Is the contagion effect present on the CEE capital markets ?

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Abstract: *Starting 2007, the world capital markets experienced periods of persistent turbulences, that emphasized the presence of common effects on the markets' stability, due to the contagion phenomenon.*

In this article, we considered the market returns of 11 capital markets - developed, emergent and frontier markets (mainly from the Central and Eastern Europe) - between January 1st, 2007-15th September, 2016. The data was used to assess the impact on the Romanian capital market implied by the turbulences that were present in the other 10 markets. In order to estimate the impact the turbulences present in the developed capital markets have on less developed capital markets, we followed a methodology proposed by Diebold and Yilmaz (2008) in order to calculate volatility indexes for daily data.

The obtained results show the influence that the developed capital markets have on the volatility of the daily returns of the Romanian capital market, as well as the insignificant effects induced by the Romanian capital market on the other analyzed markets. We found that the daily volatility of the other 10 countries have an impact of more than 34% on the daily volatility of the Romanian capital market's return (with the largest impact derived from the US market).

Key words: *capital market, contagion risk, volatility*

JEL Codes: *C13, C22, C58, D53, G01, G15*

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1. Introduction

The globalization lead to a greater exposure of the less developed capital markets to turbulences that are present on more developed capital markets. This fact was seen in the aftermath of the global financial crisis that started in US in 2007, that impacted almost every stock market in the world. As medium term effects generated by the global financial crisis, we face a continuous process of reshaping the financial systems, the regulatory framework and the economic theories in the financial field.

Due to globalization, the primary effect of shocks in the developed stock markets seen in the less developed markets is the generalized increased volatility of prices of listed companies, mainly due to massive inflows (*that lead to soaring prices*) and outflows (*that lead to plunging prices*).
In this regard, the analysis of the economic variables during the crisis help us finding the relevant causes of the turbulences, whose study is important for a large spectrum of users (*stakeholders, investors, regulatory bodies etc.*). Starting with economic variables' study, we shall consider the difference between the interdependence (*that occurs when the markets' comovement does not increase significantly after a shock, despite the high level of correlation between the markets*) and the contagion phenomenon (*that occurs when the markets' comovement is increasing when a shock is present on the financial markets*).

We should note that the impact generated by the turbulences from the developed markets depends also on the characteristics of the local economy, such as the openness degree toward the global financial system, the active institutional investors' structure and the independence of the monetary and financial authorities. As a result, it is necessary for the financial and monetary authorities from each country (*as it is the case of member states of the European Union*) to develop and implement adequate and targeted measures, with the aim of controlling the causes and effects of the turbulences that are present on financial markets and, ultimately, to improve the citizens' trust in the stability and resilience of the global financial system. This goal is also pursued by the European Commission in the process of reshaping the capital markets' legal framework, with the aim of facilitating the economic growth. As a consequence, the Capital Markets Union project, intended to be done starting 2019, aims to consolidate the financing channels for European companies and, therefore, create new jobs and foster the economic growth.

In this article, using the methodology proposed by Diebold and Yilmaz (2008) to outline the contagion effect, we define a static spillover index, whose evolution shows the impact the turbulences from the developed and emerging markets have on selected and analyzed capital markets, including the Bucharest Stock Exchange. We use the daily returns of the main indices from the 11 selected markets, in order to emphasize the impact the developed markets' volatility of returns has on the less developed markets.

2. The theoretical basis of contagion on the financial markets

In order to assess the presence and the effects of contagion, it is important to distinguish it to the one of interdependence between markets. Forbes and Rigobon (2002) state that the interdependence is present when the occurrence of a shock in one market does not lead to statistically significant increase of the comovement of the analyzed markets (even though the existence of a close connection between these financial markets). On the other hand, the contagion is present when the comovement of different markets is statistically significant, as a result of a turbulence occurred in one market.

