BUSINESS, MANAGEMENT AND EDUCATION
ISSN 2029-7491 / eISSN 2029-6169
2015, 13(2): 292–307
doi:10.3846/bme.2015.295

RELATIONSHIP BETWEEN LITHUANIAN SOVEREIGN CREDIT RISK AND EQUITY MARKET

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Received 09 November 2015; accepted 26 November 2015

Abstract. We analyse relationship between Lithuanian sovereign credit risk and equity market. The aim of the paper is to find the impact of the sovereign credit risk, which is expressed in the terms of Credit Default Swaps (CDS), on the movements of stocks prices of Lithuania. We use VAR (vector autoregression) model in order to find the relationship between Lithuanian CDS spread and OMX Vilnius index. We use impulse reaction method to investigate the impact of CDS spreads on the OMX Vilnius index. After analysis of equity index OMX Vilnius and Lithuanian CDS price relationship it was found out that there exists an opposite relationship between these two variables. When the CDS prices are rising, the equity prices decrease and vice versa. The main finding is that Lithuanian capital market returns reacts immediately to the changes of credit risk of Lithuania which is set by the global capital market and expressed by the CDS prices and Lithuanian capital market is under the great foreign pressure.

Keywords: CDS, spread, credit, OMX Vilnius, risk, stocks.

JEL Classification: G00, G01, G14.

1. Introduction

The movements of capital market affect the economy and wealth-being of individuals worldwide. Among investors into stocks are not only individuals but institutional investors as well. Pension funds are very big players in the capital market, therefore movements in the stock market have influence on the future wealth of individuals. Academicians, financial experts and almost the entire society is interested in understanding the drives of the stock market. During the crisis period the focus on movements of capital market increase dramatically. The volatility of the sovereign credit risk of the country, where the company is located is one of the factors which has a strong impact on the prices of the shares.

Global financial market expresses view on the sovereign risk in setting Eurobonds spreads and CDS (credit default swap) spreads. It is worth to notice, that these parameters are set outside the country. Longstaff *et al.* (2011) proved, that CDS spreads are not individual and they depend more on the external factors than on the country's economic conditions. It means that the sovereign risk as it is treated by the global financial market is not sovereign. Despite the fact that CDS spreads are set outside Lithuania and they are affected by the developments in other countries they have an influence on the Lithuanian capital market.

The aim of the paper is to find the impact of the sovereign credit risk, which is expressed in the terms of CDS, on the movements of stocks prices of Lithuania. We focus on the immediate reaction, therefore we use daily data. We use VAR (vector autoregression) model in order to find the relationship between Lithuanian CDS spread and OMX Vilnius index. We use impulse reaction technique to investigate the impact of CDS spreads on the OMX Vilnius index.

The rest of the paper is structured as follows. Section 2 presents literature overview focusing on CDS as an indicator of credit risk. Section 3 reveals the way of modelling Lithuanian CDS and OMX Vilnius index. Section 4 presents the results of calculations. Final section concludes the paper.

2. Literature overview

According to a traditional definition, sovereign credit risk is the risk of a government becoming unwilling or unable to meet its financial obligations. Rating agencies estimate the credit risk of the country and assign rating which expresses the sovereign debt. Actually, the ratings reflect a probability of the default of the debt repayment. Despite a very considerable experience of the credit rating institutions, a lot of criticism is addressed to them. Eijffinger (2012) claimed that the rating agencies were lagging behind markets in their judgments. Nevertheless, an analysis of Antonio *et al.* (2012) established significant responses of government bond yield spreads to changes in rating notations and outlook.

High volatility of the financial market stresses a need to use a market-based measure for the borrowing cost which is changing continuously. Country's borrowing cost in an international market is measured as a sovereign bond yield spread which is defined as a difference between the yield of the country's debt securities and risk free yield. Currently, an interest rate swap is used as an indicator of a risk free rate. The advantages of the interest rate swap are that it is highly liquid, carries relatively little counterparty risk, and provides explicit quotes for the 3, 5, 7 and 10-year maturities (see Beber *et al.* 2009). The sovereign bond yield spread is one of the measures for credit risk of the country.

CDS spread is an alternative measure for sovereign credit risk. According to Statistics of BIS[1], the total outstanding notional amount of sovereign CDS at the end of June 2014 was 2.5 trillion of USD dollars. As a measure of credit risk, CDS spreads imply a probability of default of the sovereign together with a recovery ratio in case of the default. The main advantage of CDS spreads to bond yield spreads is that they explicitly express risk and there is no influence from a risk free yield curve which can be built using some models (Ericsson *et al.* 2009).

