Silvo Dajcman[1]

CONTAGION BETWEEN NATIONAL STOCK AND BOND MARKETS DURING FINANCIAL MARKET TURMOIL — A CASE OF EUROZONE COUNTRIES

With the Eurozone sovereign debt crisis the public debt management has come to the front of the international policy agenda. Transmission of shock from one segment of a national financial market to other segments of financial market is of special importance in this respect. This paper examines whether there was a structural shift in sovereign bond market-stock market linkage in the financial crisis periods with respect to tranquil (non-crisis) period (i.e. contagion) of the Eurozone countries (namely Austria, Germany, France, Ireland, Italy, Portugal and Spain) during the greatest financial market unrests in the period from January 2000 to August 2011. A simple indicator of contagion based on dynamical conditional correlation is proposed and calculated for each country. We found that before April 2010 financial market turmoil did not coincide with the contagion between stock and sovereign bond markets in the investigated countries. In the period from April 2010 until the end of August 2011, characterized by the sovereign debt crisis in the Eurozone, a contagion between the stock and sovereign bond markets was identified for Ireland, Italy, Portugal and Spain, but not for Austria, Germany and France.

Keywords: *contagion, financial market turmoil, sovereign debt crisis, DCC-GARCH.*

JEL classification: *G11, E44, H63.*

Сільво Дайчман

ЕФЕКТ ЛАНЦЮГОВОЇ РЕАКЦІЇ НА НАЦІОНАЛЬНИХ ФОНДОВИХ РИНКАХ ПІД ЧАС КРИЗИ (НА ПРИКЛАДІ КРАЇН ЄВРОЗОНИ)

У статті показано, що криза державного боргу в Єврозоні стала міжнародною проблемою, в основному через проблеми передачі шоку від одного сегменту національного фінансового ринку на інші. Вивчено структурне зрушення на спільному фондовому ринку в періоди кризи відносно періодів стабільності в країнах Єврозони (Австрія, Німеччина, Франція, Ірландія, Італія, Португалія, Іспанія) за період із січня 2000 до серпня 2011 року. Запропоновано і розраховано простий індикатор ланцюгової реакції на основі динамічної умовної кореляції для кожної з країн. Виявлено, що до квітня 2010 р. збурення на фінансовому ринку не збігалися з реакцією між фондовим і внутрішньодержавним ринками в досліджуваних країнах. У період з квітня 2010 р. до кінця серпня 2011 р., що характеризується кризою державного боргу в Єврозоні, ланцюгова реакція між ринками була простежена для Ірландії, Італії, Португалії і Іспанії, але в Австрії, Німеччині і Франції вона була відсутня.

Ключові слова: *ланцюгова реакція, збурення фінансових ринків, криза державного боргу, DCC-GARCH.*

Сильво Дайчман

ЭФФЕКТ ЦЕПНОЙ РЕАКЦИИ НА НАЦИОНАЛЬНЫХ ФОНДОВЫХ РЫНКАХ ВО ВРЕМЯ КРИЗИСА (НА ПРИМЕРЕ СТРАН ЕВРОЗОНЫ)

В статье показано, что кризис государственного долга в Еврозоне стал международной проблемой, в основном из-за передачи шока от одного сегмента

[1] Department of Finance, Faculty of Economics and Business, University of Maribor, Slovenia.

национального финансового рынка на другие. Изучен структурный сдвиг на общем фондовом рынке в периоды кризиса относительно периодов стабильности в странах Еврозоны (Австрия, Германия, Франция, Ирландия, Италия, Португалия, Испания) за период с января 2000 до августа 2011 гг. Предложен и рассчитан простой индикатор цепной реакции на основе динамической условной корреляции для каждой из стран. Обнаружено, что до апреля 2010 г. возмущения на финансовом рынке не совпадали с реакцией между фондовым и внутригосударственным рынками в исследуемых странах. В период с апреля 2010 г. до конца августа 2011, характеризующийся кризисом государственного долга в Еврозоне, цепная реакция между рынками была прослежена для Ирландии, Италии, Португалии и Испании, но в Австрии, Германии и Франции она отсутствовала.

Ключевые слова: *цепная реакция, возмущение финансовых рынков, кризис государственного долга, DCC-GARCH.*

1. Introduction. Traditionally sovereign bonds were perceived as safe havens. Thus, when there was an increase in risk aversion at stock markets, investors substituted riskier stocks with safer sovereign bonds which consequently led to higher bond prices and reduced bond yields (Dajcman, 2012). The mounting concerns over the fiscal sustainability of the Eurozone countries led to a surge in the sovereign bond yields. In response, large scale fiscal austerity measures have been announced in practically all the Eurozone countries and the sovereign debt management has come to the front of the international policy agenda. In this paper, we investigate whether the Eurozone sovereign bond crisis of 2010-2011 also signals a structural shift in sovereign bond market — stock market linkage with respect to tranquil (non-crisis) periods. More specifically, we investigate whether there was a contagion between the stock and bond markets during the sovereign debt crisis of 2010-2011 and compare this financial crisis with the episodes of previous financial crises in the last decade.

