ŠIAULIAI UNIVERSITY

Martynas Brazauskas

DECISION-MAKING OF THE INVESTMENT PORTFOLIO FORMATION APPLYING ASSET ALLOCATION STRATEGIES IN THE DIFFERENT FINANCIAL MARKETS

Summary of Doctoral Dissertation
Social Sciences, Economics (04 S)

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ŠIAULIŲ UNIVERSITETAS

Martynas Brazauskas

INVESTICINIO PORTFELIO FORMAVIMO SPRENDIMŲ PAGRINDIMAS TAIKANT TURTO ALOKACIJOS STRATEGIJAS SKIRTINGOSE FINANSŲ RINKOSE

Mokslo daktaro disertacijos santrauka
Socialiniai mokslai, ekonomika (04 S)

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INTRODUCTION

Relevance of the research. Investment management is not only an important part of the economy, it is a complex business branch and an opportunity for small investors to increase their incomes. Investments contribute to economic growth, innovation, the development of new technologies, social welfare, nature conservation and other factors. There are many investment opportunities that create value, but not all the proposed solutions are profitable or in the interest of investors. Investors‘ personal qualities, needs, interests have led to a lot of investment strategies and opportunities in the market.

A modern investment portfolio theory is based on the application of asset allocation solutions in the formation of an investment portfolio. Various asset allocation strategies are analyzed, where investments are split between enterprises operating in different sectors, different classes of assets, different countries, continents, etc. Rapid globalization and the development of financial markets have made it possible for investors to quickly, easily and inexpensively adjust investment portfolio decisions, and diversify asset allocation strategies. Modern financial markets are characterized by close coherence, data volumes and uncertainty. The various unions, trade relations, and free trade have led to a sharp link between financial markets. This is also reflected in the ensuing financial crises, if the previous financial crises covered one country, its neighbors or only certain regions, then in 2008, the financial crisis has been characterized by its global profile. As the Internet becomes more and more important in our lives, trading in the financial markets is not without it. Increasing online sales are determining the fast data growth, which results in ever-increasing costs for data analysis. Investment objects are usually analyzed using quantitative factors, but often the uncertainty in the markets is caused by political or other events that are defined as qualitative and difficult to identify. These factors determine the respective investment managers‘ decisions.

In modern financial theory, investments are generally valued according to their returns and risks. The modern portfolio theory is based on the assumption that investors are optimizing their portfolio to maximize returns and lower risk. Therefore, the risk is not only an important trend in research, but also one of the most important factors in evaluating the performance and effectiveness of investment funds, shares and other asset classes. The variety of research areas, the development of capital markets and investment funds has led to the analysis of quite a number of different risk assessment indicators. The quantitative investment risk assessment indicators are used most widely, which are based mainly on historical price volatility. The use of historical data does not accurately

reflect the current and planned investment risk. Therefore, it is important to combine these methods with quantitative indicators for measuring investment risk, based on fundamental indicators. The benefits of the fundamental indicators to the effectiveness and risk of an investment portfolio are proven by research. The synergy of these indicators can help effectively manage the risk of an investment portfolio and reduce losses through the market volatility increase.

Effective risk management is one of the main reasons for the success of financial institutions. Improper risk assessment and selection of methodologies increases the probability of financial institutions‘ losses, insolvency or other problems, which in turn leads to losses in other financial institutions. The collapse of financial markets is causing significant losses for both investors and the state, which is forced to intervene using taxpayers‘ funds. The recurrent global financial crises show the weakness of the financial system‘s sustainability. Lack of risk assessment determines the losses not only for investors and banks, but also taxpayers.

Having analyzed the scientific research on investment risk assessments it was noticed that they often support historic volatility data. However, in order to effectively evaluate the investment risk, it is necessary to take into account not only the historical price volatility data, but also fundamental, technical, political, social and other factors. The existing need for incorporating such factors into the investment risk assessment forms the need for a theoretically reasoned and empirically verified model. The fundamentals of historical indicators of price volatility based on indicators of fundamental investment risk assessment would reduce the investment risk and increase efficiency.

Problem solving level. Various strategies are analyzed to support investment portfolio-building decisions: fundamental analysis-based strategies help measure the value of companies based on their financial statements (Graham, 1974; Anderson, Brooks, 2006; Damodaran, 2012; Singh, Kaur, 2013), technical analysis-based strategies help measure price trends on the market (Murphy, 1991; Murphy, 2004). One of the most important decisions made by investors is the subordination of investment portfolio assets (Brown, Garlappi, Tiu, 2010). Different types of asset allocation have been analyzed by different authors: strategic asset allocations (Brinson et al., 1986, 1991, 1995; Anson, 2004; Basak, Makarov, 2014; Blitz, Groot, 2014), dynamic asset allocations (Schröder, 2013; Xiong, Sullivan, Wang, 2013; Harman et al., 2014; Cardinale, Navone, Pioch, 2014; Almadi, Rapach, Suri, 2014), tactical asset allocation (Jensen, Johnson, Mercer, 2002; Blitz, Vliet, 2008; Kidd, 2014; Macijauskas, 2015). Not only the choice of strategy, but also the inclusion of appropriate asset classes in the investment portfolio is important for the expansion of an investment portfolio. Various investment diversification strategies have been analyzed and tested. The simplest strategy is to diversify the investment between different sectors,

stock indices or sectoral indices (Markowitz, 1952; Mohamad et al., 2006; Goetzmann, Kumar, 2008; Nanda et al., 2010). The allocation of assets have been also analyzed between the different countries (Lessard, 1973; Campbell et al., 2010; Asness et al., 2011; Mushtaq, Shah, 2014; Abid et al., 2014), between stocks and bonds (Hui et al. , 2006; Cardinale et al., 2014), additionally including real estate in an investment portfolio (Conover, Friday, Sirmans, 2002; Bivainis, Volodzkiene, 2008; Bikas, Laurinavičius, 2009; Brounen, Prado, Verbeek, 2010; Žilinskij, 2012), currency, metals, commodities, precious metals (Žilinskij, 2012; Bansal, Kumar, Verma, 2014; Geczy, 2014; Cibulskiene, Brazauskas, 2014; Macijauskas, 2015). Investor portfolio development includes more exotic but less liquid investments. Potential investment instruments include works of art, wine, violins (Worthington, Higgs, 2004; Rashkin, Zigmantiene, 2008; Campbell, 2008; Masset, Henderson, 2009; Jurevičienė, Savičenko, 2012; Jurevičienė, Jakavonytė, 2015).

Allocation of assets is an integral part of the management of an investment portfolio. The popularity of this strategy is determined not only by the desire to invest in exotic investment instruments and asset classes or the need to reduce investment risk. An important factor determining the popularity of this strategy is the specific characteristics of different classes of assets and their interrelationships. Research has shown that the stock market is linked to bonds (Stivers, Sun, 2002; Murphy, 2004; Patoda, Jain, 2012), gold (Chiang et al. 2013), commodities (Creti et al. 2012; Lombardi, Ravazzolo, 2013), currencies (Francis et al. 2006; Fahami et al. 2014; Valls, Chuliá, 2014). Also bonds and commodities are related to each other (Murphy, 1991), as well as bonds and currencies (Gagnon, 2005), commodities and currencies (Sujit, Kumar, 2011; Tse, Zhao, 2011). Financial markets are closely related not only to each other but also with business cycles (Murphy, 2004). The conducted studies are usually focused on the effects of different classes of assets and how they affect each other, the combination of different asset classes in the investment portfolio, and the optimal portfolio composition. However, little attention is paid to the use of financial markets for interconnections and business-cycle links to support investment decisions. In the studies, asset allocation is analyzed as a diversification of investment along the selected classes of assets, but lacks a better understanding of the different asset classes and the selection of assets belonging to the asset class.

Investment portfolio decisions are based not only on the asset allocation strategy. Asset allocation decisions are combined with momentum and value investment strategies (Blitz, Vliet, 2008), momentum and low volatility strategies (Blitz, Groot, 2014). In recent years, investment portfolio development strategies based solely on the risk of financial assets (Clarke, Silva, Thorley, 2013; Idzorek, Kowara, 2013; Guilleminot, Ohana, Ohana, 2014; Garcia-Feijio,

Kochard, Sullivan, Wang, 2015) have increasingly been analyzed. The risk assessment of financial assets is an important part of an investment portfolio formation strategy. Markowitz (1952) proposed an optimal investment portfolio formation approach, based on returns and risks, has become the basis of the modern portfolio theory. The research confirms a positive relationship between risk and return (Black, Jensen, Scholes, 1972; Citak, 2007; Chambers, Sezgin, Karaaslan, 2013). However, there is a recent increase in research that confirms the negative relationship between risk and return not only in the stock market (Kuo, Li, 2013; Chow, Hsu, Kuo, Li, 2014; Goldberg, Leshem, Geddes, 2014), but also on the bond market (Altman, Gonzalez-Heres, Chen, Shin, 2014; Carvalho, Dugnolle, Lu, Moulin, 2014). The results of the research show that there is no common opinion about the relationship between risk and return. This contradiction in the results of the research confirms the existence of anomalies of low volatility in the market, which attracts not only researchers but also investors‘ attention. The research is limited to testing low volatility anomalies using only indicators of price volatility, analyzing the synergy of this anomaly with other portfolio management strategies is more rarely. The widespread use of this strategy encourages to analyze the use of this anomaly in combination with other strategies.

There are a lot of anomalies in the financial markets: January effect, merger arbitrage effect, size effect, value effect, etc. (Kartašova, 2012). The value effect is widely analyzed. Researchers analyze the effects of various fundamentals on stock prices: share price to book value ratios (Fama, French, 1992; Kucko, 2007; Penman, Richardson, Tuna, 2007), share price to equity ratio (Anderson, Brooks, 2006l Kelly, McClean, McNamara, 2008l Truong 2009), share price to net asset value ratio (Bildersee, Cheh, Zutshi, 1993; Xiao, Arnold, 2008; Singh, Kaur, 2013), and others. Research confirms that the application of value investment principles helps achieve a higher return on investment portfolio. The theoretical application principles of value investment strategy and low volatility anomalies are similar. The use of these strategies is aimed at selecting risk-free assets that achieve higher returns. However, the research does not confirm the impact of the value investment strategy on the risk of an investment portfolio. This strategy helps achieve higher returns, but does not ensure low market risk. The analysis of the value and low volatility anomaly synergy has not been analyzed in the studies.

The scientific literature draws the attention of researchers to the following important issues of investment portfolio management: how to effectively diversify an investment portfolio; what is the optimal composition of the diversified investment portfolio; how the behavior of investors helps adopt more effective asset allocation solutions; how asset allocation helps protect against risks and losses; how to optimize the proportion between the target profit

and the risk involved; how the return on an investment portfolio depends on the assumed risk; how to properly manage and assess risks, and so on. The research discusses the effective asset allocation solutions, investment risk management, selection and application of appropriate methods in practice, and effective portfolio management solutions. This problem of the management of a diversified investment portfolio is relevant both theoretically and practically, and this dissertation work will be devoted to solve it.

The research problem: what are the theoretical assumptions on the investment portfolio formation, using asset allocation strategies, and how to make effective investment portfolio formation solutions.

The research object is the investment portfolio formation solutions.

The research aim is after analyzing the theoretical aspects of investment portfolio formation and asset allocation, to create an investment portfolio formation model based on the synergy between value and low volatility anomalies and empirically verify it.

The research objectives.

1. To analyze the solutions of investment asset allocations presented in the scientific literature.
2. To summarize the methods and indicators of attractiveness of shares and risk assessment presented in the scientific literature.
3. To identify the models used in the investment portfolio formation strategy.
4. To develop a model for the formation of an investment portfolio based on an asset allocation strategy.
5. To empirically check the model for the formation of an investment portfolio based on the asset allocation.

Methods. The following methods are used to achieve the aim and objectives of the dissertation: to carry out the analysis of literature - analysis of scientific sources, synthesis, generalization; for data collection, generalization and model formation - correlation analysis, mathematical and statistical processing, graphical representation and comparison, multi-criteria evaluation.

Results describing the scientific novelty of the work:

- After revealing the researchers‘ attitude to asset allocation solutions, the dissertation presents a strategy based on the interaction of different asset classes with business cycles in order to reduce the risk of an investment portfolio and achieve an acceptable return for investors. Modern technologies change the attitude of investors towards the investment portfolio allocation. The optimal solutions for diversifying investment portfolios offered by researchers from 20 to 50 different assets are unacceptable, when modern technologies provide opportunities for investing in the entire market both globally and individually, giving investors the opportunity to invest in

different business areas, types of technology, goods, raw materials etc. The defined optimal composition of an investment portfolio is unattractive, not only due to the rapidly changing financial market situation, but also due to the restrictions on investing in individual assets as well as in the entire market or sector.

- In the analyzed research, the authors' attitudes to asset alignment are presented only in the broad sense, when analyzing different asset classes, as well as in the narrow sense, in assessing the attractiveness of the shares. To identify asset classes, stock selection, risk assessment indicators and their application problems have been used in assessing asset attractiveness. It has been determined that the synergy between market risk assessment indicators and fundamental indicators influences the efficiency of an investment portfolio. A model based on intermarket analysis, modern portfolio theory, and value investment concepts has been developed. The versatility of the developing model allows including an asset analysis of additional asset classes (such as bonds, commodities, currencies, etc.). This creates a complete model that assesses the attractiveness and risk of different classes of assets and individual asset classes.
- The dissertation, based on research data, summarizes theoretical and practical indicators of investment risk assessment that assesses different types of market risks. In this context, an investment portfolio formation strategy is developed, based on market risk assessment indicators. It has been determined that using only risk-based indicators can increase the return on investment portfolio and efficiency of the investment portfolio. This methodology helps measure not only the broadly analyzed risks, measured by the standard deviation, but also the investors' unpleasant negative risks and the risk of extreme price changes. This strategy can be used to assess the risks in various financial markets.

Results describing the practical significance of work:

- In the investment portfolio development model the different level indicators have been integrated, which were mostly analyzed individually. The created investment portfolio development model has been tested on four major financial markets: stocks, bonds, commodities, currencies. The presented model is universal, suitable for the formation of an investment portfolio in different stages of the business cycle. Integrated investment valuation involves evaluation of attractiveness of financial markets, assessment of market risk and company's financial situation. Applying this model, investors can choose the most attractive asset classes, and then invest in relevant assets.
- The study covers two different business cycles. Financial markets and companies listed on a stock exchange have different outcomes at different

stages of the business cycle. Therefore, it is an important choice of research period. The carried out research made it possible to more realistically evaluate the results of the study. This leads to greater reliability in order to apply the test results in practice. This kind of data sample avoids the time-period bias. The period selection error occurs when an inappropriate study period is selected. Short-term surveys do not reflect long-term trends, while market anomalies are most effectively analyzed using data that includes several business cycles.

- At the end of 2017, the US stock market formed a situation where, during 20 years time, the lowest value of the VIX index was reached and the Shiller P/E index went up to the second place according to its price during more than 120 years story. The low VIX index reflects investors‘ calm and optimism, but the high value of the Shiller P/E indicator reflects the relative rise in financial markets. In the situation where stock markets are redeemed and expensive, while investors are calm and optimistic, it is important to look for effective portfolio investment and diversification solutions.
- The high return of the bond index was driven by gradually declining interest rates, and, due to the recent quantification of the largest economies in the world, interest rates were reduced to a minimum or even negative level. The return on investment in the bond market is achieved through the changes in bond values and bond coupons. Negative or near zero interest rates outweighed the bond market returns, so asset-allocation solutions become even more relevant with the growth of risk in individual asset classes.

