The Short-Run Relationship between Stock Market Prices and Macroeconomic Variables in Lithuania: An Application of the Impulse Response Function

Donatas Pilinkus, Vytautas Boguslauskas

Kaunas University of Technology
Laisves al. 55, LT-44309, Kaunas, Lithuania
e-mail: pilinkus@pilinkus.com, vytautas.boguslauskas@ktu.lt

Scientific literature has been seemingly enriched by various theoretical and empirical studies analysing the relationship between stock market returns and macroeconomic forces during the last few decades. It is often argued that stock prices are determined by some fundamental macroeconomic variables. This implies that macroeconomic variables can influence investors' investment decisions and motivates many researchers to investigate the relationships between stock market prices and macroeconomic variables. Different authors select different macroeconomic variables seeking to detect their relationship with stock market prices in various countries. Simultaneously, a number of econometric techniques such as the arbitrage pricing theory, the impulse response function, the error variance decomposition analysis, the vector error correction model, the cointegration analysis, the Granger causality tests and others may be applied for checking the existence of relationship between stock market prices and macroeconomic variables.

The current paper attempts to present several classifications of macroeconomic variables, then to select macroeconomic variables for seeking their relationship with stock market prices, and, finally, to define what macroeconomic variables have positive and what macroeconomic variables have negative effects on stock market prices in Lithuania in the short run.

Augmented Dickey Fuller test has been employed to check the stationarity of the selected time series since a spurious regression may occur if a time series is not stationary. The Impulse response function has been chosen to test the existence of the short-run relationship between stock market prices and macroeconomic variables. As the results of the Impulse response function are reliable only with a stationary time series the data has been turned into stationary after the second difference.

The study embraces six macroeconomic variables (seasonally adjusted gross domestic product at previous year prices, harmonised consumer price index as compared to 2005, the narrow money supply, unemployment rate, short-term interest rates, and exchange rate of the Litas against the US dollar) and the main Lithuanian stock market index – the OMX Vilnius index. The data are monthly and extend from the January of 2000 to the June of 2009.

In general, the results of the paper clearly indicate that macroeconomic variables are significant determinants for stock market prices in Lithuania. Gross domestic product and money supply have a positive effect on stock market prices while most of the time unemployment rate, exchange rate, and short-term interest rates negatively influence stock market prices. The findings of the paper are similar to the results of some other empirical studies. If harmonised consumer price index is considered, then it is the best example of an unstable relationship between a macroeconomic variable and stock market prices in Lithuania.

Keywords: *macroeconomic variables, stock market prices, short-run relationship, impulse response function, Lithuania.*

Introduction

The relationship between stock market prices and macroeconomic variables has been widely investigated in the scientific literature (Fama, 1981; Ibrahim, 1999; Gunes, 2007, etc.). For this purpose, scientists apply different econometric instruments: the arbitrage pricing theory has been employed by Fama (1981), Schwert (1990), Tursoy, Gunsel, Rjoub (2008); the impulse response function has been applied by Sims (1980), Nishat, Shaheen (2004), Adam, Tweneboah (2008); the error variance decomposition analysis has been incorporated by Lastrapes, Koray (1990), Laopodis (2007); the vector error correction model has been found relevant by Engle, Granger (1987), Kwon, Shin (1999); different types of cointegration analysis have been included by Nasseh, Strauss (2000), Dritsaki, Adamopoulos (2005); the Granger causality tests have been considered by Lee (1992), Hassan (2003), Dritsaki (2005), etc.

At the same time, scientists select different macroeconomic variables in their studies. Some authors choose only one or two macroeconomic factors – e.g., Comincioli (1995) seeks for the relationship between the stock market index and gross domestic product, Gallegati (2005) also prefers only one macroeconomic factor, though it is an industrial production index, Arabian, Afshar, Anjela (2008) operates with gross domestic product and oil prices; other researchers are apt to analyzing more than ten different macroeconomic variables (Tursoy, Gunsel, Rjoub, 2008). Simultaneously, authors analyze data at different time periods, i.e. daily data (Kurihara, Nezu, 2006), monthly data (Kandir, 2008; Stavarek, 2004), quarterly data (Ahmed, 2008; Comincioli, 1995) or annual data (Hussain, Mahmood, 2001; Naceur, Ghazouani, Omran, 2007).

Those scientists who employ the Impulse response function mainly analyze the short-run relationship between macroeconomic variables and stock market prices. This econometric technique has been applied to a number of countries: Pakistan (Nishat, Shaneen, 2004), Malaysia (Ibrahim, 2003), the United States (Fama, Schwert, 1977), India (Darat, Mukherjee, 1987), Japan (Mukherjee, Naka, 1995), Canada (Darrat, 1990), etc. All scientific studies show the relationship between stock market prices and macroeconomic variables. For example, Nishat and Shaneen (2004) have detected a significant opposite relationship between the Karachi stock market index and the consumer price index and a positive relation between the industrial production index and the stock market index; a positive influence of the industrial production index has been proved for a number of European countries as well (Siliverstovs, Duong, 2005; Snieska, 2008) and so no. This technique has not been applied for Lithuania so far.

