Creation of an information system for investment portfolio analysis

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Abstract: *The issue of decision-making on the formation and optimization of the investment portfolio is in the field of attention of both large investment companies and private investors. In the presented work the developed information system for investment portfolio analysis is offered. The proposed information system focused to new private investor and allows to independently assess the effectiveness of the investment portfolio by comparing the dynamics of growth of shares available on the financial market.*

Keywords: FINANSIAL INSTRUMENNT, PORTFOLIO, ANALYSIS ALGORITHM, INFORMATION SYSTEM FOR INVESTMENT, FINANSIAL RISK MANAGEMENT, PORTFOLIO OPTIMIZATION

1. Introduction

Investments in securities are one of the main directions of any financial market. An example is the intensification of recent years of buying shares of large international companies and cryptocurrencies and serves in accordance with the growth of their values. The further development of the securities market requires proper consumer information about the characteristics of financial products.

Available visual information about the financial product will allow the consumer to assess whether it meets the selected active needs and whether the consumer is willing to accept the inherent risks of such a product. Also, providing reliable information before the conclusion of the agreement will increase confidence in financial institutions and, accordingly, increase demand in the financial market and attract new customers to financial institutions. Thus, clear provision of reliable information to the consumer about financial products available on paper, as well as the use of investment instruments, should be a significant factor in increasing the income of citizens in the securities market [1-3].

In Ukraine, there has recently been a significant increase in interest in the problems of investment theory [4]. The part of private investors who are willing to invest in financial instruments is rising.

The task of optimizing investment portfolios is considered a special case in investment theory. The optimal distribution of the investment portfolio should provide the best return while maintaining the lowest risks. At the same time, the use of special mathematical methods and information tools to support decision-making makes possible effective investment activities.

As one of the means of effective optimization of the portfolio solution is the use of mathematical methods and information and communication technologies [5-6]. These tools are used to make investment decisions by analyzing data obtained from stock markets, assessing parameters, identifying and solving problems of the optimal portfolio, which allows balancing the shares of assets in terms of portfolio return to risk.

2. Prerequisites and means for solving the problem

Given that the return on assets is stochastic, investors allow optimization of MPT with the inclusion of transaction costs for investments and the addition of certain restrictions on asset categories and divisions of investment periods. Optimization of the portfolio content can take into account not only the data available in the past but also requires additional analytical research of expert opinions. It is worth noting that the method of taking into account the subjective assessment of experts conducted by different groups sometimes leads to significant differences of opinion about the end result. The solution of portfolio problems related to the reduction of investment risks, which is more acceptable to investors, is performed through formalization and quantification of risk through multicriteria decision-making and clustering, as well as using interval fuzzy formalism decision-making [7-8].

The Internet has a wide range of specialized software products for financial risk management through in-depth analysis, reporting and modeling of investment scenarios. Examples of the most famous of these are the platforms Riskalyze (https://www.riskalyze.com), LogicManager (https://www.logicmanager.com), CammsRisk (https://cammsgroup.com), Sharesight (https: // www .sharesight.com), Looker (https://looker.com), FundCount (https://fundcount.com), HiddenLevers (https://www.hiddenlevers.com), Ziggma (https://ziggma.com) and the Arbor Portfolio Manager risk management system (https://arborfs.com). These are professional investment portfolio management software products designed primarily for executives, financial advisors, asset managers and portfolio managers [9-10].

The article develops an information system to support decision-making in the formation of the securities portfolio, which is focused on domestic private consumers. The service is aimed at Ukrainian-speaking audiences, and a simple and clear interface allows non-professional or low-skilled investors to make decisions on the formation and optimization of the investment portfolio.

3. Solution of the examined problem

To analyze the data, a feature has been created that downloads stock data from the information source of financial information provider YahooFinance (https://finance.yahoo.com) using the Pandas library in .csv format [11].

The main page of the presented platform provides introductory information for beginners, which will help to understand how to properly weigh the risk and make decisions during the formation of the investment portfolio. The main theses described on the home page will tell the user exactly how to reduce risks and manage the investment process.

It is known that most of the information encountered by the investor is in tabular format, and according to the methodology of scientific knowledge, people are more receptive to visualized ways of presenting the information. Based on this, the process of visualization is taken as the basis of the newly created information system, which represents the available tabulated information in a structured form of diagrams, graphs, charts.

