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Grigorij ŽILINSKIJ

INVESTMENT PORTFOLIO SOLUTIONS

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INVESTICIJŲ PORTFELIO SPRENDIMAI

DAKTARO DISERTACIJOS SANTRAUKA

SOCIALINIAI MOKSLAI,
EKONOMIKA (04S)



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Introduction

Definition of the problem

Investment portfolio selection and management process analysis as well as search for its improvement options is an important field in the development of the modern science of economics. The significance of this field is also well reflected by the number of Nobel prizes awarded to the scientists analysing the problems of investment portfolio selection, efficiency of the financial markets and topics closely related to these issues.

Swift development of financial markets determines appearance of new challenges for both, the investors and the scientists dealing with the problems of investing. The necessity for innovative, adequate to real market conditions theoretical, conceptual and pragmatic investment portfolio selection and management solutions arises.

The Thesis analyses and introduces solutions for the problem which is formulated as insufficiency of accumulated scientific and practical exploration and inadequacy of available solutions in order to ensure effective investment portfolio – as a dominating investment strategy – selection and management for the investors who have different investment preferences in light of tendencies and challenges of nowadays financial markets, such as growing market dynamics, increasing complexity of their development options and the need for the systematic investment solutions.

In order to uncover the essence of the problem investigated in the thesis, it makes sense to identify its main problematic aspects:

- scientific literature does not provide sufficient coverage of the combining possibilities of the different assets in an investment portfolio;
- insufficient assessment of the real market limitations and costs of portfolio management in the modern portfolio theory can mislead investors by giving surplus expectations for the expected return of the portfolio;
- stock prices (return) forecasts obtained using different methods integration opportunities, which would allow to increase forecasting accuracy, are not investigated thoroughly enough;
- no methods which would assess acceptable for the investor ratio of the change of expected return and actually experienced costs while making portfolio rebalancing decisions are proposed;
- commonly suggested model of portfolio optimisation is based on the profitability and risk, however, there is no system or model which would allow a particular investor to strive for maximisation of the general attractiveness of the investment portfolio.

Topicality of the research

Swift development of the financial markets, increase in variety of investment objects and services are the proof of the complexity of efficient investment solutions and new investment opportunities. New investment portfolio diversification opportunities introduce new challenges, which demand ever more advanced scientific and practical solutions. The global financial crisis revealed that traditional measures of portfolio diversification are not efficient when financial markets are affected by factors of a systematic character. The dynamics typical for the modern financial markets require investment managers to employ adequate solutions; however, even delegated, professional investment management did not protect the investors from the reduction in the value of the investments in period of the crisis. The need to look for new ways of investment portfolio selection and management, which would allow to reduce investment risks and possible losses at the periods of market instability, emerges.

The increasing variety of the investment objects allows even private investors to frame a broadly diversified investment portfolio, incorporating different asset classes into it, but it also requires an extensive analysis of the broadly diversified portfolio selection options and evaluation of the possibilities of market volatility protection provided by it.

Fluctuations of the stock markets and the possibilities of application of financial leverage open up significant profit possibilities for active investors. Nevertheless, active management of the investment portfolio with the financial leverage introduces the necessity to assess all the limitations and costs, to ensure efficient solutions at the stages of forecasting and portfolio rebalancing.

The price bubbles emerging in the markets make us doubt appropriateness of expected return evaluation, based on historical stock return analysis, and adopt the approach of assessment of stocks the investment attractiveness, which can ensure not only matching the needs of the investor but also sustainable development of business, markets and states.

Object of the researches

Object of the scientific research of the thesis is investment portfolio selection and management.

Aim of the work

The aim of the Thesis is to propose and test empirically investment portfolio selection and management solutions matching the tendencies of modern markets for the investors with different investing preferences.

Tasks of the work

The following tasks were set in order to achieve the aim of the Thesis:

1. To analyse possibilities of different assets (asset classes) inclusion into a widely diversified portfolio and to assess efficiency of the widely diversified portfolio as a measure of risk reduction and protection from decline of particular markets.
2. To suggest concrete solutions for active portfolio management with financial leverage:
 - to evaluate the effect of limitations and costs of active portfolio management with financial leverage on the efficient set of portfolios, and to assess the expedience of its application in terms of stock prices volatility, common to the stock market of Lithuania;
 - to suggest a method for integration of separate forecasts and evaluate its efficiency at reducing stock return and currency exchange rates forecast errors (increasing accuracy of the forecasts);
 - to suggest a portfolio rebalancing method regarding excess expected return and incurred costs ratio acceptable to the investor;
 - to summarise provided suggestions, thus creating a general model of active portfolio management with financial leverage.
3. To assess the possibilities of application of the multicriteria decision making methods for the investment portfolio selection; to propose and test stocks investment attractiveness based investment portfolio selection model.
4. To formulate the development guidelines of stocks investment attractiveness based investment portfolio selection decision support system.

Methodology of research

The following methods were employed in order to achieve the aim and tasks of the Thesis: for literature analysis – analysis, synthesis and summarisation of scientific sources; validating theoretical solutions and testing them – hypothetical modelling, graphical representation and comparison, multicriteria assessment, qualitative mathematical and statistical research methods.

Scientific novelty

While conducting the researches the following results, new to the field of economics, were discovered:

1. Possibilities of the widely diversified portfolio, which includes stocks, bonds, currency and goods, selection and its efficiency in terms of instability of financial markets were assessed. The achieved results revealed that combination of different assets can be beneficial for reduction of the

portfolio risk, however, if portfolio is not rebalanced for a longer period of time, its return declines.

2. The method of evaluation of investor's actually incurred risk based on evaluation of actual return mismatch with the investor's expectations was suggested.