Therefore, the **objective of this paper** is to define the short-run relationship between Lithuanian stock market prices and macroeconomic variables by employing the Impulse response function. A set of macroeconomic variables will be offered for similar studies in the future. **The object of the article** is the relationship between macroeconomic variables and stock market prices. **Research methods** are the logical analysis and synthesis of scientific literature, the comparison and generalization method, the statistical grouping method.

Scientific novelty: though scientific literature has been seemingly enriched by theoretical and practical studies analysing the relationship between macroeconomic variables and stock market prices in different countries there is few similar studies in Lithuanian (Norvaišienė, Stankevičienė, Krušinskas, 2008; Ginevičius, Podvezko, 2009; Melnikas, 2008); moreover, no scientists have investigated the short-run relationship between macroeconomic variables and stock market prices in Lithuania applying the Impulse response function.

Classification of macroeconomic variables according to the business cycle

In the most general sense, macroeconomic variables are treated as statistical indicators that reflect an overall economic situation of the country during some period of time (Rogers, 1998) or as regular data issued by state institutions and indicating the welfare of a country (Mohr, 1998; Darnay, 1998; Ciegis, Ramanauskiene, Startiene, 2009; Kumpikaite, Ciarniene, 2008). The first attempts to calculate macroeconomic variables could be dated as back as the First World War when warring countries wanted to measure the strength of their enemies. Nowadays a large spectrum of macroeconomic variables is regularly published to indicate various tendencies in both private and public life.

According to the business cycle, it is possible to distinguish the following groups of macroeconomic variables (Rogers, 1998):

" *Procyclic macroeconomic variables* are positively correlated with the overall state of the economy, i.e. they tend to increase when the overall economy is growing. Gross domestic product is considered to be a classical example of procyclic macroeconomic variables.

" *Countercyclic macroeconomic variables*, on the contrary, move in the opposite direction of the overall economic cycle: rising when the economy is weakening, and falling when the economy is strengthening. The unemployment rate gets larger when the economy gets worse that's why it is attributed to this group.

" *Acyclic macroeconomic variables* have no relation to the health of the economy and are generally of little use.

The National Bureau of Economic Research offers another classification according to the timing how macroeconomic variables change relative to the changes of the economy as a whole (Shiskin, Moore, 1968):
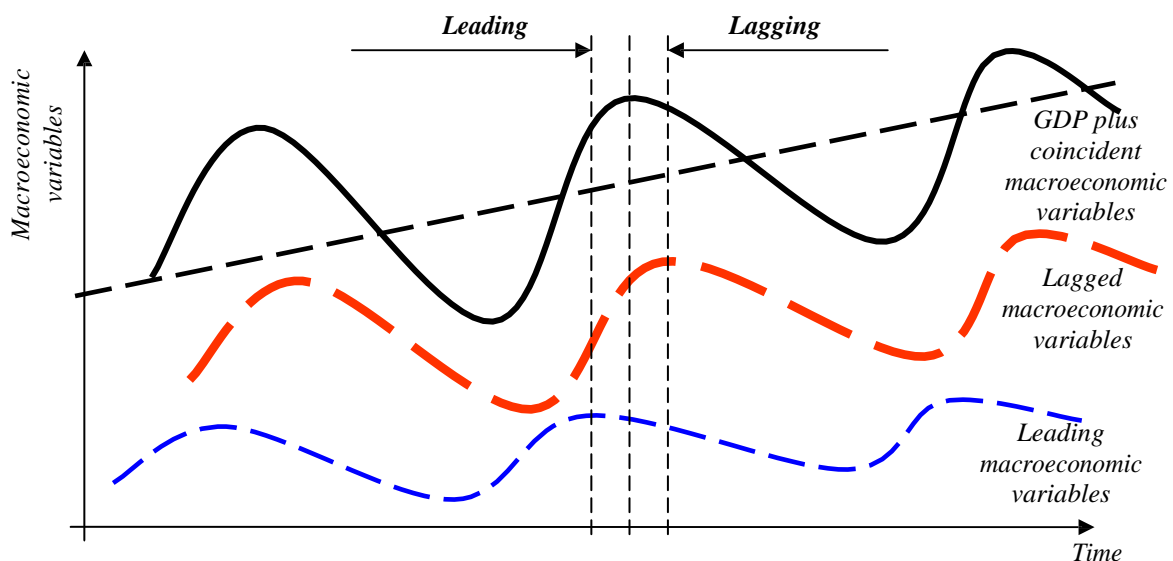

Figure 1. Leading, lagged and coincident macroeconomic variables
Source: developed by the author

"▫▫ *Leading macroeconomic variables* are indicators which change before the economy changes. Stock market returns are considered as a leading indicator, as they usually begin to decline before the economy declines and they improve before the economy begins to pull out of a recession.

"▫▫ *Lagged macroeconomic variables* are ones that do not change direction until a few quarters after the economy does. The unemployment rate is a lagged economic indicator as unemployment tends to increase for 2 or 3 quarters after the economy starts to improve.