The user has the opportunity to assess the dynamics of changes in the price of the financial instrument on the chart (Fig. 1) and, to analyze the graphs, taking into account the overlap of the moving average.

Fig. 1 *Price overview page with moving average overlap..*

The system of basic analysis makes it possible to visualize the risk of non-compliance with the profits of each activity based on the analysis of the daily trend of price changes in action.

The proposed information system allows potential investors to independently assess the effectiveness of the investment portfolio by comparing the dynamics of price growth of shares available on the financial market. When compiling an optimal portfolio, the correlation indicator between instruments is important. The user of the system can obtain both the correlation visualization (table and heat map) and the numerical characteristic found using the Pearson correlation coefficient.

An important feature of the system is the ability to predict the price of a financial instrument. SARIMA stationary series prediction methods were used, and the two most common methods for verifying stationarity were implemented: visualization and Dickie-Fuller test (ADF). The evaluation metric used to search the parameter set is the AIC value (Akaike Information Criterion).

To manage the portfolio, the system implemented the calculation of annual profitability and volatility for each instrument and for the portfolio as a whole. When calculating the efficiency of the portfolio, Sharpe's ratio is used, which is the ratio of the expected excess return of the portfolio to its volatility.

The system allows you to create different sets of portfolios to further select the best one. The Monte Carlo simulation of the construction of various randomly formed scales for basic instruments is applied. Visualization of the ratio of profit and risk of simulated investment portfolios allows the investor to assess the minimization of risk for a given level of profitability. And the calculated values of expected return, risk Sharpe's ratio help to choose the optimal result.

The results of the analysis are presented visually. The table also shows the corresponding values for the analysis of the expected profitability of the selected portfolio solution [12].

4. Conclusion

The web-based solution will help to analyze and forecast portfolios in real-time by available types of shares of different companies. This solution will help the investor to find the optimal content of the portfolio and minimize possible investment risks.

The novelty of the presented information system to support the decision-making of the securities portfolio is the ability to visually compare the assets available on the financial market in order to fill the investment portfolio in the relevant equity participation. The service is focused on the Ukrainian audience, and the application interface allows the client, based on historical data on the value of assets, to determine the share price and create a set of assets based on the forecasts offered in the system.

The created product is a web-based system for risk analysis in the investment portfolio of stocks or cryptocurrencies. The newly created information system to support decision-making in the formation of the investment portfolio and investment risk management is published on the Internet at: https://risk-investment-portfolio.herokuapp.com

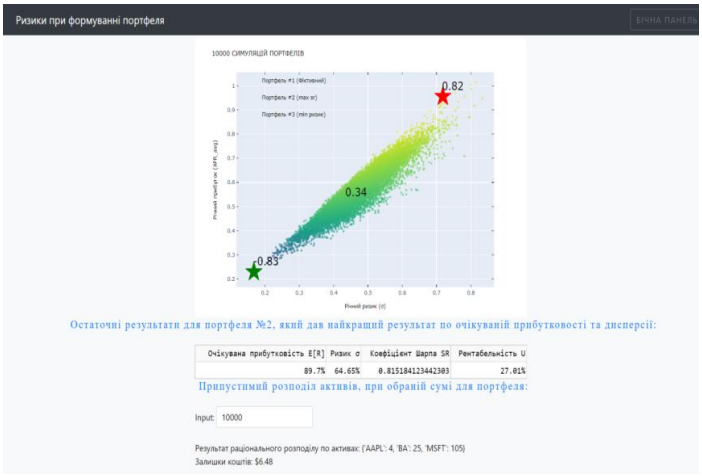

Fig. 2 *Expected returns and risk for the selected investment portfolio.*

As a result, (Fig. 3) in the form of a diagram visualizes the optimal filling of the investment portfolio.

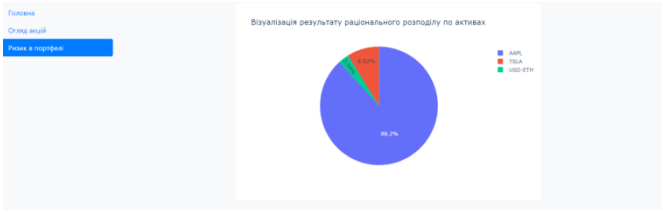

Fig.3 *Diagram of the result of rational distribution of portfolio assets.*

5. Literature

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