Comprehensive analyses of co-movement and lead-lag analysis of sovereign CDS and bond spreads is presented by IMF, 2013 and Fontana and Scheicher, 2010. It is commonly agreed by the authors that co-integration relationship of the variables holds reasonably well and both of the indicators can be leading depending on the market conditions. Leadership of CDS spreads against bond spreads is different for advanced and developing economies. According to IMF (2013), CDS prices moved faster in advanced economies during the crisis period. Gyntelberg *et al.* (2013) analysed the co-movement of CDS and bonds spreads of the euro area countries during intraday trading. They established that the CDS market dominated over the bond market in terms of price discovery in the vast majority of cases they examined. A lead-lag analysis for various euro area countries was carried out by many authors. The French CDS analysis was presented by Coudert and Gex (2010), the Italian case was described by Carboni (2011).

CDS spreads for individual Central and East European countries have been analysed by a number of authors. Some researchers carried out a lead-lag analysis of CDS spreads and bond yields spreads. Varga (2009) studied development of CDS-bond basis spread in Hungary from February 2005 to June 2008 in order to compare the results of the Hungarian CDS market analysis in an international context[2] covering the Baltic countries. He found that there was no clear leader in this market. Noteworthy, Varga analysed the markets before the crisis. A lead-lag analysis for CDS of the Czech Republic was performed by Komarkova *et al.* (2013). They concluded that the movements in the Czech sovereign CDS market preceded movements in the sovereign yield spread during the global crisis.

The research on the impact of credit risk on the macroeconomics of sovereigns increased after the sovereign debt crisis. A number of authors investigated analysed the euro area countries. Neri and Ropele (2013) analysed the impact of the sovereign debt crisis on a number of macroeconomic variables. They investigated the euro area as a whole and individual countries as well. They found that sovereign tensions had led to contraction in credit and increase in the cost of new loans. The implication of the sovereign risk channel was explored by Corsetti *et al.* (2013). They studied how sovereign default risk raised funding cost in the private sector. It is worth noting that a

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[1] Available at Internet: https://www.bis.org/statistics/d10_1.pdf

[2] Varga (2009) analysed Brasil, Bulgaria, the Czech Republic, the Republic of South Africa, Estonia, Croatia, Poland, Latvia, Lithuania, Russia, Romania and the Slovak Republic.

completely different mathematical approach was used for the studies mentioned above. Neri and Ropele (2013) based their empirical analysis on the Factor Augmented Vector Autoregressive (FAVAR) model with Bayesian methods, while Corsetti *et al.* (2013) designed their model on the basis of New Keynesian baseline theory. Despite the different approaches, the conclusions show that private borrowing is affected by sovereign risk or sovereign tensions. Some studies were related to the impact of corporate credit spreads on business cycles. Gilchrist *et al.* (2009) reported that credit market spreads had a significant impact on business cycles in the U.S. Norden and Weber (2009) proved that the CDS market contributes more to price discovery than the bond market and this effect is stronger for the US than for European firms.

The are several studies of Lithuanian capital market. The impact of sectoral economic indicators was studied by Rudzkis and Valkevičienė (2014). They used VAR model to analyse economic factors such as money supply, profitability ratio, profit of economic activity, total profit, activity charge, material asset, subsidy, financial liability ratio, financial assets, salary, operation costs, profit, social security, resources, liquidity ratio impact on security prices. They found that Econometric analysis of OMX Baltic security market proves the hypothesis that the set of sectoral regressors may vary considerably depending on the individual sector’s price indices.

Jurkšas and Kropienė (2014) Studied the impact of macroeconomic fundamentals on Lithuanian government securities prices using quarterly data for the period 2000–2013, applying five major macroeconomic variables: gross domestic product, consumer prices, interest rates, money supply, and foreign direct investment.

Stankevičienė *et al.* (2014) studied the comparison of country risk, sustainability and economic safety. Using Euromoney Country Index, European Economic Sustainability Index and Aggregate Value of State Index data authors developed a system to compare and benchmarking each country.

The credit risk market based indicators which are changing daily were investigated by Kregždė and Murauskas (2014) for Lithuanian case. They made an analysis of leading role of CDS and the bond markets in the price discovering process. A leading market for different periods is found by using the Vector Error Correction model. They found that during the volatile period price discovery takes place in the bond market and in the calm period price discovery is observed in the CDS market.

The contagion of credit risk market indicators for Baltic states was investigated by Kregždė and Murauskas (2015). They estimated the level of commonalities and differences in credit risk of the Baltic countries with regard to CDS spread. The driving forces for changes of CDS spreads in the individual country were established. They discovered that the main impact of CDS spread changes arrives from external sources.

Our VAR analysis was performed similarly to the one of Koseoglu (2013). We have also used methods to construct our VAR model that were described by Kvedaras (2005). We also used took into account some analytical econometrics ideas from Leipus (2010).

