

# EQUITY INVESTMENTS PORTFOLIO RISK IN DIFFERENT STAGES OF BUSINESS CYCLE

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## Abstract

This paper analyzes the stock market dynamics in current business cycle of Lithuania. The research has affirmed that macroeconomic environment has the very strong impact on the share prices of Lithuanian listed companies. The early warning patterns of possible sudden OMXV index decrease were suggested analyzing the changes of companies financial condition and the relative stock market and macroeconomic indicators. The factorial regression model was developed for the support of investments decision making.

Key words: business cycle, investments portfolio, macroeconomics, stock market.

## Introduction

The investments portfolio decision making is usually based on uncertainty. The investors expectations that the financial market instruments in future will behave according to their predictions determine the structure of their portfolio. Furthermore, the expectations of investors mostly are based on the financial instruments behaviour in the past and they assume that the future events can be mostly predicted based on the experience from the past. Risk and expected returns are the two main factors that affect the formation of investments portfolio. Under the common conditions, each of the rational investors in the stock market will consider that his estimation on the intrinsic value is correct. Assuming that the forecast horizon, the attitude toward risk, the available information, the processing of information will be different, most likely these values between the investors will vary. In these conditions, some investors can systematically win, while others can lose consistently. Basically, in these circumstances, the ability of investors to extract the objective information about the stock markets trends makes these markets more efficient. The literature that analyzes the determinants of investment portfolios flows has debated on the relative significance not only of domestic but also of external factors. The domestic factors like the growing stock index, favourable economic conditions and country creditworthiness attract the portfolio flows of residents to the country's financial market. Conversely, the studies have emphasized that factors like decline in interest rates and slowdown in growth of economy stimulate the capital flows to other countries. So, the understanding of common factors that drive the stock market trends is very important to every rational investor.

*The object* of this research is the equity investments portfolio risk.

*The aim* of research is to assess the business cycle impact on Lithuanian stock market.

*The tasks* of research:

- to analyze the main principles of equity investments portfolio management considering the macroeconomic conditions;
- to implement the empirical study evaluating the business cycle fluctuations impact on Lithuanian listed companies share prices.

*The methods* of this research consist of the analysis of scientific literature, NASDAQ OMX BALTIC and Statistics Lithuania data.

The main reason why the combination of stock market data and the business cycle analysis can help investors enhance their profit is that peaks and troughs of shares prices cycle possess a time lead, congruity or lag relationship with the particular macroeconomic indicators. By understanding this rotation the investors can own a more comprehensive picture and be able to see significant market and economic changes earlier than other investors only with a single market focus.

## The principles of investments portfolio management considering macroeconomic factors

The investment portfolio is considered as the set of securities held by investor. One of the most important characteristics of investment portfolio is that it always has a risk and compounding it the investors look for the balance between the expected return and acceptable risk. The securities have the loss related probability which firstly depends on the type of securities and secondly on other factors. Most often risk is associated with unfavorable economical and negative micro environment changes. In investments portfolio management the risk is not associated only with negative results because the investors understand risk as the opportunity for additional return. Investors approach to risk, related to investment to assets, could be defined as assets return deviation from expected return (Bartkus, Palevičienė, 2013). In the actual trade in financial market, rational investors try to choose an appropriate investment portfolio, reducing the investment risks and seeking the higher stability of returns.

Two different methods of financial markets analysis help the investors to make the decisions: the technical and fundamental analysis. In the active investments portfolio management the traders worldwide rely on technical analysis as their main trading tool. In this case the attention is paid on the share prices and stock

indices. Many analytic software and valuable models have been developed to make investments decisions consistent with statistical characteristics of stock prices obtained from actual financial data and the major stock-market indexes as Nasdaq, S&P500, Dow-Jones, etc. (Li, Mei, 2014). On the other hand the Efficient Market Hypothesis suggests that in a market with vast trading volume and virtually non-existent private information about fundamentals, the trading rules based on historical price information should not ascertain the excess profits to traders. In the empirical evidence there are theoretical arguments that the high frequency trading (HFT) can have negative effects. The speed of trading could put slower moving market participants at a disadvantage, leading to adverse selection and reduced market quality. The buy-side investors could struggle to trade large positions, and their speed disadvantage reduces their ability to supply liquidity leading to increased costs. The computer trades are more highly correlated with each other than human trades, indicating that strategies generated by machines are not as diverse as those developed by humans. There is also a possibility of an unproductive arms race developing with HFT institutions competing to be fastest (Manahov, Hudson, Gebka, 2014). According to V. Dragota and E. V. Tilica (2014), in the current investment environment, testing the market efficiency is still important. In recent years, software products have become more efficient, offering investors better instruments for making decisions and possibilities of faster trading, and, as a result, potential greater chances to obtain systematic abnormal earnings. But often the non-objective technical observations can distort the share prices. Also, the information publicly available has increased, providing more details concerning the companies and stock exchanges. For decision makers, a high degree of informational efficiency entails the use of passive portfolio management which involves a lower cost. In addition, if the market is efficient, funds will be allocated to the best performing projects from economic and financial viewpoints. On the other hand, a lower degree of market efficiency implies the possibility of reaching systematic abnormal earnings through the use of active portfolio management (Dragota, Tilica, 2014). Considering the fundamental factors two directions are popular. One stream of studies considers whether returns are predictable using macroeconomic indicators, while the other stream considers financial ratio predictors and, at best, the results are mixed. In addition, often the emerging market risk characteristics are different compared to developed markets. Compared to developed markets, for instance, emerging markets are highly volatile and provide attractive returns. On the issue of predictability of returns the simplest fundamentals, such as earning-price ratio and dividend-price ratio, have reasonable ability to predict the stock returns (Narayan, Narayan, Thuraisamy, 2014).