There are many definitions of contagion (e.g., Forbes and Rigobon, 2001; Dornbusch et al., 2001; Corsetti et al., 2002; Pericoli and Sbracia, 2003). Forbes and Rigobon (2001) provide one of the most commonly accepted definitions of contagion, namely the "shift contagion". Shift contagion regards contagion as a shift or change in how shocks spread from one country (or asset class) to another during normal periods (pre-crisis) and how during crisis periods. One way to measure contagion is through the conditional correlation between the returns of asset classes. The method has been extensively used in studies (e.g., Boyer et al., 1999; Bae et al., 2000; Corsetti et al., 2002; Forbes and Rigobon, 2002; Filetti et al., 2008). They predominately investigate the contagion between international stock or bond markets, yet only few studies (Baur and Lucey, 2006) investigate contagion between national stock and bond markets. In the study of Baur and Lucey (2006) the contagion is measured as an increase of the (positive) correlation between stock and bond market returns (i.e., a decrease of correlation (or a negative correlation) between stock market returns and bond yield changes) in a crisis period compared to a benchmark (pre-crisis) period. Applying this definition of contagion, this paper examines the contagion between national stock and sovereign bond markets of some Eurozone countries (namely Austria, Germany, France, Ireland, Italy, Portugal and Spain).

It is know that stock market returns and sovereign bond yield changes may exhibits substantial time variation (Gulko, 2002; Baur and Lucey, 2009; Baele et al., 2009), documented recently (Dajcman, 2012) also for some Eurozone countries (Germany, Ireland, Italy, Portugal and Spain). According to Campbell and Ammer (1993) and Stivers and Sun (2002) stock market returns and changes of sovereign bond yields move in the opposite direction due to a common discount rate effect or common movements in future expected returns. However, also positive correlations between stock market returns and the dynamics of sovereign bond yields are possible and can be explained by variations in expected inflation (since increases in inflation should negatively affect bonds, but not stocks (Campbell and Ammer, 1993) or by the the "flight-to-quality" phenomena (Gulko, 2002).

In this paper we investigate whether there was a contagion between national stock and sovereign bond markets of the Eurozone countries. We first analyze the dynamical conditional correlation between stock market returns and the dynamics of sovereign bond yields for 3 major (core) Eurozone countries (Austria, Germany and France), and 4 countries that were among the hardest hit by the sovereign debt crisis in the Eurozone (Ireland, Italy, Portugal and Spain). Next, a simple indicator of the durability of the contagion between the stock and sovereign bond market is proposed, based on the dynamic conditional correlation estimates. The contagion indicator is proposed and calculated to investigate which market turmoil events coincided with the contagion phenomena.

2. Methodology. The comovement between stock market returns and the dynamics of sovereign bond yields for investigated countries is calculated by applying a DCC-GARCH model of Engle and Sheppard (2001). The model assumes that returns from k assets are conditionally multivariate normal with zero expected value (r_t) and covariance matrix H_t. The returns of the asset (in our case stock index returns and the changes in sovereign bond yields of a particular country), given the information set available at time t-1 (ξ_{t-1}),have the following distribution[2]:

$$r_t \left| \xi_{t-1} \sim \mathrm{N}(0, \mathrm{H_t}), \right. \tag{1}$$

and

$$H_t \equiv D_t R_t D_t, \tag{2}$$

where D_t is the kxk diagonal matrix of time varying standard deviations from univariate GARCH models with $\sqrt{h_{it}}$ on the i-th diagonal, and R_t is the time varying correlation matrix.

The log likelihood of this estimator is written as:

$$L = -\frac{1}{2}\sum_{t=1}^{T}(k\log(2\pi) + 2\log(\left|D_t\right|) + \log(\left|R_t\right|) + \varepsilon_t^{'} R_t^{-1}\varepsilon_t, \tag{3}$$

where $\varepsilon_t \sim \mathrm{N}(0, \mathrm{R_t})$ are the residuals standardized by their conditional standard deviation. Elements of the matrix D_t are given by a univariate GARCH model (Engle and Sheppard, 2001):

[2] The description of the DCC-GARCH models is summarized from Engle and Sheppard (2001). We use the same notation as the authors.

$$h_{it} = \omega_i + \sum_{p=1}^{P_i} \alpha_{ip} r_{it-p}^2 + \sum_{q=1}^{Q_i} \beta_{iq} h_{it-q} \quad (4)$$

for i=1,2,…,k (variables, in our case stock indices), with the usual GARCH restrictions (for non-negativity and stationarity $\sum_{p=1}^{P_i} \alpha_{ip} + \sum_{q=1}^{Q_i} \beta_{iq} < 1$).