3. Changes of efficient set of portfolios while actively managing investment portfolio using financial leverage were evaluated. The results of modelling revealed that active portfolio management using financial leverage can be beneficial only if risk-free borrowing-lending opportunities are actively employed.

4. A method of forecast integration which allows to increase the accuracy of stock return and currency exchange rates forecasting was introduced. The results of the research revealed, that by integrating different period time series forecasts received using methods of simple and weighted moving average, it is possible to reduce mean absolute forecasting errors in comparison with the most accurate of non-integrated forecasts by 11 % in average.

5. The method of portfolio rebalancing decision making, based on expected return change and actually experienced costs ratio acceptable for the investor, was suggested. A possibility of partial portfolio rebalancing based on the marginal change in the expected return and marginal trading costs was foreseen.

6. Possibilities of multicriteria decision making methods application for stocks investment attractiveness evaluation were discovered and a model of investment portfolio selection based on the attractiveness of stocks was introduced. The model allows to select the stocks which would best match the need of the investor upon assessing stock trade, fundamental and even qualitative indicators. Guidelines of stocks investment attractiveness based investment portfolio selection decision support system development were formulated.

Practical value

While writing the Thesis, concrete investment portfolio selection and management solutions, which can be applied for investment portfolio selection and management in actual market conditions, were proposed. Assessment of the widely diversified portfolio selection possibilities can be beneficial when it comes to choosing investment assets, making decision on the periodicity of the portfolio rebalancing. Adjusted efficient set of portfolios is beneficial when making decisions concerning the active portfolio management and application of financial leverage. The methods of forecast integration and portfolio

rebalancing decision making can be applied to create decision support systems or directly applied for portfolio management. On the basis of guidelines formulated in the Thesis a real stocks investment attractiveness based investment portfolio selection decision support system can be created.

Defended propositions

1. Combining different assets (stocks, bonds, currency, goods) in the portfolio allows to reduce systematic risk of investing into a single asset (for instance stocks), however, considering the fact that both return and correlation of the return are changing over time, it is advisable to revise the content of even widely diversified portfolio.

2. Active investment portfolio management with financial leverage can be beneficial only in the instances when the fluctuations of the stock prices are sufficient to ensure the intensive risk-free borrowing and/or lending.

3. Particular forecasting methods can possess programmed errors, which can lead to inaccurate forecasting in some particular instances, therefore, in order to improve forecasting accuracy it is expedient to integrate forecasts received as a result of application of different methods. A method suggested in the Thesis can be employed for integration of forecasts.

4. The methods of the portfolio rebalancing decision making when the expected return is corrected by subtracting transaction costs cannot ensure the best meeting of investor's needs, so portfolio rebalancing decisions should be made considering expected return change and actually experienced costs ratio acceptable for the investor.

5. Portfolio management based on analysis of the change in return in past periods is insufficient for selection of the investment portfolio which would match the needs of the investor best; portfolio selection has to be based on maximisation of its investing attractiveness for a particular investor.

6. Assessment of investing attractiveness of stocks is a rather difficult, complex process which requires a lot of data and time, therefore, application of a suggested stock investment attractiveness based portfolio concept should be systemised according to the guidelines, which are detailed in the dissertation.

The scope of the scientific work

The scientific work consists of the general characteristic of the dissertation, 3 chapters, general conclusions, list of literature, list of publications and addenda. The total scope of the dissertation – 116 pages, 32 pictures, 27 tables and 16 addenda.

1. Evaluation of Passive Investor's Risk Hedging Possibilities

Passive investors and long term investments are beneficial for investment market, as they ensure sustainable market development and, in contrast to speculative capital, reduce market volatility. However, recent financial crisis showed, that the most popular methods of stock portfolio diversification – international and by sector, including bonds to investment portfolio, cannot protect investors from significant loss when markets are under the sway of systemic shocks. Therefore, investors need to include more assets to ensure efficient diversification. The first chapter of dissertation is based on the assumption, that systemic risk when investing in several markets is lower than when investing only in the stock market (Fig. 1).

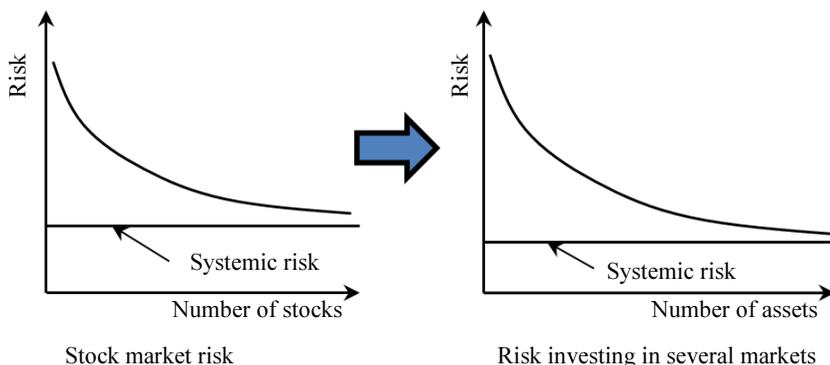


Fig. 1. Systemic risk investing in stock and several markets

After the analysis of scientific literature main asset classes which can be used to improve portfolio diversification were specified:

- 1) stocks – from different sectors and regions;
- 2) fixed income securities of different maturity and emitted by different issuers;
- 3) cash and equivalents;
- 4) currency of developed and developing countries;
- 5) different (commercial, residential, etc.) real estate in different regions;
- 6) commodities – energy resources, agricultural goods, basic metals, industrial goods and precious metals.

Financial markets' development and increasing variety of investment objects allows combination of all mentioned asset classes in one investment

portfolio through investments in Exchange trader funds (ETF). 24 ETFs were selected for analysis. After evaluation of the main characteristics of selected ETF's and correlation analysis of their return fluctuations, the assumption that systemic risk investing in several markets is lower than investing only in stock market, was confirmed. Ten investment portfolios – nine Markowitz efficient and one comparative (in which all ETFs have equal weights), were selected for analysis.