Reinhart and Rogoff (2009) define contagion as the phenomenon of occurrence of immediate effects in a number of countries following an event, considering two forms of contagion, namely the „slow-burn" spillover and the „fast and furious" phenomenon, depending on the speed and intensity of this process.

Helleiner (2011) emphasized the connection between the degree of financial contagion and the overall stance of an economy: its presence is felt especially in countries whose financial systems where vulnerable to shocks (like real estate bubbles, financial excess and so on).

Diebold and Yilmaz (2008) proposed a method for studying the contagion phenomenon, based on the autoregressive vector concept (VAR), defined by Sims (1980). With the VAR model he proposed, Sims actually eliminated one of the main problems arising from the data series analysis, namely the selection of endogenous and exogenous variables (as in a VAR model, all variables are considered as endogenous variables). So, the main advantage of VAR models is that it solved the difficult problem arising from a large data set, such as the selection of the dependent and independent variables. The autoregressive vectors developed by Sims follow an asymptotic distribution and, for the largest part of the tested hypothesis, the number of degrees of freedom associated with this Chi-square distribution is not largely different from the number of degrees of freedom of the calibrated distribution.

In a VAR model, the variables' past values are considered, in order to find the possible relations between the current and past values (evaluating the impact the past values have on the current value of the studied variables). Sims and Watson (2001) show that, for a univariate autoregressive vector, the model consists in a single linear equation, where the current values of a variable are explained by its past values. Generalizing this approach and considering that the model is linear, for an autoregressive vector with n components, the model is a linear relation of the past values of the variable and the past and current values of the other (n-1) variables.

Pfaff (2008) defines the general form of a VAR (p) process as being given by:

$$y_t = A_1y_{t-1} + A_2y_{t-2} + ... + A_py_{t-p} + u_t,$$

where we denote $y_t = (y_{1t}, y_{2t}, ..., y_{nt})$, A_i are (n x n) matrices, with i = 1,..., p, and u_t is a n-dimensional process with null estimated mean (or $E(u_t) = 0$), and the covariance matrix $E(u_tu_t^T) = \Sigma_u$ $= \begin{bmatrix} \sigma_{u1}^2 & 0 & \cdots & 0 & 0 \\ 0 & \sigma_{u2}^2 & & 0 & 0 \\ \vdots & & \ddots & \vdots & \\ 0 & 0 & \cdots & 0 & \sigma_{un}^2 \end{bmatrix}$, being constant and positive defined.

In order to use this model, it is necessary to the stationary condition being fulfilled, or $\det(I_n - A_1z - ... - A_pz^p)$ is not null for $|z| \leq 1$.

When the VAR(p) model is stationary, the stationary time series that are generated have constant means, variances and covariances. When a solution is equal to one, then at least one of the considered variables in the VAR(p) is integrated of level 1, or between the analyzed variables exists cointegrated relations.

The general VAR(p) can be rewrite as an VAR(1) process, given by the equation:

$\xi_t = A\xi_{t-1} + v_t$, where $\xi_t = \begin{bmatrix} y_t \\ \vdots \\ y_{t-p+1} \end{bmatrix}$, $A = \begin{bmatrix} A_1 & A_2 & \cdots & A_{p-1} & A_p \\ I & 0 & & 0 & 0 \\ \vdots & & \ddots & \vdots & \\ 0 & 0 & \cdots & I & 0 \end{bmatrix}$, $v_t = \begin{bmatrix} u_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}$, and the first and the third are (np x 1) vectors, and the matrix A is of (np x np) type.

Using similar reasoning a for the VAR(p), the previous model is stable if the absolute values of the matrix A's eigenvalues are less than one.