Dynamic correlation structure is defined by the following equations:

$$Q_t = (1 - \sum_{m=1}^{M} \alpha_m - \sum_{n=1}^{N} \beta_n)\overline{Q} + \sum_{m=1}^{M} \alpha_m (\varepsilon_{t-m} \varepsilon_{t\text{-}m}^{'}) + \sum_{n=1}^{N} \beta_n Q_{t-n}, \quad (5)$$

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1},$$

where M is the length of the innovation term in the DCC estimator, and N is the length of the lagged correlation matrices in the DCC estimator ($\alpha_m \geq 0$, $\beta_n \geq 0$, $\sum_{m=1}^{M} \alpha_m + \sum_{n=1}^{N} \beta_n < 1$).

$\overline{Q}$ is the unconditional covariance of the standardized residuals resulting from the first stage estimation and Q_t^* is a diagonal matrix composed of the square root of the diagonal elements of Q_t:

$$Q_t^* = \begin{bmatrix} \sqrt{q_{11}} & 0 & 0 & \cdots & 0 \\ 0 & \sqrt{q_{22}} & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & \sqrt{q_{kk}} \end{bmatrix}. \quad (6)$$

The elements of the matrix R_t are:

$$\rho_{ijt} = \frac{q_{ijt}}{\sqrt{q_{ii} q_{jj}}}. \quad (7)$$

To estimate comovements between stock and bond markets, a DCC(1,1)-GARCH(1,1) model of stock returns and bond yield changes is calculated based on demeaned stock market returns (r_{1t}) and bond yield changes (r_{2t}):

$$h_{it} = \omega_i + \alpha_i r_{it-1}^2 + \beta_i h_{it-1}$$

$$Q_t = (1 - \alpha - \beta)\overline{Q} + \alpha(\varepsilon_{t-1} \varepsilon_{t-1}^{'}) + \beta Q_{t-1}, \ (i=1,2). \quad (8)$$

After computing the dynamic conditional correlation for a particular Eurozone country, the contagion indicator (CTI) is calculated for each of the investigated country. A contagion is defined as a concurrence of a negative stock return and a positive sovereign bond yield change on the same trading day. As the return and yield changes are calculated daily, the contagion indicator can also be estimated on a daily basis. A contagion indicator for a particular day is calculated as a moving window average, based on 20 trading days around the day t (i.e., window size is 20 days or about 1 calendar month, taking 10 days before and 10 days after day t, where by the values in a particular time window can take on either the value of 1 (if a negative stock market

return and a positive sovereign bond yield change was observed on the same day) or 0 (if a negative stock market return and a positive bond yield change for a sovereign bond could not be observed any of the days in the time window). In this way, the CTI indicator can take on values within the interval [0,1]. The closer the CTI value is to 1, the more pronounced the contagion between the stock and sovereign bond markets was around time *t*. In the case of $CTI=0$, for none of the 20 trading days a contagion between the stock and sovereign bond markets could be observed. In the case of $CTI=1$, a contagion was observed for all the 20 trading days.

3. Empirical results. Comovement between stock market returns and the dynamics of sovereign bond yields were calculated for 6 Eurozone countries, listed in Table 1. The stock indices returns (r_{1t}) were calculated as the differences in the logarithms of the daily closing prices of indices ($r_{1t}=\ln(P_t)-\ln(P_{t-1})$, where P is an index value). The following indices were considered: ATX for Austria, CAC40 for France, DAX for Germany, ISEQ for Ireland, FTSE MIB for Italy, PSI20 for Portugal and IBEX35 for Spain. Yields (y) of the central government bonds (bullet issues) with 10 year maturity dates were considered. Changes (dynamics) of sovereign bond yields (r_{2t}) were calculated as $\ln(y_t)-\ln(y_{t-1})$ as suggested by Durre and Giot (2005) or by Kim and In (2007)[3]. The period of observation is different for individual countries due to data availability. Days where there was no concurrent trading at the national stock and bond market were left out. The data source for the index prices was Yahoo! Finance and for the central government bond yields — the Denmark's central bank. Table 1 presents some of the descriptive statistics of the data.

All series display significant leptokurtic behavior as evidenced by the large kurtosis with respect to the Gaussian distribution. The Jarque-Bera test rejected the hypothesis of normally distributed time series. The Ljung-Box Q-statistics rejected the null hypothesis of no serial correlation in the squared stock market returns and squared changes of sovereign bond yields up to lag 10 at the 1% significance level for all the countries. We also tested for the presence of the ARCH effect in demeaned stock index return series and demeaned series of bond yield changes. The null hypothesis of no ARCH effects was rejected at the 1% significance level for all the countries and both series. Stationarity of time series was tested by the augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. As the trend was not significant in any of the test models, only results for the models with a constant are presented. The rejection of the null hypothesis of ADF and PP tests and non-rejection of the null hypothesis of KPSS test led to the conclusion of no unit-root in the time series. The alternative hypothesis, of stationary time series, could be accepted[4].

