4.5 Integrated financial risk management and adaptive management system

Institutional instability, chronic delays in institutional reforms increase transaction costs, maximize the uncertainties of interaction, contribute to the growth of negative consequences of opportunistic behavior and limited rationality. Institutional analysis of the financial market states the underdevelopment of structural elements that determine transaction costs and the cost of agreements. The implementation of financial and credit operations in an unstable inflationary environment is constantly associated with a risk zone. Risk management in conditions of market instability is one of the main tasks of financial managers in the process of solving problems of adaptation to market relations and interactions.

Studying the features of economic risk management in the conditions of market management, it was considered necessary to take into account the positions and achievements of researchers Bazas M.F., Starovoit V.A., Skoryna V.Ye. [222], Beder T.S. [223], Bondarenko A.I. [224], Brown S.J., Goetzmann W.N., Ibbotson R.G. [225], Courakis A.S. [226], Dakhnova O.Ye., Horodetska, T.E. [227], Dowd K. [228], Hodges S. [229], Hu J., Homem-de-Mello T., Mehrotra S. [230], Kahler M. [231], Kharazishvili Yu.M. [232], Kolodiziev O.M., Lebid O.V., Grygorenko V.M. [233], Leontovych S., Radchenko O., Melnichuk O. [234], Sharpe W.F. [235], Shyshkina O. [236], Svirko S.V. [237], Ukhnal, N.M. [238], Van Horne J., Wachowicz, J. [239], Varnalii Z.S. [240] and others. The well-known economic provisions of the financial management system and modeling of the constituent elements of adaptive enterprise management are not perfect from the point of view of the development of the economic mechanism of adaptation to market conditions, require a deeper understanding and further modification, in particular, from the standpoint of the development of integrated ways of managing financial risks in the conditions of market instability and the global financial crisis.

The state of a deep financial crisis actualizes the methodological substantiation and development of a system for adapting the economic mechanism of the functioning

of business entities in the market environment and, in particular, the components of the mechanism of adaptive management of financial risks.

The purpose of writing the article is to determine the main essence of the adaptation mechanism from the standpoint of meso- and microeconomics, to propose and substantiate an integrated way of managing financial risks in conditions of market instability. The achievement of the goal was facilitated by general scientific methods: methods of theoretical research (formalization, hypothesis and assumption), methods of empirical research (observation, comparison), methods of empirical and theoretical research (analysis and synthesis, modeling); local (specific) methods: the method of analysis of situations (the method of formalization of economic conditions), the method of forecast assessment (economic and mathematical modeling), the non-traditional method (method of assessing economic risks).

Analysis of the dynamics of the institutional structure reveals the degree of socio-economic development of the country. Ukraine is characterized by imperfection of market architectonics, lack of state-institutional measures, deep transformational crisis, agrarian crisis as a crisis of orientation of equivalent exchange (loss of confidence in rules and norms). An effective and efficient institutional matrix as a system that minimizes the uncertainty of market interaction and reduces transaction costs by the implemented "rules of the market game" has not been created by the authorities.

Institutional instability provoked huge negative consequences (shadow economy, industrial espionage, corruption, economic anarchy, poverty, unemployment, etc.). In this regard, the issue of forming an economic mechanism for adaptation in a market economy or, in fact, a market mechanism is extremely fundamental. We believe that from the standpoint of meso- and microeconomics, adaptation is a form of reflection by the current enterprise and its network structures of the mechanisms of influence of the market environment, seeking to establish an equilibrium in the relations and relations of the market.

Adaptive financial risk management not only reduces uncertainty, but also reveals the adaptive-diagnostic and adaptive-modification factors and driving forces of

the causal basis of adaptation. Methods of adaptive risk management include optimization modeling of the degree of risk, signature situational modeling, matrix coding and the resulting prediction descriptor, neural networks with approximate interval modeling. We focus on an integrated way of managing financial risks as an example of optimization modeling of the degree of risk in the adaptive management system.