With the active trading or frequent portfolio rebalancing, the passive management comes from the recognition that individual equity returns are difficult to forecast and trading is not costless. The questionable benefits of active trading are unlikely to outweigh the real costs of changing the portfolio weights. So a buy and hold principle has permeated to the investments funds management services and the financial planning profession. However, the passive approach to investing is often contradicted by human behavior, especially during periods of market turmoil. Behavioral biases sometimes lead investors astray, causing them to shift their portfolio weights in response to significant swings in market indexes, often selling at the low and buying at the high price. On the other hand, some of the investment professionals routinely make use of systematic rules for exiting and re-entering portfolio strategies based on cumulative losses, gains, and other technical indicators (Kaminski, Lo, 2014).

The portfolio selection is concerned with the allocation problem of one's wealth among alternative securities in order to achieve a particular investment goal. The well-known probabilistic mean-variance model originally introduced by Markowitz plays an important role in the development of modern portfolio selection theory. It combines probability theory with optimization techniques to model the behavior investment with some uncertainties. The key principle of the mean-variance model is to use the expected mean of the return as the measurement of investment return and the variance of the return as the measurement of investment risk (Deng, Li, 2014).

N. Maknickienė (2014) has determined the main steps of the investments portfolio assets searching:

- historical data monitoring and the accumulation of experience. Changing of financial market prices is a chaotic process but it has a particular memory: what was in the past effects future. The analysis data selection and the form of evaluation is determined by the chosen method of forecasting;
- future forecasting. It is known big amount of different methods of forecasting, based in different means: arithmetic, geometric, harmonic and its hybrids. Artificial intelligence systems, like neural networks, genetic algorithms, fuzzy systems, expert systems, are also used for forecasting financial markets;
- asset allocation and assessment of reliability. Selection of portfolio elements from different financial and asset markets and dividing the invested funds for all elements with best result is the main aim of each investor. The biggest gain is selecting for a given level of risk or the lowest risk is selecting for a given level of profit.

When the investor is interested not only in domestic stock market but also in foreign markets, R. Garg and P. Dua (2014) maintain that the potential variables used to make the investments decisions and explain portfolio flows are: the domestic stock market performance, domestic economic growth, exchange rate, currency risk, country risk, stock return risk, risk diversification, liquidity, interest rate differences, returns in other markets, capital controls. Developing the statistical decision making models the variety of independent variables can be included into analysis. For example, M. Al Janabi (2014) developed the non-linear dynamic risk function

which can be defined as a vector of the money investments in each asset class, overall trading volume, constrained asset allocation proportions according to contemporary financial market regulations and subject to the imposition of rational and meaningful operational and financial boundaries, risk constraints, correlation coefficients among all asset classes, expected returns of investments, confidence level of estimated parameters under different scenarios and market settings, portfolio manager's choices of a combination of long/short trading asset positions.

The investor's decision making and the ensuing financial performance is also influenced by many psychological factors, including intelligence, the ability to make rational decisions, and personality traits. In particular, the ability to act rationally has received substantial coverage in the literature, mainly because rationality is a central assumption of even the most basic theoretical models in economics and finance. But often the investment biases are affect-heuristics that result from human emotions, which are often at odds with human rationality. Among the most commonly described biases are overconfidence, self-attribution, and the house-money effect. Furthermore, such biases typically result in detrimental financial outcomes because they promote irrational financial choices such as too much trading and taking unnecessary risks (Patterson, Daigler, 2014). Variations in investment policies due to characteristics such as age, wealth, and profession have been examined as well. In fact, individual investors actually trade infrequently and they often shift out of equities after extremely negative asset returns into fixed-income products. In retirement accounts, investors are more prone to exhibit the safe instead of explicit return chasing (Kaminski, Lo, 2014). Empirical studies provide extensive evidence of individual investors making portfolio choices which are difficult to reconcile with standard financial theory. As such, households often fail to participate in the stock market at all. Among those households that invest in equities, many studies document further costly mistakes. First, individuals tend to prefer domestic over foreign investments, thereby foregoing the benefits of international diversification. Second, many households own relatively few individual stocks, which may cause a significant exposure to idiosyncratic risk. Third, data from online brokerage accounts show that many individuals are overconfident and trade too much (Jacobs, Muller, Weber, 2014).

In assets portfolio theory factors causing investments risk are assigned to systematic (non-diversifiable risk) and unsystematic (diversifiable risk). Unsystematic risk can be avoided by the diversification of portfolio. The increase of investment portfolio assets types and numbers reduces unsystematic risk exponentially so general risk decreases too. Diversifiable risk could not be reduced absolutely. Systematic risk cannot be reduced at all (Bartkus, Palevičienė, 2013). The diversification can be used as a constraint in the portfolio construction phase to limit the concentration to individual securities. In particular, a concentrated portfolio corresponds to a large information content because the investors would only choose a very concentrated allocation if their information about future price fluctuations is perfect. Whereas an equally weighted portfolio would indicate low information content as the investors would not invest all the money into the one company's shares if their information about future price fluctuations is poor (Kolm, Tutuncu, Fabozzi, 2014).