Stock and Watson (2001) define 3 forms of the VAR model: the reduced form VAR, the recursive VAR and the structural VAR. In the reduced VAR model, each variable is given by a linear relation of the variable' s past values and the past values of the other variables and an error term that is uncorrelated with them. In the recursive VAR model, each equation's error terms are uncorrelated with other equation's error terms (*this can be done by including in the model of some current variables as endogenous variables*). It is important to stress that the results are dependent on the order we choose to insert the variables in the VAR model. In the structural VAR model, the economic theory is used in order to find the order to select the variables, considering the causality relations between the variables (*such that the number of structural VAR models depends on the goals followed by the researcher*).

These theoretical concepts are also used to test the Granger causality relations between the studied variables (*that show the usefulness of the past values of a variable to predict the values of a different variable*), to construct Impulse-Response Analysis (*that assess the impact generated on the current and future values of each variable by the increase of the current error of the VAR model* *with one unit*) and to make the variance decomposition of the forecasted errors (*that shows the percentage from the forecasted error's variance that is given by the occurrence of a shock within a time interval*).

The variance decomposition will be used in order to construct a static spillover index, following the methodology proposed by Diebold and Yilmaz (2008). Considering the structural VAR model $G(L)z_t = u_t$, where G(L) is a polynomial function obtained by using the structural VAR model, then the representation of the vectorial moving average is $z_t = \Gamma_0 u_t + \Gamma_1 u_{t-1} + \Gamma_2 u_{t-2} + ...$. Therefore, for the time interval s, the estimation error for z_t is given by the relation $z_{t+s} - E_t z_{t+s} = \Gamma_0 u_{t+s} + \Gamma_1 u_{t+s-1} + \Gamma_2 u_{t+s-2} + ... + \Gamma_{s-1} u_{t+1}$, whose variance is given by the formula:

$$Var(z_{t+s} - E_t z_{t+s}) = \Gamma_0 \Sigma_u \Gamma_0' + \Gamma_1 \Sigma_u \Gamma_1' + \Gamma_2 \Sigma_u \Gamma_2' + \ldots + \Gamma_{s-1} \Sigma_u \Gamma_{s-1}'.$$

Using this formula, we can estimate the percentage from the total variance of estimated error that is given by the variance of each analyzed structural shock.

In order to study the economic phenomena, the VAR model is widely used to find the relations between various variables that can explain the respective phenomena. Armeanu, Pascal and Cioacă (2014) used these concepts for analyzing the contagion effects considering a number of 6 European countries. Using the daily returns of the main indices of the Istanbul Stock Exchange and Bucharest Stock Exchange, for the October 1st, 2011- October 1st, 2012, Armeanu et al. (2012) found a relation of cointegration, as well as a positive relationship between the returns (*1% growth on Istanbul Stock Exchange determines 0.25% growth on the Bucharest Stock Exchange*). In Armeanu et al.(2013), the contagion phenomenon was analyzed for the Romanian and PIIGS (Portugal, Ireland, Italy, Greece and Spain) capital markets, considering the main economic and social events occurred during 2008-2014. It was proved that Italy and Spain are the most sensitive to the financial shocks, the former causing the largest spillover and the latter being the most affected by the spillover generated by the shocks in the other markets.

The obtained results from the VAR models must be cautiously analyzed and used with complementary methods, in order to derive adequate conclusions. For example, in the case of strong persistent variables, the use of Impulse-Response Analysis can lead to unuseful conclusions (*as the errors' variance can be abnormal*). The same happens when the structural changes in the analyzed variables are not considered when applying the VAR model.

Moreover, it is necessary to note that the selection order in a VAR model is important for the analysis of the relationship between the considered variables. Therefore, an economic reasoning might be used for the selection order considered, such that the proposed model to be useful (*beside the statistical testing of its validity*).

3. Methodology and data

We use the Diebold and Yilmaz (2008) approach, based on a spillover index, defined from the variance decomposition of the forecasted errors from VAR models (using a Cholesky factorization). So, the spillover index is defined as the sum of individual contributions to the estimated errors' variance, determined by some shocks on each of the analyzed assets.

