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FINANCIAL INTEGRATION INTO EU: THE ROMANIAN CASE

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Abstract

The aim of this study is to investigate the determinants of integration between stock market of Romania and other stock markets of European Union (EU) countries. Correlations between the stock returns represent the level of integration between the stock markets. Empirical analysis are performed with daily stock returns of 24 EU members including Romania for 2002-2012 period using panel data gravity models and correlations are investigated. Findings reveal that the following factors have significant and robust effects on the financial integration process of Romania with other 23 EU members; (i) EU membership, (ii) bilateral trade, (iii) GDP per capita, (iv) 2012 sovereign debt crisis and (v) East European location. The results emphasize that intensifying economic relations with EU members can contribute the integration of Romanian stock market with other EU members.

Keywords: financial integration, European Union, Romania, gravity model, stock markets

JEL Classification: F36, F21, F30, G15

Introduction

European Union (EU) is one of the best models for a successful integration in the World consisting of 27 countries. European integration involves cooperation and cohesion in many issues of social, political, economic and military realms. EU aims to abolish national borders in a broader sense allowing free movement of citizens, goods, services and capital between the member states by attaining integration. Barriers to this mobility have been removed or gradually being removed to institute the EU single market. Increased mobility of goods and services as well as financial assets between the member states contribute to the level of economic and financial integration.

European Central Bank (ECB) makes efforts for attaining financial integration and healthy financial system in the Eurozone. According to ECB *“the market for a given set of financial instruments and/or services is fully integrated if all potential market participants*

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with the same relevant characteristics (1) face a single set of rules when they decide to deal with those financial instruments and/or services; (2) have equal access to the set of financial instruments and/or services; and (3) are treated equally when they are active in the market” (ECB, 2015:4). The idea of aforementioned full integration is based on the validity of “the rule of one price”, where the spread between the prices of equivalent assets is zero in any place within the union if the markets are integrated (Baele et al., 2004: 510). Many of the financial integration studies followed this rule assuming the earnings or costs of the instruments traded in integrated markets show a co-moving pattern.

Financial integration, which is an important pillar of economic cohesion and success, is particularly important for financial stability, generating wealth and sustaining the economic growth. Financial integration in the EU led to financial development which facilitated economic growth in last decades. The study of Maudos and de Guevara (2015) empirically demonstrated this interdependency stating financial integration explains 3,75% of annual financial development and financial development achieved explains 9,5% of annual GDP growth for EU 15.

The banking union and launching Euro as a single currency between some of the members undoubtedly contributed to the level of financial integration. The adoption of Euro as a common currency can be considered as one of the strongest manifestation of economic integration. The banking union provided union-level supervision and regulation of financial services, which formerly carried independently by each country. Though the ultimate aim of EU is to reach full financial integration, the union is far from achieving it when stock market divergence of both core members (EU 15) and new members (EU 27) are considered (Pungulescu, 2013). Investigating the determinants of financial integration is a major issue to develop successful policies and strengthen the integration level between the member states. Though there are studies on the determinants of financial integration in the EU, financial integration research on Romanian case is still inadequate. Therefore, we aimed to address this issue to contribute the literature, investigating determinants of Romanian financial integration. Romania is the second most populous country after Poland when the newly accessed members of the fourth (2004) and fifth (2007) waves of expansion are considered. Disentangling the level and determinants of financial integration of newly-accessed countries, particularly sizable ones, is important to understand the success of the process of integration into EU.

EU has launched several regulatory and legislative steps to achieve financial integration, but the market-level research is important to understand effects of those regulations in practice (Grosman and Leblond, 2011). It is important to define inconsistencies between regulatory integration and market integration to pave the way to a more effective process. Our measure of integration, stock market correlations, indicates the actual market-level integration and may help understanding the latter. Furthermore, the Romanian case provides a natural experiment to investigate integration in this reign as the country is one of the most recent members. The effects of the country-level regulations and activities on the market-level integration can be observed when the research period (2002-2012) is considered.

One of the motivative factors behind this research was to investigate the elements which affect the financial integration process into EU. Financial integration has an effect of transmitting investments contributing economic development. Success of economic integration undoubtedly accelerates the integration in other spheres. Romania, which joined

the EU in 2007, an emerging nation which transformed from a centrally planned economy to an open economy in the last decade, is a good case to discuss. The analysis implemented utilizing the data accumulated before and after accession, which cover a considerable time period enough to produce unbiased results, can provide insights into the issue of financial integration. We hope to clarify the impact of EU accession on the financial integration of country dyads which include Romania and other EU members. It is a reasonable assumption that, factors influencing the integration process are different for each dyad and can be treated separately. Therefore, we adopted one central country, Romania, and other member countries in our pairs. Discovering the key factors for integration with each member country can help authorities understand the dynamics of bilateral integration and formulate better policies for a more successful alignment.