Let's make preliminary assumptions. Let the investment firm have one general manager. The general manager is the sole owner of a certain portfolio of securities. The company regularly implements its activities in an equilibrium market environment. In a hypothetically defined portfolio, the manager pays attention to costs and expects an increase in income, which is associated with a specific risk. "Sharp rule" or "Sharpe rule" provides an opportunity to unambiguously choose the right portfolio of securities. The "Sharpe rule" states that between n – The number of portfolios is chosen the one with the highest acuity index as follows:

$$\xi = \frac{\tau}{\sigma_\tau}, \qquad (1)$$

where is: ξ – acuity index; τ – expected increase in income (expected return on investment minus costs); σ_τ – the standard deviation from the increase in income.

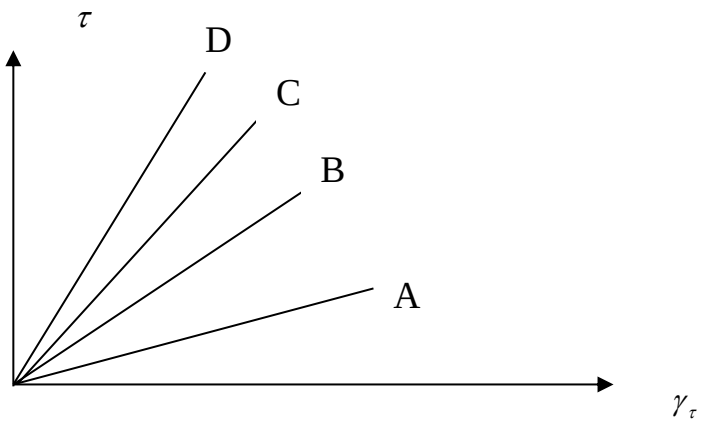
High rate ξ means a satisfactory variation in costs and a sufficiently high expected return with little risk. Low score ξ notes an unsatisfactory variation in costs and a low expected return at high risk. Suppose the risk is expressed not in the usual deviation from the income, but in the cost of risk as follows:

$$\sigma_\tau = \frac{-\gamma_\tau}{\beta}, \qquad (2)$$

where is: γ_τ – the cost of risk of expected revenue growth; β – confidence level setting; β =–1,65 if the cost of risk is based on a probability level of 95% or higher. Let's make transformations by substituting formula (2) into formula (1). As a result, we have:

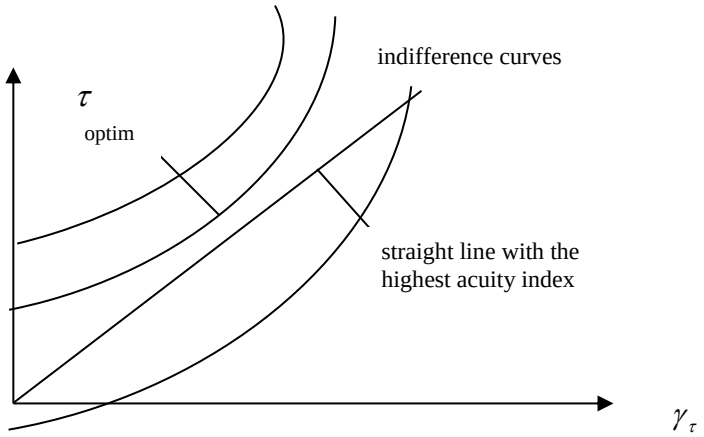
$$\xi = \frac{-\beta \cdot \tau}{\gamma_\tau} \quad (3)$$

From this it can be clearly seen that the severity indicator is proportional to the indicators of the expected increase in income and the cost of risk. Suppose that the manager wants to choose 1 portfolio of securities out of 4 available (let's denote them A, B, C, D). Each of the portfolios has its own expected increase in return and cost of risk.



Rice. 1. Using the Sharpness Indicator to Select a Portfolio of Securities

The sharpness index for each of the portfolio variants is proportional to the steepness of the straight line in relation to the original point from which they emerge. In Fig. 1. It can be clearly seen that option D has the highest acuity index. Theoretically, this means that it is this option that the manager should choose as unequivocally correct and the most effective. But according to the "Sharpe rule", all variants have the same sharpness coefficient. The manager in the situation of choice is based on his own preferences, that is, the most preferred option with the features of "risk-income" is chosen from the standpoint of optimality (Fig. 2). In other words, the preferred option may be optimal, but the optimal option is not always adaptive. In real life, managers use the "Sharpe rule" not to determine alternative investments, but to identify the need to make possible adjustments to an early selected portfolio of securities. The manager calculates sharpness indicators for the current portfolio and for the portfolio with adjustments made.