For a stationary VAR model with two variables and one lag, we derive the spillover index formula as follows. The VAR model can be written as $x_t = \Phi x_{t-1} + \varepsilon_t$, where $x_t = \begin{pmatrix} x_{1,t} \\ x_{2,t} \end{pmatrix}$ and Φ is a (2x2) matrix. Considering a stationary model, then the representation in moving average of the VAR model is $x_t = \Theta(L)\,\varepsilon_t$, where $\Theta(L)$ is the inverse of the matrix $(I-\Phi L)$.

If we denote with Q_t^{-1} the unique Choleski decomposition matrix of the covariance matrix of the error terms ε_t, $A(L) = \Theta(L)Q_t^{-1}$ and $u_t = Q_t\,\varepsilon_t$, then we obtain $E(u_t u_t') = I$. The previous equation can be rewritten as $x_t = A(L)u_t$.

Starting with this model, the optimal estimation (*derived from a Wiener-Kolmogorov linear optimization process*) for the next period is given by the relation $x_{t+1,t} = \Phi x_t$, in which the error vector is given by:

$$e_{t+1,t} = x_{t+1} - x_{t+1,t} = A_0 u_{t+1} = \begin{bmatrix} a_{0,11} & a_{0,12} \\ a_{0,21} & a_{0,22} \end{bmatrix} \begin{bmatrix} u_{1,t+1} \\ u_{2,t+1} \end{bmatrix}.$$

Therefore, the covariance matrix is given by $E(e_{t+1,t}e'_{t+1,t}) = A_0A'_0$, and the variance of the forecasted errors for the next period is equal to $a_{0,11}^2 + a_{0,12}^2$ for x_{1t} variable and, respectively, equal to $a_{0,21}^2 + a_{0,22}^2$ for x_{2t} variable.

We found that, for each variable, the variance of the forecasted error has been divided in components that are specific to the shocks occurred on the two variables. It can be defined *own part of variance* for asset x_i as the percentage from the variance of the forecasted error for the next period determined by the shocks on the x_i variable (*in the previous case,* $a_{0,11}^2$ *for* x_{1t} *and* $a_{0,22}^2$ *for* x_{2t}). Also, it can be defined *cross part of variance* for x_i asset as being the percentage from the variance of the forecasted error determined by the shocks on x_j variable (with $i \neq j$)

Summing up, for a VAR model with two variables and one lag, the contagion is estimated by $a_{0,12}^2$ (*this is the contribution the shocks on the* x_{1t} *variable have on* x_{2t} *variable*) and $a_{0,21}^2$ (*the contribution the shocks on the* x_{2t} *variable have on* x_{1t} *variable)*. It can be defined the *total spillover* as being given by the relation $a_{0,11}^2 + a_{0,12}^2$ (*that sum up the total effect of contagion between the two assets*). In order to ease the interpretation of this number, it is usually transformed to an index, by dividing it by the total variance of the forecasted error, obtaining the *spillover index*.

Because the total variance of the forecasted error is equal to $a_{0,11}^2 + a_{0,12}^2 + a_{0,21}^2 + a_{0,22}^2 =$ trace ($A_0A'_0$), then the definition of the *spillover index* is given by:

$$S = \frac{a_{0,11}^2 + a_{0,12}^2}{\text{trace } (A_0A_0')} 100.$$

Generalizing this formula, for a VAR model with N-variables of order *p*, it can be obtained the *spillover index* formula (*for the next period*):

$$S = \frac{\sum_{i,j=1_{i \neq j}}^{N} a_{0,ij}^2}{trace(A_0 A_0')} . 100$$

For a VAR model with N-variables of order p and H-future periods, the spillover index formula is given by:

$$S = \frac{\sum_{h=0}^{H-1} \sum_{\substack{i,j=1 \\ i \neq j}}^{N} a_{h,ij}^2}{\sum_{h=0}^{H-1} trace(A_h A_h')} . 100.$$

The methodology proposed by Diebold and Yilmaz will be used for data for the January 1st, 2007-September 15th, 2016 time frame, representing the main indices of Romania and other 10 countries, with developed capital markets (*France, Germany, United Kingdom, Austria and US*), emerging capital markets (*Czech Republic, Greece, Poland and Hungary*) and frontier markets (*Romania and Bulgaria*), using the MSCI classification (*available mid-September 2016*).