Restrictions on the study. In this study four main classes have been analyzed. Financial technologies provide investors with a wider range of investments. Investors can channel funds not only to more traditional asset classes, such as real estate, art, wine, whiskey, but also to newer and more and more popular asset classes: cryptocurrency, peer to peer lending platforms, etc. Selected strategy and research limit the attractiveness of this model for investors, but the proposed model is not limited to the chosen strategies, therefore additional studies can include more classes of assets in the investment portfolio formation strategy.

Selected strategies for assessing assets are limited to a number of quantitative factors used in the world of investment and do not use qualitative factors at all. The analysis showed that the used strategies increase the efficiency of the investment portfolio, regardless of the stage of the business cycle, or even from the applied passive or active strategy. Stock prices are also affected by market sensitivities, social and political factors, and although these factors are not included in the applied model, however choosing a strategy that uses a complex assessment of active attractiveness enables the qualitative factors to be included in the model.

One of the research restrictions is the selection of the data. Sample selection bias occurs when only existing and operating companies are selected for the data analysis. The study does not include companies that have gone bankrupt, merged or otherwise removed from the index or selected data sample. Such data sampling helps make the study more efficient, and processing data more quickly. However, the processed data set does not fully meet the investor‘s expectations and needs. When investing, it is not known which companies will merge, go bankrupt or otherwise terminate their activities.

In this study, the formation of an investment portfolio based on fundamental analysis uses the data presented in the financial statements. In empirical studies, data interpretation errors occur when the investment portfolio is used to generate data that was not known to the market at that time. Look-ahead bias occurs when data is used that does not exist in the market at that time. For example, the formation of the investment portfolio of companies with financial data and portfolio formation at the beginning of each year do not take into account the financial data for the previous year, the publication takes up to two months, so the beginning of the year in the market price does not reflect the data. The study uses the already calculated fundamental indicators taken from the Bloomberg database. The research is carried out with the fundamental indicators of the market, but the results of the financial year aren‘t used for the formation of the investment portfolio.

Structure and scope of the work

The dissertation consists of introduction, three sections, general conclusions, references and 3 annexes. The work consists of 146 pages, includes 27 pictures, 28 tables, 12 formulas. 309 literature sources have been used in the dissertation.

The first part of the dissertation deals with two objectives. This section analyzes and summarizes the main theoretical aspects of investment portfolio asset allocations, market risk assessment, and value investing aspects. The views of different researchers on asset allocation, risk assessment, evaluation of attractiveness of shares are presented. The summary of the first section is delivered. The second part deals with the objectives 3 and 4. In this section, the formation of an investment portfolio model, applying the strategy of asset allocation, and the justification of empirical research are presented. The summary of the second section is stated. The third part deals with the objective 5. The empirical study consists of six parts. Each section tests a different investment portfolio formation strategy.

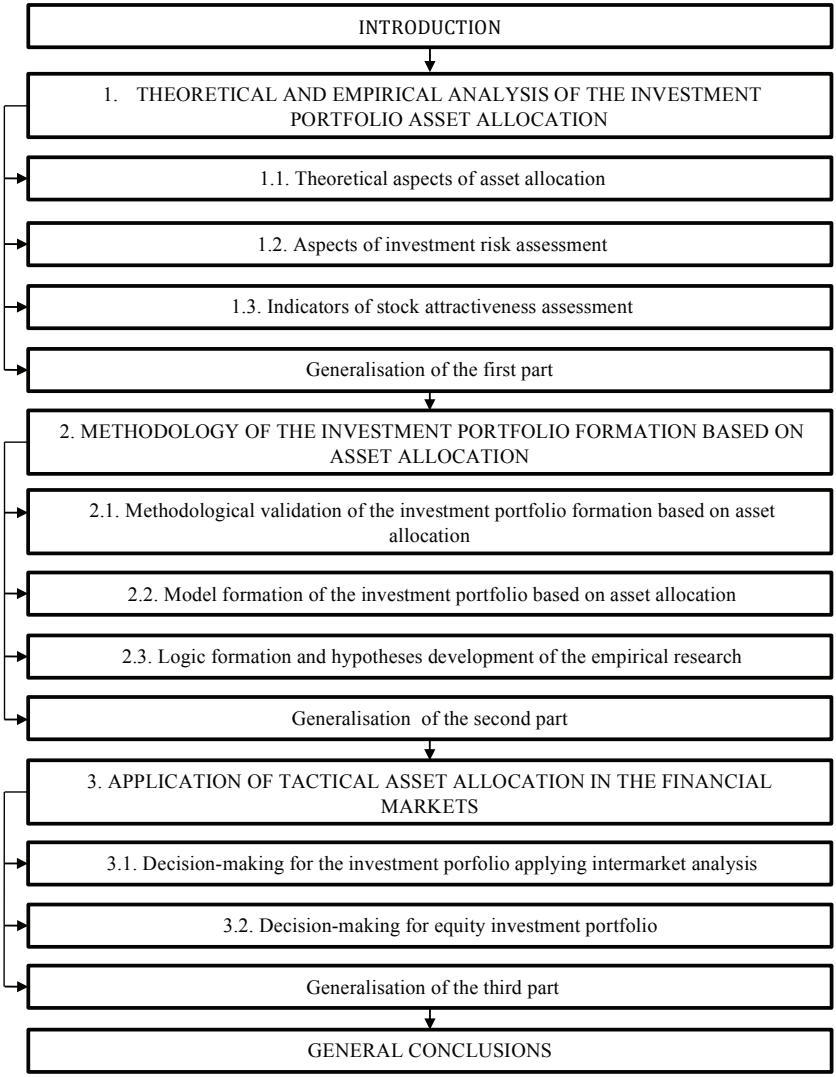


Fig. 1. Logical Structure of the Dissertation

Source: made by the author

The logical structure of the dissertation is based on the solution of the formulated scientific problem and the consistent implementation of the formed tasks.

THEORETICAL AND EMPIRICAL RESEARCH ANALYSIS ON THE SOLUTIONS OF INVESTMENT PORTFOLIO ASSET ALLOCATION

The development of derivative financial instruments and the emergence of exchange traded funds have allowed splitting up investment between different countries and classes of assets without investing directly in precious metals, goods and raw materials. Allocation of assets is an important factor in reducing the risk of an investment portfolio. Depending on the chosen strategy, the inclusion of different classes of assets in an investment portfolio helps reduce risks, as well as increase efficiency. Researchers analyze various asset allocation opportunities, offering investment portfolios of stocks, bonds, commodities, raw materials, currencies, real estate and various alternative investments such as works of art, coins, wines, whiskey, etc. in different countries or sectors. The large selection of investment objects allows meeting the various needs of investors and provides opportunities for a more efficient diversification of an investment portfolio. An overview of empirical studies has shown that asset allocation increases the efficiency of an investment portfolio. Having considered this, a further development of a strategy based on asset allocation solutions has been developed.

The study is based on the assumptions that financial markets are interlinked. Researchers are widely analyzing the relationships between financial markets, but depending on the business cycle, political situation, investor sentiment, the strength of the financial markets relationships is constantly changing. Determination of the financial market relations does not create preconditions for assessing the attractiveness of assets. In this context, the study uses a intermarket analysis to help assess the market situation and the attractiveness of individual asset classes. It is a sufficiently effective method that helps assess the riskiness of financial markets and their mutual attractiveness in the context of business cycles.

After analyzing the scientific literature on the relationship between risk and return, it turned out that researchers do not have a common view on the relationship between returns and the risks. Some researchers confirm a direct link between the risk and the return, and argues that higher returns can only be achieved with higher risk. Other empirical investigations confirm the low anomaly of investment risk, which defines the inverse relationship between return and risk. Some researchers, depending on the time periods, determine both the direct and the inverse relationship. Different results of the empirical research indicate that there is no general conclusion about the risk impact on the

results of an investment portfolio. Having considered this, the anomalies of low volatility have been further analyzed.

Risk is one of the key factors that needs to be analyzed and minimized for effective performance. The increasing risk depends on the analyzed object, its characteristics, the investor‘s skills and experience. An overview of the studies has shown that there are many different risk assessment indicators that can be divided into four main risk assessment groups. Researchers use and examine various indicators, but they have not analyzed the synergy of these indicators and their impact on the investment portfolio performance. Discussed quantitative market risk indicators assess the risk based on historical data, therefore these methods do not always reflect the actual and future risks. Only market risk indicators or only fundamental indicators are commonly used in the research. In addition, in market research with fundamental indicators, the market risk is estimated in a superficial way by calculating the standard deviation of price fluctuations. This study seeks to assess the synergy between the fundamental indicators and market risk assessment indicators and its effectiveness.

Proper use of fundamental indicators helps in the long term not only reduce the risk of an investment portfolio, but also increase its return. The studies are mostly oriented towards the use of appropriate fundamental indicators in order to create an investment portfolio, which returns were higher than a comparative index. The dissertation‘s research seeks to find suitable investment portfolio-modeling solutions that help form a low-risk investment portfolio, with the attractive and acceptable returns to investors. The analyzed principles of safety help avoid losses caused by human errors, failures, volatility, or unpredictable and rapidly changing world. In this regard, the margin of safety at work is used as an additional method for increasing the efficiency of an investment portfolio. In order to create an investment portfolio that is characterized by small market fluctuations and high returns.

METHODOLOGY FOR INVESTMENT PORTFOLIO FORMATION BASED ON ASSET ALLOCATION

The formation of an investment portfolio starts from the formation of the investment objectives. This paper analyzes the strategy of asset allocation when investing in different asset classes. The investment strategy is based on a intermarket analysis based on the interconnections between different financial markets. In addition, different stages of the business cycle have the

highest returns for the different asset classes: in the prosperous period – stocks, in the deflationary period - bonds, in the recessionary period - instruments of money market, and in the inflation period – gold. Thus, having considered the relationship between financial markets and having considered the business cycles, the investment portfolio, based on tactical asset allocation has been formed. Tactical asset allocation strategy is based on the active management of an investment portfolio in the light of market changes, fundamental or other indicators.

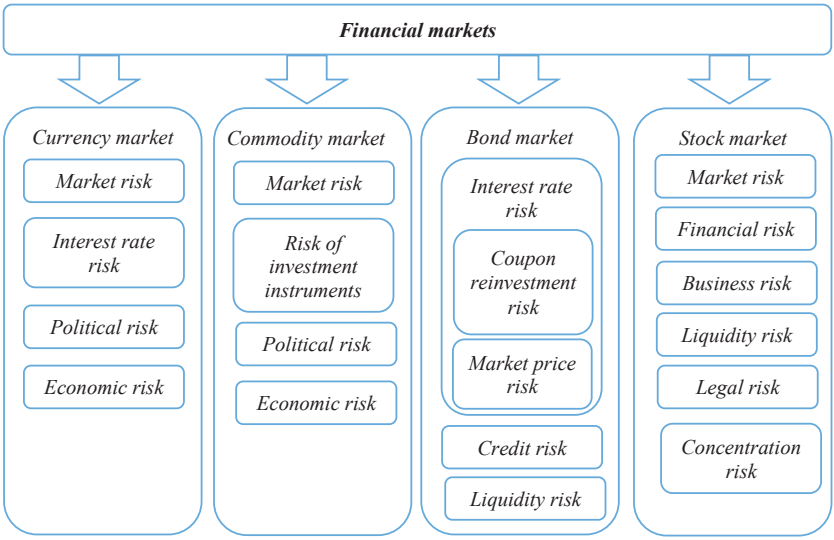


Fig. 2. Preliminary Risk Structure Prevailing in Financial Markets

Source: made by the author

In order to manage an investment portfolio more efficiently, only a intermarket analysis that is based on common interactions between the markets and business cycle stages is not taken into account. It is important to assess the specific risk of each asset class or investment object (see Fig. 2). When investing in company shares, it is important to assess its market, financial, legal and other risks. Equally, important is the price of a stock, because lower than the average share price can reduce the probability of loss, which in turn helps measure various relative indicators. When investing in bonds it is necessary to assess the interest rates, credit, and liquidity risks. Depending on the bond issue, it is important to assess the risk of default, too. Investing in goods is associated with market, political and economic risks. Merchandise is usually traded using

derivative instruments, and therefore the specific risk of derivatives also occurs. The risks of market, interest rates, political, economic prevail in the currency market. Different asset classes are characterized by different risks, which can be both quantitative and qualitative. Due to the large number of risk assessment indicators that are different for many classes of assets require developing different risk assessment models for multiple criteria. Each asset class requires a separate and detailed study, so the research carried out in this work only includes a general strategy of asset allocation, with the selection of asset classes that fall into the investment portfolio and the shares that are among the most popular classes of assets among investors.

The policy for analyzing investment portfolios in the study is similar. At the work, investment portfolios are formed on 1st January 1991-2014, and are realized on the last working day of the certain year. The investment portfolio rebalancing is carried out every year, except for the strategy of asset allocation. In order to assess the effectiveness of the chosen strategies, the rebalancing of investment portfolios is additionally carried out every 6 months and 3 months.

The identification of the main asset classes is carried out in order to assess which classes of assets are to be invested, the degree of asset allocation and what classes of assets will further be analyzed.

The attractiveness of financial markets is assessed using the principles of intermarket analysis. The attractiveness of financial markets is measured using relative indicators between financial markets. The attractiveness of each class of assets is determined by their attractiveness for different classes of assets (see Fig. 3).

The next step involves investment portfolio building solutions. When creating investment portfolios, based on asset allocation, three investment portfolio management strategies are analyzed, i.e an momentum strategy, strategy of attractiveness and eternal portfolio strategy. The used relative indicators help measure the risks of financial markets, but additional strategies are needed to support investment portfolio management and management decisions. Depending on the specificity of the indicators, the strategies were selected for the study, which take into account trends of relative indicators. This step involves internal strategy management and evaluation of results, i.e. when the asset class or investment philosophy itself is unchanged. In this step, according to the results, the frequency of the rebalancing of the investment portfolio is adjusted.

The final step in the formation of an investment portfolio is the evaluation of the results. However, this is not the final step. After evaluating the results of an investment portfolio, a new portfolio is created or its composition is changed. Also, depending on the results, the main objectives and investment policy can be changed.

After analyzing the results of the investment portfolio based on the asset allocation, the investment portfolio development options from one asset class are further analyzed. The initial selection of the bonds is carried out in order to select the companies eligible for the survey, the data of which will be sufficient for analyzing at least two business cycles.