"▫▫ *Coincident macroeconomic variables* are ones that simply move at the same time the economy does and, for example, the gross domestic product is attributed to this group of indicators.

Figure 1 depicts how leading, lagged and coincident indicators move compared to gross domestic product throughout time.

Leading macroeconomic variables dominate in scientific literature since their fluctuations set signals and help predict what the economy will be like in the future (Chen, 2009; Dua, 2004). It is relevant to state that a separate macroeconomic variable is doomed to subjectivity, thus a set of macroeconomic variables is required for a more precision picture on economic developments.

Selection of macroeconomic variables by estimating their relationship with stock market prices

Different economic theories such as Classical, Keynesian, Monetary and others allocate unequal power to various macroeconomic variables (Dritsaki, Adamopoulos, 2005). Therefore, it is an uneasy task to select proper macroeconomic variables that could be most valuable in tracing the relationship between macroeconomic variables and stock market prices. The current issue has been investigated for a long time (Miller, Modigliani, 1961). As Chen, Roll and Ross (1986) state, selection of relevant and proper macroeconomic factors requires much efforts and it would be expedient to consider theoretical and empirical literature in this field of study before undertaking such a decision (Humpe, Macmillan, 2007).

Dritsaki (2005) notices the most important thing in selecting macroeconomic variables is to preserve that those variables would objectively reflect not only general situation in the country's economy but also financial status of the country. In that respect, many scientists believe that financial resources are closely related to economic output of the country which is measured either by **gross domestic product** or **industrial production** volumes (Fama, 1981; Chen, Roll, Ross, 1986; Cheung, Ng, 1998; Binswanger, 2000; Lakstutiene, 2008). Some authors prefer industrial production index to gross domestic product since it is calculated every month (not every quarter) and, thus, more often reflects economic situation (Padhan, 2007). Moreover, industrial production index becomes vital if industrial sector prevails in the country under analysis (Agrawalla, Tuteja, 2007).

As DeFina (1991) points out, **inflation** negatively influences companies due to speedily increasing costs.

Seeking for the relationship between stock market and macroeconomic variables inflation is most often measured by consumer price index (Atmadja, 2005; Dritsaki, 2005; Laopodis, 2007), though some scientists also include other inflation reflecting indices, for example, producer price index (Teresienė, Aarma, Dubauskas, 2008).

Another popular macroeconomic variable is i**nterest rates** in such type of studies. Some authors include only short-term interest rates (Dritsaki, 2005; Atmadja, 2005), others select only long-term interest rates (Siliverstovs, Doung, 2005) while the third group of scientists analyzes both short-term and long-term interest rates (Chen, Roll, Ross, 1986; Mukherjee, Naka, 1995). As a rule, short-term interest rates are influenced by business cycles and monetary policies and long-term interest rates are more related to long-term economic perspectives of the country (Humpe, Macmillan, 2007).

Money supply stands for another macroeconomic indicator which many scientists embrace when they seek for the relationship between stock market prices and macroeconomic forces (Urich, Wachtel, 1981; Chaudhuri, Smiles, 2004). Tan and Baharumshah (1999) argue that it is more expedient to analyze the narrow money M1 while others operate with broadly-defined money supply M2 (Tursoy, Gunsel, Rjoub, 2008). There is another group of scientists who avoid this scientific discussion and enrol both concepts of money supply in their empirical investigations.

Stock prices can be influenced by **exchange rate** fluctuations as the currency devaluation may lead to inflationary processes in the country what reduces consumer expenditure and profits earned by local companies. Analysis of the exchange rate fluctuations can be found in a number of empirical studies (Adam, Tweneboah, 2008; Ahmed, 2008; Ibrahim, 2003; Kwon, Shin, 1999).

As economists most often speak about gross domestic product, inflation and unemployment analysing various economic phenomena, **unemployment** should be incorporated into such studies as well (Tursoy, Gunsel, Rjoub, 2008).

The aforementioned variables, i.e., gross domestic product, industrial production, inflation, interest rates, money supply, and unemployment rate, reflect domestic economic processes and the exchange rate fluctuations are more related with the international economic context.

Data and methodology

The macroeconomic variables used in this paper are as follows: seasonally adjusted gross domestic product (GDP) at previous year prices; harmonised consumer price index (HCPI) as compared to 2005, the narrow money supply (M1), i.e. currency in circulation and overnight deposits in Litas and foreign currencies; unemployment rate (UR) reflecting tendencies in the labour market; three months Vilnius interbank offered rate (VILIBOR3M) which is based on the quotes of not less than 5 local commercial banks, designated by the Bank of Lithuania, which are most active in Lithuanian money market; and the exchange rate of Litas against the US dollar (USD_LTL). The data are monthly and extend from the January of 2000 to the June of 2009.

The stock price movements are represented by the main Lithuanian stock market index – the OMX Vilnius (OMXV) index. A value of the index is acquired on the last business day of the month. The OMXV index indicates stocks which are quoted in the securities exchange of Vilnius. Most Lithuanian companies – "TEO LT", "City Service", "Klaipedos Nafta", "Ukio bankas" and others – are included in the index, thus, it may be assumed that dynamics of OMXV index reflects the overall country's economic situation quite reasonably.