3. Modelling Lithuanian CDS and OMX Vilnius indices

There are five steps that are needed to be taken during the creation of VAR:

1. Model specification,
2. Parameters evaluation,
3. Verification of stationary variables,
4. Lag selection,
5. Model adequacy analysis.

Firstly, a two dimensional p order VAR equation is constructed. This equation describes dynamic relationship between CDS spreads and equity returns.

$$\begin{aligned} &OMX(t)=\alpha_1+\varphi_{11}OMX(t-1)+\varphi_{12}OMX(t-2)+\ldots+\varphi_{1p}OMX(t-p)+\\ &\varphi_{21}CDS(t-1)+\varphi_{22}CDS(t-2)+\ldots+\varphi_{2p}CDS(t-p)+\varepsilon_1(t).\\ &CDS(t)=\alpha_2+\varphi_{31}OMX(t-1)+\varphi_{32}OMX(t-2)+\ldots+\varphi_{3p}OMX(t-p)+\\ &\varphi_{41}CDS(t-1)+\varphi_{42}CDS(t-2)+\ldots+\varphi_{4p}CDS(t-p)+\varepsilon_2(t). \end{aligned} \tag{1}$$

In the (1) equation OMX and CDS represent two different time series variables. In this case it is OMX Vilnius index and CDS index. In this model each variable is described using its own past lags. In the first part of (1) equation α_1 is the intercept. $\varphi_{1\beta}$ is the parameter next to OMX variable, where $\beta\in[1,p]$ and p is the lag degree; $\varphi_{1\beta}$ is the parameter next to CDS variable, where $\beta\in[1,p]$ and $\varepsilon_1(t)$ is the error term. In the second part of the equation α_2 is the intercept, $\varphi_{1\beta}$ is the parameter next to OMX variable, where $\beta\in[1,p]$ and p is the lag degree, $\varphi_{2\beta}$ is the parameter next to CDS variable, where $\beta\in[1,p]$ and p is the lag degree and ε_2 (t) is the error term.

In this research the data of OMX Vilnius index and Lithuanian CDS was chosen. The analysed period was between 2008 September to 2013 March. As it can be seen from Figure 1 CDS spreads and equity index values are moving into the opposite directions. The growing credit risk increases CDS spreads and decreases equity index values. By using this graph analysis it can be seen that there exists a movement into the opposite directions between sovereign CDS spreads and equity index.

The data is divided into two main periods: crisis period, between 2008 October until 2009 September and period after crisis between 2009 October until 2013 march. The beginning and ending of each of the periods coincide with the places where the curves cross each other.

Our chosen VAR model is a vector autoregressive model used to describe dynamic relationships between stationary variables. Model is autoregressive when its values are dependent on its past values.

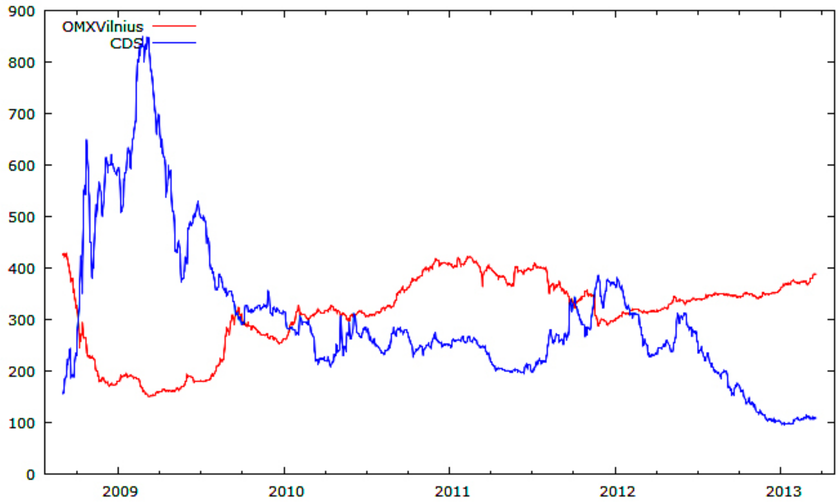

Fig. 1. The graph of OMX Vilnius and Lithuanian CDS spreads

Notes: CDS index is a solid line and its scale is on the left (in basis points). OMX Vilnius index is shown in a dashed line and its scale is on the right (values of OMX Vilnius index).

VAR model is applied to data that has stationary variables. This means that all of the values of the series need to be spread around the mean and the variance and covariance are constant and finite. This can be checked by using Augmented Dickey-Fuller test. In this test a null hypothesis must be chosen. The hypothesis says that there exists a unit root, which means that the data is non stationary. If the hypothesis is rejected we can draw a conclusion that the data is stationary and suitable to use in VAR test.