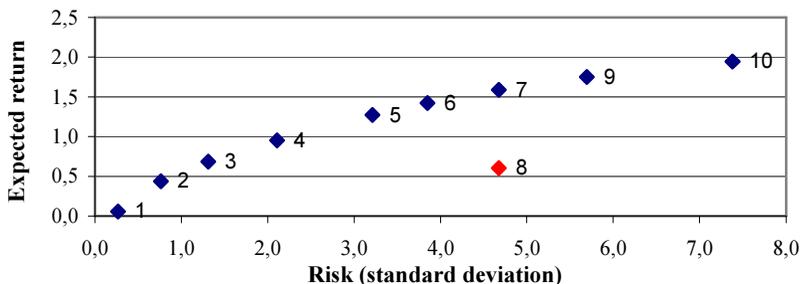


Fig. 2. Return-risk trade-offs of selected portfolios'

Return-risk trade-offs of selected portfolios' (Fig. 2) reveal the benefit of portfolio diversification – expected return of the optimal portfolio (with the same risk as comparative) is three times higher. Efficiency evaluation of selected portfolios has shown, that the real return of optimised portfolios is relevant to expected and only unrisky and comparative portfolios have suffered losses. In the period of 2011-02-10–2011-11-10 results of optimised risky portfolios were better than expected return, however, in longer period 2011-02-10–2012-04-10, the average return has not achieved expected return. Therefore, we can draw a conclusion that due to dynamic changes in investment markets and time varying correlations, even widely diversified investment portfolio must be periodically rebalanced.

2. Portfolio Solutions for Active Investors

The second chapter analyses the problem of active portfolio management with financial leverage. Active portfolio management ensures personal investor's development and gives opportunity to avoid loss in terms of market instability. Three factors, crucial for efficient active portfolio management, were analysed in the Thesis:

- 1) the changes of efficient set of portfolios actively managing investment portfolio with financial leverage;
- 2) forecasting accuracy of stock return;
- 3) portfolio rebalancing decision making.

Analysis of scientific sources showed that the most attention is paid to evaluation of changes of risk and return combinations, determined by different borrowing and lending rates. However, active portfolio management with financial leverage, especially in emerging market, has more limitations and costs, which must be evaluated, such as limited borrowing and lending opportunities or fixed operations costs for small operations.

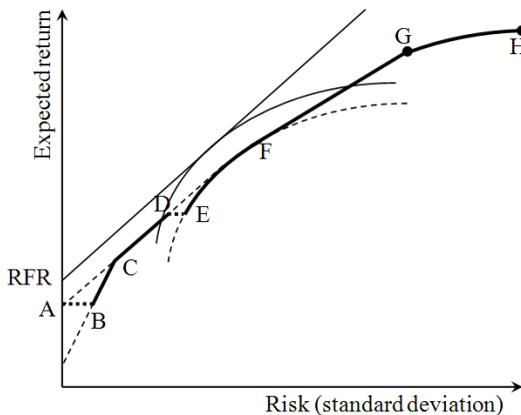


Fig. 2. Efficient set of portfolios actively managing investment portfolio with financial leverage

The modelled efficient set of portfolios (Fig. 2) showed, that active portfolio management with financial leverage can be more useful than basic Markowitz portfolio only when market fluctuations are high enough to ensure intensive lending or borrowing. Due to limited borrowing possibilities the double (investment and financing decision) separation theorem must be expanded to triple (initial investment decision, financing decision and correction of initial investment decision) separation.

The analysis of expediency of active investment portfolio management with financial leverage showed that it is reasonable to use financial leverage – risk-free borrowing allows to increase expected return 10,65 %, when borrowing costs are 2,19 %; or even 66,7 % expected return with 10 % borrowing costs in terms of high market volatility. However high expected

return doesn't mean high real return for investor and crucial factor to ensure efficiency of active portfolio management is high prediction accuracy, so the forecasts integration method, based on prediction accuracy in the past, was proposed in the Doctoral Dissertation. Formula 1 is used to integrate separate forecasts:

$$X_{t+1} = \sum_{k=1}^m \frac{X_{t+1}^k \times \sum_{k=1}^m (MSE_t^k)^2}{(MSE_t^k)^2 \times \sum_{k=1}^m \frac{\sum_{k=1}^m (MSE_t^k)^2}{(MSE_t^k)^2}}. \quad (1)$$

The empirical research was carried out to evaluate efficiency of proposed method integrating different period time series forecasts. The results of the research showed that integrating different period single moving average forecasts reduced mean square error by 9,48 %, in case of weighted moving average – by 12,84 %.

Portfolio rebalancing problem is analysed in scientific literature evaluating two main aspects: portfolio rebalancing strategies and portfolio rebalancing algorithms. Portfolio rebalancing algorithms are focused on expected return maximisation after rebalancing costs:

$$\max E(R_p) = \sum_{i=1}^n w_i^t E(R_i^t) + r_- w_-^t - r_+ w_+^t - \sum_{i=1}^k (c_i^+ w_i^+ + c_i^- w_i^-) - \sum_{j=k+1}^n c_j^+ w_j. \quad (2)$$

However, when rebalancing a portfolio investor incurs real costs for expected return, therefore using formula 2 cannot ensure the best meeting of investor's needs. Portfolio rebalancing decision should be made evaluating excess return and incurred costs ratio:

$$K = f(E(R_{p_0}); E(R_p); C) \geq K_{\min}, \quad (3)$$

which can be specified:

$$\frac{E(R_p) - E(R_{p_0})}{C} \geq K_{\min}, \quad (4)$$

or for partial portfolio rebalancing:

$$\frac{\Delta E(R)}{\Delta C} \geq K'_{\min}. \quad (5)$$

Suggested method meets investor needs to a better extent and allows reduction of the rebalancing costs by eliminating operations when expected return is insignificantly bigger than incurred costs.