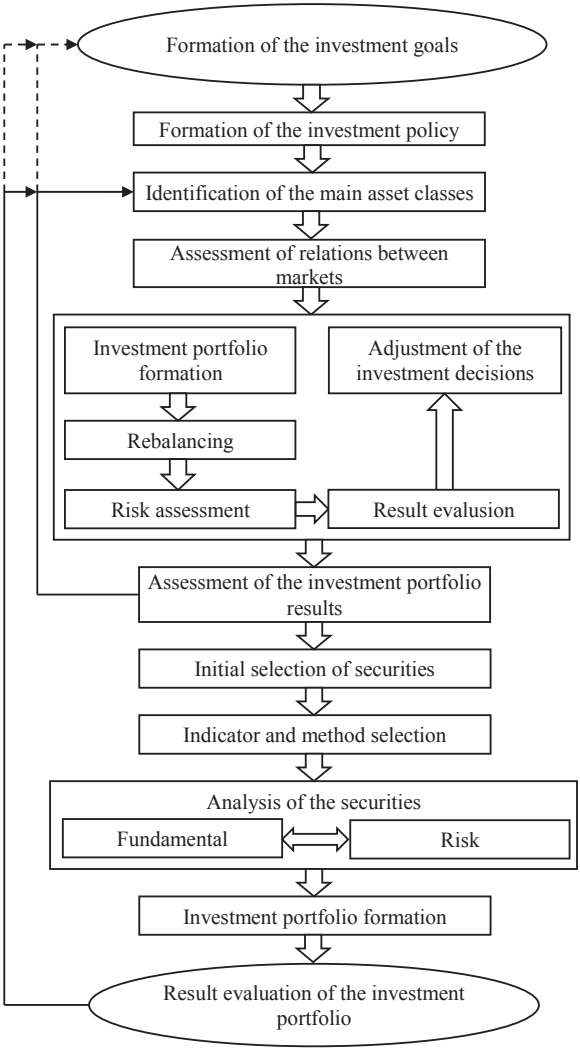


Fig. 3. Model of Investment Portfolio Formation

Source: made by the author

The equity portfolio is formed using indicators that are designed to measure the attractiveness of the stock in terms of the analyzed and selected strategies. The equity portfolios comprise investment portfolios based on the principles of low volatility anomaly and margins of safety. The low volatility anomaly is analyzed using market risk indicators, the safety margin is analyzed using fundamental indicators (see Fig. 4). Taking into account the specifications of these strategies, a new strategy is formed based on the synergy between these strategies.

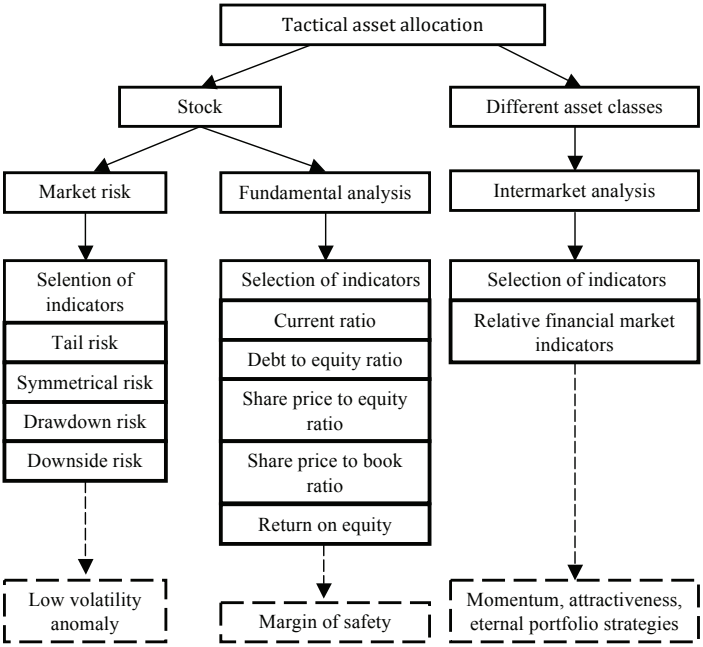


Fig. 4. Tactical Asset Allocation Scheme

Source: made by the author

The last step in this model (see Fig. 3) is to evaluate the results of an investment portfolio comprised of stocks. Depending on the results of the investment portfolio, a new portfolio is being formed or its composition changed. Also, depending on the results, the main objectives and investment policy can be changed.

The formed investment portfolio model is applicable to the empirical study. In order to evaluate the effectiveness of the analyzed strategies, different studies are identified, which separately include asset allocation and stock markets. In

the final result of the investment portfolio formation, these actions can not be separated. Both the choice between financial markets and the risk assessment of different assets classes are an integral part of one action.

The proposed investment portfolio model is based on the different investment portfolio formation strategies. In order to evaluate the effectiveness of these strategies, empirical studies are carried out on several business cycle stages. This chapter discusses the logic, strategies and methods of the empirical research (see Fig. 5).

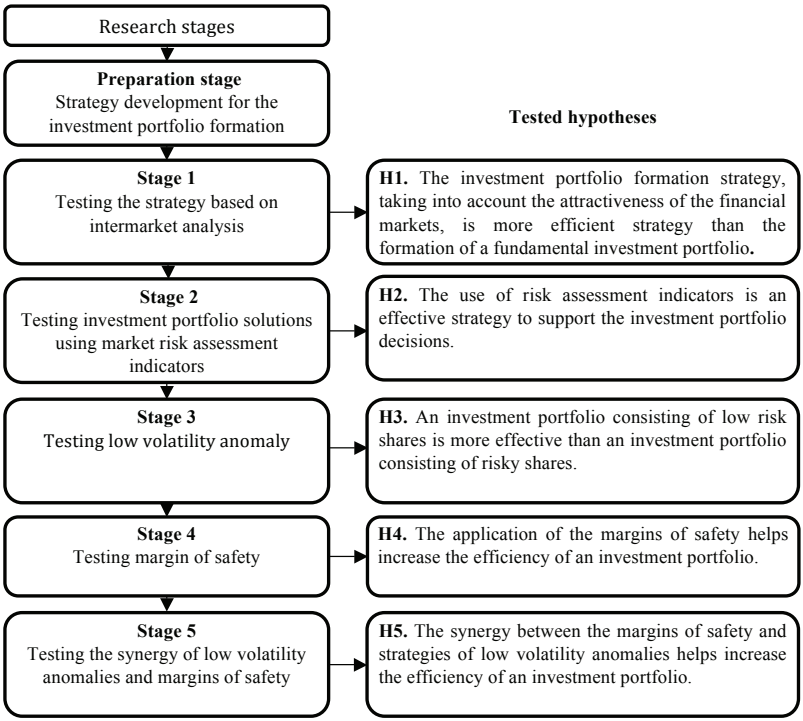


Fig. 5. Logic of Empirical Research

Source: made by the author

Hypotheses in the dissertation work:

H1 The strategy of investment portfolio formation, taking into account the attractiveness of financial markets, is a more effective than the formation of a fundamental investment portfolio.

H2 The use of risk assessment indicators is an effective strategy to support investment portfolio decisions.

H3 An investment portfolio consisting of low risk shares is more effective than an investment portfolio consisting of risky shares.

H4 The application of the margins of safety helps increase the efficiency of the investment portfolio.

H5 The margins of safety and synergy of the strategies low volatility anomalies help increase the efficiency of an investment portfolio.

The justification of hypothesis H1. Financial markets are closely related. Stock markets influence on bond markets (Stivers, Sun, 2002; Murphy, 2004; Patoda, Jain, 2012), commodity markets operate on stock markets (Creti et al., 2012; Lombardi, Ravazzolo, 2013; Chiang et al., 2013), currency markets affects bond and stock markets (Murphy, 2004; Francis et al., 2006; Tian, Ma, 2010; Fahami etc. 2014; Valls, Chuliá, 2014, etc.). Therefore, in different business cycle phases, different asset classes have the best results (Boyd, Mercer, 2010; Dzikevičius and Vertov, 2012; Rowland, Lawson, 2012). Thus, it can be assumed that beneficial application of these relationships and different stages of the business cycle can be used to evaluate and select the most attractive asset classes, thus improving the efficiency of the investment portfolio in the different stages of the business cycle.

The justification of hypothesis H2. The analysis of the empirical research has shown that the researchers do not find a unified view of the relationship between risk and return on securities. However, the risk is an integral part of the formation of an investment portfolio (Markowitz, 1952; Sharpe 1964). More recently, empirical studies have been conducted in which securities selection is carried out by using market risk assessment indicators (Clarke, Silva, Thorley, 2013; Idzorek, Kowara, 2013; Guilleminot, Ohana, Ohana, 2014). The researchers even suggest that asset allocation using risk indicators is more effective than the asset allocation based only on returns (Page, Taborsky, 2011). Having considered that, it can be assumed that the risk is an important part of the investment portfolio formation, so it is important to evaluate the effectiveness of this strategy.

The justification of hypothesis H3. The golden rule of financial theory states that high returns can only be achieved with high risk and low risk returns (Markowitz, 1952; Sharpe 1964). Researchers extensively analyze the relationship between risk and return. Some researchers confirm a positive relationship between risk and return (Citak, 2007; Chambers, Sezgin, Karaaslan, 2013; Nimal and Fernando, 2013), others did not confirm this theory (Fama, French, 1992). However, the theory is often based on researchers, fund managers, financiers, and various investors. Based on this theory, textbooks are published, theories of investment portfolio formation are being developed. Therefore, consistently and courageously, it is said that in order to achieve higher profits, it is necessary to assume higher risk, often without even mentioning that higher

profits may not exist. By analyzing the relationship between risk and return, among the one of asset class, researchers find the opposite relationship to the theory of finance. In the long term, stocks with low volatility and low risk achieve higher returns than the high-risk stocks (Kuo, Li, 2013; Chow, Hsu, Kuo, Li, 2014; Altman, Gonzalez-Heres, Chen, Shin, 2014; Goldberg, Leshem, Geddes, 2014). This is called anomaly of low volatility.

Using this strategy, investment is being done in stocks with low price fluctuations. Most often, these are stable enterprises with good balance, with no big debts, stable cash flow and stable dividend payments. Shares with low volatility during the bull market period fall into risky assets, but as market volatility grows up or the luck market begins, they help reduce portfolio risk and increase its efficiency.

The increasing practical application of the strategies of low volatility anomalies is reflected in the development of ETF funds based on this strategy. The first ETF funds investing in low volatility shares appeared in 2011. In 2017 the total assets of the ETF using this strategy amounted to more than 38 billion USD. The largest ETF funds investing in stocks with low volatility are iShares Edge MSCI Min Vol US ETF (USMV) and PowerShares S&P 500 Low Volatility ETF (SPLV). The total assets controlling by ETF funds make up to 19.2 billion USD.

Such popularity of this strategy was determined by the painful 2008-2009 experience and quantitative economic stimulation of different countries (Goldberg, Geddes, 2014). Quantitative economic stimulation raised the value of shares and bonds. Because of the low return of the bonds, investors are trying to change them, and the best alternative is the shares. However, quantitative stimulation has also affected stock markets. As they reach new records, investors are looking for securities that are low risk and high return. Investigators also contribute to the popularity of this strategy. Empirical studies are carried out more often to confirm the existence of anomalies not only in the stock market, but also in the bond market.

The human brain has been formed in such a way as to maximize its benefits with the lowest possible risk (Zweig, 2008). This strategy helps keep abreast of human nature and achieve one of the main goals of investors - the higher returns per risk unit.

The justification of hypothesis H4. Researchers analyze and validate the effectiveness of the application of value investment principles in the formation of an investment portfolio (Anderson, Brooks, 2006; Kucko, 2007; Penman, Richardson, Tuna, 2007; Xiao, Arnold, 2008; Kelly, McClean, McNamara, 2008; Singh, Kaur, 2013). The use of fundamentals for the formation of an investment portfolio is analyzed not only in the context of individual asset classes (Žilinskij, 2012; Brazauskas, 2014; Marcišauskienė, 2016), but also in the context of asset

allocation (Blitz, Vliet 2008; Cardinale, Navone, Pioch, 2014; Kim, Lee, Lee, 2014). The effectiveness of the fundamentals is analyzed by the researchers in the markets of different periods. The studies are carried out in 3 years' time period (Kucko, 2007), in 9 years' time period (Kelly, McClean, McNamara, 2008), in 11 years' time period (Truong, 2009), in 15 years' time period (Singh, Kaur, 2013), in 29 years' time period (Anderson, Brooks, 2006). Research is diverse, part of which includes several business cycles, but most commonly some fundamental indicators are analyzed that do not take into account active risks and the impact of indicators on the active risk. Considering that, the survey is conducted using a variety of fundamental indicators that are intended not only to increase the return on investment portfolio but also to assess the risks of the companies. A study is conducted to assess the impact of the fundamental characteristics on the risk of an investment portfolio.

The justification of hypothesis H5. An overview of the empirical studies has shown that researchers mainly analyze two similar strategies, the principle of which is similar. These strategies are based on the assumption that there is the possibility of taking low risks and achieving higher returns than investing at risk. But only few empirical studies were conducted to assess the synergies between these strategies, and this paper seeks to assess the effectiveness of the synergy of low volatility anomaly and margin of safety.

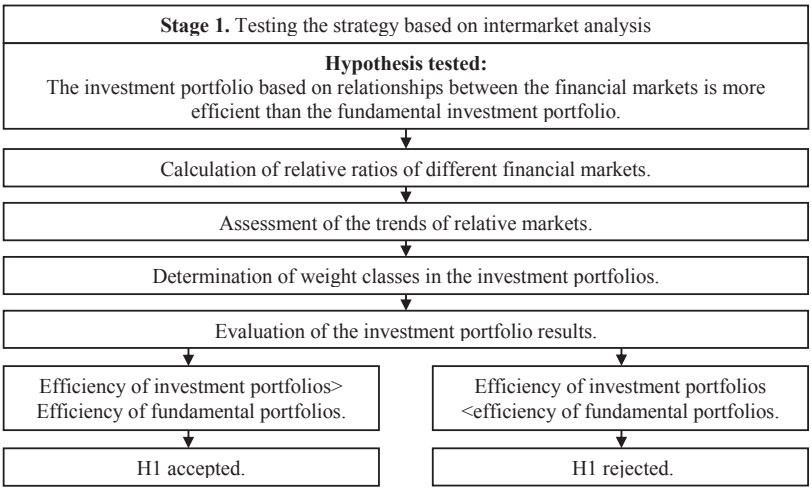


Fig. 6. Logic of Stage 1 of the Research

Source: made by the author

The first stage of the research was to test the effectiveness of the selected asset allocation strategy (see Fig. 6). Tactical asset allocation strategy is based on intermarket analysis. The relative analysis of different markets is used for the intermarket analysis. Relative indicators allow assessing the relationship between the different financial markets, their strengths and weaknesses, and trends (Murphy, 2004). Table 1 shows the relative market indicators and their preliminary evaluation according to J. J. Murphy (1991). The relative indicators are calculated using different indices that reflect the different financial markets: stocks - MSCI All Country World Index, commodities - S&P GSCI (Goldman Sachs Commodity Index), Total Return Index, bonds - Barclays Capital Bond Composite - Global Index; currency - U.S. Dollar Index.

Table 1

Relative Indicators

Indicator	Assessment
Bonds/shares	When the indicator rises, bonds are bought, when the indicator decreases, shares are bought.
Commodities/shares	When the indicator rises, commodities are bought, when the indicator decreases, shares are bought.
Shares /currency	When the indicator rises, shares are bought, when the indicator decreases, currency is bought.
Commodities/bonds	When the indicator rises, commodities are bought, when the indicator decreases, bonds are bought.
Bonds/currency	When the indicator rises, bonds are bought, when the indicator decreases, currency is bought.
Commodities/ currency	When the indicator rises, commodities are bought, when the indicator decreases, currency is bought.

Source: made by the author

Investment portfolios will be formed according to the strategies of momentum and markets attractiveness. The relative indicators used for estimating the trend of the market are calculated for the different markets. The first step in developing the investment portfolio based on a intermarket analysis is to calculate the relative indicators of different financial markets. Relative financial market ratios are calculated using two different market indices. The next step is to assess the dynamics of the relative market indicators. The decision to include a certain class of assets in the investment portfolio is based on the relative indicators of the asset class and the trends in comparison with the other asset classes.