Modeling stock market returns and bond yield changes for all the countries as a DCC(1,1)-GARCH (1,1) proved appropriate as by the Ljung-Box test results the hypothesis of no serial correlation in the standardized residuals could not be rejected

[3] Alternatively, changes (dynamics) of sovereign bond yields can also be calculated as $\ln(1+y_t)-\ln(1+y_{t-1})$, as also suggested by Durre and Giot (2005). The results of the dynamical conditional correlation analysis also for the later definition of bond yield changes however differ only marginally and lead to the same conclusions as with the chosen definition of sovereign bond yield changes.

[4] The results are not presented here but can be obtained from the author.

(at the 5 % significance level)[5]. The results of the DCC-GARCH analysis and the estimates of the CTI indicator are presented in Figures 1 and 2.

Table 1. **Descriptive statistics of stock returns and bond yield changes**

	Period of observation	Min	Max	Mean	Std. deviation	Skewness	Kurtosis	Jarque-Bera statistics
AUSTRIA -Stock index returns -Bond yield changes	3 January 2000 – 24 August 2011	-0.1025 -0.05899	0.1202 0.06851	0.0002003 -0.0002461	0.01507 0.01061	-0.34 0.2562	11.01 5.60	7,726.34*** 839.23***
FRANCE -Stock index returns -Bond yield changes	3 January 2000 – 24 August 2011	-0.09472 -0.04921	0.1059 0.06003	-0.0002147 -0.0002295	0.01566 0.0106	0.03 0.12	7.89 4.78	2.942.10*** 399.03***
GERMANY -Stock index returns -Bond yield changes	3 January 2000 – 24 August 2011	-0.07433 -0.07596	0.108 0.07696	-0.0000586 -0.0003083	0.01628 0.01237	0.04 0.01	7.16 7.01	2,122.30*** 1,824.34***
IRELAND -Stock index returns -Bond yield changes	4 January 2000 – 24 August 2011	-0.1396 -0.2163	0.09733 0.08505	-0.0002369 0.0001593	0.01507 0.01248	-0.58 -1.33	10.48 38.29	6,987.67*** 148,021,78***
ITALY -Stock index returns -Bond yield changes	3 November 2003 – 24 August 2011	-0.08599 -0.1406	0.1087 0.07492	-0.0002858 -0.0000559	0.01458 0.01052	-0.04 -1.03	11.33 22.35	5,711.31*** 31,145.98***
PORTUGAL -Stock index returns -Bond yield changes	11 February 2005 – 24 August 2011	-0.1038 -0.3001	0.102 0.1455	-0.0001672 0.0008502	0.01262 0.0167	-0.04 -2.92	13.72 76.15	7,933.89*** 371,564.56***
SPAIN -Stock index returns -Bond yield changes	3 January 2000 – 24 August 2011	-0.09586 -0.1582	0.1348 0.06068	-0.0001121 -0.0000417	0.01542 0.01112	0.13 -1.21	8.68 23.10	3,929.97*** 49,884.47***

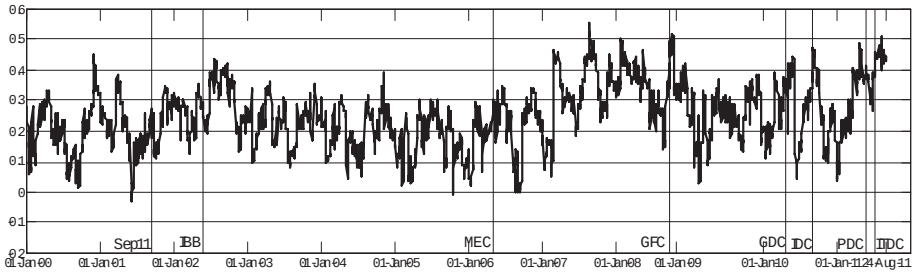
Notes: The Jarque-Bera statistics: *** indicates that the null hypothesis (of normal distribution) is rejected at the 1% significance level.

As expected, a volatile dynamic conditional correlation between stock returns and sovereign bond yield dynamics is observable for all the countries (Figures 1 and 2), thus confirming the findings of Gulko (2002), Connolly et al. (2004), Baur and Lucey (2009), Baele et al. (2009) and Dajcman (2012). The dynamic conditional correlation for Germany, Austria, and France was mostly positive during the observed period, while for the countries affected by the sovereign debt crisis the correlation turned negative more often and for longer periods of time, especially after the start of 2010, when the sovereign debt crisis in the Eurozone emerged.

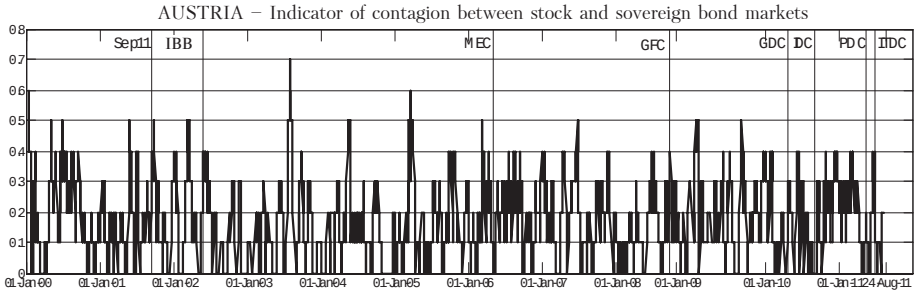
[5] The results are not presented here but can be obtained from the author.