All active portfolio management suggestions in chapter 2 were summarized in an integrated active portfolio management model.

3. Investment Portfolio Based on Stock Investment Attractiveness

Most investment portfolio selection models are based on the analysis of stock return fluctuations in past periods. However, good results in the past cannot ensure return in the future. Only comprehensive evaluation of stock investment attractiveness ensures selection of stocks which meet the needs of the investor best and allows resource allocation to the most perspective sectors.

After analysis of scientific literature two main multicriteria decision making method groups, appropriate for solving portfolio selection problem, were identified:

1. Multiattribute decision making (MADM) methods, which are used for stock ranking (investment attractiveness evaluation);
2. Multiobjective decision making (MODM) methods, which are used to directly solve the portfolio selection problem.

Stock ranking and attractiveness evaluation problem was analysed by Huang 2012; Xidonas et al. 2009a,b; Chung, Kim 2001; Sevastjanov, Dymova 2009; Samaras et al. 2008; Ehrgott et al. 2004; Voulgaris et al. 2000; Garcia et al. 2010; Tiryaki, Ahlatcioglu 2005; Lee et al. 2009; Stasytytė 2011. Summarizing criteria proposed by the abovementioned authors, the classification of investment attractiveness evaluation criteria was suggested in the Thesis and 18 criteria selected for empirical research.

Multiobjective decision making methods suggested by the scientists for portfolio selection have two to twelve objectives, however, using more than two objectives complicates optimisation of the portfolio, so it is reasonable to involve all relevant factors in stock attractiveness efficiency evaluation and optimise the portfolio by maximising its attractiveness for investor and minimizing stock intercorrelations in it. The basic portfolio optimisation model based on stock investment attractiveness is shown in Fig. 3.

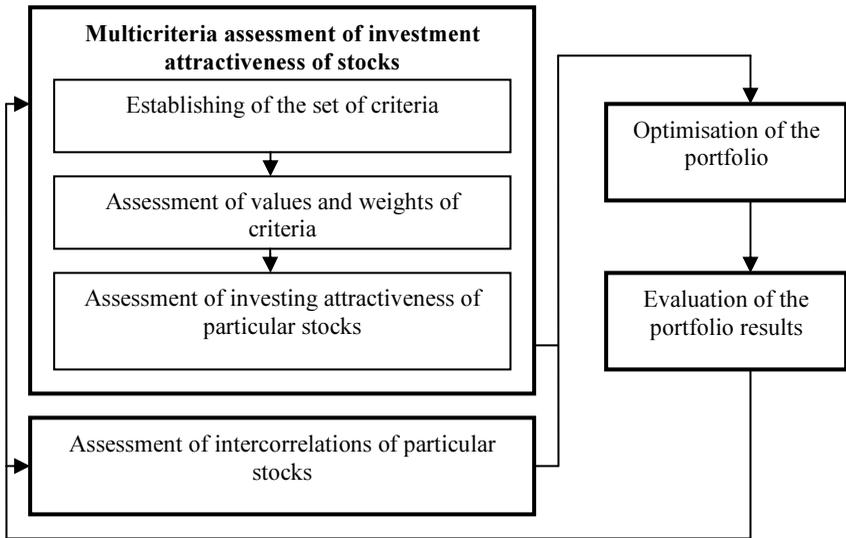


Fig. 3. Basic stock investment attractiveness based portfolio optimisation model

The COPRAS method was selected and improved for empirical evaluation of suggested method's efficiency in the period of 2006-2011. The results of the analysis showed, that portfolios selected using suggested model have gained better results than comparative portfolios, suggested lower risk investment portfolio gained an average of 13,77 % return (with 23,59 % standard deviation); risky portfolio – 14,91 % (28,03 %); comparative portfolio with equal weights – 12,55 (27,29 %); basic Markowitz portfolio – 10,13 % (23,41 %). Despite the fact, that portfolios, selected using suggested model, had best risk return ratios, they didn't avoid loss at the peak of financial crisis. The basic model has also limitations (for example, it needs a lot of time for data collection and processing), which could be eliminated by developing decision support systems. The guidelines for development portfolio selection decision support system were framed in the Thesis.

The main factors ensuring efficient functioning of the proposed system and elaborated in the Thesis are:

1. Operative selection of reliable data;
2. Data processing possibilities;
3. Decision making and monitoring.

General Conclusions

Investment portfolio selection solutions for investors with different investment preferences detailed in the dissertation – widely diversified portfolio selection solutions for the investors who prefer not to rebalance their portfolios, active portfolio management solutions for the investors who prefer to make profit from brief price fluctuation in the market, a way of portfolio selection based on stock investment attractiveness for investors who periodically rebalance their portfolios, allow to make some general conclusions.

1. Increasing variety of investment objects opens up new investment options which allow to make profit not only from traditional investment objects but also from currency exchange rates or changes of goods or resources prices, whereas small or even negative return intercorrelations ensure good portfolio diversification and suggests that systematic risk of a single market (e.g. stock) can be reduced by investing into several different investment markets.

2. Selection of a widely diversified portfolio revealed that expected return of Markowitz optimal portfolio is almost three times higher than that of analogous comparative portfolio of similar risk, thus the greater benefit of portfolio optimisation is experienced in case of greater number of assets and lesser correlations between their returns, and selection of higher risk portfolios can be ineffective because of a small number of assets included into the portfolio.