4. The results

We collected data for the January 1st, 2007-September, 15th, 2016 time interval representing the closing values of the main indices from 11 capital markets: DJIA (US), FTSE 225 (United Kingdom), CAC40 (France), DAX30 (Germany), ATX (Austria), PX (Czech Republic), ATHEX (Greece), WIG20 (Poland), BUX (Hungary), SOFIX (Bulgaria) and BET (România), available on www.stooq.com and www.yahoo.com (*finance section*), as well as the official web-sites of the market operators. We used these data to calculate the daily returns of the analyzed markets, to construct a VAR model and, therefore, to make the variance decomposition, in order to define a spillover index.

Considering the daily returns for each index in the analyzed time frame, we use the Granger causality tests (*for each pair of the daily returns series*) in order to capture the causality relations. In Table 1 are presented a part of these results, being emphasized the relation of the BET index with the other 10 indices.

Table 1 Pairwise Granger Causality Tests for selected indexes (01.01.2007-15.09.2016)

Null Hypothesis:	Obs	F-Statistic	Prob.
DJIA does not Granger Cause BET	2532	210.398	3.E-85
BET does not Granger Cause DJIA		1.49813	0.2237
FTSE does not Granger Cause BET	2532	39.8035	1.E-17
BET does not Granger Cause FTSE		2.92872	0.0536
DAX does not Granger Cause BET	2532	53.3704	2.E-23
BET does not Granger Cause DAX		2.09874	0.1228
CAC40 does not Granger Cause BET	2532	40.8252	4.E-18
BET does not Granger Cause CAC40		0.79771	0.4505
ATX does not Granger Cause BET	2532	50.3549	4.E-22
BET does not Granger Cause ATX		0.90415	0.4050
WIG20 does not Granger Cause BET	2532	32.7124	9.E-15
BET does not Granger Cause WIG20		0.88840	0.4114
ATHEX does not Granger Cause BET	2532	13.5200	1.E-06
BET does not Granger Cause ATHEX		0.20786	0.8123
BUX does not Granger Cause BET	2532	20.6590	1.E-09
BET does not Granger Cause BUX		0.34060	0.7114
PX does not Granger Cause BET	2532	23.1861	1.E-10
BET does not Granger Cause PX		3.23226	0.0396
SOFIX does not Granger Cause BET	2532	3.12541	0.0441
BET does not Granger Cause SOFIX		4.85706	0.0078

Source: www.bvb.ro, own calculation

From this table, the probability values indicate that, except for Bulgaria, the Romanian capital market is not in a causality relation with any other capital market (*BET does not Granger cause any of the other 9 capital markets*). Moreover, from the Table 1 we can find that is rejected the null hypothesis that the 10 analyzed capital markets does not Granger cause the BET index (*with the only exception being Bulgaria, but the probability level being less than 5%*). We can conclude that the Romanian capital market is influenced by the other 10 capital markets (*including the ones that are European Union's members*).

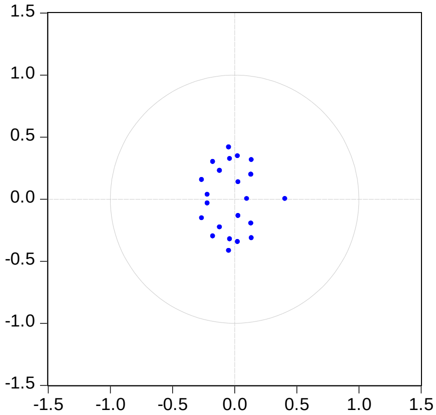
Using the conclusions derived from the Granger causality tests, we can say that the US market has a significant influence over the other markets, as it is rejected every null hypothesis of DJIA not being in Granger causality relation.