According to international finance theory, the foreign portfolio investment flows are an inevitable outcome of investors that want to invest in other countries in order to diversify the risk of their portfolio and achieve higher returns. The developing countries have been making conscious efforts to attract foreign financial capital which increases the abilities to economic growth and financial market development in the host country. Notwithstanding the beneficial impacts of portfolio flows to the investor as well as to the host country, these flows have also been a source of concern. The foreign investor has to take into consideration country and currency risk in addition to other factors compared to investing in the home country (Garg, Dua, 2014). Another group of theories argues that financial crisis spreads from one country to another due to market imperfections or the behaviour of international investors. Information asymmetries make investors more uncertain about the actual economic fundamentals of a country. A crisis in one country may prompt the international investors to reassess the risks in other countries. The uninformed or less informed investors may find it difficult to extract the objective information from the falling stock prices and follow the strategies of better informed investors, generating excess co-movements across the markets. The degree of anticipation of a crisis by investors is crucial for the existence of contagion because of investors' attention allocation. Sudden shifts in market confidence and expectations have been identified as important factors causing contagion (Dungey, Gajurel, 2014). The foreign institutional investors and the finances they provide may also result in stock market gains to domestic investors unrelated to the underlying real economy fundamentals. However, there are risks in attracting such financial flows. For depending upon the economic conditions in their own countries, or opportunities as they arise elsewhere, the foreign institutional investors may withdraw their deposits prematurely. This creates economic distress. Some bailouts may be necessary to protect the system against such consequences (Rao, 2010).

Decomposing a complete business cycle into four phases (expansion, slowdown, recession and recovery) K. Liang and C. Yen (2014) found the different stock market behaviors in each cyclical phase:

- in the expansion phase, the growth rate of the economy is high, with booming investment activities and inflation pressure. Even the stock market would be bullish with huge profit, though it usually peaks at the end of this stage, as increases in interest rates are likely to have an unfavorable effect on stock prices;

- in the slowdown phase, inflation remains high at the beginning of this stage and growth rate starts to deteriorate from its highest level. Profit margins of corporations shrink as economic growth slows down, making the stock market bearish;
- in the recession phase, low inflation rates keep interest rates low and the bond market bullish. However, when nearing the end of this stage, the fall in interest rates helps the stock market, and if the customary early upturn in profits also occurs, investor optimism in stocks is doubly justified even though business activity is still depressed and sliding downward;
- in the recovery phase, stock markets are still bullish, due to improvement of profit and low interest rates.

In sum, the peaks (troughs) of the stock market usually occur at the end of expansion (end of recession phases), which all lead the turning points of the business cycle (Liang, Yen, 2014).

The stock market performance is also supposed to illustrate the condition of the country's economy: if stock prices start to fall economic depression is likely to take place and, conversely, rising stock prices show possible economic growth. Considering the state of the countries' economies it is important to find out what factors influence the fluctuations of stock market indices. D. Pilinkus (2010) developed the model of the impact of macroeconomic indicators on stock market index. It enables to present a complex estimation of causality and dependence of the relation between macroeconomic indicators and stock market index during both short and long runs. The classification of macroeconomic indicators in Lithuania with respect to Granger causality relations and coincidence with stock market index is:

- leading: imports, trade balance, government debt;
- coincident: foreign direct investments;
- lagging: GDP, exports, money supply, short-term interest rates (Pilinkus, 2010).

In addition to money supply effects, M. Ariff, T. Chung and M. Shamsheer (2012) found that a monetary disturbance such as an unexpected increase or decrease in money supply causes disequilibrium in asset portfolios. Investors thus attempt to rebalance their desired money positions as well as other assets when the monetary changes occur in the financial system. The prices of shares are affected by changing expectation of dividends, and the main effect of money supply is on the expected growth rate of dividends. Growth rate of dividends increases when permanent changes in a firm's earnings have occurred through firms undertaking successful projects because of the lower cost of capital when interest rates fall after money supply increases. Thus, the money supply and stock prices are very likely positively related through this channel. Also, the inflation risk is an important factor in the long run of investment. To hedge the inflation risk, in the case of optimal asset allocation with inflation, the treasury inflation protected securities are needed, as the inflation-indexed zero coupon bonds. The evaluation of inflation in the investments decision making often includes the nominal interest rate, real interest rate and the inflation index. The inflation index is also a factor to characterize the connection between the nominal market and the real market (Guan, Liang, 2014).

Modeling the stock market changes W. Yoon and K. Park (2014) classified the economic conditions into three periods according to volatility levels of the stock market: the stable period, the unstable period and the crisis period. Their research was mainly focused on the market instability index that can sub-classify unstable period of stock market into five different levels of risk warning according to the signal strength of instability. This approach allows a closer look and analysis about the nature of unstable periods to foretell how the stock market will proceed in advance. For example, one can interpret the current instability as a one-time event caused by temporary stock market impact that can be stabilized soon, or the serious warning to foretell upcoming financial crisis. Furthermore, proper policy actions can be taken to prepare for the possible financial crisis according to five different risk warning levels of instability during unstable period (Yoon, Park, 2014). In the recent uncertain investments portfolio management it is important to understand the factors that drive portfolio flows. This can help to avoid the imbalances arising out of large inflows and sudden reversal capital crunch. The main purpose of further empirical research is to detect cyclical behaviours of stock market in the business cycle, and find the lead or lag relationships among them. Through the empirical study it will be tried better understand the cyclical sequence in the stock markets. Furthermore, the results will be helpful for investors to know how to enhance their gains by incorporating the cyclical behaviour.

## **Empirical study**

The OMX Vilnius (OMXV) index changes in the period of 2004.01.01 – 2013.06.30 are shown in Figure 1. Considering the beginning of year 2004 as the basic point, the highest increase of OMXV was in 2007.10.08 when the value of index was 59 144 or 339% of the basic value. The lowest point of this graph is the 2009.03.10, when the index was 14 992 and compared to the previous peak point it decreased by 74,7%. According to these most significant peak and trough points the analyzed period can be divided into three main stages of OMXV changes: growth (until 2007.10.08) – decrease (until 2009.03.10) – growth (since 2009.03.10). In parallel to this index the changes of Lithuanian GDP are shown in Figure 1. The highest GDP (near to index peak) of 32,4 billion EUR was in 2008, so this indicator is lagging the index by 1 year.