Figure 1. **The dynamic conditional correlation between stock returns and the sovereign bond yield changes and contagion indicator for Austria, France and Germany**

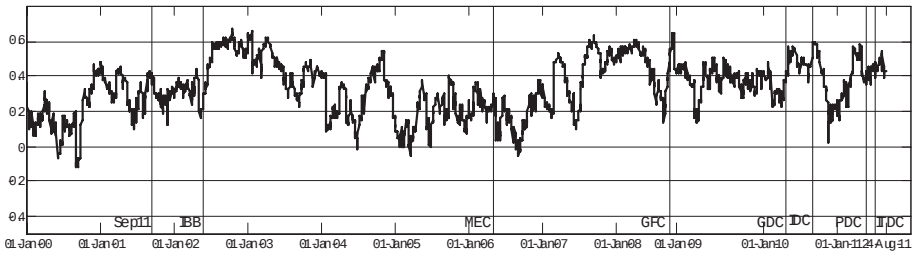
AUSTRIA – Dynamic conditional correlation between stock returns and government bond yield changes



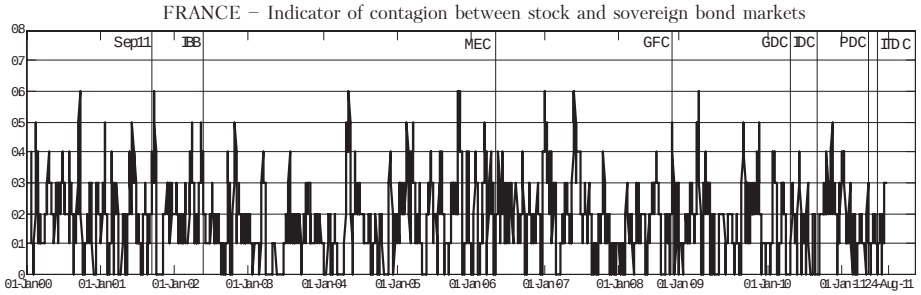
AUSTRIA – Indicator of contagion between stock and sovereign bond markets



FRANCE – Dynamic conditional correlation between stock returns and government bond yield changes

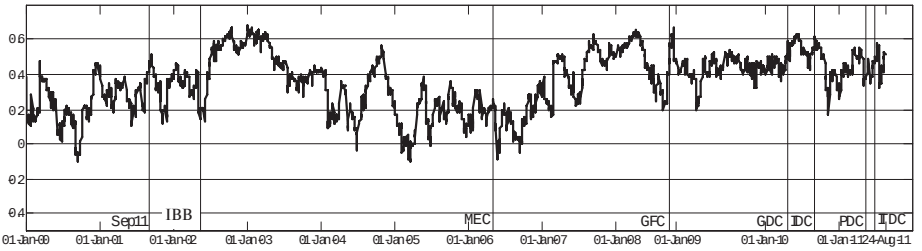


FRANCE – Indicator of contagion between stock and sovereign bond markets

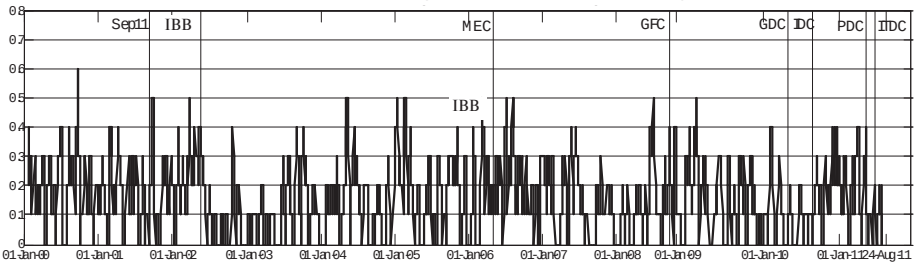


The End of *Figure 1*

GERMANY – Dynamic conditional correlation between stock returns and government bond yield changes