Time series analysis must be based on stationary data for drawing useful inferences. A data series is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed. The correlation between a series and its lagged values are assumed to depend only on the length of the lag and not when the series started. This property is known as stationarity and any series obeying this is called a stationary time series.

The unit root test has been applied to check whether a series is stationary or not. Stationarity condition has been tested using Augmented Dickey Fuller (ADF) test. Compared to Dickey Fuller (DF) test, the ADF approach controls higher-order correlation by adding lagged difference terms of the dependent variable to the regression.

The impulse response function, as an econometric technique, has been employed to investigate the short-run (up to one year) impact caused by the vector auto regression model when it received some impulses. The impulse response function describes the response to the error by the endogenous variables. It depicts the current and future responses of endogenous variables to one standard deviation on the disturbing term.

Research results on the short-run relationship between stock market prices and macroeconomic variables in Lithuania

Table 1 reports the ADF test statistics for the presence of unit root of the level, first and second differences over the sample period. For the level series, the results show the existence of unit root for all variables as it fails to reject the null hypothesis of nonstationarity with an exception of money supply. After the first difference, HCPI, UR, USD_LTL, and OMXV t-statistic results are higher than the critical values, however GDP, M1, and VILIBOR3M are still nonstationary. After second difference, the ADF test of unit root indicates that all variables are stationary and would not cause spurious regression outcomes.

Table 1

Unit root tests on level, first and second differences (critical values at 5% level are in the brackets)

Variable	ADF statistics		
	Level	First differences	Second differences
GDP	-2,319544 (-2,888157)	-0,492150 (-2,888157)	-7,440027 (-2,888157)
HCPI	2,663913 (-2,887425)	-7,296585 (-2,887425)	-8,052489 (-2,888669)
M1	-3,777975 (-2,890327)	0,563799 (-2,890327)	-7,197823 (-2,890327)
UR	-1,575868 (-2,887425)	-2,792015 (-2,887425)	-6,725297 (-2,889753)
VILIBOR3M	-0,618338 (-2,890327)	-2,087248 (-2,890327)	-7,709329 (-2,890327)
USD_LTL	-1,185860 (-2,887190)	-9,997513 (-2,887425)	-9,643312 (-2,888411)
OMXV	-0,978956 (-2887190)	-8,639553 (-2,887425)	-12,20385 (-2,887909)

Source: developed by the author

In Figure 2 it is possible to observe that GDP has an immediate positive effect on OMXV index. The effect peaks during the second month and remains positive throughout all twelve months. The result is similar to other studies (Ibrahim, 2003; Somoye, Akintoye, Oseni, 2009). In the meantime, the response of OMXV to HCPI is not as immediate as to GDP and the positive and negative effects interchange each other. The effect continues to be positive only after the ninth months. This support the Rapach's (2002) claim that real stock prices positively respond to a permanent inflation shock in the long-run.

Figure 3 outlines the response of OMXV to M1 which is similar to that of GDP – even the peak of the effect remains the same, i.e. during the second months. The difference is that the positive effect of M1 is stronger compared to the influence of GDP innovations. The positive influence of money supply has been detected in other studies as well (Dumitrescu, Horobet, 2009).

The unemployment rate negatively influences OMXV index most of the time. Therefore, an increase in the unemployment rate causes a decrease of OMXV index and the effect peak is reached during the eighth month. The result is similar to Arestis, Baddeley, and Sawyer (2007) who conducted their analysis in the case of nine euro area countries.

Figure 4 discloses that the negative impact of the shock in the exchange rate is similar to the effect of unemployment rate innovations. The difference, however, is that the impact is immediate and it peaks not during the eighth month, as in the case of unemployment, but during the second and fifth months. The result of the negative relationship between the exchange rate and stock prices supports empirical finding of Aydemir and Demirhan (2009) as well as Akin and Basti (2008) for the Turkish market.