Similarly the other analyzed four macroeconomic indicators (Figure 2) also lag the index peak by 1 year: in 2008 the highest compensation of employees (CE) was 14,4 billion EUR, exports (EXP) – 19,3 billion

EUR, consumption expenditures of households (CEH) – 21,2 billion EUR and investments (INV) – 8,2 billion EUR.

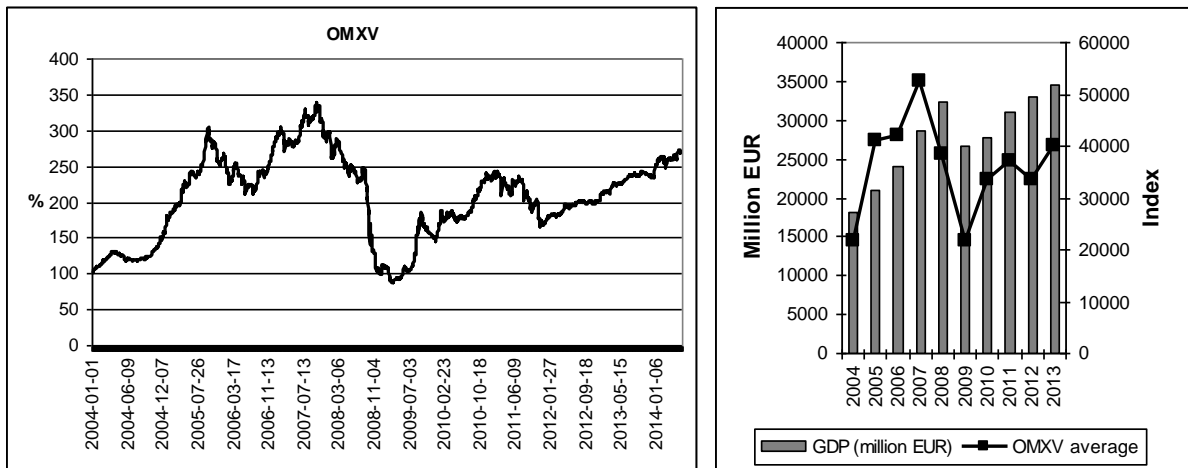


Fig. 1. The OMXV index and GDP in Lithuania (Source: NASDAQ OMX Baltic, EUROSTAT)

The unemployment rate and the number of bankrupted companies are coincident with the OMXV peak. The least unemployment rate of 4,2% and the bankruptcies of 606 companies were also in 2007 (Figure 2).

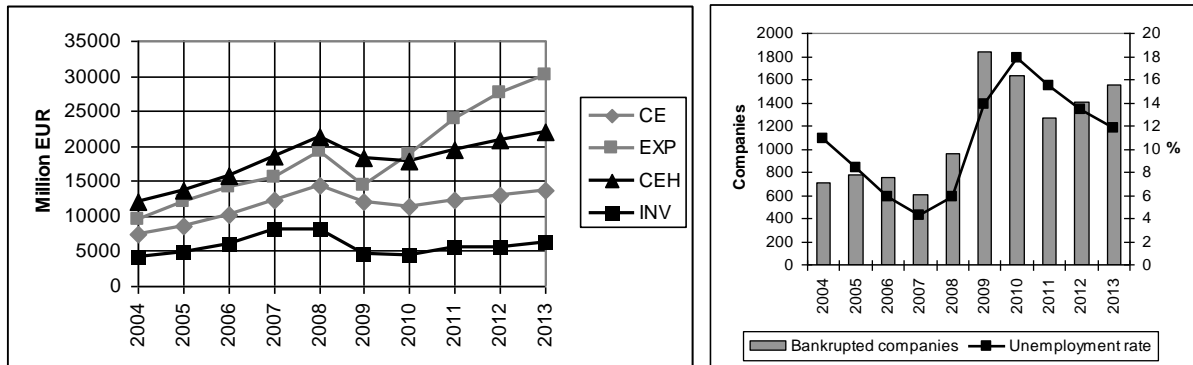


Fig. 2. The macroeconomic indicators of Lithuania in 2004 – 2013 (Source: EUROSTAT, Statistics Lithuania)

In the trough point of index OMXV the GDP, exports and the number of bankrupted companies are coincident. In 2009 bankrupted 1 844 companies, the Lithuanian GDP was 26,7 billion EUR, exports – 14,5 billion EUR. The compensation of employees, consumption expenditures of households, investments and unemployment rate lag the OMXV trough point by 1 year. These indicators were the worst in 2010: CE – 11,5 billion EUR, CEH – 17,8 billion EUR, INV – 4,5 billion EUR, unemployment rate – 17,8%.

Because the most decrease of index OMXV was in period of 2007.10.08 – 2009.03.10, further the capitalization of listed companies was analyzed. In NASDAQ OMX Baltic stock market there are listed 47 Lithuanian companies, 17 whereof are in the Main List and 30 are in the Secondary List. The analyzed period had no data of 10 companies capitalization because they were added to list later or the trade was stopped in this period.

The decrease in capitalization of Lithuanian listed companies is shown in Figure 3. The quartiles ( $Q_i$ ) of decrease were calculated that divide the companies into 4 equal parts. To the first group belong 9 companies that had the most significant fall of capitalization in range (81,62%; 96,78%]. Also the 4th group consists of 9 companies with the least decrease of capitalization in range [18,58%; 57,11%). The stock market data of these companies is given in Table 1.