GERMANY – Indicator of contagion between stock and sovereign bond markets



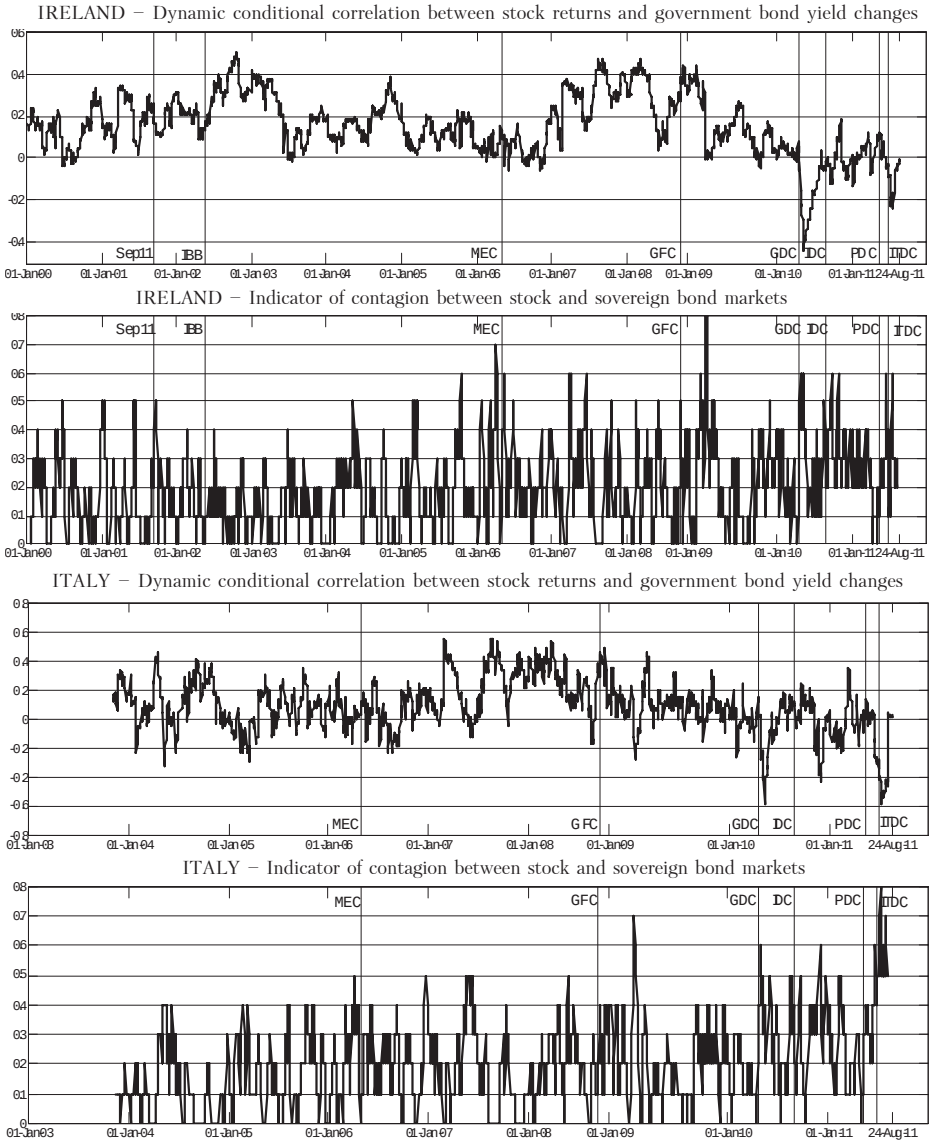
Notes: On the time axis, the following financial turmoil events are denoted: Sep11 = the 9/11 attack on the WTC, IBB = The internet bubble burst (May 21, 2002) when the Dow Jones Industrial reached its peak), MEC = the Middle East financial markets crash (the start of May 2006 is denoted), GFC = the global financial crisis (September 16, 2008, the collapse of Lehman Brothers), GDC = the Greek debt crisis (April 23, 2010, when the Greek government requested a bailout from the EU/IMF), IDC = Ireland's debt crisis (September 1, 2010, when the Irish government started negotiations for a bailout with the ECB/IMF), PDC = Portugal's debt crisis (May 16, 2011, when Eurozone leaders approved a bailout of financial help for Portugal), ITDC = Italy's debt crisis (the start of July 2011, when financial market expectations for Italian bailout request were mounting and the bond yields reached the level, at which other countries with sovereign debt crisis had requested help).

The indicator of contagion is volatile also, and taking values from 0 to 0.8. The highest values (0.7 and 0.8) were achieved in Ireland, Italy, Portugal and Spain, indicating that the periods of contagion between stock and sovereign bond markets were most durable in these countries. In the period before the Eurozone sovereign debt crisis of 2010-2011, increases in a contagion indicator normally did not coincide with the financial market turmoil, indicating that although the stock markets returns fell, the negative correction on sovereign bond yields did not follow (or the correction took place in a shorter time period than at the stock markets). As argued by Dajcman (2012), the sovereign bonds before the outbreak of Eurozone debt crisis were mostly perceived as "safe havens" in the periods of financial market turmoil. Investors in the investigated countries substituted riskier stocks with less risky sovereign bonds.