Rice. 2. Determination of the most preferred variant of the securities portfolio in a situation of the same severity ratios

Between the two alternatives, the choice is made thanks to the "Sharpe rule". That is, three situations are played: 1) a "corrected version of the portfolio" is selected if it provides a greater sharpness indicator; (2) the "adjusted portfolio option" is rejected if it gives a lower severity score; 3) if the sharpness indicators are the same, then the manager applies the "curve method", that is, the most preferred or optimal option is chosen. In other words, in a formalized form, the choice is expressed as follows:

$$\begin{cases} \xi^{new} = \dfrac{-\beta \cdot \tau^{new}}{\gamma_\tau^{new}} \triangleright \dfrac{-\beta \cdot \tau^{old}}{\gamma_\tau^{old}} = \xi^{old} \Rightarrow \\ \Rightarrow \dfrac{\tau^{new}}{\tau^{old}} \triangleright \dfrac{\gamma_\tau^{new}}{\gamma_\tau^{old}} \end{cases} \quad (4)$$

On the left side of inequality (4) there is an excess of the new expected income in relation to the old one, and on the right side there is an excess of the new cost of risk over the old one. That is, new investments must be accepted if their percentage impact on the expected return is higher than on the cost of risk. The rule of decision-making may well be expressed in formulas for comparing expected and required income. If the required income is the minimum required for the implementation of the measures taken, then it can be obtained from equation (4) by multiplying both sides by τ^{old} thus:

$$\begin{cases} \tau^{new} \triangleright \dfrac{\gamma_\tau^{new}}{\gamma_\tau^{old}} \cdot \tau^{old} = \left(1 + \dfrac{\gamma_\tau^{*}}{\gamma_\tau^{old}}\right) \cdot \tau^{old} \\ \gamma_\tau^{*} = \gamma_\tau^{new} - \gamma_\tau^{old} \end{cases}, \quad (5)$$

where is γ_τ^{*} – additional income.

To make decisions, the manager can use the system (5) quite simply, namely to determine: 1) the expected income in the current position of the portfolio; 2) the expected income of the "adjusted portfolio"; 3) old expected income including costs; (4) new expected income including costs; 5) additional income. If a new position increases risk, the additional return is positive, and the additional return required is greater than the expected additional return from the current position, then the greater expected additional return is needed to offset the increased risk. If the new position reduces the overall risk, the additional income is negative and the required additional income is less than the expected additional from the current position, then it is possible, given the circumstances, to accept the lower required additional income, because the new position reduces the risk. But if the new position does not increase the risk, the additional income is zero and the required additional income corresponds to the expected additional income on the current position, then there is no need to make any changes. "Sharpe rule", more specifically systems (4) or (5), may be acceptable, for example, in such decision-making situations: 1) when acquiring an asset; in case of probable investments in long-term or short-term securities; 2) in insurance transactions; 3) when determining the optimal size of investments and others.

Let's assume a different situation. The firm has short-term liabilities and debts. The probability of failure of the activity falls into the "zone of proximal development". The net income of the company is equal to the income received from long-term investments, minus the amounts paid taking into account short-term liabilities. A firm can go bankrupt if net income is negative and cannot be covered by capital. In a formalized form, the probability of bankruptcy can be represented as follows:

$$\begin{cases} \dfrac{\mu-\eta_\mu}{\sigma_\mu} \lhd \dfrac{\frac{1}{n}\cdot\left(K+\eta_\mu\right)}{\sigma_\mu} \\ \dfrac{K+\eta_\mu}{\sigma_\mu} = -z^f \Rightarrow K = -z^f \cdot \sigma_\mu - \eta_\mu \\ K = \gamma_\mu - \eta_\mu \end{cases} \quad (6)$$

where is: μ – net income of the company; η_μ – expected net income; K – the capital of the company; σ_μ – standard deviation of net income; z^f – indicator of normalized function, comparable to the probability of bankruptcy; z^f =–2,33 if the probability of bankruptcy is 0,01; γ_μ – the cost of net income risk. In a situation of probable bankruptcy, it is necessary to determine the conditions for the occurrence of bankruptcy and adjust the capital dynamics of the firm in order to change the situation. That is, the owner manager figures out the value z^f, substitutes this value into the system (6), determines the value K, analyzes the capital dynamics of the company and corrects the situation.