Depending on the market trends, weights of asset classes in the investment portfolio are calculated. According to the momentum strategy, it is investing in growing markets and according to the attractiveness strategy it is investing

in cheaper markets. Depending on the chosen asset management strategy, the procedure is repeated after the scheduled time period. During the research, the composition of the investment portfolio is reviewed every year, six months and three months. During the period *t*, the weights of classes of assets are determined taking into account the results of the *t-1* period relative indicators.

In this stage of the research, an investigated hypothesis or investment portfolio based on the attractiveness of financial markets was more efficient than the fundamental investment portfolio. Depending on the results of the investment portfolios, the hypothesis is confirmed or rejected.

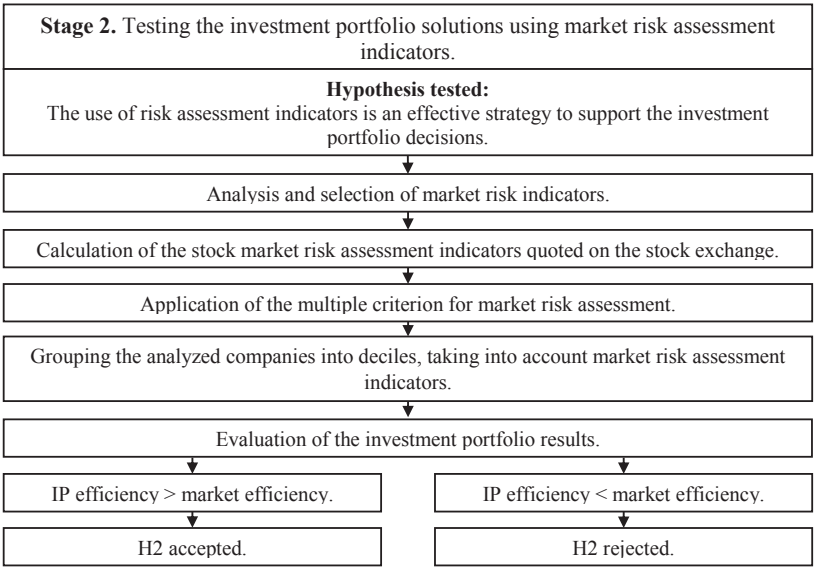


Fig. 7. Logic of Stage 2 of the Research

Source: made by the author

The second stage of the research is designed to assess the effectiveness of risk assessment indicators (see Figure 7). The survey is carried out using data from the shares of companies entering the S & P 500 index. Depending on the availability of the data, different number of companies are used for the research every year. In this study, in 1991, an analysis was made of 118 enterprises that were used for the formation of investment portfolios, in 2014 the investment portfolios were formed from 478 companies. The first step in the study is the analysis and selection of risk assessment indicators. Depending on the results of the theoretical analysis, the study is conducted using not only the standard

deviation, but the study uses a synergy of the different market risk indicators in order to assess not only positive but also negative risks. Investor losses are due to adverse changes in prices, so it is important to take this into account when assessing asset risks. The second stage is the calculation of risk assessment indicators. The indicators are calculated using the historical data of stock price volatility.

The third step is the multi-criteria evaluation of the data. In the dissertation, the selection of a multi-criteria method is not an important part, therefore, the multi-criteria methods are chosen according to the specifics of the applied indicators. In the practical part of the work, geometric mean and COPRAS multi-criteria methods are used for data processing and attractiveness assessment. The geometric mean is used in this stage of the research.

The study is conducted using different composition of the investment portfolios. In order to limit the amount of the analyzed investment portfolios, but without limiting the number of assets entering them, the study is performed by dividing the analyzed enterprises into deciles. After grouping the companies in the investment portfolios, the analysis of these investment portfolios continues.

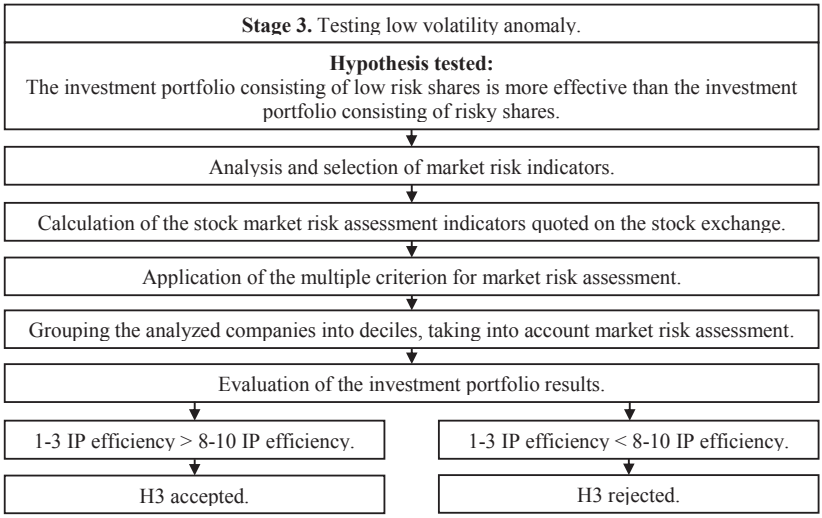


Fig. 8. The Logic of Stage 3 of the Research

Source: made by the author

When testing the third hypothesis, the logic of the research is similar to the second stage (see Figure 8). Test of the low volatility anomaly is performed by comparing the completed investment portfolios with each other. The third

hypothesis is tested according to the efficiency of the investment portfolio indicators. If the investment portfolios made of low-risk shares are more effective than the investment portfolios made of high-risk shares, then the hypothesis will be confirmed. Having confirmed the hypothesis, it can be argued that there is an anomaly of low volatility in the market. Otherwise, the hypothesis will be rejected.

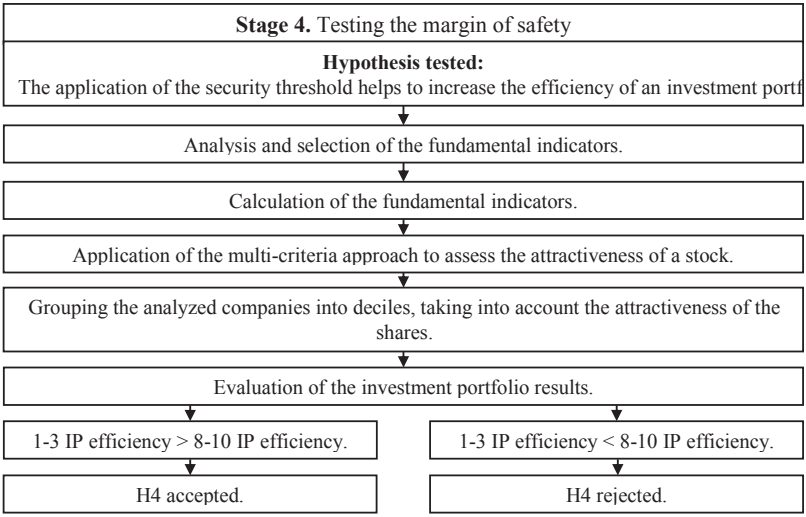


Fig. 9. Logic of Stage 4 of the Research

Source: made by the author

The fourth stage of the research is designed to assess the effectiveness of the margin of safety (see Fig. 9). The survey is carried out using data from the shares of the companies entering the S&P 500 index. Depending on the availability of the data, different number of companies are used every year in the research. In this study, in 1991, the analysis was made of 118 enterprises that were used for the formation of investment portfolios, in 2014 the investment portfolios were formed from 478 companies. The first step in the study is the analysis and selection of fundamental indicators. To measure the investment attractiveness of enterprises, there are five fundamental indicators that reflect different groups of the fundamental indicators. The current ratio assesses the company‘s liquidity, the debt to equity ratio evaluates the company‘s solvency, and the return of equity reflects the profitability of the company. The research focuses on the relative indicators that measure the relative cheapness of quoted companies in terms of their profit, book value or other financial data. Taking into account that

the relative price is widely analyzed, the research confirms the positive impact of these indicators on return of the investment portfolio, two relative indicators will be used to assess the attractiveness of the shares, in order to assess the company‘s price, taking into account the company‘s profit and its book value. The second step of the research is the calculation of the fundamental indicators. The indicators are calculated using historical financial data of the shares.

The selected indicators are taken into account in the formation of the fundamentally-based investment portfolio. Selected indicators are interpreted differently, the decreasing values of some indicators make investments more attractive, while the increasing values of the other indicators makes investments more attractive. Also, for each investor, the significance of the indicators is different in the selection of investments. The third step of the research involves the evaluation of the stock attractiveness. In order to make it easier to assess the stock attractiveness, the COPRAS method proposed by E. K. Zavadsk and A. Kaklausko (1996) will be used.

The research was conducted using different composition of the investment portfolios. In order to limit the amount of analyzed investment portfolios, but without limiting the number of assets entering them, the fourth step of the research was performed: the analyzed companies were broken down into deciles. After grouping the companies into the investment portfolios, the analysis of these investment portfolios was continued.

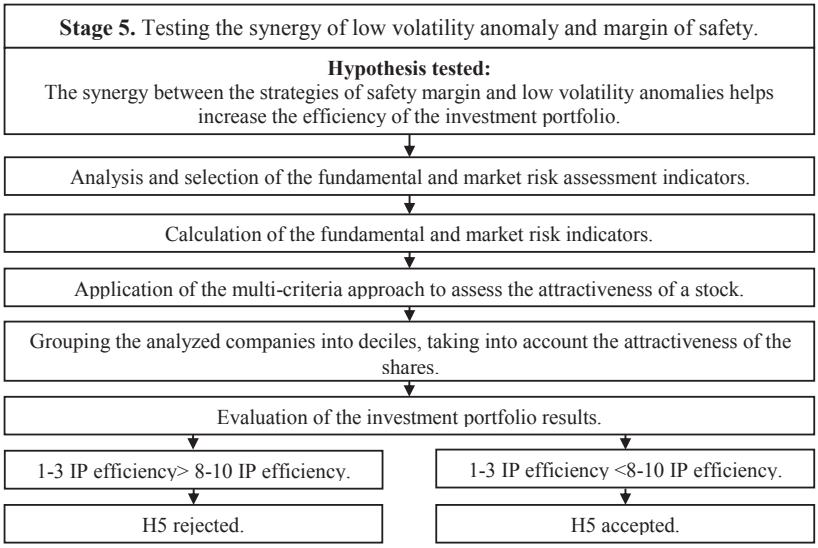


Fig. 10. Logic of Stage 5 of the Research

Source: made by the author

The fifth stage of the research was aimed at testing the synergy of the strategies based on the margin of safety and low anomaly-based strategies (see Fig. 10). The first step in the research was to assess the use of the fundamental and market risk indicators. The second step was to calculate these indicators. Different indicators are used to evaluate the attractiveness of the shares, which are presented in different numeral forms and interpreted differently. Having considered that, the third step of the research involved the use of multi-criteria methods for assessing the attractiveness of the stock. This study used the multi-criteria COPRAS method. The fourth step of the research was to diversify the analyzed shares into deciles. The fifth step involved the result interpretation and was aimed to confirm or deny the fifth hypothesis.

Taking into account the theoretical analysis and the review of the empirical research, the results of all investment portfolios analyzed in the dissertation were evaluated using various quantitative indicators: conditional annual growth rate, standard deviation, downside standard deviation, value at risk (confidence interval 95 per cent or 99 per cent), maximum annual loss, variation coefficient, Sharpe coefficient, Sortin coefficient, Calmar coefficient, information coefficient, and tracking error.

TESTING DECISIONS OF TACTICAL ASSET ALLOCATIONS IN THE FINANCIAL MARKETS

In this part the empirical research is carried out in accordance with the research methodology developed in the second part of the dissertation. The analysis of asset allocation based investment portfolio consists of five steps. The first step is to test the asset allocation strategy in the selected financial markets. The chosen strategy is based on the interactions between financial markets and their indirect interaction with business cycles. Stages 2-5 include testing the equity portfolio formation strategies in equity markets. The second and third stages involve the use of market risk assessment indicators for the formation of the investment portfolios and the testing of low volatility anomalies. The fourth stage of the study involves the application of a value investment strategy in the stock market. Taking into account the theoretical assumptions, empirical research overview and empirical studies, the fifth stage of the study analyzes the margins of safety and the synergy of low volatility anomalies.

Testing the developed model, analyzing the selected strategies, five hypotheses were tested. Each hypothesis included different studies and/or parts

of them. Studies have shown that three hypotheses were accepted and two hypotheses were rejected (see Table 2). Taking into account the results of the research, it can be argued that in the long-term stock markets the anomalies of low volatility do not exist, which proved to be inadequate both in exploring this phenomenon individually and in investigating as a synergy with the margin of safety strategy. The results of the research showed that it is possible to improve the results of the investment portfolio by using the financial market relations and to support the investment decisions based on equity risk indicators and fundamental indicators.

Table 2

The Results of the Research Hypotheses

Hypothesis		Results	Comments
H1	The investment portfolio formation strategy, taking into account the attractiveness of the financial markets, is more efficient strategy than the formation of a foundamental investment portfolio.	Accepted	The exploitation of the financial market relations and trends helped achieve better investment portfolio performance than fundamental investment portfolios.
H2	The use of risk assessment indicators is an effective strategy to support investment portfolio decisions.	Accepted	Investment portfolio formation solutions based on risk-assessment indicators were more effective than the comparative index.
H3	The investment portfolio consisting of low risk shares is more effective than the investment portfolio consisting of risky shares.	Rejected	Shares with low volatility were characterized by lower returns and performance than risky stocks.
H4	The application of the margin of safety helps increase the efficiency of the investment portfolio.	Accepted	The application of the margin of safety increased the efficiency of the investment portfolios comparing them with each other and with a comparative index.
H5	The synergy between the strategies of the margin of safety and low volatility anomaly helps increase the efficiency of the investment portfolio.	Rejected	The synergy of the chosen strategies failed and the effectiveness of the investment portfolios did not create the preconditions to support this hypothesis.

Source: made by the author.

The results of research on investment portfolios based on intermarket analysis showed different results. Different periods of investment portfolio transformation revealed different trends in selected strategies. The strategy

based on market attractiveness was most effective when the investment portfolio was reorganized every year. In order to exploit the attractiveness of the market, longer investment periods are needed because they invest in cheap or tight financial markets. The study has shown that in order to achieve higher returns than comparative strategies, it is necessary to keep the investment portfolio longer, only then you can get a trend change and a positive return. The opposite trend is evident in analyzing the momentum strategy. By applying the momentum strategy, the performance of an investment portfolio improves when the review period is shrinking. More active investment portfolio management helps more effectively use the momentum strategy to follow the market trends. The investment portfolio review period has had a modest impact on underlying investment portfolios. This shows that management activity does not have a direct impact on the results of an investment portfolio, but the study does not include commission, sales commission fees and other costs. Therefore, it can be assumed that a longer investment portfolio holding period is more attractive to invest in all classes of assets. The research carried out allows confirming the first hypothesis.

The formation of investment portfolios, using only market risk assessment indicators, is a growing and increasingly widespread strategy. The study showed that the investment portfolios created by this strategy were more effective than the comparative S&P 500 index. Investment portfolios made up of low risk assets were characterized by a lower risk than a comparative index, but also higher returns. Also, investment portfolios with a similar risk to the comparative index were twice as high as the average annual return. In the study, investment portfolios were split into deciles to assess the effectiveness of different risk-based investment portfolios. The most risky investment portfolios were characterized by higher returns and higher efficiency than investment portfolios based on low volatility anomalies strategy. The carried out research allowed confirming the second hypothesis and reject the third hypothesis.