It is visible that in the group of the highest decrease of capitalization dominates the companies from Main List, while the least decrease is typical for the companies in Secondary List. Expanding the sample to all companies shown in Figure 3 and the 2nd quartile considering as the classification threshold, the high decrease of capitalization (74,85%; 96,78%] was observed in 69,2% companies from the Main List and 37,5% from the Secondary.

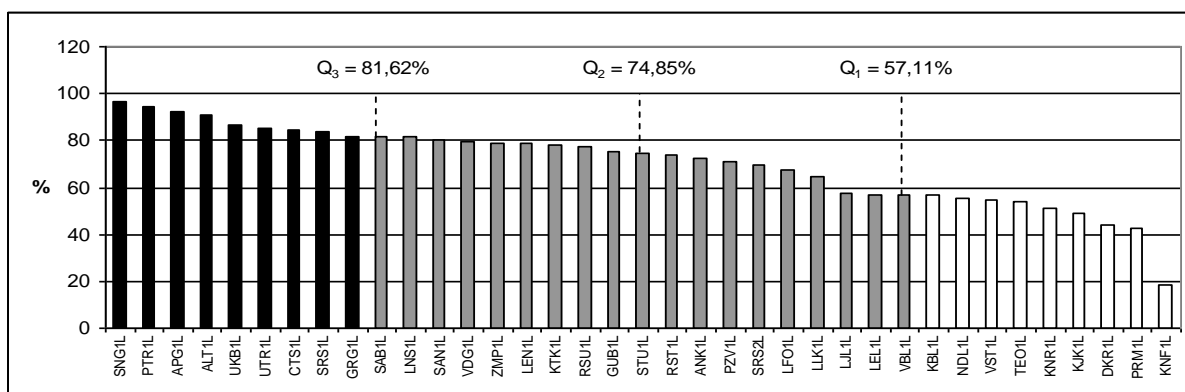


Fig. 3. The capitalization fall (-%) of Lithuanian listed companies in 2007.10.08 – 2009.03.10 (Source: NASDAQ OMX Baltic)

List. In the group of low capitalization decrease in range [18,58%; 74,85%) the proportion is different: 30,8% from the Main List and 62,5% from the Secondary List. So the less risk of high capitalization decrease in economic downturn is in the Secondary List

Table 1. The capitalization of Lithuanian listed companies (EUR) (Source: NASDAQ OMX Baltic)

Company	Ticker	Baltic List	2007-10-08	2009-03-10	Change %
<i>The highest decrease in capitalization</i>					
Snaigė	SNGIL	Main	60 037 673	1 934 247	-96,78
Panevėžio statybos trestas	PTRIL	Main	107 443 670	5 966 462	-94,45
Apranga	APGIL	Main	201 358 786	15 331 887	-92,39
ALT investicijos	ALTIL	Secondary	62 709 659	5 593 819	-91,08
Ūkio bankas	UKBIL	Main	284 852 875	38 739 991	-86,40
Utenos trikotažas	UTRIL	Main	34 179 486	5 170 006	-84,87
City Service	CTSIL	Main	92 373 118	14 500 753	-84,30
Snoras	SRSIL	Secondary	352 788 791	56 754 311	-83,91
Grigiškės	GRGIL	Secondary	31 245 069	5 734 476	-81,65
<i>The least decrease in capitalization</i>					
Klaipėdos baldai	KBLIL	Secondary	7 686 664	3 311 178	-56,92
DNB bankas	NDLIL	Secondary	405 758 775	180 095 437	-55,62
VST	VSTIL	Secondary	829 141 124	377 959 136	-54,42
TEO LT	TEOIL	Main	578 236 872	266 697 006	-53,88
Kauno energija	KNRIL	Secondary	19 777 043	9 708 425	-50,91
Klaipėdos jūrų krovinių kompanija	KJKIL	Secondary	73 392 198	37 430 021	-49,00
Dvarčionių keramika	DKRIL	Secondary	15 376 873	8 606 459	-44,03
Pramprojektas	PRMIL	Secondary	3 718 023	2 135 702	-42,56
Klaipėdos nafta	KNFIL	Secondary	111 926 553	91 126 043	-18,58

If the stock market is efficient the financial results of companies have the high impact on the shares prices, when the investors make the investment decisions according to the changes of companies financial conditions. The consolidated financial statistics of Lithuanian companies affirm that the net income, the number of profitable companies before the economic downturn were the highest in 2007 as the index OMXV (Figure 4), while the revenue lags the index by 1 year.

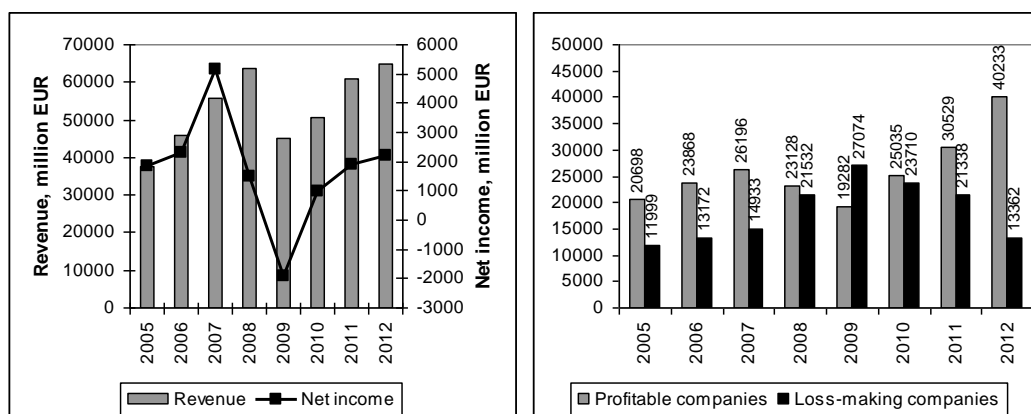


Fig. 4. The revenue, net income, profitable and loss-making companies (Source: Statistics Lithuania)

In the economic downturn of 2009 the revenue, net income, the number of profitable and loss making companies were the worst, similarly to the trough point of index OMXV.

