INVESTMENT PORTFOLIO THEORIES

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ABOUT ARTICLE

Abstract: The article analyzes the evolution of financial risk management models in the formation of an investment portfolio. The theory of G. Markowitz , the founder of the modern portfolio theory , and its main ideas were studied. Markowitz's scientific work was reviewed by his student W. Sharpe 's improved theory and the main differences between them, degrees of superiority and error. "Arbitrage price theory" of S.Ross, who made a significant contribution to portfolio theory , was studied, its different aspects from other models were analyzed. Nedosekin and Zaychenko, who developed the next portfolio theory, were discussed in the article "Uncertain set model". Also, investment portfolio optimization models, their advantages and disadvantages, and their differences are compared.

INTRODUCTION

In accordance with the decree "On the development strategy of the new Uzbekistan for 2022-2026 ", new strategic directions for the development of the financial sector were defined and tasks for achieving the goals set ahead were set. [1] To fulfill these goals and objectives, the new Uzbekistan needs to develop a modern financial market. For this, it is necessary to reduce the gap between theory and practice while applying modern theories.

The modern financial market is characterized by significant complexity of the processes taking place in it. In this, the globalization of international markets, currencies, interest rates, stock prices and raw material prices are increasing. In such conditions, the type of financial risks and the degree of danger are increasing. As a result, financial markets have become complex, risky and volatile. The gap between economic theories and real processes has increased. In this regard, the development of the theory and methods of optimization of the securities portfolio has become a very urgent task. This article provides an analytical overview of stock portfolio optimization techniques.

Review of literature

The founder of the modern portfolio theory, G. Markowits , wrote in his scientific works about the need to form a portfolio by checking the correlation between each item. Before Markovist, the classical approach to stock value was based on the discounted value model developed by John Bury William. [2] Markowitz observed that risk was not taken into account in this model and proposed his own model. When Markowitz [3] was defending his doctoral dissertation in the field of economics, putting forward his theory, Milton Friedman, a well-known economist of his time, criticized him and his contribution as not having economic significance. But until now, all portfolio theories, portfolio optimization and portfolio diversification issues have been developed by a number of economists based on the scientific work of Makovits. One of the most prominent of them is U.Sharpe [4], who modified the work of Markowitz by adding the beta variable. In doing so, he showed that it is now necessary to analyze the changes of the stocks according to the market index, rather than the correlation of the stocks in the portfolio. In this case, the calculation system has become easier and served to increase the level of accuracy. When he proposed his model in 1962, the editors of Moliya magazine refused to publish the article. However, Sharpe waited for the editorial board to change, and in 1964, the world-famous CAPM (Capital asset pricing model) was published in this journal. The model was independently developed in the 1960s by Jack Trainor (1961, 1962) [5], John Littner (1965) [6] and Jan Mossin (1966) [7].

Analysis and results

In general, portfolio theory is "a concept that examines the optimal combination of forms of wealth (including money, government bonds, real estate, etc.) chosen by economic subjects, seeking to use this wealth as efficiently as possible" [8] The modern financial market requires a modern portfolio theory. The founder of the modern portfolio theory is G. Markovitz . Markovitz proposed to form a portfolio of securities based on the approach to the selection and formation of the portfolio based on its expected return and riskiness. Within the framework of this theory, the investor maximizes the expected return of the portfolio for a certain level of risk by diversifying his investments. or is assumed to seek to minimize risk for an expected rate of return.

The Markovitz model is considered appropriate for forming a portfolio of securities of various characteristics belonging to various sectors in a stable state of the stock market. The main drawback of the model is that the expected return on securities is assumed to be equal to the average return on the data of previous periods.

The risk in the model is estimated with a standard deviation, which requires a normal distribution of profits. Later, this approach was developed in the works of J. Tobin [9] and V. Sharpelar.

A few years after the publication of G. M. Markowitz's works, J. Tobin's works on the subject, such as "National Economic Policy" (1966) and "The New Economy: A Decade View" (1972), appeared. However, there were significant differences in the approaches of the two authors. G. M. Markowitz studied the problem from the point of view of microeconomic analysis, and first of all, he paid attention to the behavior of the individual investor, which, in his opinion, constitutes the optimal portfolio based on the return and the standard deviation of the return. J. Tobin's approach was macroeconomic, because the object of his research was to divide the total capital in the economy into two forms: cash (in the form of cash) and non-cash (in the form of securities). G. M. Markowits demanded not economic analysis of the initial rules of the theory, but mathematical analysis of their consequences and creation of algorithms for solving optimization problems. J. Tobin paid attention to the analysis of the factors that force investors to form a portfolio of assets, not to keep capital in one form or another, for example, in cash. In addition, the GM Markowitz model is mainly applied to portfolios of stocks, which are risky assets. J. Tobin proposed to include risk-free assets in the analysis, in particular, government bonds.

In 1963, W. Sharpe, a student of G. M. Markowitz , published the article "Simplified model of portfolio investment analysis". In this article, the author proposed a simple method of forming a portfolio of securities.

The advantage of the Sharpe model is the mathematically based relationship between return and risk. The higher the risk, the higher the return on the stock. The main drawback in this model is the need to predict stock market returns and the risk-free rate of return. The model does not take into account the risk of changes in the risk-free return. In addition, a significant variation in the ratio between the risk-free return and the stock market return gives model errors. Sharpe's model can be applied to the large number of securities that characterize most of the relatively stable stock market.

the U.Sharpe model and the G,M.Markowits model is that the U.Sharpe model looks at the relationship between the returns of each security and the return of the entire market, while the G.M.Markowits model looks at the relationship between the returns of mutual securities. Thus, according to the U. Sharpe model, it is assumed that the return of a security in a certain period is related to the return of the market index in the same period. In this case, when the market index rises, the price of the security rises and vice versa. One of the main advantages of the U.Sharpe model is that it provides results that are slightly different from those obtained by the Markowits model, while providing a significant reduction in the amount of calculations in determining the optimal portfolio.