The evaluation of the attractiveness of the shares using the principles of the margin of safety allowed achieving the highest efficiency by comparing the investment portfolios with each other as well as comparing them with the comparative index. This shows that the principles of value investment are valid in the long-term period. The research showed that the most unattractive investment portfolio is the most effective, but the basis of this investment portfolio is the enterprises in the information technology sector. Companies in this sector were at great risk of bankruptcy, especially during the Dot-Com bubble, while research was carried out applying survived and going companies. Therefore, these results can be considered as a basis for future research, but can not be considered as a basis for rejecting the hypothesis of the dissertation. In view of this, the fourth hypothesis was confirmed.

A study has shown that the synergy between strategies for high volatility and margin of safety is more effective. This strategy allowed selecting fast growing and less risky businesses. Highly volatile enterprises are usually fast-growing companies as well, but they can be very risky. In order to avoid this, fundamental analysis was used to help select profitable and non-marketable companies. In this regard, the fifth hypothesis was rejected.

GENERAL CONCLUSIONS

1. The analysis of literature showed that asset allocation is an important factor in reducing the risk of an investment portfolio and increasing its efficiency. Various asset allocation options are being analyzed, offering investment portfolios of shares, bonds, commodities, raw materials, currencies, real estate and various alternative investments such as works of art, coins, wines, whiskey, etc. in different countries or sectors. The large selection of the investment objects allows meeting the various needs of investors and provides opportunities for a more efficient diversification of an investment portfolio. The research on financial markets has found that close links exist between the financial markets. The financial markets as well as the economy are cyclical, but in different periods of the business cycle, they are changing in different directions. In different phases of the business cycle, the financial markets are characterized by different characteristics, which leads to the domination of the different financial markets. It has been determined that in order to assess the attractiveness of the financial markets, the inetrmarket analysis is carried out.

2. Having analyzed the scientific literature on the topic of the investment risk assessment, it was established that risk is one of the most important factors that are analyzed for the purpose of effective performance. The emerging risk depends on the analyzed object, its characteristics, the investor‘s skills and experience. Researchers analyze and develop various risk assessment methods and indicators that help assess the risk of investment funds or individual asset classes. They can be subdivided into symmetric, tail, downside and drawdown, risk-adjusted and alternatives methods. Risk-adjusted methodologies are subdivided into CAPM-based models and RAROC methodologies. Having analyzed the literature on the relationship between risk and return, it turned out that researchers do not have a common view on the relationship between the involved returns and risks. Some researchers confirm a direct link between the

involved risk and return, and argues that higher returns can only be achieved with higher risk. Other empirical studies confirm a small variation of anomalies, which define the inverse relationship between return and risk. Some researchers, depending on the time periods, determine both direct and inverse relationship.

The analysis of literature and empirical research showed that fundamental analysis is relevant in the selection of shares. The use of fundamentals in the long-term period helps assess the company‘s risk, increases the return on the investment and improves the efficiency of the investment portfolio. In order to evaluate the attractiveness of the shares, indicators have been used that assess the company‘s liquidity, solvency, profitability, relative price in terms of profit and book value. The attractiveness of the shares was evaluated using a value investment strategy. Value investors look for the value of a genuine company, but the markets are volatile, and investors require to claim a margin of safety for each investment they carry out. The margin of safety helps avoid losses caused by human error, failure, volatility or unpredictable and rapidly changing world.

3. Summarizing the issue of intermarket analysis, and the results of the empirical research carried out by various researchers, it was found that financial markets are linked by various relationships. It has been determined that when analyzing the problem of the financial market penetration assessment, researchers analyze the relative indicators of the financial markets. In different phases of the business cycle, the financial markets are moving at different pace or direction. This determines the attractiveness of some of the financial markets for others. Considering that, using relative indicators, the attractiveness of each financial market has been evaluated in the respect of all analyzed financial markets.

Based on the analysis of the theory and the results of empirical research, market risk assessment indicators have been selected. Equity market risk analysis deals with the volatility-based indicators that reflect the four main types of the market risks: symmetrical risk, tail risk, drawdown risk, and downside risk. The investment portfolio model draws a lot of attention to investor risk aversion, which is why a comprehensive market risk assessment is proposed, where three out of four indicators are intended to measure the risk of adverse changes in price. Based on these indicators, an equity risk and investment attractiveness assessment is performed using a geometric average of the multi-criteria approach.

Summarizing the empirical research, five fundamental indicators assessing the attractiveness of the model have been used to reflect different groups of fundamental indicators. The attractiveness of the shares is assessed using indicators that reflect the company‘s liquidity, solvency, profitability and relative price. It has been identified that profitability and solvency ratios are maximizing and liquidity and relative rates are minimizing. Based on these indicators, the

evaluation of the attractiveness of the shares has been performed using the COPRAS multi-criteria approach.

4. In order to deal with the scientific issue raised in the dissertation and solve the objectives, an investment portfolio formation model has been developed. The model is made up of two parts. The first part refers to the analysis of the financial markets, intermarket analysis, the momentum of the financial markets and their mutual attractiveness. In this model, the attractiveness of the financial markets is assessed using relative indicators. The second part refers to the valuation of the attractiveness of a stock using fundamental indicators and market risk assessment indicators. In most of the investment portfolio analyzes, either analysis of individual asset classes or analysis of financial markets is carried out. This model proposes the analysis of securities when financial market selection and stock selection complement each other. Intermarket analysis helps identify the attractive financial markets, the micro-level analysis helps determine the attractiveness of a stock, measured by the company‘s financial position and price volatility. The developed model is suitable for the empirical research. In order to assess the effectiveness of the analyzed strategies, different studies have been identified which separately include the four main financial markets and individual stock markets. In the final result of the formation of the investment portfolio, these actions can not be separated. Both the choice between financial markets and the risk assessment of the different asset classes bacomes the integral part of one action.

5. The first hypothesis was to assess whether the investment portfolio formation strategy, taking into account the attractiveness of the financial markets, is more effective strategy than the formation of a fundamental investment portfolio, proved to be true. The results of research on the investment portfolios based on intermarket analysis showed different results. Different periods of the investment portfolio redevelopment showed different trends in the selected strategies. A market attractiveness based strategy was the most effective when the investment portfolio was reorganized every year. In order to exploit the attractiveness of the market, longer investment periods are needed because the investors usually invest in cheap or tight financial markets. The research has shown that in order to achieve higher returns than applying comparative strategies, it is necessary to keep the investment portfolio longer, only then you can get a trend change and a positive return. The opposite trend is evident in analyzing the momentum strategy. By applying the momentum strategy, the performance of an investment portfolio improves as the analyzed period is shrinking. More active investment portfolio management helps more effectively use the momentum strategy to follow the market trends. The investment portfolio analyzed period had a slight impact on the fundamental investment portfolios. This shows that management activity does not have a direct impact on the results of the investment portfolio, but the study does not include commission fees and other costs. Therefore, it can

be assumed that a longer investment portfolio period is more attractive to invest in all classes of assets.

The second hypothesis, which was aimed at assessing whether the use of risk assessment indicators is an effective strategy to support investment portfolio decisions, proved to be true. The formation of the investment portfolios applying only market risk assessment indicators is a growing and increasingly widespread strategy. The study showed that investment portfolios created by this strategy were more effective than the comparative S&P 500 index. The investment portfolios made up of low risk assets were characterized by lower risk than a comparative index, but also higher returns. Also, the investment portfolios with similar risk to the comparative index were twice as high as the average annual return. This shows that stock selection based on risk-based indicators is an effective strategy to improve the performance of the investment portfolio.

The third hypothesis, aimed at verifying that the investment portfolio consisting of low risk shares is more effective than the investment portfolio consisting of risky shares, was rejected. In the study, investment portfolios were split into deciles to assess the effectiveness of the different risk-based investment portfolios. The most risky investment portfolios were characterized by higher returns and higher efficiency than the investment portfolios based on the strategy of low volatility anomalies. This shows that a higher return in the stock market can be achieved only at a higher risk.

The fourth hypothesis, which was aimed at verifying whether the application of the margin of safety strategy helps increase the efficiency of the investment portfolio, has proved to be true. The research showed that the evaluation of the attractiveness of the shares using the principles of the margin of safety allowed achieving the highest efficiency by comparing the investment portfolios with each other, as well as comparing them with the comparative index. This shows that the principles of value investment are valid in the long-term period. The research showed that the most attractive investment portfolio is the most effective, but the basis of this investment portfolio is the enterprises in the information technology sector. Companies in this sector were at great risk of bankruptcy, especially during the Dot-Com bubble, while research was carried out applying survived and going companies. Therefore, these results can be considered as the basis for future research, but cannot be considered as a basis for rejecting the hypothesis.

The fifth hypothesis, aimed at verifying whether the synergy between margins of safety and the strategies of low volatility anomalies help increase the efficiency of the investment portfolio, has been rejected. A study has shown that the synergy between strategies for high volatility and margins of safety is more effective. This strategy helped select fast growing and less risky businesses. Highly volatile enterprises are mainly fast-growing companies, but they can be very risky. In order to avoid this, fundamental analysis was used to select profitable but undervalued companies.

The dissertation analyzes and studies cover only a part of the proposed investment portfolio model. Considering that, further research directions are foreseen:

1. The analysis of the empirical research has shown that the debt securities market is an important part of the investment portfolio's allocation. This market is characterized by credit risk, liquidity risk, interest rate risk, which includes the coupon reinvestment risk, market price risk and other features. Different risks and their characteristics require detailed analysis. Especially when the market is in a situation where the stable countries, such as the United States, are compared with the profitability on commercial enterprise bonds.

The development of the financial markets provides individual investors with new opportunities to access or simply replace hard-to-reach financial markets. The bond market is expensive and difficult to access for the investors who have small amounts of money. Depending on the acceptable risk, the bonds may be converted into loans. Mutual lending platforms provide the investors with the opportunity to participate in the debt market. Therefore, further research can be linked to the debt market analysis, making risk assessment models acceptable to the individual investors.

2. The currency market is distinguished by its globalization, liquidity and size. Therefore, this asset class is the integral part of the investment portfolio research. This market is strongly influenced by political and economic risks. It is also inseparable from the market risk and interest rate risk. When analyzing the investment strategies based on the emerging markets, it is important to evaluate the impact of currencies on the performance of the investment portfolio. Therefore, further research can be associated with the identification and analysis of the emerging risks in the currency market.

3. Researchers do a lot of empirical studies and analyze the asset allocation strategies for commodities into the investment portfolio. The commodities are not directly traded on the financial markets, so there is the additional risk of derivatives besides the market risk. Commodities are often used to affect other countries, both at economic and political level. Therefore, further research can be related to the inclusion of commodities into the investment portfolio in more detailed analysis and identification of the emerging risks that are acceptable and easy to identify for both institutional and individual investors.

4. Only quantitative factors are used to evaluate the investment portfolio attractiveness in the research. However, changes in the financial markets are not only determined by quantitative factors, but also by qualitative factors such as political decisions, wars, expectations, emotions, etc. Further research can be expanded by identifying, analyzing and incorporating qualitative factors into the investment portfolio formation strategy.

Approval and dissemination of the research results.

The results of the research have been presented in reviewed publications:

1. Brazauskas M. (2015). Low Investment Risk Anomaly: A Case of Warsaw Stock Exchange. *Lithuania universities young researchers of management and economic conferences publications*, No 18, 47–54, ISSN 1822-6736.
2. Brazauskas M., Cibulskienė D. (2016). A Theoretical approach to quantitative downside risk measurement methods. *Central and Eastern European Journal of Management and Economics*, Vol. 4, No. 2, 105–123.
3. Brazauskas M., Cibulskienė D., Tamašauskas M. (2016). Comparative Analysis of Quantitative Risk-Adjusted Performance Measurement Methods. *Economics and Management: Current Issues and Perspectives*, 1 (38), 6–14, ISSN 1648-9098.
4. Brazauskas M. (2016). Alternative Risk Measurement Methods: Theoretical Aspects of the Margin of Safety. *Social Research*, Vol. 39 (1), 5–12, ISSN 1392-3110.
5. Brazauskas M., Cibulskienė D. (2017). Decision-making of the investment portfolio applying intermarket analysis. *Scientific papers of the university of Pardubice*, Series D, No. 40 (2/2017), Vol. XXIV, 16–26, ISSN 1804-8048, indexed in Scopus.

In other not reviewed publications:

1. Low volatility anomaly (2017, http://www.investavimas.lt/mazo-kintamumo-anomalija/).
2. When everything is too good in stock market, that it would end well (2017, http://www.investavimas.lt/kai-akciju-rinkose-viskas-per-grazu-kad-baigtusi-gerai/).
3. Intermarket analysis. What promises financial markets (2018, http://www.investavimas.lt/tarprinkine-analize-ka-zada-finansu-rinkos/).

In conference presentations:

1. 2015, Low Investment Risk Anomaly: A Case of Warsaw Stock Exchange. 18th Republican PhD and Master Students' Scientific Conference, Kaunas.
2. 2015, Security Analysis: Margin of Safety. 15th international scientific conference named after Ernestas Galvanauskas, Šiauliai.
3. 2016, Decision-making of the investment portfolio applying intermarket analysis. 16th international scientific conference named after Ernestas Galvanauskas, Šiauliai.

SANTRAUKA

Tyrimo aktualumas. Investicijų valdymas yra ne tik svarbi ekonomikos dalis, tai sudėtinga verslo šaka ir galimybė smulkiesiems investuotojams padidinti gaunamas pajamas. Investicijos prisideda prie ekonomikos augimo, inovacijų, naujų technologijų kūrimo, socialinės gerovės, gamtos apsaugos ir kitų veiksnių. Vyrauja daugybė investavimo galimybių, kurios sukuria vertę, tačiau ne visi siūlomi sprendimai yra pelningi arba atitinka investuotojų interesus. Investuotojų asmeninės savybės, poreikiai, interesai nulėmė, kad rinkoje vyrauja daugybė investavimo strategijų ir galimybių.

Moderni investicinio portfelio teorija yra pagrįsta turto alokacijos sprendimų taikymu investicinio portfelio formavimo procese. Analizuojamos įvairios turto alokacijos strategijos, kai investicijos išskaidomos tarp skirtinguose sektoriuose veikiančių įmonių, skirtingų turto klasių, įvairių šalių, žemynų ir kt. Sparti globalizacija ir finansų rinkų plėtra suteikė investuotojams galimybę greitai, nesudėtingai ir pigiai pritaikyti investicinio portfelio sprendimams pagrįsti įvairias turto alokacijos strategijas. Šiuolaikinės finansų rinkos pasižymi glaudumu, duomenų kiekiu ir neapibrėžtumu. Įvairios sąjungos, prekybiniai ryšiai, laisva prekyba nulėmė, kad finansų rinkos tapo smarkiai susijusios tarpusavyje. Tai atsispindi ir kylančiose finansų krizėse: ankstesnės finansų krizės apimdavo vieną šalį, jos kaimynes ar tik tam tikrą regioną, o 2008 m. kilusi finansų krizė pasižymėjo savo globalumu. Internetui tampant vis svarbesniam mūsų gyvenime, be jo neapsieina ir prekyba finansų rinkose. Didėjanti prekyba internetu skatina spartų duomenų didėjimą, o tai lemia vis didesnius kaštus, skiriamus duomenų analizei. Investiciniai objektai dažniausiai analizuojami naudojant kiekybinius veiksnius, tačiau dažnai neapibrėžtumą rinkose sukelia politiniai ar kiti įvykiai, kurie apibrėžiami kaip kokybiniai ir sunkiai identifikuojami. Šie veiksniai lemia atitinkamus investicijų valdytojų sprendimus.

