., Purdenko O. A.