After looking at the graphs a hypothesis that the data is non stationary might be build. This is due to the fact that the values are not spread out around the mean but are moving up and down. Therefore in the ADF test the transformed data – the first differences is used. In this test, the null hypothesis states that there exists a unit root. In this case the process is non stationary. However, because the p value is smaller than confidence level (0.05) (Table 1 in Appendix), the hypothesis needs to be rejected. Therefore the first differences of OMX Vilnius index and CDS are stationary.

Later one needs to choose lags order. Informational criteria such as Akaike, Bayes-Shwarz and Hannah-Quinn might also be used. They describe the significance levels of lags. Akaike criterion showed which lag to choose, the most suitable lag order was presented by the smallest value. In our case it was 13. However, BIC and HQC information criteria showed that 1 lag would be the most suitable, therefore only one lag equation was constructed. VAR coefficients can be seen in Table 2 (see Appendix). Equation (2) is VAR(1). The Δ in front of the variables shows that we are using first differences of the variables.

$$\begin{aligned}
\triangle OMX(t) &= \underset{[0.0025]}{0.0923} \cdot \triangle OMX(t-1) - \underset{[<0.0001]}{0.0478} \cdot \triangle CDS(t-1) - \underset{[0.8008]}{0.0312} + \varepsilon_1(t) \\
\triangle CDS(t) &= \underset{[0.0626]}{0.1537} \cdot \triangle OMX(t-1) + \underset{[<0001]}{0.2160} \cdot \triangle CDS(t-1) - \underset{[0.9345]}{0.0276} + \varepsilon_2(t).
\end{aligned} \tag{2}$$

The VAR model is adequate then and only then when its residuals do not depend on any tendencies. In this case it is important that residuals wouldn't autocorrelate. Model residuals autocorrelation can be verified by analysing each coefficient individually or using joint null hypothesis which states that all residuals autocorrelations are equal to zero. Residuals autocorrelation may be checked using Box-Pierce, Ljung-Box statistics or Durbin-Watson method. The last one was chosen.

In Durbin–Watson method there is a null hypothesis chosen which says that autocorrelation does not exist. It is true when $d_U \leq d \leq 4 - d_U$. In this research the n = 1512, d needs to be in the interval [1.9165, 2.0835]. When the first test is done with first order lag, d is equal 0.017840. This means that the null hypothesis needs to be rejected and there exists residuals correlation. This problem may be solved using several methods: adding new factors, changing the lags order, performing data transformation or doing Cochrane-Ocrut procedure.

In this case lag order change was chosen. After increasing lag order to the second one a new coefficient is found: 2.002807. However when we look at the crisis period it was discovered that the Durbin – Watson statistic does not belong to the interval.

Therefore, using empirical analysis it is found out that the needed lag order is 5, and the coefficients are: 2.052080 during crisis period, 1.973601 after crisis period and 1.997238 during the whole period. At this point a meaningful VAR equation can be constructed. The new coefficients are written in Table 3 (see Appendix).

The t value describes the significance of the coefficient. The p test is using null hypothesis which states that coefficient does not impact on equation values. When p statistics is smaller than 0.05, the value fits into small 5% interval and then the hypothesis needs to be rejected. The coefficients that are in the interval are significant. In this research the most significant coefficients during the whole period are φ_{11}, φ_{21}, and φ_{25}.

4. Results

The new VAR model equation is written by using VAR coefficients for first differences with the lags of 5th degree (Table 3 in Appendix). This equation describes equity index OMX Vilnius dependency on equity past values and CDS past values (Equation (3)). The values in parentheses show the lags and the numbers in square brackets describe the significance of the coefficients above them.

$$\begin{aligned}
&\triangle OMX(t) = -0.0339 + 0.0872 \cdot \triangle OMX(t-1) + 0.0404 \cdot \triangle OMX(t-2)\\
&\qquad [0.7832] \qquad [0.0047] \qquad [0.1913]\\
&+0.0426 \cdot \triangle OMX(t-3) + 0.0301 \cdot \triangle OMX(t-4) - 0.0512 \cdot \triangle OMX(t-5)\\
&\qquad [0.1676] \qquad [0.3305] \qquad [0.0949]\\
&-0.0491 \cdot \triangle CDS(t-1) + 0.0004 \cdot \triangle CDS(t-2) + 0.0199 \cdot \triangle CDS(t-3) \oplus\\
&\qquad [<0.001] \qquad [0.9753] \qquad [0.3418]\\
&+0.0111 \cdot \triangle CDS(t-4) - 0.0425 \cdot \triangle CDS(t-5) + \varepsilon_1(t)\\
&\qquad [0.3380] \qquad [0.0002]\\
&\triangle CDS(t) = -0.0377 + 0.1716 \cdot \triangle OMX(t-1) - 0.0311 \cdot \triangle OMX(t-2)\\
&\qquad [0.9102] \qquad [0,0396] \qquad [0.7104]\\
&+0.0391 \cdot \triangle OMX(t-3) + 0.1533 \cdot \triangle OMX(t-4) - 0.0281 \cdot \triangle OMX(t-5)\\
&\qquad [0.6403] \qquad [0.0671] \qquad [0.7345]\\
&+0.2059 \cdot \triangle CDS(t-1) + 0.0311 \cdot \triangle CDS(t-2) + 0.0946 \cdot \triangle CDS(t-3)\\
&\qquad [<0.001] \qquad [0.3229] \qquad [0.0026]\\
&-0.0272 \cdot \triangle CDS(t-4) + 0.0746 \cdot \triangle CDS(t-5) + \varepsilon_2(t).\\
&\qquad [0.3865] \qquad [0.0165]
\end{aligned} \tag{3}$$