Šiuolaikinėje finansų teorijoje investicijos dažniausiai vertinamos atsižvelgiant į jų grąžą ir riziką. Moderni investicinio portfelio teorija remiasi prielaida, kad investuotojai, optimizuodami savo portfelį, siekia kuo didesnės grąžos ir mažesnės rizikos. Taigi rizika yra ne tik aktuali tyrimų kryptis, bet ir vienas iš svarbiausių veiksnių vertinant investicinių fondų, akcijų ir kitų turto klasių rezultatus ir efektyvumą. Mokslinių tyrimų krypčių įvairovė, kapitalo rinkų, investicinių fondų plėtra lėmė tai, kad analizuojama gana daug ir įvairių rizikos vertinimo rodiklių. Plačiausiai naudojami kiekybiniai investicinės rizikos vertinimo rodikliai, kurie remiasi istoriniu kainų kintamumu. Istorinių duomenų naudojimas netiksliai atspindi esamą ir planuojamą investicinę riziką. Todėl šiuos metodus svarbu suderinti su kiekybiniais investicinės rizikos vertinimo ro-

dikliais, kurie remiasi fundamentaliais rodikliais. Fundamentalių rodiklių nauda investicinio portfelio efektyvumui ir rizikai yra įrodyta moksliniais tyrimais. Šių rodiklių sinergija gali padėti efektyviai valdyti investicinio portfelio riziką ir sumažinti nuostolius išaugus rinkos nepastovumui.

Efektyvus rizikos valdymas yra viena iš pagrindinių finansinių institucijų sėkmės priežasčių. Netinkamas rizikos vertinimas ir metodikų parinkimas padidina finansinių institucijų nuostolių, nemokumo ar kitų problemų tikimybę, tai savo ruožtu lemia kitų finansinių institucijų nuostolius. Finansų rinkų griūtis lemia didelius nuostolius tiek investuotojams, tiek valstybei, kuri yra priversta įsikišti naudojant mokesčių mokėtojų lėšas. Pasikartojančios pasaulinės finansų krizės parodo finansų sistemos tvarumo silpnumą. Netinkamai įvertinus riziką, nuostolių patiria ne tik investuotojai ir bankai, bet ir mokesčių mokėtojai.

Atsižvelgiant į atliktus tyrimus, investicinei rizikai vertinti dažniausiai naudojami istoriniais kainų kintamumo duomenimis paremti rodikliai. Tačiau norint efektyviai įvertinti investicinę riziką būtina atsižvelgti ne tik į analizuojamus istorinius kainų kintamumo duomenis, bet ir į fundamentalius, techninius, politinius, socialinius ir kitus veiksnius. Egzistuojantis tokių veiksnių įtraukimo į investicinės rizikos vertinimą poreikis suformuoja teoriškai pagrįsto ir empiriškai patikrinto modelio sudarymo poreikį. Pagrindus istoriniais kainų kintamumo duomenimis paremtų ir fundamentalių investicinės rizikos vertinimo rodiklių sinergiją, toks modelis leistų sumažinti investicijų riziką ir padidinti efektyvumą.

Problemos ištirtumo lygis. Analizuojamos įvairios strategijos, skirtos investicinio portfelio formavimo sprendimams pagrįsti: fundamentalia analize paremtos strategijos padeda įvertinti įmonių vertę, atsižvelgiant į jų pateikiamas finansines ataskaitas (Graham, 1974; Anderson, Brooks, 2006; Damodaran, 2012; Singh, Kaur, 2013), o technine analize paremtos – įvertinti kainų tendencijas rinkoje (Murphy, 1991; Murphy, 2004). Vienas iš svarbiausių investuotojų priimamų sprendimų yra investicinio portfelio turto alokacija (Brown, Garlappi, Tiu, 2010). Analizuojamos skirtingos turto alokacijos rūšys: strateginė turto alokacija (Brinson ir kt., 1986, 1991, 1995; Anson, 2004; Basak, Makarov, 2014; Blitz, Groot, 2014), dinaminė turto alokacija (Schröder, 2013; Xiong, Sullivan, Wang, 2013; Harman ir kt., 2014; Cardinale, Navone, Pioch, 2014; Almadi, Rapach, Suri, 2014), taktinė turto alokacija (Jensen, Johnson, Mercer, 2002; Blitz, Vliet, 2008; Kidd, 2014; Macijauskas, 2015). Išskaidant investicinį portfelį svarbus ne tik strategijos pasirinkimas, bet ir tinkamų turto klasių įtraukimas į investicinį portfelį. Analizuojamos ir testuojamos įvairios investicijų išskaidymo strategijos. Paprasčiausia strategija, kai investicijos išskaidomos tarp skirtingų sektorių, akcijų indeksų ar sektorių indeksų (Markowitz, 1952; Mohamad ir kt., 2006; Goetzmann, Kumar, 2008; Nanda ir kt., 2010). Taip pat analizuojama turto alokacija tarp skirtingų šalių (Lessard, 1973; Campbell ir kt., 2010; Asness ir kt., 2011; Mushtaq, Shah, 2014; Abid ir kt., 2014), tarp akcijų

ir obligacijų (Hui ir kt., 2006; Cardinale ir kt., 2014), papildomai į investicinį portfelį įtraukiant nekilnojamąjį turtą (Conover, Friday, Sirmans, 2002; Bivainis, Volodzkienė, 2008; Bikas, Laurinavičius, 2009; Brounen, Prado, Verbeek, 2010; Žilinskij, 2012), valiutas, metalus, žaliavas, tauriuosius metalus (Žilinskij, 2012; Bansal, Kumar, Verma, 2014; Geczy, 2014; Cibulskienė, Brazauskas, 2014; Macijauskas, 2015). Investicinio portfelio formavimui įtraukiamos ir labiau egzotinės, tačiau mažiau likvidžios investicijos. Kaip potencialios investavimo priemonės įvardijami meno kūriniai, vynas, smuikai (Worthington, Higgs, 2004; Raškinis, Zigmantienė, 2008; Campbell, 2008; Masset, Henderson, 2009; Jurevičienė, Savičenko, 2012; Jurevičienė, Jakavonytė, 2015).

Turto alokacija yra neatsiejama investicinio portfelio valdymo dalis. Šios strategijos populiarumą lemia ne tik noras investuoti į egzotinius investicinius instrumentus ir turto klases ar poreikis sumažinti investicinę riziką. Svarbus veiksnys, lemiantis šios strategijos populiarumą, yra skirtingų turto klasių specifinės savybės ir jų tarpusavio ryšiai. Atlikti tyrimai parodė, kad akcijų rinka yra susijusi su obligacijomis (Stivers, Sun, 2002; Murphy, 2004; Patoda, Jain, 2012), auksu (Chiang ir kt., 2013), prekėmis (Creti ir kt., 2012; Lombardi, Ravazzolo, 2013), valiutomis (Francis ir kt., 2006; Fahami ir kt., 2014; Valls, Chuliá, 2014). Taip pat tarpusavyje susijusios obligacijos ir prekės (Murphy, 1991), obligacijos ir valiutos (Gagnon, 2005), prekės ir valiutos (Sujit, Kumar, 2011; Tse, Zhao, 2011). Finansų rinkos yra glaudžiai susijusios ne tik tarpusavyje, bet ir su verslo ciklais (Murphy, 2004). Atlikti tyrimai dažniausiai yra orientuoti į skirtingų turto klasių poveikį viena kitai, įvairių turto klasių derinimą investiciniame portfelyje, optimalios portfelio sudėties paiešką. Tačiau mažai dėmesio skiriama finansų rinkų tarpusavio ryšių bei ryšių su verslo ciklais panaudojimui investiciniams sprendimams pagrįsti. Tyrimuose turto alokacija analizuojama kaip investicijų išskaidymas tarp pasirinktų turto klasių, tačiau stokojama gilesnio požiūrio į skirtingas turto klases ir atitinkamai turto klasei priklausančių aktyvų atranką.

Investicinio portfelio sprendimams pagrįsti naudojama ne tik turto alokacijos strategija. Turto alokacijos sprendimai derinami kartu su inertiškumo ir vertės investavimo strategijomis (Blitz, Vliet, 2008), inertiškumo ir mažo kintamumo strategijomis (Blitz, Groot, 2014). Pastaruoju metu vis plačiau analizuojamos investicinio portfelio formavimo strategijos, paremtos tik finansinio turto rizika (Clarke, Silva, Thorley, 2013; Idzorek, Kowara, 2013; Guilleminot, Ohana, Ohana, 2014; Garcia-Feijóo, Kochard, Sullivan, Wang, 2015). Finansinio turto rizikos vertinimas yra svarbi investicinio portfelio formavimo strategijos dalis. H. Markowitz (1952) pasiūlytas optimalaus investicinio portfelio formavimo metodas, atsižvelgiant į grąžą ir riziką, tapo modernios portfelio teorijos pagrindu. Atlikti tyrimai patvirtina teigiamą rizikos ir grąžos ryšį (Black, Jensen, Scholes, 1972; Citak, 2007; Chambers, Sezgin, Karaaslan, 2013). Tačiau

pastaruoju metu daugėja mokslinių tyrimų, kurie patvirtina neigiamą rizikos ir grąžos ryšį ne tik akcijų rinkoje (Kuo, Li, 2013; Chow, Hsu, Kuo, Li, 2014; Goldberg, Leshem, Geddes, 2014), bet ir obligacijų rinkoje (Altman, Gonzalez-Heres, Chen, Shin, 2014; Carvalho, Dugnolle, Lu, Moulin 2014). Tyrimų rezultatai parodo, kad nėra bendros nuomonės dėl rizikos ir grąžos ryšio. Toks tyrimų rezultatų neatitikimas patvirtina rinkoje egzistuojančią mažo kintamumo anomaliją, kuri pritraukia ne tik tyrėjų, bet ir investuotojų dėmesį. Atliekami tyrimai apsiriboja mažo kintamumo anomalijos testavimu naudojant tik kainų svyravimus įvertinančius rodiklius, rečiau analizuojant šios anomalijos sinergiją su kitomis investicinio portfelio valdymo strategijomis. Paplitęs šios strategijos taikymas skatina ieškoti šios anomalijos panaudojimo galimybių derinant su kitomis strategijomis.

Finansų rinkose egzistuoja daugybė anomalijų: sausio mėnesio efektas, susijungimų arbitražo efektas, dydžio efektas, vertės efektas ir kt. (Kartašova, 2012). Plačiai yra analizuojamas vertės efektas. Tyrėjai nagrinėja įvairių fundamentalių rodiklių poveikį akcijų kainoms: akcijos kainos ir buhalterinės vertės santykio (Fama, French, 1992; Kucko, 2007; Penman, Richardson, Tuna, 2007), akcijos kainos ir pelno santykio (Anderson, Brooks, 2006; Kelly, McClean, McNamara, 2008; Truong 2009), akcijos kainos ir trumpalaikio turto santykio (Bildersee, Cheh, Zutshi, 1993; Xiao, Arnold, 2008; Singh, Kaur, 2013) ir kt. Tyrimai patvirtina, kad vertės investavimo principų taikymas padeda pasiekti didesnę investicinio portfelio grąžą. Vertės investavimo strategijos ir mažo kintamumo anomalijos teoriniai taikymo principai yra panašūs. Naudojant šias strategijas siekiama atrinkti nerizikingus aktyvus, kurie pasiektų didesnę nei rinkos grąžą. Tačiau tyrimai nepatvirtina vertės investavimo strategijos poveikio investicinio portfelio rizikai, t. y. ši strategija padeda pasiekti didesnę grąžą, tačiau neužtikrina mažos rinkos rizikos. Atliekamuose tyrimuose mažai analizuojama vertės ir mažo kintamumo anomalijų strategijų sinergija.

Mokslinėje literatūroje atkreipiamas tyrėjų dėmesys į tokias svarbias investicinio portfelio valdymo problemas: kaip efektyviai išskaidyti investicinį portfelį; kokia optimali išskaidyto investicinio portfelio sudėtis; kaip investuotojų elgsena padeda priimti efektyvesnius turto alokacijos sprendimus; kaip turto alokacija padeda apsisaugoti nuo rizikos ir netekčių galimybių; kaip optimizuoti ryšį tarp siekiamo uždirbti pelno ir prisiimamos rizikos; kaip investicinio portfelio grąža priklauso nuo prisiimamos rizikos; kaip tinkamai suvaldyti ir įvertinti riziką ir kt. Tyrimuose diskutuojama dėl efektyvių turto alokacijos sprendimų, investicinės rizikos valdymo, tinkamų metodų parinkimo ir taikymo praktikoje, efektyvių investicinio portfelio valdymo sprendimų. Ši išskaidyto investicinio portfelio valdymo problema yra aktuali tiek teoriniu, tiek praktiniu požiūriu, jos sprendimui ir bus skirtas šis disertacinis darbas.

Tyrimo problema – kokios yra investicinio portfelio formavimo teorinės prielaidos, taikant turto alokacijos strategijas, ir kaip priimti efektyvius investicinio portfelio formavimo sprendimus?

Tyrimo objektas – investicinio portfelio formavimo sprendimai.

Tyrimo tikslas – išnagrinėjus investicinio portfelio formavimo ir turto alokacijos teorinius aspektus, sudaryti investicinio portfelio formavimo modelį, pagrįstą vertės ir mažo kintamumo anomalijų sinergija, ir jį empiriškai patikrinti.

Tyrimo uždaviniai:

1. Išanalizuoti mokslinėje literatūroje pristatomus investicinio turto alokacijos sprendimus.
2. Apibendrinti mokslinėje literatūroje pateikiamus akcijų patrauklumo ir rizikos vertinimo metodus bei rodiklius.
3. Identifikuoti investicinio portfelio formavimo strategijoje naudojamus modelius.
4. Sudaryti turto alokacijos strategija grįsto investicinio portfelio formavimo modelį.
5. Empiriškai patikrinti turto alokacija grįsto investicinio portfelio formavimo modelį.

Metodai. Disertacijos tikslui ir keliamiems uždaviniams pasiekti darbe taikomi tokie metodai: literatūros analizei – mokslinių šaltinių analizė, sintezė, apibendrinimas; duomenų rinkimui, apibendrinimui ir modelio sudarymui – koreliacinė analizė, matematinis ir statistinis apdorojimas, grafinis vaizdavimas ir lyginimas, daugiakriteris vertinimas.