The same tendency was estimated in the NASDAQ OMX Baltic stock market. The revenue, net income, their changes ( $\Delta$  (%)) and averages of Lithuanian listed companies were calculated in Table 2.

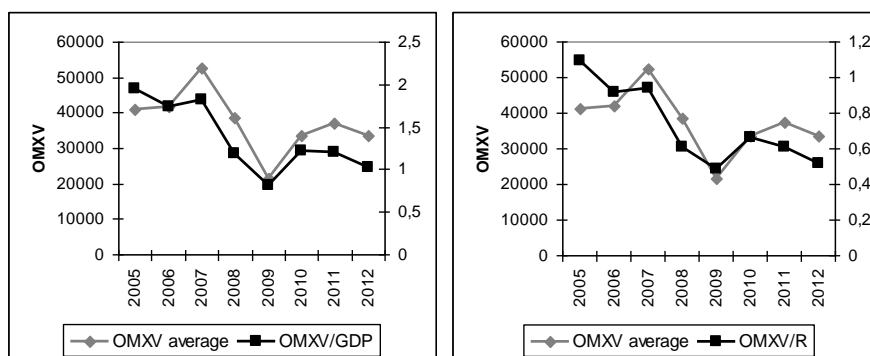
**Table 2. The revenue and net income of Lithuanian listed companies (million EUR)** (Source: NASDAQ OMX Baltic)

Company	Revenue			Net income		
	2007	2009	$\Delta$ (%)	2007	2009	$\Delta$ (%)
<i>The highest decrease in capitalization</i>						
Snaigė	118,8	35,1	-70,5	-3,3	-11,1	Loss
Panevėžio statybos trestas	149,7	53,5	-64,3	8,8	-4,5	Loss
Apranga	106,8	91,2	-14,6	7,2	-4,9	Loss
ALT investicijos	57,3	0,0	-100,0	2,3	-3,7	Loss
Ūkio bankas*	64,3	34,3	-46,7	22,4	-20,4	Loss
Utenos trikotažas	39,8	20,4	-48,7	-2,3	-0,03	Loss
City Service	60,6	108,5	79,0	3,2	4,4	37,5
Snoras (no data available)*	-	-	-	-	-	-
Grigiškės	41,7	34,4	-17,5	1,5	0,8	-46,7
Average	79,9	47,2	-40,9	5,0	-4,9	-198,0
<i>The least decrease in capitalization</i>						
Klaipėdos baldai	44,7	49,2	10,1	0,9	1,5	66,7
DNB bankas*	92,1	96,9	5,2	31,0	-117,8	Loss
VST	305,2	327,1	7,2	19,5	1,3	-93,3
TEO LT	229,8	236,2	2,8	47,2	49,0	3,8
Kauno energija	49,1	81,2	65,4	-2,5	1,9	Loss
Klaipėdos jūrų krovinių kompanija	54,6	33,5	-38,6	5,5	4,8	-12,7
Dvarčionių keramika	20,1	12,9	-35,8	-0,4	-1,7	Loss
Pramprojektas	3,2	1,8	-43,8	0,15	0,02	-86,7
Klaipėdos nafta	22,8	33,7	47,8	2,5	10,9	336,0
Average	91,3	96,9	6,1	11,5	-5,6	-148,7

\*The revenue of banks are equal to the net interest, services and commissions income

The revenue and net income differences in groups of the highest (HD) and the least (LD) decrease in capitalization allow to distinguish their peculiarities. In the recession phase of business cycle (in 2009) the group's HD average revenue decrease was 40,9% and the net income decreased by 198%, also the 75% of these companies were loss-making. Conversely, in group LD the average revenue growth of 6,1% was observed, the net income decreased by 148,7%, and the 33,3% of companies were loss-making. These differences reflect that the financial conditions of companies are in the focus of investors' attention. So, managing the investments portfolio risk the predicted average decrease of revenue and net income can foresee the extent of share prices downfall. Of course the annual financial reports will show the deterioration of financial rates in next year after the slump of share prices. The quarterly financial reports analysis can warn about the possible share prices fall, the estimated two years rates dividing by eight quarters. In this case the high share price decrease risk of a company can be predicted in economic recession if after the the peak point the quarterly average decrease of revenue is 5,1%, net income – 24,8%. The growing revenue and the quarterly average net income decrease by 18,6% can point the lesser fall of share prices.

To predict the OMXV sudden decrease the relative rates of OMXV to macroeconomic indicators were calculated. The most coincident with the OMXV annual average are the OMXV to GDP (OMXV/GDP) and OMXV to the consolidated revenue of Lithuanian companies (Figure 5), the correlation coefficients of these relations are 0,83 and 0,74 accordingly.