Considering the importance of each analyzed capital market within the global financial system, we construct a VAR model for the 11 time series, the selection order being DJIA, FTSE,

DAX, CAC40, ATX, WIG20, ATHEX, BET, BUX, PX and SOFIX for 2 lags, using the collected daily data.

We found that the VAR model is stable, as can be seen from the fact that all eigenvalues are less than one in absolute value (*graphically represented in Figure 1*).

Figure 1 Inverse Roots of AR Characteristic Polynomial



Source: own calculation

Applying the VAR Granger Causality test on the daily returns time series, we found that the returns of the US, French and Austrian capital markets have influence on the daily returns' volatility of the BET index from the Bucharest Stock Exchange (the results being presented in Table 2).

Table 2 VAR Granger Causality/Block Exogeneity Wald Test (01.012007-26.08.2016)

Dependent variable: BET

Excluded	Chi-sq	df	Prob.
DJIA	291.0020	2	0.0000
FTSE	1.686876	2	0.4302
DAX	0.512708	2	0.7739
CAC40	13.65241	2	0.0011
ATX	12.47026	2	0.0020
WIG20	3.654004	2	0.1609
ATHEX	2.820635	2	0.2441
BUX	0.303831	2	0.8591
PX	1.016233	2	0.6016
SOFIX	5.744818	2	0.0566
All	468.0143	20	0.0000

Source: own calculation

Furthermore, starting from the methodology proposed by Diebold and Yilmaz, we make the variance decomposition of the forecasted errors of the VAR model for the daily data of the selected 11 time series. From the variance decomposition, we calculate the spillover index for daily returns, which reveals the impact the external and internal factors have on the contagion effect (*the results being presented in Table 3*).

Analyzing the data from the Table 3, we found that, for Romania, the shocks present on the external markets explain 34.32% of the volatility of the Romanian capital market, the largest contributors being the US and UK markets and, also, but less important, being the capital markets from Austria, Poland and Germany. This situation is due to the fact that largest investors on the Romanian capital market are foreign investors (*especially investors from the US, the UK, Austria and Poland*). The contribution of the Austrian capital market can be explained by the listing on the Bucharest Stock Exchange of two large issuers that are also traded on the Wiener Boerse (*from the energy and banking sectors*). The Romanian capital market is also influenced by the evolutions on the Polish capital market, the largest capital market in the Eastern and Central Europe, where are present large institutional investors, that allocate some of their funds for investments in the issuers listed on the Bucharest Stock Exchange.

On the other hand, this result emphasizes the fact that Romanian retail investors are sentiment driven investors, as the evolution on the developed markets impact the decisions made by the retail investors (*and, considering the poor liquidity, this drives to large swings in prices and therefore in amplified volatility*).

We also found that the Romanian capital market's influence on the other analyzed markets is a marginal one, only of 7.46%, the largest impact being identified on the capital markets of Bulgaria, the Czech Republic and Hungary (*smaller than the Bucharest Stock Exchange, in terms of market capitalization*).

Also, the data presented in Table 3 show that the most exposed capital markets to external shocks are the French, the German, the Austrian, the Czech, the Polish and the Hungarian markets, that receive from the other countries 87.82%, 70.41%, 68.46%, 63.68%, 46.39% and, respectively, 46.17% of the shocks, the largest part from the shocks occurred in the developed markets, such the US and the UK markets.