The rest of this article is organized as follows. Relevant studies in established literature are presented in the next part. Data and Methodology section covers the data and variables employed as well as the econometric methods of the study. After providing empirical findings and discussion, the conclusions are presented in the final part of the article.

1. Literature Review

Financial integration provides increased access to foreign markets, reduction in the costs of financial transactions, fragmentation in the sources of funding for investments, increased competition between institutions offering financial services which contribute to efficiency and more appropriate allocation of resources (Maudos and de Guevara, 2015).

Flavin et al. (2002), Baele et al. (2004), Cappiello et al. (2008), Pungulescu (2013), Enoch et al. (2013) and ECB adopted the indicators of equity markets, money markets, bond markets or loan markets to measure financial integration. ECB, monitoring the level of financial integration, reports that financial integration level of money, bond and loan markets are gradually increasing. However, when equity markets are considered, volatility is prevailing, the segmentation of equity markets is pertinent and member nations show mixed levels of integration (Cappiello et al., 2008; ECB, 2015). Since 2004, 13 nations have entered the EU and the number of new members increases the challenges of stock market integration. The volatilities observed in stock market integration show that adopted legal and technical measures cannot be sufficient to mitigate the effects of market imperfections inherent in stock markets.

The researchers show concern for different aspects of financial integration; the type of integration, level of integration, benefits or disadvantages of integration and the impacts of integration on macroeconomics both at regional and global level. Determinants of financial integration are another avenue of research. Flavin et al. (2002), Walti (2011), Vo and Daly (2007), Schmitz and Hagen (2011), Devereux and Sutherland (2011), Davis (2014), Maudos and de Guevara (2015), Egger and Falkinger (2015), Pungulescu (2013), Bekaert et al. (2013) and Cappiello et al. (2008) are some of the recent studies devoted to determinants of financial integration. Brief information on the literature is presented in table no. 1.

The nature of integration is spatial and regional contiguity is one of the drivers of integration. Therefore, many studies on determinants of financial integration considered distance as an important factor relevant to gravity law. The impacts of common border, language and currency, market capitalization, bilateral trade, trade openness, GDP,

exchange rate volatility, tax rates, consumption volatility and business cycle co-movements have often been investigated in the research of financial integration determinants. The variables of this study are mostly derived from established literature. Membership of EU or EMU and the region such as being located in East Europe are other variables that considered in studies confined to integration in EU area. Additionally, we employed the membership of Schengen agreement in our research pertaining to integration within EU, considering its potential on restricting mobility can have impact on integration

Table no. 1. The literature pertaining to determinants of financial integration

Author(s)	Sample	Period	Dependent variable	Independent variables and the direction of their effect
Flavin et al. (2002)	National stock market data for 27 countries	1999	Correlation between stock markets i and j	Distance (-), market capitalization (+), common border (+), common language (none), common currency (+), colonial links (none), overlapping opening hours (+)
Walti (2011)	15 developed markets	1975-2006	Stock market return correlations	Monetary integration (+), exchange rate volatility (-), bilateral trade (+)
Vo and Daly (2007)	78 countries	1980-2003	Various measures of international financial integration	Capital control measures (-), GDP (+), education level (+), trade openness (+), level of financial development (+), inflation (-), tax rates (-)
Schmitz and Hagen (2011)	EU-15 countries	1981-2005	Capital flows	differences of GDP per capita (+), capital stock (+), European monetary union (EMU) membership (+)
Devereux and Sutherland (2011)			Consumption volatility	Financial integration (bond markets) (+)
			Consumption volatility	Financial integration (bond and equity markets) (-)
Davis (2014)	78 countries	1991-2004	Business cycle co-movement	Credit market integration (+)
			Business cycle co-movement	Capital market integration (-)
Maudos and de Guevara (2015)	EU-15 countries	1999-2012	Financial development	Financial integration (+)
			GDP growth	Financial development (+)
Egger and Falkinger (2015)	OECD members	1991-2011	Financial integration	International trade (+)
Pungulescu (2013)	EU-27 countries	1980-2010	Financial integration	EU membership (EU-15 vs EU-27)(+), EMU membership (+)
Bekaert et al. (2013)	EU-27 countries	1990-2007	Stock market valuation	EU membership (+), EMU membership (none), Bilateral trade (+), Eastern Europe indicator (-), Distance to Brussels (-)
Cappiello et al. (2008)	EMU members and non-EMU members	1987-2008	Equity returns co-movements	EMU membership (+)
Lucey and Zhang (2010)	23 emerging and 23 developed markets	1995-2007	Stock market return correlations	Geographical distance (-), cultural distance (-), religion (+), region (+), bilateral trade (+), market capitalization (+), GDP growth rate (-), differences legal system (-)