The influence of VILIBOR3M is more often negative than positive. Similarly, Alam and Uddin (2009) have also proved the existence of a significant negative relationship in fifteen developed and developing countries: Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain, and Venezuela.
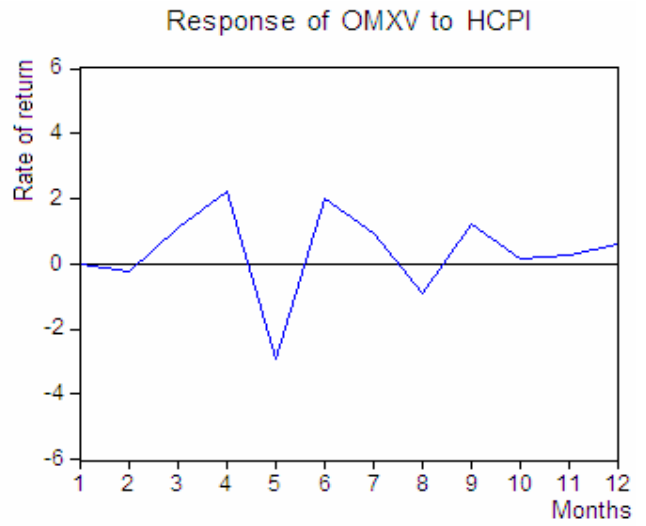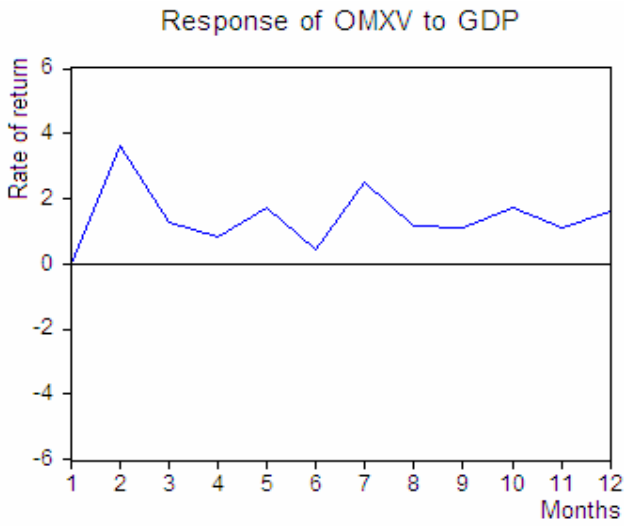
Figure 2. Responses to Cholesky one standard deviation innovations: responses of OMXV to GDP and HCPI.
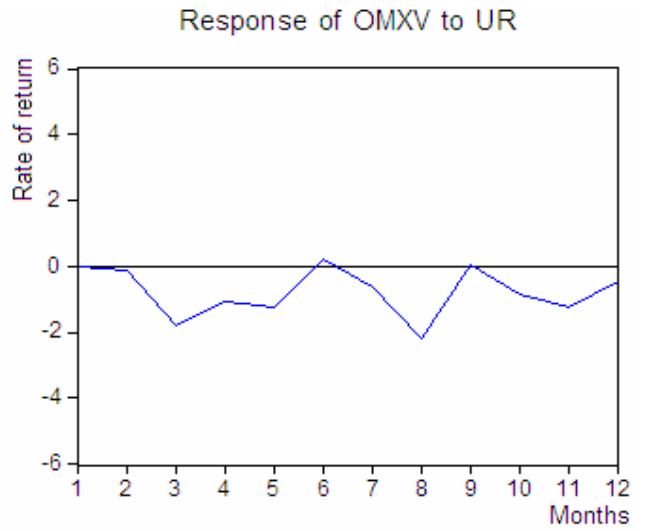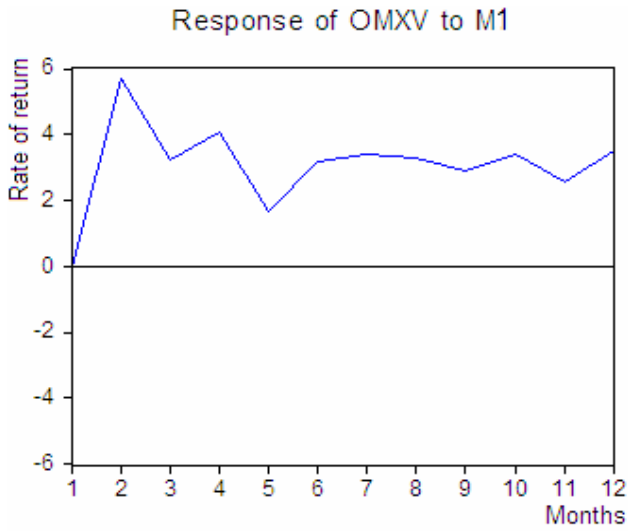*Source: developed by the author*

Figure 3. Responses to Cholesky one standard deviation innovations: responses of OMXV to M1 and UR
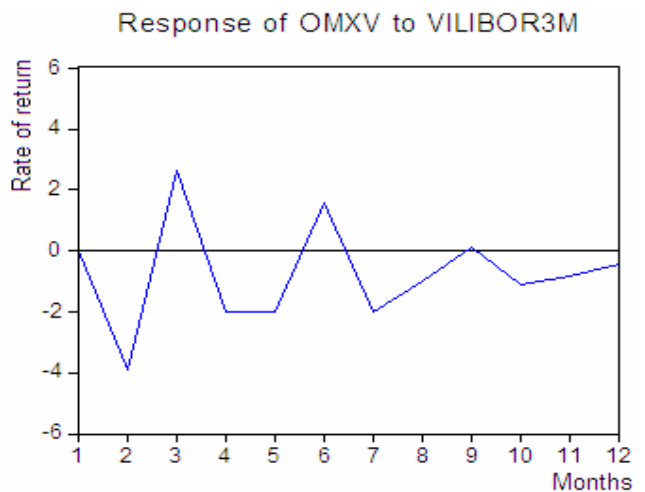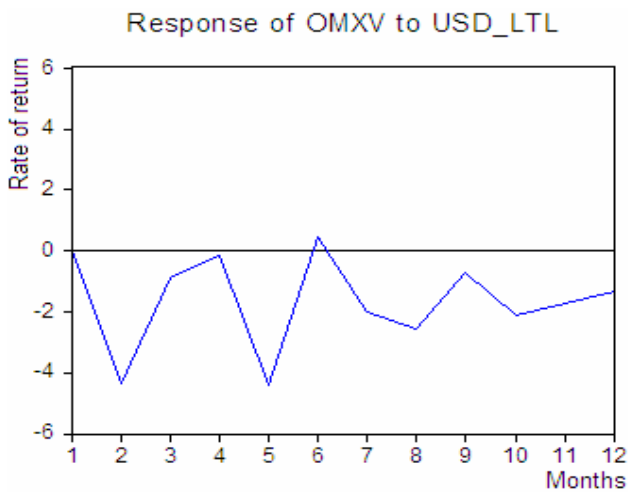*Source: developed by the author*