Finally, the created VAR model is used in impulse-reaction analysis. In this analysis it is important that VAR residuals which are used would not be correlated – the data performs homoscedasticity.

For testing residuals homoscedasticity Breusch-Pagan test is used. The null hypothesis of this test states that the residuals of this model are homoscedastic. There is a LM formula ($LM = n \cdot R^2$, where n is the number of observations and R^2 the coefficient of determination) is used. Then it is compared with the critical value of the model. If the LM statistic is smaller than the critical value the null hypothesis is not rejected. In our test the calculated LM statistic is 0.378002 and the critical value is 5.99146, therefore the residuals are homoscedastic.

We take VAR equations for each period (the whole period, crisis and after crisis) separately and give impulses to each. We examine how the variables reacted in each period during the first 30 days after the impulse. We draw graphs which describe the reactions to those impulses. The first variable in the name of the graph indicates the variable that receives the impulse. The second variable is the one which reacts to the changes in the first variable behaviour and its reaction is plotted in the graph.

Figure 2 describes the reactions of the impulses during the whole period. After OMX Vilnius index is given an impulse, index value rises to 4.25 (Fig. 2, upper left corner). Later index values suddenly decrease but recover pretty fast – in 5 days. During 5–9 days period the values stay a little bit above 0. On the 9th day impulse effect is gone, equity index values are stable again.

From the graph in Figure 2 on the right in the upper corner it can be see that after given an impulse to CDS prices, OMX Vilnius index values change. Minimal values are reached on the first and fifth days. Firstly, when CDS prices are given an impulse, equity returns fall to a negative value and by this they show the negative dependencies. Later they rise for a short while (during the 3rd day they are above 0) and later they fall again, they reach –0.45 on the 5th day. Later impulse impact decreases and equity returns return to their initial position with a little fluctuation during 7 and 8 days. During the 15th day impulse impact almost disappears.

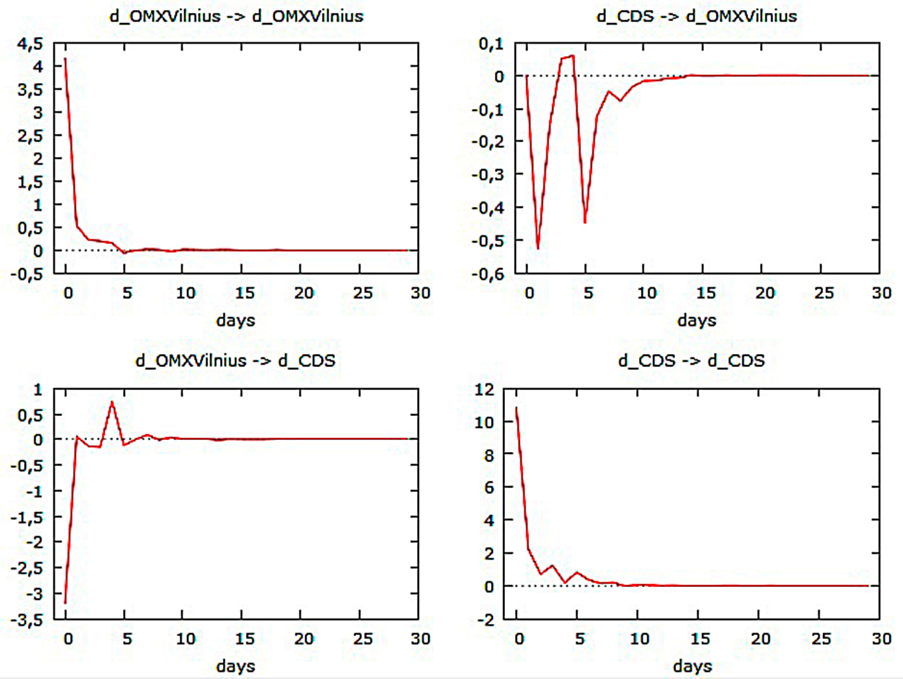

Fig. 2. Impulse – reaction graphs for the whole period

Notes: d_OMXVilnius -> d_OMXVilnius: an impulse given to equity index and response of the equity index; d_CDS -> d_OMXVilnius: an impulse given to CDS and response of the equity index; d_OMXVilnius -> d_CDS: an impulse given to the equity index and response of the CDS; d_CDS -> d_CDS: an impulse given to CDS index and response of the CDS index.