Unlike the classical efficient market model, which excludes the possibility of arbitrage, the ART model (Arbitrage Pricing Theory) offers the possibility of increasing portfolio returns without increasing risk in some cases. The model was developed by S. Ross [10] in 1976 and can be used in the same way as the Sharpe model in the case of market equilibrium.

To use this model, you need to calculate as many linear models as the number of selected assets. Since the number of assets is assumed to be large, the calculation process becomes very laborious. In addition, the market situation is changing rapidly, and this type of model cannot be used for a long time. The model needs to be rebuilt to fit the situation. In this case, the problem of its adequacy arises and the problem of quality control is not solved.

	Markowitz model of investment portfolio	U. Sharpe's index model	Arbitrage Pricing Theory (Arbitrage Pricing Theory (APT))	Nedosekin's model of fuzzy set descriptions	Investment Portfolio Vulnerability Model

Investment portfolio model	$E_i = \sum_{j=1}^{n} R_i \cdot P_{ij}$ here, $P_{ij} = 1$ n=determines the number of profitability estimates for each security; R_i= individual potential income P_{ij}= probability of occurrence.	$R = \dfrac{(r_2 - r_1)^x \sigma}{\sigma_2} + r_1$ Ratio of index return to index volatility (risk-free return component).	$E_p = \lambda_0 + b_{p1}(\lambda_1) + b_{p2}(\lambda_2) + \cdots + b_{pk}(\lambda_k)$ here, Risk premium - λ_i...k b_i...k is sensitivity to different securities	$R = \dfrac{r_2 max - r_1 min}{\sigma_2 max}, (r_2 av - r_1 av) /\sigma_2 av), \dfrac{r_2 max - r_1 min}{\sigma_1 min}$	$VIB - C = (R_{liq} + R_{los})/(\dfrac{R}{P} + \dfrac{R}{L})$ here, R_{liq}- liquidity risk; R_{los}- the risk of losing the value of investment portfolio assets; $\dfrac{R}{P}$ —Risk to return ratio; $\dfrac{R}{L}$ —Ratio of risk to liquidity
Market type	Quiet stock market	Quiet stock market	Quiet stock market	Quiet and dynamic stock market	Quiet and dynamic stock market
An element of the investment portfolio	D_i is the dispersion of individual securities; C_{ik} - exchange rate volatility covariance; E_i - mathematical expectation; σ - mean square deviation of stock risk.	β-factor (determines the expected return for a specific share and the relation of each share to the market) r_i is the level of profitability of the stock in the portfolio; σ- expected volatility of assets in the portfolio;	Common risk factors ($b_k * (\lambda_k)$) Indicators: Economic; Inflation etc. β-factor. E_i and other factors.	r- the expected profitability of the portfolio; σ- the expected volatility of the portfolio;	Liquidity risk; Risk of loss of value of investment portfolio assets; Risk to return ratio; Ratio of risk to liquidity
Achievements	It works well in the context	A new method has	Here, as the	It provides compatibility between	Forms the investment

	of the fixed paradigm of the stock market	not been developed, the existing method has been simplified. Therefore, it is not necessary to determine the covariance of each share with each other, but it will be enough to study the relationship of each share with the general market.	market portfolio and index are not studied, it is easy to calculate compared to other models	classical probabilistic models and uncertain parameters	portfolio based on the rationality approach and ensures the safety of the investment
Disadvantages	It has a number of model assumptions that do not correspond very well with the reality of the stock market (especially in times of crisis when paradigms have changed, when it is clear that price processes are not stationary).	It uses the close relationship between the price movements of individual stocks	In practice, it is difficult to determine exactly what factors should be included in the model	The model is built for the highest possible level of risk. Probability levels are formed based on expert opinion.	Equity and debt capital can be used only within the framework of the existing investment portfolio formation strategy

classic Markowitz model is the fuzzy set model of investment portfolio optimization proposed by Nedosekin and improved by Zaychenko. [11] Correlation of assets in the portfolio is not considered and taken into account in this model. The very low yield threshold can be a simple scalar or an arbitrary fuzzy number. In this way, two sources of information (an asset's average return and volatility) are

combined into one (an estimated yield or price corridor), thereby combining two sources of uncertainty into one. In this setting, portfolio optimization means maximizing the portfolio's expected return at point T for a fixed level of portfolio risk.

CONCLUSION

In conclusion, it can be noted that initially the portfolio theory was determined based on the discounted value theory created by John Bury William. Markowits, witnessing the absence of the risk factor in this model, suggested the selection and formation of a portfolio of securities based on the approach based on its expected return and riskiness. And the portfolio has increased attention to diversification. Based on his work , W. Sharpe , Jack Trainor, John Littner and Ian Mossin created the CAPM. Now, the degree of dependence of the financial instruments that make up the portfolio, not on each other, but on the market index has been studied. In addition, "Theory of Arbitrage Prices" was put forward by S. Ross, which provides an opportunity to increase portfolio returns without increasing risk. This model provided an alternative to the Sharpe model. The next model improved on the basis of the fuzzy logic model is the fuzzy set model of investment portfolio optimization created by Nedosekin and Zaychenko. This model is based mainly on quality indicators. So, we can see that the evolution of financial risk management models in the formation of the investment model has improved from quantitative indicators to the combination of qualitative and mixed models.

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