The period from April 2010 until the end of August 2011 (the last month covered in our study) is characterized by sovereign debt crisis in the Eurozone. Greece, Ireland, Portugal and Italy were among the hardest hit, with sovereign bond yields rising to national record heights. In Figures 1 and 2 one can see a diverse time path of the contagion indicator for the core and the periphery Eurozone countries. Whereas at the outbreak of the Greek, Irish, Portugese and Italian sovereign debt crises there

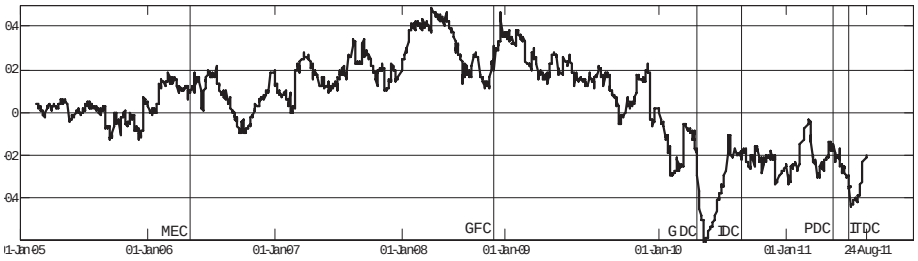
was a contagion (as measured by an increase in the contagion indicator) in the periphery Eurozone countries, there was no contagion between national stock and sovereign bond markets in the core Eurozone countries (one can notice reduction of contagion indicator in the core Eurozone countries at the events of sovereign debt crises of the Eurozone periphery countries). In the periphery Eurozone countries the stock and bond markets returns fell concurrently, in Austria, France and Germany such a concurrent drop in stock and bond market returns was not observable.

Figure 2. **The dynamic conditional correlation between stock returns and the sovereign bond yield changes and contagion indicator for Ireland, Italy, Portugal, and Spain**

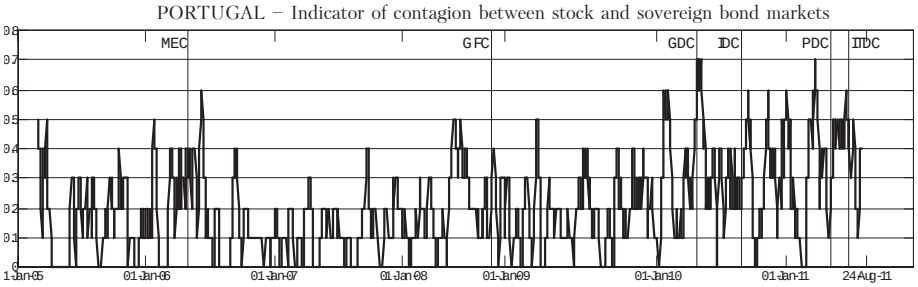


The End of *Figure 2*

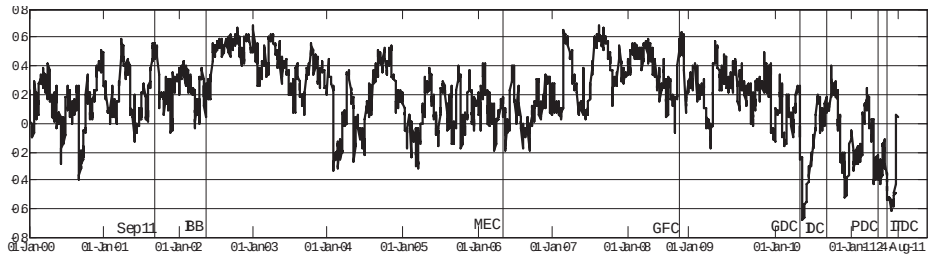
PORTUGAL – Dynamic conditional correlation between stock returns and government bond yield changes



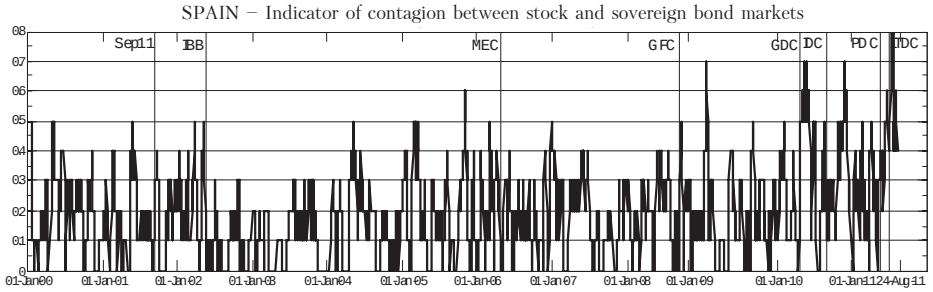
PORTUGAL – Indicator of contagion between stock and sovereign bond markets



SPAIN – Dynamic conditional correlation between stock returns and government bond yield changes



SPAIN – Indicator of contagion between stock and sovereign bond markets



Notes: See notes for Figure 1.

The results have important implications for the public debt and financial stability management. Through contagion analysis the knowledge is learnt of whether a shock in one segment of a national financial market is transmitted across markets via channels that appear only during turbulent periods or whether these shocks are transmitted via channels or inter-linkages that exist in all the states of the world (non-crisis as well as crisis period). As argued by Gravele and Morley (2006), the effectiveness of economic policy measures aimed at reducing market's vulnerability to contagion

will depend on whether or not contagion occurred as a result of the transmission of shocks through pre-existing long-term linkages or through crisis contingent channels.