3. Testing of the widely diversified portfolio revealed, that during a 9 month period results of all except the lowest risk portfolios exceeded their expected profitability, however, during the period of 14 months results were lower than expected, thus, due to time-varying characteristics of investment objects with increasing amount of time passing after the selection of portfolio its correspondence to the needs of the investor can decline, therefore, it is advisable to periodically revise composition of even a widely diversified portfolio.

4. Assessment of investment portfolio selection applying risk-free lending and borrowing possibilities is described in scientific literature, however, due to real market limitations and costs, efficient set of portfolios acquires a more complicated form when actively managing investment portfolio with financial leverage, whereas application of financial leverage is beneficial only when the risk-free borrowing and lending possibilities are used intensively. Empirical investigation of expedience of application of financial leverage while actively managing the revealed, that fluctuations of the Lithuanian stock market are sufficient to achieve better profit-risk combinations

when actively managing the investment portfolio with financial leverage than when investing only personal money.

5. Critical factor in pursuit of effective active investment portfolio management are accurate stock return forecasts. Since particular forecasting methods can fail to ensure accuracy of forecasting in particular periods of time, a method of forecast integration based on accuracy of forecasts is suggested in the Thesis. The results of testing of the method by integrating different period time series forecasts revealed, that in case of simple moving average, mean absolute forecast errors of the integrated forecasts were smaller than non-integrated forecast errors, when forecasting changes of indices – by 10,88 %, when forecasting stock return – by 9,19 %, when forecasting currency exchange rates – by 9,98 %; in case of weighted moving average by 14,45 %, 12,01 %, 12,87 % accordingly.

6. Active portfolio management requires frequent rebalancing of the portfolio, therefore, it is crucial to ensure proper portfolio rebalancing decision making. The scientific literature usually propagates the application of the portfolio rebalancing decision making method when the expected return is corrected by subtracting transaction costs, which is inaccurate, thus the method based on expected return change and actually experienced costs ratio acceptable for the investor proposed in the Thesis should be applied.

7. After analysis of scientific literature on the topic of multicriteria decision making, a model of portfolio selection based on the investment attractiveness of stocks, which integrated MADM and MODM method groups for portfolio selection, was suggested. After elaborating particular model fulfilment solutions its testing was carried out. The testing revealed, that by applying the model it is possible to achieve a higher return of the investments than by investing available assets in equal parts or into Markowitz efficient portfolio: return of the lower risk portfolio was in average by 3,64 % higher than the return of Markowitz portfolio and by 1,22 % higher than actually much more risky basic portfolio.

8. Selection of a portfolio based on investment attractiveness of stocks allows to ensure development of the investor as a personality, better correspondence of the investments to the needs of the investor and contribute to sustainable development of business and economy, however, it has certain restrictions (requires a lot of data and time to process them), thus, practical implementation and possibilities of the model could be greatly boosted by a decision support system for a stock investment attractiveness based portfolio selection, guidelines for creation of the mentioned system were framed in the Thesis.

List of Published Works on the Topic of the Dissertation In the reviewed scientific periodical publications

Žilinskij, G.; Rutkauskas A. V. 2012. Akcijų investiciniu patrauklumu paremtas investicijų portfelio sudarymo modelis, *Veršlas: teorija ir praktika* [Business: Theory and Practice] 13(3): 242–252. doi: 10.3846/btp.2012.26. (EBSCO, *Business Source Complete*)

Rutkauskas, A. V.; Žilinskij, G. 2010. Finansinio svėro naudojimas aktyviai valdant investicijų portfelį, *Veršlas: teorija ir praktika* [Business: Theory and Practice] 11(3): 194–203. doi: 10.3846/btp.2010.22. (EBSCO, *Business Source Complete*)

In the other editions

Žilinskij, G. 2012. Different period time series forecasts integration as a tool of increasing the accuracy of stock return prediction, *7-osios tarptautinės mokslinės konferencijos „Business and Management 2012“, įvykusios Vilniuje 2012 m. gegužės 10–11 d., medžiaga*. Vilnius: Technika, 292–298. doi: 10.3846/bm.2012.039. ISBN 978-609-457-116-9.

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Žilinskij, G. 2009. Kapitalo rinkos teorijos taikymas aktyviam portfelio valdymui, *Veršlas XXI amžiuje: 12-osios Lietuvos jaunųjų mokslininkų konferencijos „Mokslas – Lietuvos ateitis“, įvykusios Vilniuje 2009 m. vasario 5 d., pranešimai* [CD]. Vilnius : VGTU Verslo vadybos fakultetas [1–8].

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INVESTICIJŲ PORTFELIO SPRENDIMAI

Problemos formulavimas

Investicijų portfelio sudarymo ir valdymo proceso analizė, jo tobulinimo galimybių paieška yra svarbi šiuolaikinio ekonomikos mokslo plėtojimo kryptis. Šios krypties svarbą pagrindžia investicijų portfelio sudarymo, finansų rinkų efektyvumo ir glaudžiai susijusią tematiką nagrinėjančių mokslininkų gautų Nobelio premijų už pasiekimus ekonomikos moksle skaičius.

Sparti finansų rinkų plėtra nulemia naujus iššūkius investuotojams ir investavimo problematiką nagrinėjantiems mokslininkams. Iškyla būtinybė sukurti inovatyvius, šiuolaikinėms finansų rinkų sąlygoms adekvačius teorinius, koncepcinius ir pragmatinius investicijų portfelio sudarymo ir valdymo sprendimus.