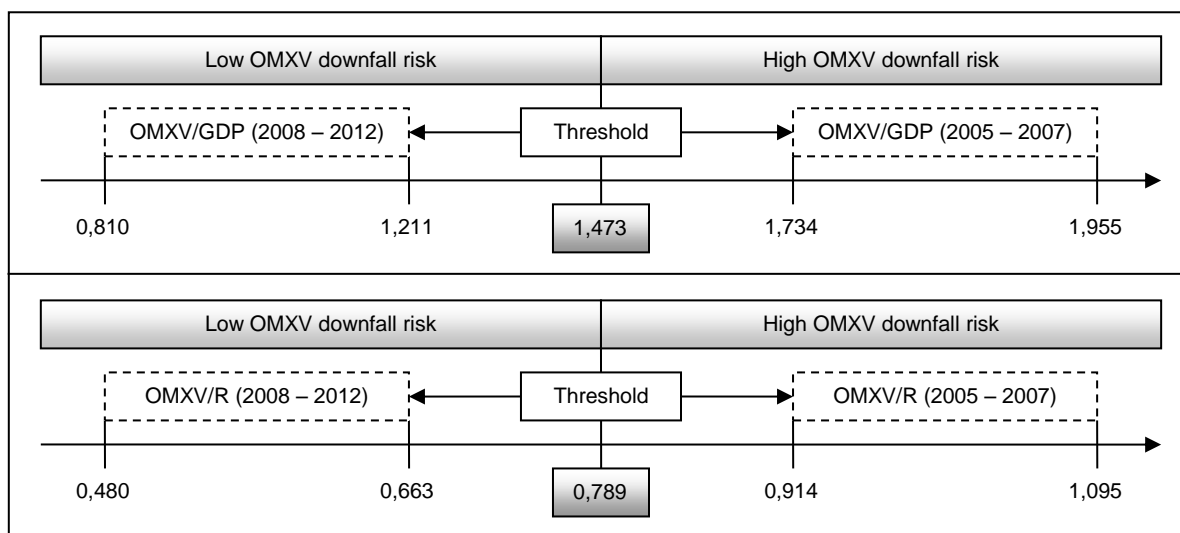
**Fig. 5. The relative coefficients of index OMXV** (Source: made by author)

Analyzing the most significant trough points of OMXV in Figure 1, before the huge downfall of 2008 – 2009 the not so deep trough was also in 2006. The relative coefficients can warn about these troughs (Table 3).

**Table 3. The critical relative coefficients of index OMXV** (Source: made by author)

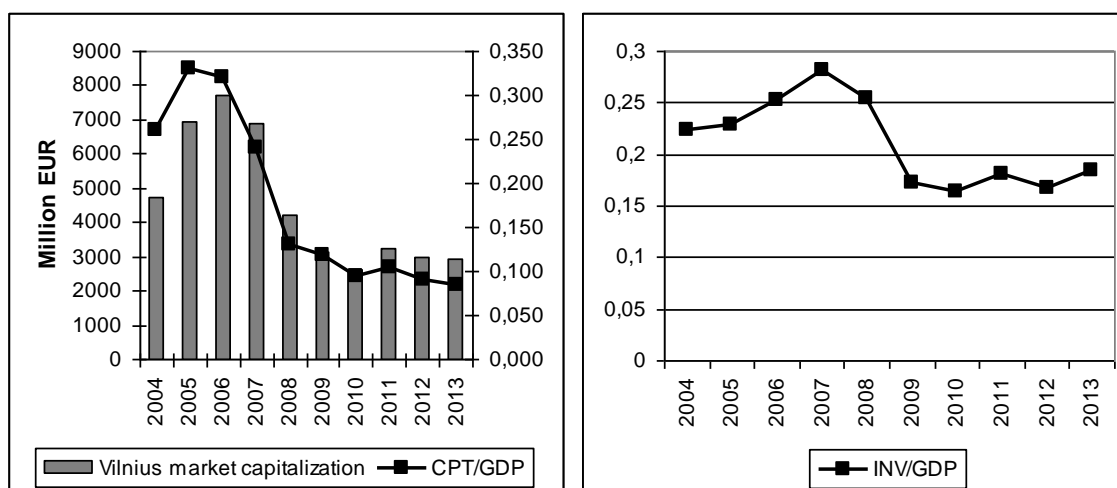
Rate	2005	2006	2007	2008	2009	2010	2011	2012
OMXV/GDP	1,955	1,734	1,826	1,185	0,810	1,211	1,200	1,016
OMXV/R	1,095	0,914	0,938	0,604	0,480	0,663	0,608	0,516

Before the index downfall, in 2005 – 2007 the OMXV to GDP rate was in range of [1,734; 1,955], while since 2008 it was in range of [0,810; 1,211]. Also the OMXV to revenue rate in 2005 – 2007 was high in range of [0,914; 1,095] compared to further years when it was [0,480; 0,663]. So, these higher relative values can warn the invertors about the peak point of share prices and the oncoming downfall. In future years the GDP and companies revenue growth allow to increase the OMXV index until the critical relative values will be reached. Statistically it can be determined the thresholds of OMXV/GDP and OMXV/R rates that were calculated as the average values of the „grey zone“ in the developed scales (Figure 6).



**Fig. 6. The threshold values of the relative coefficients warning about the possible OMXV downfall** (Source: made by author)

To predict the average OMXV value of a year, the factorial regression model was developed. The set of previously analyzed macroeconomic and stock market variables was supplemented by the Vilnius stock market capitalization (CPT) in the end of a year and the investments (gross capital formation) to GDP ratio. The highest Vilnius stock market capitalization of 7,7 billion EUR was in the end of year 2006. In the economic downturn of 2009 it was 3,1 billion EUR, while the least capitalization was in the end of year 2010 – 2,6 billion EUR. The highest values of capitalization to GDP ratios in range of [0,240; 0,331] also were in years 2004 – 2007. The high values of investments to GDP ratios remained 1 year longer – until 2008. The fluctuations of these variables can allow to predict the average OMXV value for the next year (Figure 7).