4. Conclusion. In this paper, we investigated whether the Eurozone sovereign bond crisis of 2010-2011 also signals a structural shift in correlation (i.e., a contagion) between national sovereign bond market and stock market with respect to tranquil (non-crisis) periods. We examined the between national stock and sovereign bond markets in some of the core Eurozone countries (Austria, Germany and France) and some of the periphery Eurozone countries that were among the hardest hit by the sovereign debt crisis of 2010-2011 (Ireland, Italy, Portugal and Spain). A simple indicator of contagion was proposed, based on dynamical conditional correlation. We found that the greatest financial market turmoil before April 2010 did not coincide with the contagion between stock and sovereign bond markets, indicating that although the stock markets returns fell, the negative correction on sovereign bond yields did not follow (or the correction took place in shorter time period than at the stock markets). In the period from April 2010 until the end of August 2011, characterized by sovereign debt crises in Eurozone, a diverse time path of the contagion indicator for the core and the periphery Eurozone countries is noticed. Whereas at the outbreak of the Greek's, Ireland's, Portugal's and Italy's sovereign debt crisis there was a contagion (as measured by an increase in the contagion indicator) in the periphery Eurozone countries, there was no contagion between national stock and sovereign bond markets in the core Eurozone countries with a strong fiscal position.

References:

Bae, K-H., Karolyi, G. A. and Stulz, R. M. (2000). A new approach to measuring financial contagion.NBER Working Paper No. 7913.

Baele, L., Bekaert, G. and Inghelbrecht, K. (2009). The determinants of stock and bond return comovements.NBER Working Paper No. 15260.

Baur, D. and Lucey, B. M. (2006). Flight-to-quality or contagion. An empirical analysis of stock-bond correlations.IIIS Discussion Paper No. 122, 2006.

Baur, D.G. and Lucey, B. M. (2009). Flights and Contagion - An Empirical Analysis of Stock-Bond Correlations, Journal of Financial Stability, 5 (4):339-352.

Boyer, B.H., Michael, S.G. and Loretan, M. (1999). Pitfalls in tests for changes in correlation. Federal Reserve Board Working Paper No. WP 597R.

Campbell, J. Y. and Ammer, J. (1993). What moves the stock and bond markets? A variance decomposition for long-term asset returns,The Journal of Finance, 48(1):3-37.

Corsetti, G., Pericoli, M. and Sbracia, M. (2002). Some contagion, some interdependence - more pitfalls in tests of financial contagion.C.E.P.R. Discussion Papers, No. 3310.

Dajcman, S. (2012). Comovement between stock and bond markets and the flight-to-quality during financial market turmoil - a case of the Eurozone countries most affected by the sovereign debt crisis of 2010-2011, Applied Economics Letters, 19(17): 1655-1662.

Dornbusch, R., Park, Y. C. and Claessens, S. (2001). Contagion: Why crises spread and how this can be stopped,in: Claessens, S. and Forbes, K. (eds), International Financial Contagion, New Yorks: Springer, 2001, pp. 19-42.

Durre, A. and Giot, P. (2005). An international analysis of earnings, stock prices and bond yields. European Central Bank Working Paper No. 515.

Engle, F.R. and Sheppard, K. (2001). Theoretical and Empirical properties of Dynamic Conditional Correlation Multivariate GARCH. NBER Working Paper No. 8554.

Filetti, P. F., Hotta, L. K. and Zevallos, M. (2008). Analysis of Contagion in Emerging Markets. Journal of Data Science, 6(4):601-626.

Forbes, K. J. and Rigobon, F. (2001). Measuring contagion: Conceptual and empirical issues, in Claessens, S. and Forbes, K., International Financial Contagion, New York: Springer, 2001, pp. 43-66.

Forbes, K. J. and Rigobon, F. (2002). No contagion, only interdependence: measuring stock market comovements.The Journal of Finance, 57(5):2223-2261.

Gravele, T. and Morley, J. (2006). Detecting shift-conftagion in currency and bond markets. Journal of International Economics, 28(2):409-423.

Gulko, L.(2002). Decoupling. Journal of Portfolio Management, 28(3): 59-66.

Kim, S. and In, F. (2007). On the relationship in stock prices and bond yields in the G7 countries: Wavelet analysis. Journal of International Financial Markets, Institutions and Money, 17(2):167-179.

Pericoli, M. and Sbracia, M. (2003). A Primer On Financial Contagion. Journal of Economic Surveys, 17(4):571-608.

Stivers, C. and Sun, L. (2002). Stock market uncertainty and the relation between stock and bond returns. Federal Reserve Bank of Atlanta, Working Paper 2002-3.

Стаття надійшла до редакції 30.07.2012.