Figure 4. Responses to Cholesky one standard deviation innovations: responses of OMXV to USD_LTL and VILIBOR3M
Source: developed by the author

The above evidence clearly indicates the existence of the short-run relationship between stock market prices and macroeconomic variables in Lithuania. Gross domestic product and money supply are the most influential positive determinants of the OMXV index while unemployment rate, exchange rate, and short-term interest rates mostly have a negative influence on stock prices quoted in the stock market of Lithuania.

Conclusions

The analysis carried out in this paper reveals that scholars and practitioners offer different classifications of macroeconomic variables. No matter what the classification is, macroeconomic variables are relevant indicators of movements in equity markets. This issue has been widely debated across a variety of markets and time horizons.

Many studies undertake different macroeconomic variables when searching for the relationship between macroeconomic factors and stock market prices. A set of six most relevant macroeconomic variables has been selected for the investigation in Lithuania, i.e. gross domestic product, inflation, interest rates, money supply, exchange rate, and unemployment rate. As OMX Vilnius index reflects stock price fluctuations of principal Lithuanian companies and, consequently, indicates the overall country's economic situation it has been chosen as a representative for stock market price fluctuations. The paper reveals the selected variables verify to be proper as significant relationships have been perceived.

As a rule, time series are non-stationary, thus Augumented Dickey Fuller test has been employed to test if the data is stationary or not. The selected time series have become stationary only after second difference. The impulse response function has been selected to analyze the short-run relationship between macroeconomic variables and stock market prices as many scientists employ this econometric technique. The applied technique confirms similar results of other studies, i.e. gross domestic product and money supply have a strong positive effect on stock market prices in the short run while unemployment rate, exchange rate, short-term interest rates cause opposite movements for stock prices. This undoubtedly confirms the existence of the short-term relationship between stock market returns and macroeconomic variables in Lithuania.

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Donatas Pilinkus

Trumpalaikis sąryšis tarp akcijų kainų ir makroekonominių rodiklių Lietuvoje: reakcijos į impulsą funkcijos pritaikymas

Santrauka

Mokslinėje literatūroje vis labiau analizuojamas sąryšis tarp makroekonominių rodiklių ir akcijų kainų. Juo ypač susidomėta paskutinius du dešimtmečius. Daugelyje mokslinių šaltinių teigiama, jog egzistuoja sąryšis tarp akcijų kainų ir pagrindinių šalies makroekonominių rodiklių. Taigi galima daryti išvadą, jog makroekonominių rodiklių pokyčiai gali daryti įtaką investuotojų sprendimams. Dėl to dar labiau susidomėta šia tematika.

Tyrinėtojai taiko skirtingus ekonometrinius tyrimo metodus, norėdami aptarti sąryšį tarp makroekonominių rodiklių ir akcijų kainų: arbitražinės kainodaros teoriją (Fama, 1981; Schwert, 1990; Tursoy, Gunsel, Rjoub, 2008), reakcijos į impulsą funkciją (Sims, 1980; Nishat, Shaheen, 2004; Adam Tweneboah, 2008), paklaidų variacijos skaidymo analizę (Lastrapes, Koray, 1990; Laopodis, 2007), vektorinių paklaidų korekcijos modelį (Engle, Granger, 1987; Kwon, Shin, 1999); kointegracijos analizę (Nasseh, Strauss, 2000; Dritsaki, Adamopoulos, 2005), Grangerio priežastingumo testus (Lee, 1992; Hassan, 2003; Dritsaki, 2005) ir kt. Tuo pačiu metu skirtingi autoriai renkasi skirtingus makroekonominius rodiklius ir ieško sąryšio tarp jų ir akcijų kainų. Kai kurie autoriai yra linkę taikyti tik vieną ar du makroekonominius rodiklius. Pavyzdžiui, Comincioli (1995) pasirenka tik bendrąjį vidaus produktą, Gallegati (2005) – tik pramonės produkcijos indeksą, Arabian, Afshar, Anjela (2008) naudoja bendrąjį vidaus produktą ir naftos kainas, kiti – daugiau nei dešimt makroekonominių rodiklių (Tursoy, Gunsel, Rjoub, 2008). Būtina paminėti ir tai, kad skirtingose ekonomikos teorijose, pavyzdžiui, klasikinėje, keinsistinėje, monetarisinėje ir kitose atskiri makroekonominiai rodikliai nevienodai reikšmingi. Dėl šios priežasties yra labai sunku parinkti reikšmingus makroekonominius rodiklius. Ši mokslinė problema yra keliama jau seniai (Miller, Modigliani, 1961). Chen, Roll ir Ross (1986) teigia, kad reikšmingiems makroekonominiams rodikliams parinkti reikalinga daug pastangų, todėl prieš galutinai pasirenkant yra tikslinga išsamiai išanalizuoti tiek teorinę literatūrą, tiek ir empirinius tyrimus (Humpe, Macmillan, 2007). Panašiai skirtingi autoriai renkasi nevienodus laiko periodus, t. y. kasdienius (Kurihara, Nezu, 2006), mėnesinius (Kandir, 2008; Stavarek, 2004), ketvirtinius (Ahmed, 2008; Comincioli, 1995) ar metinius (Hussain, Mahmood, 2001; Naceur, Ghazouani, Omran, 2007) duomenis.