Disertacijoje nagrinėjama ir sprendžiama problema formuluojama kaip šiuolaikinėje ekonomikos teorijoje ir praktikoje sukaupto mokslinio pažinimo bei siūlomų sprendimų nepakankamas adekvatumas siekiant užtikrinti efektyvų investicijų portfelio – kaip dominuojančios investavimo strategijos – sudarymą ir valdymą skirtingus investavimo būdus pasirenkantiems investuotojams esant šiuolaikinėms finansų rinkoms būdingoms tendencijoms ir iššūkiams, tokiems kaip didėjanti rinkų dinamika, sudėtingėjanti jų plėtros galimybių įvairovė ir investavimo sprendimų sistemiškumo poreikis.

Nagrinėjamos problemos esmę atskleidžia pagrindiniai jos aspektai:

- mokslinėje literatūroje nepakankamai įvertintos skirtingų aktyvų (turto klasių) derinimo investicijų portfelyje galimybės;
- nepakankamas realios rinkos apribojimų ir portfelio valdymo sąnaudų įvertinimas gali klaidinti investuotojus;
- nepakankamai išnagrinėtos skirtingais metodais gautų akcijų kainų (gražos) prognozių integravimo galimybės;
- nėra pasiūlyta efektyvių sprendimų dėl portfelio sudėties keitimo priėmimo metodų;
- nėra modelio ar sistemos, kurie leistų optimizuojant portfelį siekti maksimizuoti bendrą investicijų portfelio patrauklumą investuotojui.

Darbo aktualumas

Sparti finansų rinkų plėtra, investicinių priemonių ir paslaugų įvairovės didėjimas – efektyvių investavimo sprendimų sudėtingumo ir naujų investavimo galimybių įrodymas. Naujos investicijų diversifikavimo galimybės kelia iššūkius, reikalaujančius pažangių mokslinių ir praktinių sprendimų. Globali finansų krizė parodė, kad tradiciniai portfelio diversifikavimo būdai nėra efektyvūs, kai finansų rinkos yra veikiamos sisteminio pobūdžio veiksnių.

Šiuolaikinėms finansų rinkoms būdinga dinamika reikalauja adekvačių investicijų valdytojų sprendimų, tačiau net deleguotas, profesionalus investicijų valdymas krizės laikotarpiu neapsaugo investuotojų nuo investicijų vertės sumažėjimo. Iškyla būtinybė ieškoti naujų portfelio sudarymo ir valdymo būdų, leidžiančių sumažinti investicijų riziką ir galimus nuostolius padidėjusio rinkų nepastovumo laikotarpiu.

Didėjanti investicinių priemonių įvairovė leidžia net privatiems investuotojams sudaryti plačiai diversifikuotą investicijų portfelį, bet reikalauja išsamesnės plačiai diversifikuoto portfelio sudarymo galimybių analizės ir jo suteikiamų apsisaugojimo nuo rinkų nepastovumo galimybių vertinimo.

Akcijų rinkų svyravimai ir finansinio sverto taikymo galybės atveria didesnio uždarbio galimybes aktyviems investuotojams. Tačiau aktyviai valdant investicijų portfelį taikant finansinį svertą iškyla būtinybė įvertinti visus apribojimus ir sąnaudas, užtikrinti efektyvius sprendimus prognozavimo ir sprendimo dėl portfelio sudėties keitimo etapuose.

Rinkose besiformuojantys burbulai verčia abejojti praeities laikotarpių gražos analizės tinkamumu vertinant laukiamą investicijų gražą ir taikyti akcijų investicinio patrauklumo vertinimo požiūrį, kuris gali užtikrinti investicijų atitiktį investuotojo poreikiams bei darnią verslo, rinkų ir šalių plėtrą.

Tyrimų objektas

Darbo mokslinių tyrimų objektas – investicijų portfelio sudarymas ir valdymas.

Darbo tikslas

Pagrindinis disertacijos tikslas – pasiūlyti ir empiriškai aprobuoti šiuolaikinių rinkų tendencijas atitinkančius investicijų portfelio sudarymo ir valdymo sprendimus skirtingus investavimo polinkius turintiems investuotojams.

Darbo uždaviniai

Darbo tikslui pasiekti yra keliami šie uždaviniai:

1. Išanalizuoti skirtingų aktyvų įtraukimo į plačiai diversifikuotą portfelį galimybes ir įvertinti plačiai diversifikuoto portfelio, kaip rizikos mažinimo ir apsisaugojimo nuo atskirų rinkų smukimo priemonės, efektyvumą.

2. Pasiūlyti konkrečius aktyvaus portfelio valdymo taikant finansinį svertą sprendimus:

- įvertinti aktyvaus portfelio valdymo taikant finansinį svertą apribojimų ir sąnaudų poveikį efektyviajai portfelių ribai;
- pasiūlyti ir empiriškai aprobuoti atskirų prognozių integravimo metodą;

- pasiūlyti sprendimo keisti portfelio sudėtį priėmimo metodą;
 - apibendrinti pateiktus pasiūlymus sukuriant bendrą aktyvaus portfelio valdymo taikant finansinį svertą modelį.
3. Įvertinti daugiakriterio sprendimų priėmimo metodų taikymo investicijų portfeliui sudaryti galimybes, pasiūlyti ir empiriškai apčiuoti akcijų investiciniu patrauklumu paremtą investicijų portfelio sudarymo modelį.
 4. Suformuluoti akcijų investiciniu patrauklumu paremto investicijų portfelio sudarymo sprendimų paramos sistemos sukūrimo gaires.

Tyrimų metodika

Disertacijos tikslui ir keliamiems uždaviniams pasiekti darbe buvo taikoma: literatūros analizei – mokslinių šaltinių analizė, sintezė ir apibendrinimas; teoriniams sprendimams pagrįsti ir juos apčiuoti – hipotetinis modeliavimas, grafinis vaizdavimas ir lyginimas, daugiakriteris vertinimas, kiekybiniai matematiniai ir statistiniai tyrimo metodai.