Looking at the crisis period it can be seen that after given an impulse to the equity returns they rise to the highest point in the whole period – to 4.5 (Fig. 3 in the left upper corner). Later the values suddenly fall and during the 2nd day they decrease and reach the value below the initial position: –0.5. Later the equity index fluctuate a little bit around 0 and impulse effect totally disappears only 15th day.

After given an impulse to the CDS prices the equity returns change more and these changes in values stay longer than in the whole period (Fig. 3 in the right upper corner). There can be seen a negative impact of the impulse to CDS on the first days when equity values fall to –0.45 and later they rebound for a little bit and fall again on the 5th day to –1. This is the biggest fall during all of the periods. Later equity returns start to rise again, but they come back to their initial position only on the 20th day. This is the longest time the values take to recover.

During the crisis period the equity returns are given an impulse and they rise up to 3.5 (Fig. 4 in the left upper corner). Later there is a fast decrease and during the first day they reach 0.25. During this period the equity returns take only 5 days to return to their initial position.

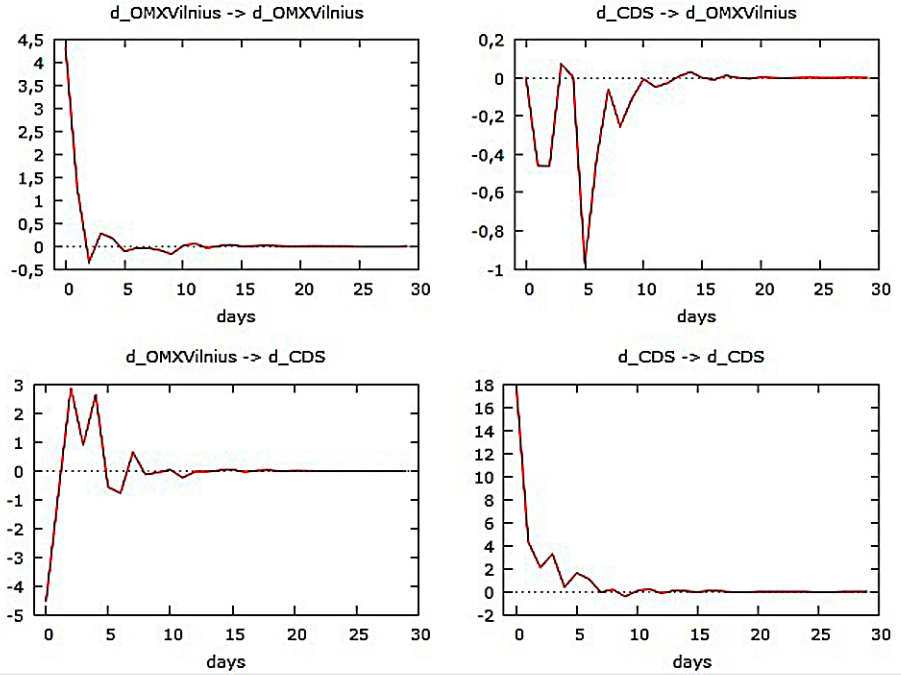

Fig. 3. Impulse – reaction graphs for the crisis period

Notes: d_OMXVilnius -> d_OMXVilnius: an impulse given to equity index and response of the equity index; d_CDS -> d_OMXVilnius: an impulse given to CDS and response of the equity index; d_OMXVilnius -> d_CDS: an impulse given to the equity index and response of the CDS; d_CDS -> d_CDS: an impulse given to CDS index and response of the CDS index.