If the manager-owner compares two portfolios of securities, then the system (6) will tell you how much capital is needed in each option in order to ensure a level of security. That is, we have:

$$\begin{cases} K^{old} = \gamma_\mu^{old} - \eta_\mu^{old} \\ K^{new} = \gamma_\mu^{new} - \eta_\mu^{new} \end{cases} \quad (7)$$

Capital claim calculations provide information on exactly how the changes should be financed. You can then apply the "Sharpe rule" to determine the potential for change.

Suppose a group of owner-investors owns a firm and they hire professional managers to manage. The interests of managers do not always coincide with the interests of the owners. In case of satisfaction of the benefits of the owners, the manager can receive a high remuneration. Each manager's income will, in a sense, be a function of the manager's share of the manager's contribution to the overall benefit of the owners-investors. Using the benefit of owners-investors as a rating scale, managers are

rewarded on this scale. This approach is attractive at least in the following aspects: 1) risk and expected return are theoretically correctly assessed; 2) managers are interested in taking the initiative in making decisions to maximize the benefits of the owners; 3) a competent manager can be sanctioned if a small risk gives rise to large problems; a weak manager can be rewarded if, with a lot of risk, everything goes well. So far, we have dealt with situations in which incomes have been normally distributed. But, what about financial risks in an "abnormal" market environment? The choice of the method of managing financial risks in an "abnormal" market environment depends on the result of studying the essence and parameters of this "abnormality".

Let's define the general deviation from normal as "Fat Tails". Then the normal distribution has a thickness parameter of 3. If the distribution is "abnormal", then the additional thickness of the distribution is above 3. In this case, the effectiveness of the "Sharpe rule" remains in force, although the "Fat Tails" factor will have some influence in determining the capital requirements. Therefore, in the conditions of "abnormal" distribution, capital requirements need to be changed. Particular attention is paid to z^f, as z^f =–2,33 should be replaced with z^f =–3,00.

Such a setting of the function will allow to reflect the effects of the market environment in the "abnormal" distribution. In addition, it is possible to take into account the "Generalize the Sharpe rule" in the modification of Hodges S. [229], which includes the entire possible scope of the manifestations of the distribution. "Generalize the Sharpe rule" in a formalized form can be represented as follows:

$$\begin{cases} \xi^{Hodges} = \sqrt{-2 \cdot \ln\left(-\chi^{opt}\right)} \\ \chi = -\exp\left(-\varsigma\right) \end{cases}, \qquad (8)$$

where is: ξ^{Hodges} – generalized acuity indicator; χ – utility function (benefits of owners-investors); ς – income level; χ^{opt} – optimal expected benefit of the owners-investors. The "Generalize the Sharpe rule" is suitable in situations with unlimited distribution of income. With a normal distribution, this modified rule cannot be used.

The above method of financial risk management is integrated. It is quite applicable to any type of risks of the market environment. Its implementation can be

considered ideal for enterprises related to funds and investment management. With further modification of the method, it can also be used in relation to financial institutions, banks, non-financial corporations and other enterprises in the "abnormal" market environment of Ukraine. This integrated management method is extremely interesting and useful for dealers and other professionals facing "abnormal" distributions and risks.

Thus, in the course of the study, it is established that in conditions of market instability, the choice of the method of managing financial risks depends not only on the parameters and results of studying the nature of "abnormality", but also on the possibility of using the "Generalize the Sharpe rule" in the modification of Hodges S. It is substantiated that the modified version of the "acute rule" takes into account all possible distribution situations, allows you to quickly adjust capital dynamics, maximize the benefits owner-investors, adequately assess the risk and expected return. The rule "Generalize the Sharpe rule" in the modification of Hodges S. applies to absolutely any type of risk in a socially-oriented market economy.