Darbo mokslinis naujumas

Rengiant disertaciją buvo gauti šie ekonomikos mokslui nauji rezultatai:

1. Įvertintos plačiai diversifikuoto portfelio sudarymo galimybės ir efektyvumas rinkų dinamikos sąlygomis. Gauti rezultatai parodė, kad derinti skirtingas turto klases gali būti naudinga mažinant portfelio riziką, tačiau ilgesnį laiką nekeičiant portfelio sudėties jo grąža sumažėja.
2. Pasiūlytas investuotojo faktiškai patirtos rizikos vertinimo metodas.
3. Įvertinti efektyviosios portfelių ribos pokyčiai aktyviai valdant investicijų portfelį taikant finansinį svertą. Rezultatai parodė, kad aktyvus portfelio valdymas taikant finansinį svertą gali būti naudingas tik tuo atveju, kai aktyviai naudojamosi nerizikingo skolinimo/skolinimosi galimybėmis.
4. Pasiūlytas prognozių integravimo metodas, leidžiantis tiksliau prognozuoti akcijų grąžą ir valiutų kursų pokyčius. Tyrimo rezultatai parodė, jog integruojant skirtingo periodo laiko eilučių paprastojo ir svertinio slankiojo vidurkio metodais gautas prognozes galima sumažinti vidutines absoliučias prognozavimo paklaidas vidutiniškai apie 11 proc.
5. Pasiūlytas sprendimo keisti portfelio sudėtį, atsižvelgiant į investuotojui priimtina laukiamos grąžos pokyčio ir realiai patiriamų sąnaudų santykį, priėmimo metodas. Numatyta galimybė keisti portfelio sudėtį iš dalies.
6. Atskleistos daugiakriterio sprendimų priėmimo metodų taikymo akcijų investiciniam patrauklumui nustatyti galimybės ir pasiūlytas akcijų investiciniu patrauklumu paremtas investicijų portfelio sudarymo modelis leidžia į portfelį atrinkti geriausiai investuotojo poreikius atitinkančias akcijas. Suformuluotos gairės akcijų investiciniu patrauklumu paremto portfelio sudarymo sprendimų paramos sistemai sukurti.

Darbo rezultatų praktinė reikšmė

Rengiant disertaciją pasiūlyti konkretūs investicijų portfelio sudarymo ir valdymo sprendimai pritaikomi realiomis rinkos sąlygomis. Plačiai diversifikuoto portfelio sudarymo galimybių įvertinimas naudingas pasirenkant investicinio turto klases, priimant sprendimą dėl portfelio sudėties peržiūros periodiškumo, sumodeliuota efektyvioji portfelijų riba – priimant sprendimus dėl aktyvaus portfelio valdymo ir finansinio svorto taikymo. Prognozių integravimo ir sprendimo keisti portfelio sudėtį priėmimo metodus galima naudoti sprendimų paramos sistemoms kurti ir portfeliui valdyti. Darbe suformuluotų gairių pagrindu gali būti sukurta akcijų investiciniu patrauklumu paremto portfelio sudarymo sprendimų paramos sistema.

Ginamieji teiginiai

1. Skirtingų turto klasių derinimas investicijų portfelyje leidžia sumažinti sisteminę investavimo į vieną turto klasę (pvz., akcijas) riziką, tačiau, atsižvelgiant į tai, jog tiek grąža, tiek grąžos tarpusavio koreliacijos kinta laike, net plačiai diversifikuoto portfelio sudėtį tikslinga periodiškai peržiūrėti.

2. Aktyvus portfelio valdymas taikant finansinį svortą gali būti naudingas tik tuo atveju, kai akcijų kainų svyravimai pakankamai dideli, kad užtikrintų intensyvų nerizikingo skolinimo/skolinimosi galimybių naudojimą.

3. Atskiri prognozavimo metodai gali turėti užprogramuotų klaidų, todėl siekiant tiksliau prognozuoti tikslinga integruoti skirtingais metodais gautas prognozes, tam galėtų būti taikomas disertacijoje pasiūlytas metodas.

4. Vien sandorių sąnaudų eliminavimu paremti sprendimo keisti portfelio sudėtį priėmimo metodai negali užtikrinti geriausiai investuotojo poreikius atitinkančių sprendimų, todėl sprendimus tikslinga priimti remiantis laukiamo pelningumo pokyčio ir realiai patiriamų sąnaudų santykiu.

5. Portfelio valdymas remiantis praeities grąžos analize nėra tinkamas investuotojo poreikius atitinkančiam investicijų portfeliui sudaryti ir turi būti paremtas investicinio patrauklumo maksimizavimu konkrečiam investuotojui.

6. Akcijų investicinio patrauklumo vertinimas yra gana sudėtingas, kompleksinis, daug laiko ir duomenų reikalaujantis procesas, todėl akcijų investiciniu patrauklumu paremto portfelio koncepcijos taikymas turi būti sistemizuotas pagal disertacijoje pateiktas gaires.

Disertacijos struktūra

Disertaciją sudaro įvadas, trys skyriai ir rezultatų apibendrinimas. Taip pat yra 16 priedų. Darbo apimtis – 116 puslapių, neskaitant priedų, tekste panaudotos 45 numeruotos formulės, 32 paveikslai ir 27 lentelės. Rašant disertaciją buvo panaudoti 207 literatūros šaltiniai.

Bendrosios išvados

Disertacijoje detalizavus investicijų portfelio sprendimus skirtingiems investuotojams – plačiai diversifikuoto portfelio sudarymo sprendimus portfelio sudėties nelinkusiems keisti investuotojams, aktyvaus portfelio valdymo sprendimus investuotojams, linkusiems užsidirbti iš trumpalaikių kainų svyravimų rinkoje, ir pasiūlius akcijų investiciniu patrauklumu paremtą portfelio sudarymo būdą periodiškai portfelio sudėtį peržiūrintiems investuotojams, galima pateikti šias išvadas.