Table 3 The spillover index for daily returns (01.01.2007-15.09.2016)

	US	**United Kingdom**	**Germany**	**France**	**Austria**	**Poland**	**Greece**	**Romania**	**Hungary**	**Czech Republic**	**Bulgaria**	Contribution from the other markets
US	97.80515	0.209605	0.147917	0.615521	0.029549	0.004833	0.255236	**2.08E-05**	0.150595	0.776144	0.005429	2.19485
United Kingdom	40.29816	57.0946	1.018672	1.008005	0.011056	0.003222	0.261058	**0.178649**	0.00094	0.118038	0.007601	42.9054
Germany	45.76294	22.62085	29.5855	1.390601	0.0079	0.001513	0.243083	**8.21E-02**	0.018341	0.28423	0.00292	70.4145
France	45.33409	27.73445	14.27794	12.17104	0.002303	0.023255	0.27654	**0.042922**	0.016633	0.117552	0.003286	87.82896
Austria	36.2761	24.66542	5.300769	1.688682	31.53401	0.018263	0.287312	**0.000713**	0.173815	0.052898	0.002017	68.46599
Poland	24.29902	16.19329	2.841232	1.374104	1.436384	53.60986	0.043331	**0.036547**	0.011815	0.100477	0.053935	46.39014
Greece	12.54636	10.73973	1.194138	0.820586	1.554485	1.147416	71.31504	**0.183705**	0.067768	0.288027	0.142743	28.68496
Romania	**21.15065**	**6.189753**	**1.041355**	**0.307689**	**3.788497**	**1.22466**	**0.587659**	**65.68**	**0.010861**	**0.000778**	**0.018102**	**34.32**
Hungary	22.73456	10.38321	2.62204	1.906605	2.269819	4.88174	0.190332	**1.010708**	53.82963	0.019435	0.151918	46.17037
Czech Republic	28.48452	17.28085	1.075358	1.102772	7.616908	4.442948	0.716831	**1.849753**	1.008851	36.31081	0.110393	63.68919
Bulgaria	10.79103	1.105027	0.257346	0.266022	0.988762	0.283062	0.086454	**4.079729**	0.015738	1.044203	81.08263	18.91737
Contribution to the other markets	287.6774	137.1222	29.77677	10.48059	17.70566	12.03091	2.947836	**7.464872**	1.475357	2.801782	0.498344	509.9817
Total Contribution	385.4826	194.2168	59.36227	22.65163	49.23967	65.64077	74.26288	**73.14487**	55.30499	39.11259	81.58097	1100
												46.36198

Source: own calculation

When we construct a single index for the collected data, we find that 46.36% of the variance of the forecasted errors is due to the contagion effect, as measured by the spillover index. This value reflects the interaction of every analyzed market with the global financial system and the occurrence, in this time interval, of the global financial crisis, that lead to an increase in the volatility of the prices (*data volatility and the way we construct the VAR model partially explain the statistically identified relations from Table 3*).

5. Conclusions

Using the methodology proposed by Diebold and Yilmaz (2008) and data from the January 1st, 2007-September, 15th, 2016 time interval, for 11 capital markets (*developed countries - USA, United Kingdom, France and Germany, and from the Central and Eastern Europe -Austria, Poland, Greece, Romania, Hungary, Czech Republic and Bulgaria*) we developed a spillover index, in order to analyze the presence of the contagion phenomenon. In this regard, we used a VAR model for daily returns that explains the Romanian capital market's returns in relation with the other markets.

We obtained that the volatility of the daily returns of the Romanian capital market are determined by the volatility present on the most mature capital markets (the US and UK capital markets), as well as on the most important capital markets from the Central and Eastern Europe, namely Austrian and Polish ones.

Because the obtained results show connections between the Central and Eastern Europe capital markets and the developed markets, they are of interest for a large spectrum of users (*supervisory authorities, institutional investors, researchers, etc.*), interested in finding the contagion effects on the stability of capital markets. This result shows the need to start the reform on the Romanian capital market, in order to strengthen its place as a financing venue for the Romanian companies, especially considering the perspective of the Capital Markets Union process intended to be initiated starting early 2019.

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