2. Data and Methodology

2.1. Gravity Model and Data

Inspired by the Newton's law of gravity, a large number of researchers analyzed different questions like immigration (Bunea, 2012), bilateral trade (Guan and Qiang, 2015), the integration between certain sectors (Serrano, García-Casarejos, Gil-Pareja, Llorca-Vivero, & Pinilla, 2015) and stock market integration (Flavin, Hurley and Fabrice, 2002) utilizing panel data models based on gravity law. Nature of bilateral financial asset holdings and trade in financial assets, show a gravity form similar to trading in goods (Flavin et al., 2002; Okawa and Van Wincoop, 2012) where geography is an important issue.

Correlation coefficients between the stock returns of two countries are generally regarded as a proxy presenting integration level of the related countries in the studies of stock market integration. Two main factors that may affect this correlation, compatible with gravity law, are the size of the stock markets and the distance between countries. However, additional control variables, assumed to have impact on the integration, are included to alleviate the problem of omitted variable bias similar to other econometric methods. Frequently employed variables are size of economies, bilateral trade volume between them, common language, common religion, common borders, overlapping opening hours and news about the markets (Flavin, Hurley and Fabrice, 2002; Bracker and Koch, 1999; Pretorius, 2002; Lucey and Zhang, 2010).

The dependent variable used in the study, pairwise correlation coefficients of stock exchange markets of Romania and 23 EU members. Yearly correlation coefficients, obtained by using daily closing values, are utilized for analyses for the period of 2002-2012. These coefficients reflect pair-dependent and time-varying nature (both on the daily and annual level) of financial integration. Table no. 2 shows the correlations of stock market indices of the Romanian (BET) and 23 EU members.

Table no. 2. Pairwise correlation coefficients of Romanian stock index and other 23 EU member stock indices (2002-2012)

<i>Year</i>	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
AUSTRIA (ATX) Vienna	0.06	0.18 ^a	0.01	0.06	0.12 ^c	0.40 ^a	0.52 ^a	0.6 ^a	0.43 ^a	0.45 ^a	0.45 ^a
BELGIUM (BEL20) Bursseles	0.07	0.01	-0.04	0.09	0.11 ^c	0.34 ^a	0.42 ^a	0.51 ^a	0.43 ^a	0.42 ^a	0.41 ^a
BULGARIA (SOFIX) Sofia	-0.08	0.3 ^a	0.37 ^a	0.17 ^b	0.21 ^a	0.14 ^b	0.32 ^a	0.35 ^a	0.16 ^b	0.4 ^a	0.18 ^a
CROATIA (CROBEX) Zagreb	0.08	0.41 ^a	0.14 ^b	0.21 ^a	0.23 ^a	0.20 ^a	0.60 ^a	0.56 ^a	0.42 ^a	0.46 ^a	0.40 ^a
CZECH REP. (PX) Prague	0.04	0.13 ^b	-0.10	0.20 ^a	0.25 ^a	0.30 ^a	0.64 ^a	0.58 ^a	0.52 ^a	0.46 ^a	0.43 ^a
DENMARK (OMXC20) Copenhagen	0.09	0.14 ^b	0.04	-0.01	0.12 ^c	0.31 ^a	0.54 ^a	0.46 ^a	0.45 ^a	0.40 ^a	0.31 ^a
ESTONIA (OMXTGI) Tallinn	0.01	0.04	0.11 ^c	0.11	0.13 ^b	0.28 ^a	0.39 ^a	0.32 ^a	0.34 ^a	0.51 ^a	0.23 ^a
FINLAND (OMXHEX) Helsinki	0.01	0.12 ^c	0.01	0.09	0.05	0.23 ^a	0.41 ^a	0.50 ^a	0.40 ^a	0.41 ^a	0.37 ^a
FRANCE (CAC40) Paris	0.05	0.03	-0.04	0.13 ^b	0.13 ^b	0.29 ^a	0.40 ^a	0.53 ^a	0.39 ^a	0.44 ^a	0.41 ^a