1. Didėjanti investicinių priemonių įvairovė atveria naujas investavimo galimybes, leidžiančias gauti pelno ne tik iš tradicinių investavimo priemonių, bet ir iš valiutų kursų ar prekių ir išteklių kainų kitimo, o mažos ar net neigiamos gražos tarpusavio koreliacijos užtikrina gerą portfelio diversifikaciją ir leidžia teigti, jog sisteminė vienos (pvz., akcijų) rinkos rizika gali būti sumažinta investuojant keliose skirtingose investicijų rinkose.

2. Plačiai diversifikuoto portfelio sudarymas parodė, jog Markowitz optimalaus portfelio laukiama graža yra beveik trigubai didesnė nei analogiškos rizikos lyginamojo portfelio. Tai pagrindžia didesnę portfelio optimizavimo naudą esant didesniai aktyvų skaičiui ir mažesnėms koreliacijoms, o didesnės rizikos portfelį pasirinkimas gali būti neefektyvus dėl mažo į portfelio sudėtį įtraukiamų aktyvų skaičiaus.

3. Plačiai diversifikuoto portfelio efektyvumo testavimas parodė, kad 9 mėnesių laikotarpiu visų, išskyrus mažiausios rizikos, optimizuotų portfelį rezultatai viršijo jų laukiamą pelningumą, tačiau 14 mėnesių laikotarpiu buvo prastesni už laukiamus, t. y. dėl laikui bėgant kintančių investicinių objektų charakteristikų didėjant laikotarpiui nuo portfelio sudarymo momento, jo atitiktis investuotojo poreikiams gali mažėti, taigi net plačiai diversifikuojant portfelį tikslinga periodiškai peržiūrėti jo sudėtį.

4. Mokslinėje literatūroje yra įvertintos investicijų portfelio sudarymo naudojant nerizikingą skolinimą ir skolinimąsi galimybės, tačiau dėl realios rinkos apribojimų ir sąnaudų, siekiant aktyviai valdyti investicijų portfelį taikant finansinį svertą efektyvioji riba įgyja sudėtingesnę formą, o finansinio sverto taikymas yra naudingas tik tuomet, kai yra intensyviai naudojamasi nerizikingo skolinimo ar skolinimosi galimybėmis. Finansinio sverto taikymo tikslingumo aktyviai valdant portfelį empirinis tyrimas parodė, kad Lietuvos akcijų rinkos svyravimai yra pakankami, kad aktyviai valdant investicijų portfelį taikant finansinį svertą būtų pasiektos geresnės pelningumo – rizikos kombinacijos, nei investuojant tik nuosavas lėšas.

5. Kritinis veiksnys siekiant efektyviai aktyviai valdyti investicijų portfelį yra tikslios akcijų gražos prognozės. Kadangi atskiri prognozavimo metodai gali neužtikrinti prognozavimo tikslumo atskirais laikotarpiais, darbe

pasiūlytas prognozavimo tikslumu paremtas prognozių integravimo metodas. Jo testavimo integruojant skirtingų periodų laiko eilučių prognozes rezultatai parodė, jog paprastojo slankiojo vidurkio atveju integruotų prognozių vidutinės absoliučios prognozavimo paklaidos buvo mažesnės už 1 periodo neintegruotų prognozių paklaidas, prognozuojant indeksų pokyčius – 10,88 proc., akcijų gražą – 9,19 proc., valiutų kursų pokyčius – 9,98 proc.; svertinio slenkančiojo vidurkio atveju atitinkamai: 14,45 proc., 12,01 proc., 12,87 proc.

6. Aktyviai valdant portfelį reikia dažnai keisti portfelio sudėtį, tad svarbu užtikrinti tinkamą sprendimų keisti portfelio sudėtį priėmimą. Mokslinėje literatūroje dažniausiai taikomas sandorių sąnaudų eliminavimu paremtas sprendimo keisti portfelio sudėtį priėmimo metodas nėra tikslus, todėl priimant sprendimą keisti portfelio sudėtį turėtų būti įvertinamas laukiamo pelningumo pokyčio ir realiai patiriamų sąnaudų santykis.

7. Atlikus mokslinės literatūros daugiakriterio sprendimų priėmimo tematika analizę pasiūlytas akcijų investiciniu patrauklumu paremtas portfelio sudarymo modelis, integruojantis MADM ir MODM metodų grupes portfelio pasirinkimo problemai spręsti. Detalizavus modelio įgyvendinimo sprendimus modelis buvo testuojamas. Gauti rezultatai parodė, kad taikant modelį galima pasiekti didesnę investicijų gražą nei investuojant turimas lėšas lygiomis dalimis ar į Markowitz efektyvųjų portfelį: mažesnės rizikos portfelio gražą buvo vidutiniškai 3,64 proc. didesnė už Markowitz portfelio gražą ir 1,22 proc. didesnė už faktiškai gerokai rizikingesnę bazinį portfelį.

8. Akcijų investiciniu patrauklumu paremtas portfelio sudarymas leidžia sudaryti geriau investuotojo poreikius atitinkantį portfelį, užtikrinti investuotojo kaip asmenybės vystymąsi, prisidėti prie verslo ir ekonomikos darnios plėtros užtikrinimo, tačiau turi apribojimų, reikalauja daug duomenų ir laiko sąnaudų jiems apdoroti, todėl modelio taikymo galimybės ir pritaikomumą praktikoje galėtų smarkiai išplėsti akcijų investiciniu patrauklumu paremto portfelio sudarymo sprendimų paramos sistema, kurios sukūrimo gairės yra suformuluotos disertacijoje.

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