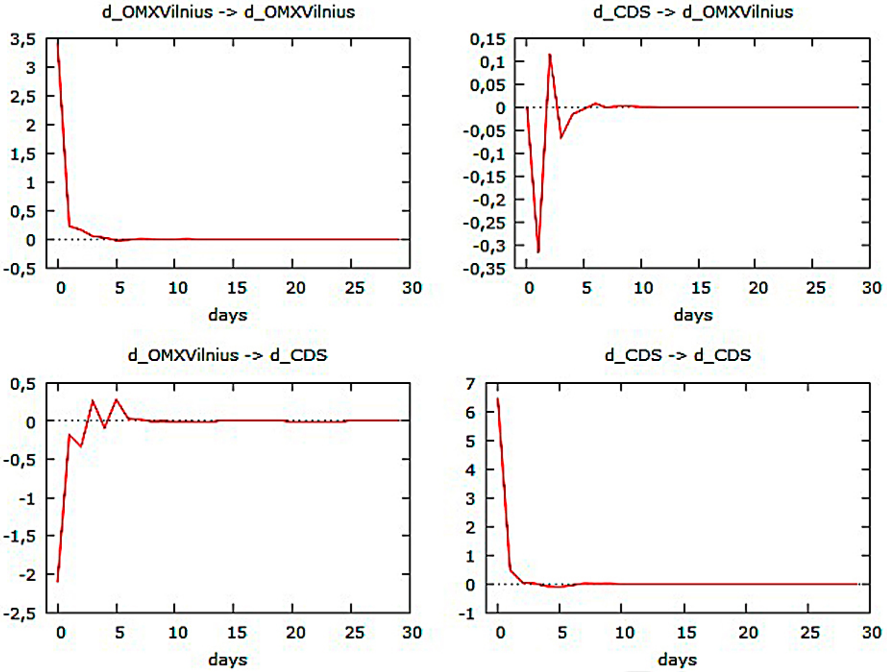

Fig. 4. Impulse – reaction graphs for the period after crisis

Notes: d_OMXVilnius -> d_OMXVilnius: an impulse given to equity index and response of the equity index; d_CDS -> d_OMXVilnius: an impulse given to CDS and response of the equity index; d_OMXVilnius -> d_CDS: an impulse given to the equity index and response of the CDS; d_CDS -> d_CDS: an impulse given to CDS index and response of the CDS index.

When looking at the period after crisis it is possible to see that the changes in CDS values have a big effect on equity returns (Fig. 4 in the right upper corner). During the econd day equity returns fall to –0.31760 and during the fourth day to –0.066098. However during this period the values come back to their initial position pretty fast and already during 6–7 days impulse impact is almost unrecognized and fluctuating round 0.

5. Conclusions

After analysis of equity index OMX Vilnius and Lithuanian CDS price relationship during the period from September 2008 to 2013 March it was found out that there exists an opposite relationship between these two variables. When the CDS prices are rising, the equity prices decrease and vice versa. Both of the market prices were more sensitive during the crisis period of 2008 October until 2009 September. Then the CDS prices increased in a fast manner and equity index prices decreased.

It is worth to notice, that the credit risk of Lithuania which is set by the international capital market and expressed by the CDS price has an impact on the capital market of

Lithuania. Our analysis shows, that five Vilnius OMX index past values and five CDS past values impacted on the present equity index value.

In this research it is found out that the tendencies in OMX Vilnius equity index changes after given a shock to CDS. This impulse affected equity prices into opposite direction, the lowest point was reached during the crisis period (–1). It took 20 days in order for the impulse impact to disappear. During the whole period it only took 15 days, and during the time after crisis: less than 10 days. Later after given a shock to equity index it was found out that equity returns rose the most and took the longest time to return to its initial position during crisis period. This showed that during the crisis period CDS and equity index values are more sensitive and are the slowest to recover. During the period of after crisis, equity index was less sensitive (coefficient fell only to 0.3) and recovered faster.

The analysis of the OMX Vilnius equity returns and Lithuanian CDS prices shows that the strongest negative relationship of these two variables is during the crisis period when the credit risk is high. Then the CDS prices rose fast and equity returns decreased. During the crisis period the equity returns took the longer time to recover. However, after this period passed, the equity returns started to rise again making the CDS prices fall. Therefore it can be seen that there is a continual dynamics between these two markets.

The final finding is that Lithuanian capital market returns react sharply to the credit risk of Lithuania which is set by the global capital market and expressed by the CDS prices. Taking into account research made by a number of authors, showing that sovereign CDS prices are more affected by the international environment than on economic indicators of the country, we make a conclusion that Lithuanian capital market is under the great foreign pressure. The analysis of the credit risk of the surrounding countries can help to understand behaviour of Lithuanian CDS prices and Lithuanian capital market return.

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APPENDIX

Table 1. ADF test results for first differences

	Whole period		Crisis period		Period after crisis	
	OMX Vilnius	CDS	OMX Vilnius	CDS	OMX Vilnius	CDS
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
p with trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
(a-1)	–0.8380	–0.759	–1.0092	–0.7306	–0.8973	–0.9124
(a-1) with trend	–0.8446	–0.761	–1.0837	–0.7537	–0.8974	–0.9128
tau_ct(1)	–21.5461	–20.34	–12.3583	–9.3130	–19.3428	–19.7680
tau_ct(1) with trend	–21.6566	–20.37	–12.9363	–9.4629	–19.3327	–19.7624