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
GERMANY (DAX) Frankfurt	0.03	0.01	-0.06	0.11	0.15 ^b	0.3 ^a	0.42 ^a	0.52 ^a	0.37 ^a	0.42 ^a	0.4 ^a
GREECE (ATHEX) Athens	-0.09	0.15 ^b	-0.02	0.10	0.17 ^a	0.34 ^a	0.61 ^a	0.54 ^a	0.37 ^a	0.33 ^a	0.21 ^a
HUNGARY (BUX) Budapest	0.07	0.20 ^a	-0.07	0.06	0.15 ^b	0.39 ^a	0.45 ^a	0.56 ^a	0.55 ^a	0.42 ^a	0.35 ^a
IRELAND (ISEQ) Dublin	0.13 ^c	0.08	-0.04	0.11	0.17 ^b	0.43 ^a	0.42 ^a	0.43 ^a	0.37 ^a	0.41 ^a	0.35 ^a
ITALY (FTSEMIB) Milano	0.01	0.04	-0.06	0.10	0.14 ^b	0.25 ^a	0.43 ^a	0.55 ^a	0.37 ^a	0.4 ^a	0.42 ^a
LATVIA (OMXR) Riga	-0.08	-0.03	0.00	-0.03	0.04	0.21 ^a	0.31 ^a	0.13 ^b	0.22 ^a	0.26	0.1 ^a
LITHUANIA (OMXV) Vilnius	0.16 ^b	-0.04	0.01	0.07	0.05	0.37 ^a	0.49 ^a	0.38 ^a	0.30 ^a	0.49 ^a	0.17 ^b
NETHERL. (AEX) Amsterdam	0.06	0.07	-0.03	0.11	0.15 ^b	0.34 ^a	0.40 ^a	0.55 ^a	0.40 ^a	0.45 ^a	0.38 ^a
POLAND (WIG20) Warsaw	0.19 ^a	0.16 ^b	-0.1	0.14 ^b	0.22 ^a	0.26 ^a	0.49 ^a	0.58 ^a	0.52 ^a	0.52 ^a	0.31 ^a
PORTUGAL (PSI20) Lisbon	0.07	0.09	0.00	0.14 ^b	0.19 ^a	0.25 ^a	0.48 ^a	0.52 ^a	0.42 ^a	0.41 ^a	0.34 ^a
SLOVAK (SAX) Bratislava	-0.16 ^b	0.02	-0.07	0.06	-0.03	0.1	0.14	0.17 ^c	0.07	-0.15 ^b	-0.1
SPAIN (IBEX) Madrid	0.05	0.03	-0.04	0.10	0.12 ^c	0.21 ^a	0.40 ^a	0.57 ^a	0.40 ^a	0.37 ^a	0.37 ^a
SWEDEN (OMXS30) Stockholm	0.02	0.07	-0.02	0.11 ^c	0.06	0.32 ^a	0.45 ^a	0.46 ^a	0.38 ^a	0.36 ^a	0.30 ^a
UNITED K. (FTSE100) London	0.08	0.08	-0.07	0.08	0.21 ^a	0.31 ^a	0.43 ^a	0.47 ^a	0.31 ^a	0.42 ^a	0.28 ^a

^a, Significant at %1 level. ^b, Significant at %5 level. ^c, Significant at %10 level.

(1) Statistically insignificant coefficients are included as 'zero' in the analyses.

(2) The index closing values of the countries not member of common currency of EURO are converted to EURO before calculating the correlations. Daily currency rates have been obtained from the <http://stoq.com/web> address.

The gravity model which is designed to determine the factors influencing the correlation coefficients (indicating co-movements and integration between Romanian and other stock markets) seen in table no. 2 can be formulated as Eq.1;

$$\begin{aligned}
 \log \text{COR}_{i,t} = & \beta_1 + \beta_2 \text{MCAP}_{i,t} + \beta_3 \text{MCAP}_{i,t-1} + \beta_4 \log \text{KM}_{i,t} + \beta_5 \text{EU}_{i,t} \\
 & + \beta_6 \text{EUZ}_{i,t} + \beta_7 \text{BRD}_{i,t} + \beta_8 \log \text{OH}_{i,t} + \beta_9 \log \text{CH}_{i,t} + \beta_{10} \text{TRD}_{i,t} \\
 & + \beta_{11} \text{TRD}_{i,t-1} + \beta_{12} \text{TAX}_{i,t} + \beta_{13} \text{TAX}_{i,t-1} + \beta_{14} \text{SCH}_{i,t} \\
 & + \beta_{15} \log \text{GDP}_{i,t} + \beta_{16} \log \text{GDP}_{i,t-1} + \beta_{17} \text{EAST}_{i,t} \\
 & + \beta_{18} \text{CRIS}_{i,2008} + \beta_{19} \text{CRIS}_{i,2009} + \beta_{20} \text{CRIS}_{i,2012} + u_{i,t}
 \end{aligned} \quad (1)$$