Tie mokslininkai, kurie savo tyrimuose taiko reakcijos į impulsą funkciją, analizuoja trumpalaikį sąryšį tarp makroekonominių rodiklių ir akcijų kainų. Ši ekonometrinė tyrimo metodika buvo pritaikyta daugeliui šalių: Pakistanui (Nishat, Shaneen, 2004), Malaizijai (Ibrahim, 2003), Jungtinei Karalystei (Fama, Schwert, 1997), Indijai (Darat, Mukherjee, 1987), Japonijai (Mukherjee, Naka, 1995), Kanadai (Darrat, 1990) ir kt. Visos studijos rodo, kad egzistuoja sąryšis tarp makroekonominių rodiklių ir akcijų kainų. Pavyzdžiui, Nishat ir Shaneen (2004) aptiko reikšmingą atvirkštinį sąryšį tarp Karačio akcijų rinkos indekso ir vartojimo prekių kainų indekso bei tiesioginį sąryšį tarp pramonės produkcijos indekso ir akcijų kainų indekso. Tiesioginis pramonės produkcijos indekso poveikis buvo patvirtintas ir daugelyje Europos valstybių (Siliverstovs, Doung, 2005) ir kt. Kad ir kaip būtų, šis tyrimo metodas dar nebuvo pritaikytas Lietuvai.

Būtent ši priežastis ir nulėmė **darbo tikslą**, t. y. siekį apibrėžti trumpalaikį sąryšį tarp Lietuvos akcijų rinkoje kotiruojamų įmonių kainų ir šalies makroekonominių rodiklių, taikant reakcijos į impulsą funkciją. Šiam tikslui įgyvendinti buvo sudarytas makroekonominių rodiklių rinkinys, kurį galima naudoti ir kituose panašaus pobūdžio studijose. **Darbo objektas** – tai sąryšis tarp makroekonominių rodiklių ir akcijų kainų. **Tyrimo metodai** yra mokslinės literatūros loginė analizė ir sintezė, lyginamoji analizė ir apibendrinimo metodas, statistinio grupavimo metodas.

Temos aktualumas: nors įvairiose šalyse yra gana daug teorinių ir praktinių darbų nagrinėjama tematika, tačiau panašaus pobūdžio studijų Lietuvoje beveik nėra. Be to, nei vienas mokslininkas dar nenagrinėjo trumpalaikio sąryšio tarp makroekonominių rodiklių ir akcijų kainų Lietuvoje, taikant reakcijos į impulsą funkciją.

Darbo tikslas yra įgyvendinamas, naudojant Lietuvos akcijų rinkos indeksą OMXV, kuris atspindi daugumos Lietuvos akcijų biržoje kotiruojamų įmonių akcijų kainų svyravimus bei pagrindinius ir dažniausiai panašaus pobūdžio tyrimuose naudojamus makroekonominius rodiklius: bendrąjį vidaus produktą, infliaciją, trumpalaikę palūkanų normą, pinigų pasiūlą M1, valiutos kurso svyravimus, nedarbo lygį. Tai

nuo 2000-ųjų metų sausio mėn. iki 2009-ųjų metų birželio mėn. duomenys.