Table 2. VAR for first differences, lag degree 1

Period	The whole period		Crisis period		After crisis period	
	Coefficient	t	Coefficient	t	Coefficient	t
	–0.0312	–0.250	0.1135	0.3280	0.0950	0.8160
	0.0923	3.030	0.0682	1.0740	0.0280	0.7890
	–0.0478	–4.280	–0.0287	–1.6500	–0.0505	–2.8080
	–0.0276	–0.080	–0.0861	–0.0700	–02323	–1.0070
	0.1537	1.860	02717	1.1600	–0.0057	–0.0800
	0.2160	7.130	0.2543	3.9580	0.0709	1.9910

Table 3. VAR coefficients for first differences, lag degree 5

The whole period			Crisis period		
Coefficient	t	p	Coefficient	t	p
–0.0339	–0.2753	0.7832	0.0092	0.0327	0.9739
0.0872	2.8360	0.0047***	0.2647	4.2340	<0.01***
0.0404	1.3080	0.1913	–0.1759	–2.7790	0.0059***
0.0426	1.3810	0.1676	0.1637	2.8640	0.0046***
0.0301	0.9735	03305	–0.0215	–0.3891	0.6975
–0.0512	–1.6720	0.0949*	–0.0465	–0.8561	0.3926
–0.0491	–4.3030	<0.01***	–0.0255	–1.6570	0.0988*
0.0004	0.0309	0.9753	–0.0128	–0.8305	0.4017
0.0110	0.9510	0.3418	0.0122	0.8142	0.4163
0.0111	0.9585	0.3380	0.0020	0.1304	0.8963
–0.0425	–3.7070	<0.01***	–0.0488	–3.2790	0.0012***
–0.0377	–0.1128	0.9102	–0.2951	–0.2431	0.8082
0.1716	2.0600	0.0396**	0.0693	0.2580	0.7966
–00311	–0.3715	0.7104	0.7546	2.7740	0.0060***
0.0391	0.4675	0.6403	0.0123	0.0499	0.9602
0.1533	1.8330	0.0671*	0.5556	0.0499	0.0202**
–0.0281	–0.3393	0.7345	–0.5371	–2.3030	0.0222**
0.2059	6.6680	<0.01***	0.2389	3.6130	0.0004***
0.0311	0.9890	0.3229	0.0599	0.9029	0.3675
0.0946	3.0200	0.0026***	0.1604	2.4920	0.0134**
–0.0273	–0.8664	0.3865	–0.0484	–0.7403	0.4598
0.0746	2.4020	0.0165**	0.0777	1.2140	0.2259

After crisis period

	Coefficient	t	p
	0.0705	0.6338	0.5263
	0.1014	3.3150	<0.01***
	–0.0170	–0.5551	0.5790
	0.0586	1.9840	0.0474**
	0.0002	0.0051	0.9959
	–0.0451	–1.5650	0.1179
	–0.0385	–3.6630	<0.01***
	0.0016	0.1556	0.8764

	Coefficient	t	p
	–0.0030	0.2836	0.7767
	–0.0037	0.3485	0.7275
	–0.0390	–3.7560	<0.01***
	–0.2287	–0.9840	0.3254
	–0.0080	–0.1130	0.9100
	–0.0930	–1.3080	0.1911
	0.0876	1.2300	0.2189
	–0.0379	–0.5329	0.5942
	0.0699	0.9875	0.3237
	0.0715	1.9970	0.0462**
	0.0007	0.0200	0.9841
	–0.0042	–0.1173	0.9067
	–0.0083	–0.2301	0.8180
	–0.0216	–0.6038	0.5461

Notes: Here α_1 represents intercept coefficient in the first equation where dependent variable is equity index OMX Vilnius, φ_{11} coefficient next to the first OMX Vilnius lag, φ_{12} coefficient next to the second OMX Vilnius lag, φ_{13} coefficient next to the third OMX Vilnius lag, φ_{14}coefficient next to the fourth OMX Vilnius lag, φ_{15} coefficient next to the fifth OMX Vilnius lag, φ_{21} coefficient next to the first CDS lag, φ_{22} coefficient next to the second CDS lag, φ_{23} coefficient next to the third CDS lag, φ_{24} coefficient next to the fourth CDS lag, φ_{25} coefficient next to the fifth CDS lag.

Here α_2 represents intercept coefficient in the second equation where dependent variable is CDS, φ_{31} coefficient next to the first OMX Vilnius lag, φ_{32} coefficient next to the second OMX Vilnius lag, φ_{33} coefficient next to the third OMX Vilnius lag, φ_{34} coefficient next to the fourth OMX Vilnius lag, φ_{35} coefficient next to the fifth OMX Vilnius lag, φ_{41} coefficient next to the first CDS lag, φ_{42} coefficient next to the second CDS lag, φ_{43} coefficient next to the third CDS lag, φ_{44} coefficient next to the fourth CDS lag, φ_{45} coefficient next to the fifth CDS lag.

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