Where "i" represent the countries compared with Romania (i=1.....23); "t" refers to the period "t", log shows the logarithm of the related proxy and $\text{COR}_{i,t}$ expresses the correlation coefficient between stock market indices of Romania and country "i" for year "t". Explanations on the other variables are given in table no. 3.

Table no. 3. The explanation of the variables included in the gravity model (Eq.1)

Indep. Variables	Description	Calculation	Source of Raw Data
MCAP _{it}	The sum of market capitalization of Romanian and country "i" stock markets divided by the sum of GDP values of both countries. This variable is employed as control to the effect of GDP on the dependent variable.	$\frac{MCAP_{Rom.} + MCAP_i}{GDP_i + GDP_{Rom.}}$	http://data.worldbank.org/indicato r
Log KM _{it}	Logarithm of the distance between the locations of stock markets of Romania and the country "i".	http://www.oktrans.com.tr/tr/ulkeler_arasi_mesafe.html	
EU _{it}	Dummy variable: 1 if both Romania and the country "i" is an EU member, 0 otherwise.		
EUZ _{it}	Dummy variable: 1 if the country "i" is an member of EMU, 0 otherwise.	http://ec.europa.eu/economy_finance/euro/adoption/euro_area/index_en.htm	
BRD _{it}	Dummy variable: 1 if the country "i" shares a common border with Romania, 0 otherwise		
Log OH _{it}	The logarithm of the absolute value of the difference (in minutes) between the stock market opening hours of Romania and the country "i"	$ OH_i - OH_{Rom.} $	http://www.wikipedia.com/wiki/List_of_Stock_Exchange_changes
Log CH _{it}	The logarithm of the absolute value of the difference (in minutes) between the stock market closing hours of Romania and the country "i"	$ CH_i - CH_{Rom.} $	
TRD _{it}	The ratio of the sum of bilateral trade and total trade volumes of Romania and the country "i".	$\frac{Exp_{R \rightarrow i} + Imp_{R \leftarrow i}}{Exp_i + Exp_R + Imp_i + Imp_R}$	http://www.trade-map.org/countrymap/Index.aspx
TAX _{it}	The absolute value of the difference between total taxes (as a percentage of GDP) in country "i" and Romania	$ TAX_i - TAX_{Rom.} $	http://data.worldbank.org/indicato r
SCH _{it}	Dummy variable: 1 if the country "i" is a Shengen member, 0 otherwise.		http://ec.europa.eu/
Log GDP _{it}	The logarithm of the ratio of GDP per capita for country "i" and GDP per capita for Romania. This variable is employed as controls to the effect of the country population on the dependent variable.	$\frac{GDP_i}{GDP_{Rom.}}$	http://data.worldbank.org/indicato r
EAST _{it}	Dummy variable: 1 if the country "i" is an Eastern European country, 0 otherwise.		
CRIS2008	Dummy variable for 2008 crisis: 1 for the year 2008, 0 otherwise.		
CRIS2009	Dummy variable for 2009 crisis: 1 for the year 2009, 0 otherwise.		
CRIS2012	Dummy variable for sovereign debt crisis: 1 for the year 2012, 0 otherwise.		

Note: (1) To analyze the effects of lagged values of independent variables on the dependent variable, one period lagged values of the variables which change according to both individuals and time (MCAP, TRD, TAX and GDP) are included in the model.
(2) When calculating logarithms of COR, KM, OH, CH and GDP, the constant 1 is added to each observation in order to avoid the possibility of taking the log of 0.

Table no. 4 shows the summary of statistics related to the variables included in the model. As seen in table no. 4, logCOR, MCAP, TRD, TAX and logGDP are not stationary at the I(0) level but when the first differences are taken, the series become stationary at the I(1) level. Therefore, new series obtained by the first differences of the variables are employed in the analysis.