**Fig. 7. Vilnius stock market capitalization and relative independent variables** (Source: made by author)



The factorial regression model:

$$\begin{aligned}
 OMXV_{t+1} = & 11,1444 - 4.0432 \cdot \frac{OMXV}{GDP_t} + 13,028 \cdot \frac{OMXV}{R_t} + 0,0005 \cdot INV_t - 43.6592 \cdot \frac{INV}{GDP_t} + \\
 & + 13,3727 \cdot \frac{CPT}{GDP_t} - 3.2848 \cdot \frac{OMXV}{GDP_t} \cdot \frac{OMXV}{R_t} + 0,0004 \cdot \frac{OMXV}{GDP_t \cdot INV_t}
 \end{aligned} \quad (1)$$

Where  $OMXV_{t+1}$  is the prediction of the average index OMXV for the year  $t + 1$ ;  
 $OMXV/GDP_t$  – the average OMXV index to GDP ratio of the year  $t$ ;  
 $OMXV/R_t$  – the average OMXV index to the consolidated revenue of companies in year  $t$ ;  
 $INV_t$  – the gross capital formation (investments) of year  $t$ ;  
 $INV/GDP_t$  – the investments to GDP ratio of year  $t$ ;  
 $CPT/GDP_t$  – the Vilnius stock market capitalization in the end of year  $t$ .

The prediction error of the analyzed 2005 – 2013 years data sample is equal to 0%. So, if the main patterns of future economic recession in Lithuania will be similar, the regression model can warn about the possible sudden decrease of OMXV index one year before this appearance.

## Conclusions

1. Trading in financial market the main aim of investors is to reduce the investment risk and to ascertain the high returns from their investment portfolio. The decision making of rational investors is mostly based on the historical data monitoring and the accumulation of investment experience, share prices future forecasting, evaluation of investments risk and the formation of investment portfolio. Various software products and technical analysis nowadays help investors to make the investment decisions and faster trading, but the assessment of only the non-objective technical information sometimes can distort the share prices. The investor's decision making also can be influenced by emotions and many other psychological factors that are often contrary to human rationality. So, understanding the macroeconomical and specific factors of particular companies that influence the share prices allows to manage the investment portfolio risk more effectively and to reduce the probability of loss. The ability to analyze the stock market environment allows to understand the nature of unstable periods and to predict how the share prices will change in future periods.

2. The empirical research evaluated the relation of share prices to the business cycle and affirmed the proposition that the peak of the stock market usually occur at the end of expansion and the trough is typical in the end of recession phase. The highest peak point of index OMXV was in 2007, while the most significant trough was observed in 2009. In the analyzed sample of 37 Lithuanian listed companies the capitalization all of them decreased from 18,58% to 96,78%. The analysis has shown that the less decrease of capitalization in the economic downturn was typical to the companies in the Secondary List of stock market. The financial warning indicators of this situation can be the quarterly revenue and net income of companies. The high share price decrease of a company can be expected in economic recession if after the the peak point the quarterly average decrease of revenue is about 5%, net income – 25%. The less decrease of share prices can be expected for the companies with the growing revenue in economic recession and the quarterly average net income decrease by about 19%.

3. Two relative macroeconomic and stock market indicators were suggested in this research to warn about the oncoming economic recession and sudden downfall of share prices: the OMXV to GDP and the OMXV to the consolidated revenue of enterprises. The significant differences of these ratios values in the economic expansion, recession and recovery were observed, so the determined thresholds can allow to foresee the high risk of share prices downfall. According to these ratios the investment risk to buy shares is growing in the economic expansion period until the calculated critical relative indicators are reached.

4. The developed factorial regression model allows to predict the average absolute OMXV index value for the next year analyzing the current year's macroeconomic and stock market data. So in general it can be concluded that this research extended the understanding about the equity stock trends in the business cycle and suggested some instruments assessing the investment portfolio risk.

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#### INVESTICIJŲ Į AKCIJAS PORTFELIO RIZIKA SKIRTINGOSE VERSLO CIKLO STADIJOSE

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#### **Santrauka**

Straipsnyje analizuojami investicijų į akcijas portfelio rizikos pokyčiai skirtingose verslo ciklo stadijose. Pastarųjų metų Lietuvos makroekonominių rodiklių svyravimai apibūdina reikšmingus ekonomikos būklės pokyčius, o NASDAQ OMX Vilnius (OMXV) indekso kreivė atspindi reikšmingus listiguojamų įmonių akcijų kainų svyravimus. Sugretinus šiuos rodiklius nustatytas reikšmingas šalies verslo ciklo poveikis indekso vertėms. Analizuojant 2007 m. indekso piką ir 2009 m. dugną sugrupuotos įmonės, kurių akcijų kapitalizacijos rodikliams ekonomikos pokyčiai turėjo didžiausią ir mažiausią neigiamą poveikį. Nustatytos vidutinės ketvirčio pardavimo pajamų ir grynojo pelno pokyčių vertės, leidžiančios investuotojams įvertinti galimas įmonių akcijų kainų pokyčių kryptis ir mastą ekonomikos rodiklių kritimo laikotarpiu. Suformuoti santykiniai OMXV ir BVP bei OMXV ir konsoliduotų šalies įmonių pardavimo pajamų rodikliai, kurių nustatytų ribų peržengimas gali investuotojus įspėti apie galimą staigų akcijų kainų mažėjimą. Sudarytas faktoriškas regresijos modelis, leidžiantis prognozuoti vidutinį metinį OMXV indeksą vieneriems metams į priekį pagal makroekonominius ir vertybinių popierių biržos rodiklius. Tyrimo rezultatai gali padėti investuotojams padidinti supratimą apie verslo ciklo svyravimuose būdingus akcijų kainų pokyčius ir palengvinti vertybinių popierių portfelio valdymą.

Reikšminiai žodžiai: akcijų rinka, investicijų portfelis, makroekonomika, verslo ciklas.