FEATURES OF MODELING INVESTMENT PORTFOLIO RISKS UNDER CRISIS CONDITIONS

Maryna Iurchenko

Candidate of Physical and Mathematical Sciences,
Associate Professor Department of Informatics and Statistic, Researcher,
Klaipeda University, Lithuania

The acceleration of globalization processes over the past decade has led to the formation of a new global financial architecture, the key determinants of which are a significant acceleration of capital flows, dynamic growth in the volume of capital redistribution through financial markets, and the widespread use of securities trading operations as an investment channel. This allows mobilizing temporarily free financial resources of investors regardless of their location. At the same time, the functioning of financial markets both at the level of individual countries and on a global scale leads to the emergence of a wide range of various risks that need to be promptly identified, their concentration levels predicted, and a system of measures for their possible neutralization developed. Moreover, in the context of increasing crises in financial markets under the influence of global risks, transformation processes are significantly accelerated, signals and behavioral reactions appear that financial markets have not encountered before. In light of the above, the problems of assessing the risks of portfolio investments in response to modern challenges, as well as the formalization of the risk assessment process using economic and mathematical methods maximally adapted to the changing conditions of financial markets, are becoming especially relevant. These methods can form the basis for developing algorithms for preventive measures and behavioral strategies for rapid and timely response.

The existing shortcomings of Markowitz's portfolio theory have spurred the emergence of a large number of modified models, which have significantly increased the practical possibilities of portfolio investing at each historical stage. Modern approaches to assessing financial risks in the formation of investment portfolios in unstable environments involve the use of elements from probability theory and mathematical statistics to formulate an adequate model of stock market processes, estimate their parameters, and develop recommendations for making investment decisions.

Among the most interesting contemporary approaches, it's worth noting the modern stochastic methods proposed by J. Bishwal [1] and D. Dilger [2], who suggested evaluating the risk behavior of investors using mainstream theories of payment obligation assessment. Portfolio investments, as is well known, are described by multifactor models. For instance, some

authors [3] have proposed alternative characteristics of the nature of risk and developed a model that differs from the classical models of William Sharpe and Harry Markowitz, allowing the use of stochastic analysis methods for calculating the profitability of risky operations. Promising unifying models at present include those proposed by A. Matviychuk [4], V. Ankhom [5], and S. Berzin [6], which offer innovative methodologies for developing probabilistic models for evaluating the profitability of investment decisions.

The Ukrainian economic school has introduced certain nuances in the interpretation of the concepts of "risk" and "investment portfolio." Among the works of Ukrainian authors, it is worth highlighting the research [7] that examines various mechanisms for predicting changes in systematic and specific risk upon the occurrence of certain events. This research has laid the foundation for developing a model of investment portfolio risks in the context of a global crisis. The main shortcomings of the MPT model have been analyzed and presented Table 1.

Table 1

Main Assumptions of Modern Portfolio Theory and Their Shortcomings

Assumption	Shortcomings of the Assumptions
1	2
All investors seek to maximize expected return (or economic utility).	According to this assumption, investors aim to maximize economic utility to achieve the highest expected return on their invested capital (as much as possible) regardless of other considerations. This is a key assumption of the efficient market hypothesis on which modern portfolio theory is based. However, in reality, markets are not always efficient, and the goals of investors can vary significantly.
All investors have the same investment time horizon.	This assumption suggests that all investors have the same timeframe for their investments, influencing their risk tolerance and investment strategy. In reality, investors often have varying investment horizons – some may invest for the short term, while others may have a long-term focus. Moreover, investors can change their initial plans and adjust their investment horizons depending on market conditions. This variability can significantly affect decision-making and the types of assets chosen for a portfolio.
All investors are risk-averse and rational.	This assumption suggests that investors are inclined to take on higher risk only when offered a correspondingly higher expected return. This is a key assumption of the efficient market hypothesis. However, findings from behavioral economics indicate that market participants often behave irrationally and are sometimes compelled to pay a premium for risk. This means that their risk tolerance can be inconsistent and influenced by emotions, market sentiment, and other non-rational factors.

1	2
All investors make decisions solely based on expected return and risk.	This implies that the utility curve is a function of expected return and expected variance (or standard deviation) of returns. It assumes that, for a given level of risk, investors prefer more profitable portfolios. Similarly, at a specified expected return, investors favor lower risk. In these assumptions, an individual asset or portfolio is considered efficient if no other asset or portfolio offers a higher expected return for the same (or lower) risk or lower risk for the same (or higher) expected return. However, this assumption often fails in practice, especially during financial crises when all assets tend to have positive correlations, causing them to change (decrease) proportionally.
All investors have access to the same information.	This assumption is also a premise of the efficient market hypothesis, which posits that all investors can access the same information to make decisions. In reality, financial markets are characterized by information asymmetry, insider trading, and participants who are better informed than others. Such disparities can lead to significant advantages for certain investors, skewing the market dynamics and undermining the premise that all investors are on equal footing regarding information. This can result in inefficient pricing of assets and challenges in achieving optimal portfolio decisions.
Calculations are made without considering taxes and transaction costs.	This assumption leads to a significant simplification of modern portfolio theory. In reality, financial assets are subject to taxation and operational costs (such as commissions paid to brokers and dealers), which can substantially affect investment returns. Ignoring these factors may lead investors to select a different combination of assets within their investment portfolios, potentially resulting in less optimal decisions. Thus, a more comprehensive approach that incorporates these considerations is essential for accurately assessing investment performance.

Source: compiled by the author

The model obtained in the study allows, unlike existing ones, to present the risk of an investment portfolio in the form of two components. The estimation of the variance of asset returns has been found. It is shown that the factor of systematic risk generally dominates the process of forming the expected return of the investment portfolio in a transforming economy. The presence of a high level of risk is characterized by the value of the parameter β_m.

$$\mathbb{E}\left(S_m\right) = \sum_{m=1}^{3} \beta_m \alpha_m + \beta_1 \theta_1 (3\,\mathcal{F}\left(\beta_t^* \alpha_1 - 1\right) + \beta_3 \alpha_3 \left(3\,\mathcal{F}\left(\beta_3 \alpha_3\right) - 1\right).$$

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