Bendrasis vidaus produktas arba pramonės produkcijos apimtis yra svarbūs tokio pobūdžio tyrimams, nes jie atspindi šalies ekonominį augimą (Fama, 1981; Chen, Roll, Ross, 1986; Cheung, Ng, 1998; Binswanger, 2000). DeFina (1991) teigia, kad infliacijos didėjimas daro neigiamą įtaką akcijų kainoms. Infliacija dažniausiai atspindima vartojimo prekių kainų indeksu (Atmadja, 2005; Dritsaki, 2005; Laopodis, 2007), nors kai kurie tyrinėtojai naudoja ir kitus infliaciją atspindinčius indeksus, pavyzdžiui, gamintojų kainų indeksą. Šiame darbe infliaciją atspindi vartojimo prekių kainų indeksas. Dalis mokslininkų renkasi trumpalaikę palūkanų normą (Dritsaki, 2005; Atmadja, 2005), kiti – ilgalaikę palūkanų normą (Siliverstovs, Doung, 2005), nors yra ir tokių tyrinėtojų, kurie savo studijose naudoja tiek trumpalaikę, tiek ilgalaikę palūkanų normas kartu (Che, Roll, Ross, 1986; Mukherjee, Naka, 1995). Pinigų pasiūla yra dar vienas svarbus makroekonominis rodiklis (Urich, Wachtel, 1981; Chaudhuri, Smiles, 2004), ieškant sąryšio su akcijų kainomis. Vieni autoriai savo tyrimuose naudoja pinigų pasiūlą siaurąja prasme (Tan, Baharumshah, 1999), kiti – platesne prasme M2 (Tursoy, Gunsel, Rjoub, 2008). Akcijų kainų svyravimams gali daryti įtaką ir šalies valiutos kurso svyravimai, todėl daugelis mokslininkų šį rodiklį naudoja empirinėje analizėje (Adam, Tweneboah, 2008; Ahmed, 2008; Ibrahim, 2003; Kwon, Shin, 1999). Kadangi nedarbo lygis yra vienas iš svarbiausių šalies ekonominę padėtį įvertinančių makroekonominių rodiklių, jis taip pat yra naudojamas tiriant sąryšį tarp makroekonominių rodiklių ir akcijų kainų (Tursoy, Gunsel, Rjoub, 2008). Tai dažniausiai mokslinėje literatūroje naudojami makroekonominiai rodikliai, kurie geriausiai atspindi šalies makroekonominius procesus. Tai ir lėmė šių makroekonominių rodiklių pasirinkimą.

Kadangi tiriant reakcijos į impulsą funkciją duomenys turi būti stacionarūs, siekiant išvengti netikrų ir iškraipytų sąryšių, todėl buvo pasirinktas vienetinės šaknies testas, kuriuo ir buvo tikrinamas duomenų stacionarumas. Visi duomenys tapo stacionariais diferencijavus antru laipsniu.

Atlikti empiriniai tyrimai rodo, kad bendrasis vidaus produktas greitai tiesiogiai veikia OMXV indeksą. Šis poveikis yra stipriausias po dviejų mėnesių, vėliau jis silpnėja, bet išlieka tiesioginis per visą dvylikos mėnesių periodą. Panašius rezultatus yra gavę ir kiti mokslininkai (Ibrahim, 2003; Somoye, Akintoye, Oseni, 2009). Nagrinėjant OMXV indekso ir vartojimo prekių kainų indekso sąryši, galima pastebėti, kad kainų indeksas neturi tokio staigaus poveikio akcijų kainoms kaip bendrasis vidaus produktas ir šis poveikis nėra pastovus. Nuo devinto mėnesio galima įžvelgti tiesioginį sąryšį tarp Lietuvos akcijų kainų indekso ir vartojimo prekių kainų indekso (tai patvirtina Rapach (2002) teiginius), nes tikėtina, jog akcijų kainos turi tiesioginį sąryšį su infliacija ilguoju laikotarpiu. Pinigų pasiūla M1 daro įtaką OMXV indeksui panašiai kaip ir bendrasis vidaus produktas, netgi maksimalus poveikis yra pasiekiamas tuo pačiu metu, t. y. po dviejų mėnesių. Tiesioginė pinigų pasiūlos įtaka yra akcentuojama ir kituose darbuose (Dumitrescu, Horobet, 2009). Nedarbo lygis didžiąją laiko dalį per metus daro neigiamą įtaką OMXV indeksui, t. y. dėl nedarbo lygio augimo mažėja OMXV indeksas, ir šio poveikio didžiausias efektas yra pasiekiamas per aštuntą mėnesį. Panašius rezultatus yra gavę Arestis, Baddeley ir Sawyer (2007), kurie atliko savo tyrimą su devyniomis euro zonos valstybėmis. Valiutos kurso svyravimai, kaip ir nedarbo lygis, daro neigiamą poveikį OMXV indeksui. Tokius pačius rezultatus gavo Aydemir ir Demirhan (2009) Turkijos rinkoje. Trumpalaikės palūkanų normos poveikis akcijų kainoms yra daugiau atvirkštinis nei tiesioginis. Alam ir Uddin (2009) taip pat nustatė, kad reikšmingas atvirkštinis ryšys egzistuoja penkiolikoje išsivysčiusių ir besivystančių pasaulio šalių.

Atlikti tyrimo rezultatai rodo, kad Lietuvoje neabejotinai egzistuoja trumpalaikis sąryšis tarp akcijų kainų ir makroekonominių rodiklių. Bendrasis vidaus produktas ir pinigų pasiūla turi didžiausią tiesioginį sąryšį su akcijų kainomis, o nedarbo lygio, valiutos kurso svyravimų ir trumpalaikės palūkanų normos poveikis dažniausiai yra atvirkštinis akcijų kainoms Lietuvos rinkoje.