Darbo mokslinį naujumą nusakantys rezultatai:

- Atskleidus tyrėjų požiūrį į turto alokacijos sprendimus, disertacijoje pateikiama strategija, paremta skirtingų turto klasių sąveika su verslo ciklais, norint sumažinti investicinio portfelio riziką ir siekiant priimtinos investuotojams grąžos. Šiuolaikinės technologijos keičia investuotojų požiūrį į investicinio portfelio alokaciją. Mokslininkų siūlomi optimalūs investicinių portfelių išskaidymo sprendimai tarp 20–50 skirtingų aktyvų tampa nepriimtini, kai šiuolaikinės technologijos suteikia galimybes investuoti į visą rinką tiek pasaulio, tiek atskirų šalių mastu, suteikiamos galimybės investuoti į skirtingas įmonių veiklos sritis, technologijų rūšis, prekes, žaliavas ir t. t. Apibrėžta optimali investicinio portfelio sudėtis tampa nepatraukli ne tik dėl greitai besikeičiančios finansų rinkų situacijos, tačiau ir dėl apribojimų investuoti ne tik į pavienius aktyvus, bet ir į visą rinką ar sektorių.
- Remiantis atliktais tyrimais, pateikiami tyrėjų požiūriai į turto alokaciją ne tik plačiąja prasme, kai analizuojamos skirtingos turto klasės, tačiau ir siaurąja prasme, vertinant akcijų patrauklumą. Identifikuojami naudoti turto klasių, akcijų atrankos, rizikos vertinimo rodikliai ir jų taikymo problemos vertinant aktyvų patrauklumą. Nustatyta, kad rinkos rizikos vertinimo ro-

diklių ir fundamentalių rodiklių sinergija turi įtakos investicinio portfelio efektyvumui. Sudarytas modelis paremtas tarprinkinės analizės, modernios portfelio teorijos, vertės investavimo koncepcijomis. Plėtojamo modelio universalumas leidžia į jį įtraukti papildomų turto klasių (pvz., obligacijų, prekių, valiutų ar kt.) aktyvų analizę. Taip sudaromas pilnas modelis, kuris įvertina skirtingų turto klasių ir individualių turto klasių aktyvų patrauklumą ir riziką.

- Disertacijoje, remiantis mokslinių tyrimų duomenimis, apibendrintai pateikti teoriniai ir praktiniai investicinės rizikos vertinimo rodikliai, kurie įvertina skirtingas rinkos rizikos rūšis. Atsižvelgiant į tai, sudaryta ir pagrįsta investicinio portfelio formavimo strategija, paremta tik rinkos rizikos vertinimo rodikliais. Nustatyta, kad, naudojant tik riziką įvertinančius rodiklius, galima padidinti investicinio portfelio grąžą ir efektyvumą. Ši metodika padeda įvertinti ne tik plačiai analizuojamą riziką, matuojamą standartiniu nuokrypiu, tačiau ir investuotojų nemėgstamą neigiamą riziką bei ekstremalių kainų pokyčių riziką. Ši strategija gali būti naudojama vertinti rizikai įvairiose finansų rinkose.

Darbo praktinį reikšmingumą nusakantys rezultatai:

- Sudarytame investicinio portfelio formavimo modelyje integruoti skirtingo lygmens rodikliai, kurie mokslinėje literatūroje dažniausiai buvo analizuojami atskirai. Sukurtas investicinio portfelio formavimo modelis yra patikrintas keturiose pagrindinėse finansų rinkose: akcijų, obligacijų, prekių, valiutų. Pateikiamas modelis yra universalus, tinkantis investicinio portfelio formavimui įvairiose verslo ciklo stadijose. Kompleksinis investicijų vertinimas apima finansų rinkų patrauklumo vertinimą, rinkos rizikos bei įmonės finansinės situacijos vertinimą. Remdamiesi šiuo modeliu investuotojai gali atrinkti patraukliausias turto klases ir tik tada investuoti į atitinkamus aktyvus.
- Tyrimas apima du skirtingus verslo ciklus. Finansų rinkos ir įmonės, kurių akcijos kotiruojamos biržoje, pasižymi skirtingais rezultatais įvairiose verslo ciklo stadijose. Todėl yra svarbus tyrimo laikotarpio pasirinkimas. Atliktas tyrimas leido realiau vertinti tyrimo rezultatus. Tai lemia didesnį patikimumą siekiant praktiškai pritaikyti tyrimo rezultatus. Tokia duomenų imtis įgalino išvengti tyrimo laikotarpio pasirinkimo klaidos (angl. *time-period bias*). Laikotarpio pasirinkimo klaida pasireiškia, kai pasirenkamas netinkamas periodas tyrimui. Trumpojo laikotarpio tyrimai neatspindi ilgojo laikotarpio tendencijų, tuo tarpu rinkos anomalijas efektyviausia analizuoti naudojant duomenis, kurie apima keletą verslo ciklų.
- 2017 m. pabaigoje JAV akcijų rinkoje susiformavo situacija, kai buvo pasiekta mažiausia per 20 metų VIX indekso reikšmė ir Shiller P/E rodiklis pakilo į antrą vietą pagal brangumą per daugiau nei 120 m. istoriją. Maža VIX

indekso reikšmė atspindi investuotojų ramumą ir optimizmą, tačiau aukšta Shiller P/E rodiklio reikšmė parodo santykinį finansų rinkų brangumą. Susidarius situacijai, kai akcijų rinkos yra perpirktos ir brangios, o investuotojai ramūs ir optimistiškai nusiteikę, svarbu ieškoti efektyvių investicinio portfelio formavimo ir diversifikavimo sprendimų.

- Didelę obligacijų indekso grąžą lėmė palaipsniui mažėjančios palūkanų normos, o dėl paskutinio didžiausių pasaulio valstybių ekonomikų kiekybinio skatinimo sprendimų palūkanų normos buvo sumažintos iki minimalaus ar netgi neigiamo lygio. Obligacijų rinkoje investicinė grąža pasiekiama per obligacijų verčių pokyčius ir obligacijų kuponus. Neigiamos arba artimos nuliui palūkanų normos išsėmė obligacijų rinkos grąžos galimybes, taigi turto alokacijos sprendimai tampa dar aktualesni augant rizikai atskirose turto klasėse.

Tyrimo apribojimai. Atliekant tyrimą analizuojamos keturios pagrindinės turto klasės. Finansinės technologijos suteikia galimybes investuotojams plačiau išskaidyti investicijas. Investuotojai nukreipti lėšas gali ne tik į labiau tradicines turto klases, tokias kaip nekilnojamasis turtas, meno kūriniai, vynas, viskis, tačiau ir į naujesnes bei vis populiarėjančias turto klases: kriptovaliutas, tarpusavio skolinimo platformas ir kt. Pasirinkta strategija ir tyrimas apriboja šio modelio patrauklumą investuotojams, tačiau pasiūlytas modelis nėra apribotas tik pasirinktomis strategijomis, todėl, atlikus papildomus tyrimus, galima įtraukti daugiau turto klasių į investicinio portfelio formavimo strategiją.

Pasirinktos aktyvų patrauklumo vertinimo strategijos apsiriboja tik dalimi investicijų pasaulyje naudojamų kiekybinių veiksnių ir visiškai nenaudoja kokybinių veiksnių. Atlikta analizė parodė, kad naudojamos strategijos padidina investicinio portfelio efektyvumą, nepriklausomai nuo verslo ciklo stadijos ar netgi nuo taikomos pasyvios ar aktyvios strategijos. Vertybinių popierių kainas taip pat veikia rinkos sentimentai, socialiniai, politiniai veiksniai, todėl nors šie veiksniai neįtraukti į naudojamą modelį, tačiau pasirinka strategija, kai taikomas kompleksinis aktyvų patrauklumo vertinimas, suteikia galimybę į modelį įtraukti kokybinius veiksnius.

Vienas iš atlikto tyrimo apribojimų yra duomenų atranka. Duomenų atrankos klaida (angl. *Sample selection bias*) pasireiškia, kai duomenų analizei pasirenkamos tik egzistuojančios ir veikiančios įmonės. Tyrime neįtraukiamos įmonės, kurios bankrutavo, susijungė ar kitaip buvo pašalintos iš indekso ar pasirinktos duomenų imties. Tokia duomenų atranka padeda efektyviau atlikti tyrimą, greičiau apdoroti duomenis. Tačiau apdorota duomenų imtis nevisiškai atitinka investuotojų lūkesčius ir poreikius. Investuojant nėra žinoma, kurios įmonės susijungs, bankrutuos ar kitaip nutrauks veiklą.

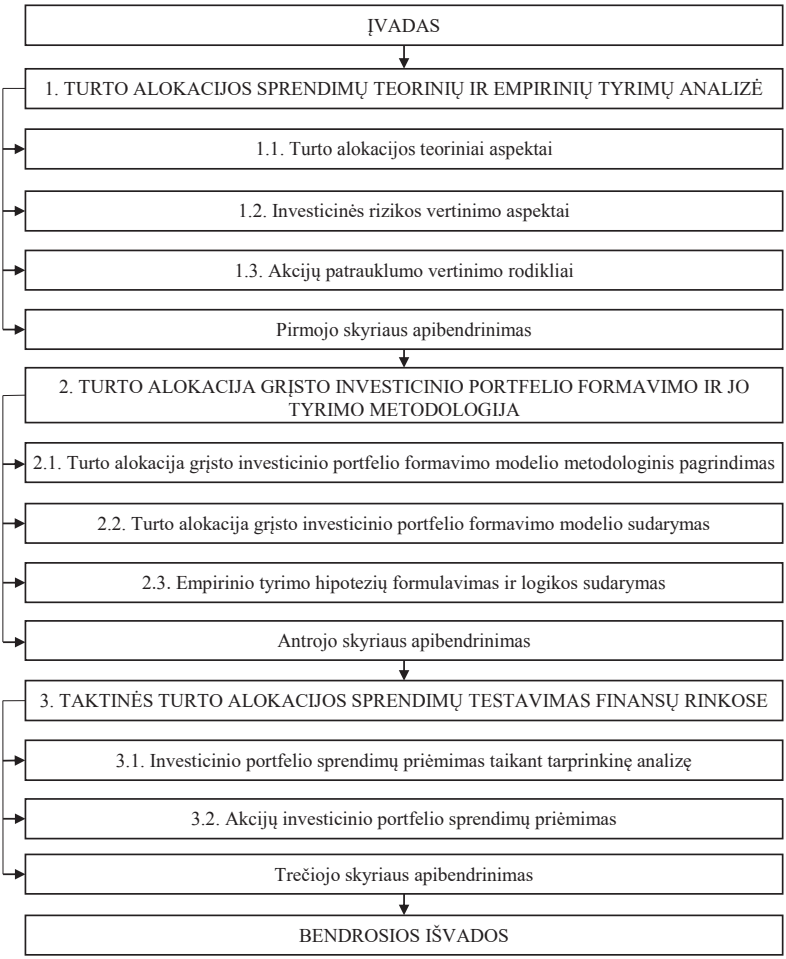
Šiame tyrime investiciniam portfeliui formuoti pagal fundamentaliąją analizę yra naudojami duomenys, kurie pateikiami finansinėse ataskaitose. Empiriniuose tyrimuose pasitaiko duomenų interpretacijos klaidų, kai formuojant investicinį portfelį naudojami duomenys, kurie tuo metu nebuvo žinomi rinkai. Žiūrėjimo į ateitį klaida (angl. *Look-ahead bias*) pasireiškia, kai naudojami duomenys, kurie tuo metu rinkoje neegzistuoja. Pavyzdžiui, naudojant finansinius įmonių duomenis ir investicinį portfelį formuojant kiekvienų metų pradžioje, neatsižvelgiama į tai, kad finansinių duomenų už praėjusius metus paskelbimas užtrunka iki dviejų mėnesių, todėl metų pradžioje esanti rinkos kaina neatspindi šių duomenų. Tyrime naudojami jau apskaičiuoti fundamentalūs rodikliai, kurie paimti iš *Bloomberg* duomenų bazės. Tyrimas atliekamas su rinkoje egzistavusiais fundamentaliais rodikliais, tačiau investicinio portfelio formavimui naudojami ne finansinių metų rezultatai.

Darbo struktūra ir apimtis

Disertaciją sudaro įvadas, trys skyriai, bendrosios išvados, literatūros sąrašas ir 4 priedai. Darbo apimtis – 146 puslapiai, 27 paveikslėliai, 28 lentelės, 12 formulių. Disertacijoje panaudota 309 literatūros šaltiniai.

Pirmajame disertacijos skyriuje sprendžiami du uždaviniai. Šiame skyriuje nagrinėjami ir apibendrinami pagrindiniai teoriniai investicinio portfelio turto alokacijos, rinkos rizikos vertinimo, vertės investavimo aspektai. Pristatomi skirtingų tyrėjų požiūriai į turto alokaciją, rizikos vertinimą, akcijų patrauklumo vertinimą. Antrajame skyriuje sprendžiami trečiasis ir ketvirtasis uždaviniai. Šiame skyriuje atliekamas investicinio portfelio formavimo, taikant turto alokacijos strategiją, modelio sudarymas, pristatomas empirinio tyrimo pagrindimas. Trečiajame skyriuje sprendžiamas penktasis uždavinys. Atliekamas empirinis tyrimas susideda iš šešių dalių. Kiekvienoje dalyje testuojama skirtinga investicinio portfelio formavimo strategija.

Disertacijos loginė struktūra paremta suformuluotos mokslinės problemos sprendimu ir nuosekliu suformuotų uždavinių įgyvendinimu (žr. 11 pav.).



11 pav. Disertacijos loginė struktūra

BENDROSIOS IŠVADOS

1. Atlikta mokslinės literatūros analizė parodė, kad turto alokacija yra svarbus veiksnys siekiant sumažinti investicinio portfelio riziką ir padidinti jo efektyvumą. Analizuojamos įvairios turto alokacijos galimybės, siūloma į investicinį portfelį įtraukti įvairių šalių ar sektorių akcijas, obligacijas, prekes, žaliavas, valiutas, nekilnojamąjį turtą bei įvairias alternatyvias investicijas, tokias kaip meno kūriniai, monetos, vynas, viskis ir kt. Didelis investicinių objektų pasirinkimas leidžia patenkinti įvairius investuotojų poreikius ir suteikia galimybes efektyviau išskaidyti investicinį portfelį. Atlikus mokslinių tyrimų, tiriančių finansų rinkas, analizę, nustatyta, kad finansų rinkas sieja glaudūs ryšiai. Finansų rinkos kaip ir ekonomika gyvuoja cikliškai, tačiau skirtingais verslo ciklo laikotarpiais jos kinta skirtingomis kryptimis. Skirtingose verslo ciklo fazėse finansų rinkos pasižymi skirtingomis savybėmis, tai lemia skirtingų finansų rinkų dominavimą. Nustatyta, kad siekiant įvertinti finansų rinkų tarpusavio patrauklumą yra atliekama tarprinkinė analizė.

2. Išanalizavus mokslinę literatūrą investicijų rizikos vertinimo tema nustatyta, kad rizika yra vienas iš svarbiausių veiksnių, kurie yra analizuojami siekiant efektyviai vykdyti veiklą. Kylanti rizika priklauso nuo analizuojamo objekto, jo savybių, investuotojo įgūdžių ir patirties. Tyrėjai analizuoja ir kuria įvairius rizikos vertinimo metodus ir rodiklius, kurie padeda įvertinti investicinių fondų ar atskirų turto klasių rizikingumą. Juos galima suskirstyti į simetrinius, uodegų, nuosmukio ir neigiamą riziką įvertinančius bei alternatyvius ir metodikas, pakoreguotas pagal riziką. Metodikos, pakoreguotos pagal riziką, skirstomos į besiremiančias CAPM modeliu ir RAROC metodikas. Išanalizavus literatūrą, analizuojančią ryšius tarp rizikos ir grąžos, paaiškėjo, kad tyrėjai neturi bendros nuomonės, koks ryšys sieja grąžą ir prisiimamą riziką. Vieni tyrėjai patvirtina tiesioginį ryšį tarp prisiimamos rizikos ir grąžos ir teigia, kad didesnę grąžą galima pasiekti tik prisiimant didesnę riziką. Kiti tyrėjai empiriniais tyrimais patvirtina mažo kintamumo anomaliją, kuri apibrėžia atvirkštinį ryšį tarp grąžos ir rizikos. Dalis tyrėjų, priklausomai nuo laiko periodų, nustato ir tiesioginį, ir atvirkštinį ryšį.

Atlikta literatūros ir empirinių tyrimų analizė parodė, kad vykdant akcijų atranką svarbi fundamentalioji analizė. Fundamentalių rodiklių naudojimas ilguoju laikotarpiu padeda įvertinti įmonės riziką, padidinti investicijos grąžą ir investicinio portfelio efektyvumą. Akcijų patrauklumui įvertinti naudojami rodikliai, įvertinantys įmonės likvidumą, mokumą, pelningumą, santykinį pigumą pelno ir buhalterinės vertės atžvilgiu. Akcijų patrauklumas vertinamas taikant vertės investavimo strategiją. Vertės investuotojai ieško tikrosios įmonės vertės, tačiau rinkos pasižymi nepastovumu, todėl investuotojai privalo reikalauti

saugumo ribos kiekvienai investicijai, kurią jie atlieka. Saugumo riba padeda išvengti nuostolių, kylančių dėl žmogiškųjų klaidų, nesėkmių, kintamumo ar nenuspėjamo ir greitai besikeičiančio pasaulio.

3. Apibendrinus tarprinkinės analizės problematiką, tyrėjų atliktų empirinių tyrimų rezultatus, nustatyta, kad finansų rinkas sieja įvairūs ryšiai. Nustatyta, kad, spręsdami finansų rinkų patrauklumo vertinimo problemą, tyrėjai analizuoja santykinius finansų rinkų rodiklius. Skirtingose verslo ciklo fazėse finansų rinkos juda skirtingu tempu ar kryptimi. Tai lemia vienų finansų rinkų patrauklumą kitų atžvilgiu. Atsižvelgiant į tai, naudojant santykinius rodiklius, kiekvienos finansų rinkos patrauklumas yra įvertinamas visų analizuojamų finansų rinkų atžvilgiu.

Remiantis analizuojama teorija ir empirinių tyrimų rezultatais, atrinkti rinkos rizikos vertinimo rodikliai. Akcijų rinkos rizikai įvertinti analizuojami kainų kintamumu paremti rodikliai, kurie atspindi keturias pagrindines rinkos rizikos rūšis: simetrinę riziką, uodegų riziką, neigiamą riziką, nuosmukio riziką. Sudarytame investicinio portfelio formavimo modelyje daug dėmesio skiriama investuotojų nemėgstamos rizikos vertinimui, todėl pasiūlytas kompleksinis rinkos rizikos vertinimo rodiklis, kuriame trys iš keturių rodiklių yra skirti dėl neigiamų kainų pokyčių kylančiai rizikai įvertinti. Remiantis šiais rodikliais atliekamas akcijų rizikos ir investicinio patrauklumo vertinimas naudojant daugiakriterį metodą – geometrinį vidurkį.

Apibendrinus empirinius tyrimus, modelyje akcijų patrauklumui vertinti naudojami penki fundamentalūs rodikliai, kurie atspindi skirtingas fundamentalių rodiklių grupes. Akcijų patrauklumas įvertinamas naudojant rodiklius, atspindinčius įmonės likvidumą, mokumą, pelningumą bei santykinį pigumą. Identifikuota, kad pelningumo ir mokumo rodikliai yra maksimizuojantys, o likvidumo ir santykinio pigumo rodikliai – minimizuojantys. Remiantis šiais rodikliais atliekamas akcijų patrauklumo vertinimas naudojant daugiakriterį metodą COPRAS.

4. Siekiant išspręsti disertacijoje iškeltą problemą ir numatytus uždavinius, sukurtas investicinio portfelio formavimo modelis. Modelis yra sudarytas iš dviejų dalių. Pirmoji dalis remiasi finansų rinkų analize, tarprinkine analize, finansų rinkų inertiškumu ir jų tarpusavio patrauklumu. Šiame modelyje finansų rinkų tarpusavio patrauklumas įvertinamas naudojant santykinius rodiklius. Antroji dalis remiasi akcijų patrauklumo vertinimu naudojant fundamentalius rodiklius ir rinkos rizikos vertinimo rodiklius. Daugelyje investicinio portfelio analizės tyrimų atliekama arba individualių turto klasių analizė, arba finansų rinkų analizė. Šiame modelyje siūloma taikyti vertybinių popierių analizę, kai finansų rinkų atranka ir akcijų atranka viena kitą papildo. Tarprinkinė analizė padeda nustatyti patrauklias finansų rinkas, o mikrolygmens analizė – akcijų patrauklumą, vertinant pagal įmonės finansinę būklę ir kainų kintamumą. Su-

kurtas modelis pritaikytas empiriniams tyrimams atlikti. Siekiant įvertinti analizuojamų strategijų efektyvumą, išskiriami skirtingi tyrimai, kurie atskirai apima keturias pagrindines finansų rinkas ir atskirai akcijų rinkas. Formuojant investicinį portfelį pagal sudarytą modelį, šie veiksmai negali būti atskiriami. Tiek pasirinkimas tarp finansų rinkų, tiek skirtingų turto klasių rizikos vertinimas yra neatsiejama vieno veiksmo dalis.

5. Pirmoji hipotezė, kuria buvo siekiama įvertinti, ar investicinio portfelio formavimo strategija, atsižvelgiant į finansų rinkų tarpusavio patrauklumą, yra efektyvesnė strategija nei sudarant bazinį investicinį portfelį, pasitvirtino. Investicinių portfelių, sudarytų naudojant tarprinkinę analizę, tyrimų rezultatai parodė nevienareikšmius rezultatus. Skirtingi investicinio portfelio performavimo laikotarpiai atskleidė skirtingas pasirinktų strategijų tendencijas. Rinkų patrauklumu paremta strategija buvo efektyviausia, kai investicinis portfelis buvo pertvarkomas kas metus. Siekiant išnaudoti rinkos patrauklumą reikalingi ilgesni investicinio portfelio išlaikymo laikotarpiai, nes investuojama į atpigusias arba pingančias finansų rinkas. Tyrimas parodė, kad, siekiant pasiekti didesnę grąžą nei palyginamosios strategijos, reikia ilgiau išlaikyti investicinį portfelį, tik tada galima sulaukti trendo pasikeitimo ir teigiamos grąžos. Priešingos tendencijos pastebimos analizuojant inertiškumo strategiją. Taikant šią strategiją investicinio portfelio rezultatai gerėja trumpėjant peržiūros laikotarpiui. Aktyvesnis investicinio portfelio valdymas padeda efektyviau išnaudoti inertiškumo strategiją sekant rinkos tendencijas. Investicinio portfelio peržiūros laikotarpis turėjo nedidelę įtaką baziniams investiciniams portfeliams. Tai parodo, kad valdymo aktyvumas neturi tiesioginio poveikio investicinio portfelio rezultatams, tačiau tyrime neįtraukiami pirkimo-pardavimo komisiniai mokesčiai ir kitos sąnaudos. Todėl galima daryti prielaidą, kad ilgesnis investicinio portfelio išlaikymo laikotarpis yra patrauklesnis siekiant investuoti į visas turto klases.

Antroji hipotezė, kuria buvo siekiama įvertinti, ar rizikos vertinimo rodiklių naudojimas yra efektyvi strategija investicinio portfelio sprendimams pagrįsti, pasitvirtino. Investicinių portfelių formavimas naudojant tik rinkos rizikos vertinimo rodiklius yra populiarėjanti ir vis plačiau naudojama strategija. Atliktas tyrimas parodė, kad pagal šią strategiją sudaryti investiciniai portfeliai pasižymėjo didesniu efektyvumu nei palyginamasis S&P 500 indeksas. Investiciniai portfeliai, sudaryti iš aktyvų su maža rizika, pasižymėjo ne tik mažesne rizika nei palyginamasis indeksas, bet ir didesne grąža. Taip pat investiciniai portfeliai, kurių rizika panaši į palyginamojo indekso, pasižymėjo dvigubai didesne vidutine metine grąža. Tai parodo, kad akcijų atranka, remiantis rizikos vertinimo rodikliais, yra efektyvi strategija, padedanti pagerinti investicinio portfelio rezultatus.

Trečioji hipotezė, kuria buvo siekiama patikrinti, ar investicinis portfelis, sudarytas iš maža rizika pasižyminčių akcijų, yra efektyvesnis nei investicinis

portfelis, sudarytas iš rizikingų akcijų, buvo atmesta. Atliekant tyrimą investiciniai portfeliai buvo išskaidomi į decilius, siekiant įvertinti skirtinga rizika pasižyminčių investicinių portfelių efektyvumą. Rizikingiausi investiciniai portfeliai pasižymėjo didesne grąža ir didesniu efektyvumu nei remiantis mažo kintamumo anomalijos strategija sudaryti investiciniai portfeliai. Tai parodo, kad akcijų rinkoje didesnę grąžą galima pasiekti tik prisiimant didesnę riziką.

Ketvirtoji hipotezė, kuria buvo siekiama patikrinti, ar saugumo ribos strategijos taikymas padeda padidinti investicinio portfelio efektyvumą, pasitvirtino. Atliktas tyrimas parodė, kad akcijų patrauklumo vertinimas, naudojant saugumo ribos principus, leido pasiekti didžiausią efektyvumą, tiek lyginant investicinius portfelius tarpusavyje, tiek lyginant su palyginamuoju indeksu. Tai rodo, kad vertės investavimo principai veikia ilguoju laikotarpiu. Atliktas tyrimas atskleidė, kad didžiausiu efektyvumu išsiskiria nepatraukliausias investicinis portfelis, tačiau šio investicinio portfelio pagrindą sudaro informacinių technologijų sektoriaus įmonės. Šio sektoriaus įmonės pasižymėjo didele bankrotų rizika, ypač Dot-Com burbulo metu, bet šiame tyrime naudojamos tik išlikusios ir veiklą vykdančios įmonės. Todėl šiuos rezultatus galima vertinti kaip pagrindą ateities tyrimams, tačiau negalima laikyti pagrindu atmesti darbe iškeltą hipotezę.

Penktoji hipotezė, kuria buvo siekiama patikrinti, ar saugumo ribos ir mažo kintamumo anomalijos strategijų sinergija padeda padidinti investicinio portfelio efektyvumą, buvo atmesta. Atliktas tyrimas parodė, kad efektyvesnė yra didelio kintamumo ir saugumo ribos strategijų sinergija. Ši strategija padėjo atrinkti sparčiai augančias ir mažiau rizikingas įmones. Didžiausiu kintamumu pasižymi sparčiu augimu išsiskiriančios įmonės, tačiau jos gali būti labai rizikingos. Siekiant to išvengti naudojama fundamentalioji analizė, kuri padeda atrinkti pelningas ir rinkoje neįvertintas įmones.

Disertacijoje atlikta analizė ir tyrimai apima tik dalį pasiūlyto investicinio portfelio formavimo modelio. Atsižvelgiant į tai, numatomos tolesnės tyrimų kryptys:

1. Empirinių tyrimų analizė parodė, kad skolos vertybinių popierių rinka yra svarbi investicinio portfelio alokacijos dalis. Ši rinka pasižymi kredito rizika, likvidumo rizika, palūkanų normų rizika, kuri apima kupono reinvestavimo riziką, rinkos kainos riziką, ir kitomis savybėmis. Skirtingos rizikos ir jų savybės reikalauja detalios analizės. Ypač tada, kai rinkoje susiformuoja situacija, kai saugiomis laikomų valstybių, tokių kaip JAV, obligacijų pajamingumas susilygina su komercinių įmonių obligacijų pajamingumu.

Finansų rinkų plėtra suteikia individualiems investuotojams naujų galimybių pasiekti arba tiesiog pakeisti sunkiai prieinamas finansų rinkas. Obligacijų rinka yra brangi ir sunkiai prieinama investuotojams, kurie disponuoja mažomis sumomis. Priklausomai nuo priimtinos rizikos, obligacijos gali būti pakeistos paskolomis. Tarpusavio skolinimo platformos suteikia investuotojams galimybę

dalyvauti skolų rinkoje. Todėl tolesni tyrimai gali būti siejami su skolų rinkos analize, sudarant rizikos vertinimo modelius, priimtinus individualiems investuotojams.

2. Valiutų rinka išsiskiria savo globalumu, likvidumu ir dydžiu. Taigi ši turto klasė yra neatsiejama investicinio portfelio formavimo tyrimų dalis. Šią rinką stipriai veikia politinė ir ekonominė rizika. Taip pat ji neatsiejama nuo rinkos rizikos ir palūkanų normos rizikos. Analizuojant investavimo strategijas, paremtas besivystančių rinkų regionais, svarbu įvertinti valiutų poveikį investicinio portfelio rezultatams. Todėl tolesni tyrimai gali būti siejami su kylančių rizikų valiutų rinkoje identifikavimu ir analize.

3. Tyrėjai atlieka daug empirinių tyrimų ir analizuoja turto alokacijos strategijas įtraukiant prekes į investicinį portfelį. Prekėmis nėra tiesiogiai prekiaujama finansų rinkose, taigi be rinkos rizikos, kyla papildoma išvestinių instrumentų rizika. Prekės dažnai naudojamos paveikti kitoms šalims tiek ekonominiu, tiek politiniu lygmeniu. Todėl tolesni tyrimai gali būti siejami su prekių įtraukimu į investicinį portfelį, detaliau analizuojant ir identifikuojant kylančias rizikas, kurios būtų priimtinos ir nesudėtingai identifikuojamos tiek instituciniams investuotojams, tiek individualiems investuotojams.

4. Patrauklumui įvertinti tyrime naudojami tik kiekybiniai veiksniai. Tačiau finansų rinkų pokyčius lemia ne tik kiekybiniai veiksniai, bet ir kokybiniai veiksniai, tokie kaip politiniai sprendimai, karai, lūkesčiai, emocijos ir kt. Tolesni tyrimai gali būti praplėsti kokybinių veiksnių identifikavimu, analize ir įtraukimu į investicinio portfelio formavimo strategiją.

Rezultatų aprobavimas ir sklaida

Darbo rezultatai pateikti recenzuojamuose leidiniuose:

1. Brazauskas M. (2015). Mažos investicinės rizikos anomalija: Varšuvos vertybinių popierių biržos atvejis. *Lietuvos aukštųjų mokyklų vadybos ir ekonomikos jaunųjų mokslininkų konferencijų darbai*, Nr. 18, 47–54, ISSN 1822-6736.
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1. Mažo kintamumo anomalija (2017, http://www.investavimas.lt/mazo-kintamumo-anomalija/).
2. Kai akcijų rinkose viskas per gražu, kad baigtųsi per gerai (2017, http://www.investavimas.lt/kai-akciju-rinkose-viskas-per-grazu-kad-baigtusi-gerai/).
3. Tarprinkinė analizė. Ką žada finansų rinkos (2018, http://www.investavimas.lt/tarprinkine-analize-ka-zada-finansu-rinkos/).

Pranešimai konferencijose:

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3. Brazauskas M. (2016). Investicinių sprendimų pagrindimas taikant tarprinkinę analizę. 16-oji E. Galvanausko tarptautinė mokslinė konferencija „Regiono konkurencingumo kaitos tendencijos“, Šiauliai.

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