Table no. 4. Descriptive statistics of independent variables of gravity model (Eq.1)

Independent Variables	Mean	St. Dev.	Minimum	Maximum	Unit Root Test I(0)	Unit Root Test I(1)
Log COR	0.085061	0.070419	-0.0775	0.2135	Has a unit root	Stationary
MCAP (%)	40.85257	29.18651	7.8338	141.4588	Has a unit root	Stationary
Log KM	3.247383	0.232168	2.5539	3.5717	-	-
EU	0.521739	0.500517	0	1	-	-
EUZ	0.664031	0.473264	0	1	-	-
BRD	0.086956	0.282337	0	1	-	-
Log OH	1.639722	0.206155	1.2041	1.959	-	-
Log CH	1.596796	0.570197	0	2.179	-	-
TRD (%)	0.275865	0.369425	0.00023	2.2352	Has a unit root	Stationary
TAX (%)	7.603659	7.549790	0.00727	50.028	Has a unit root	Stationary
SCH	0.679841	0.467461	0	1	-	-
Log GDP	0.710128	0.248136	0.23250	1.2227	Has a unit root	Stationary
EAST	0.391304	0.489010	0	1	-	-
CRIS2008	0.090909	0.288050	0	1	-	-
CRIS2009	0.090909	0.288050	0	1	-	-
CRIS2012	0.090909	0.288050	0	1	-	-

Notes: (1) Unit root tests are applied to the variables changing depending on both the individuals and time.

(2) The stationarity of the series is crucial for preventing spurious relations between the variables in the panel data analysis. Therefore, we used (i) Levin, Lin and Chu (2002) for testing common unit root, (ii) Im-Pesaran-Shin (2003) W-statistics and (iii) ADF-Fisher Chi-Square for testing unit root for each individual (country) prior to panel data analysis

2.2. Panel Data Analysis

Gravity model, constructed in line with the aim of the study, is settled by the panel data regression analysis. Panel data facilitates observation of the trends of individuals (here, countries) across time (here, the period of 2002-2012) combining time series and cross-section data (Baltagi, 2005). Therefore, panel data has ability to reflect the characteristics both varying depending on subjects and time.

The variables of KM, EU, EUZ, BRD, OH, CH, SCH and EAST employed in our model reflect the effects change only depending on the individuals while the variables of CRIS2008, CRIS2009 and CRIS2012 depict the characteristics change only depending only time. On the other hand, TRD, TAX, MCAP and GDP are the variables reflecting the characteristics changing due to both cross-sections and time.

However, there may exist exogenous variables, excluded due to data availability or difficulty of measuring, that should be included for obvious effects on the outcomes (here, for example, social and political circumstances in the countries, terror and security problems and important news pertaining to the companies listed in stock markets). The existence of correlation between these excluded variables and explaining variables cause the correlation between the error term of the regression model and independent variables. Such an occasion may lead deviation in the estimation of parameters in the model expressed in Eq.1. Best suitable panel model selection, which is performed after identifying individual and/or time effects in the model, is crucial to avoid biased results and estimation.

The existence of time and/or individual effects in our model (Eq.1) is investigated utilizing the tests shown in table no. 5.

If the results of the specific tests indicate the existence of individual unit and/or time effects in the Equation 1, the model can be solved using fixed effect models as well as random effect models. Hausman (1978) tests are applied to determine whether fixed or random effect models are more suitable for the panel data analysis. If, there are no individual unit and/or time effects observed, then, the Equation 1 can be solved utilizing pooled ordinary least square (OLS) estimator.

3. Estimation Results

3.1. Panel Data Model Selection

Determining individual unit and time effects are crucial in obtaining robust and unbiased estimation results in panel data analysis. Therefore, specific tests are applied for the datasets. The results of statistical tests explained above are given in table no. 5.

Table no. 5. Results of the tests

Tests	(1) LR Test	(2) F Test	(3) LR Test	(4) LM Test	(5) ALM Test	(6) Score Test	(7) LR Test
Regression Models	Random Individual and Time Effects	Fixed Effects Model	Random-Effects ML Model	Random Effects GLS Model	Random Effects GLS Model	Random Effects ML Model	Random Time Effects ML Model
PANEL A: Model Statistics							
OF-Stat.	-	10.00	-	-	-	-	-
Chi ² Sat.	50.68	-	114.86	138.70	138.70	114.86	50.68
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PANEL B: Test Statistics							
F or Chi ² Sat.	1.66	0.71	0.00	0.00	1.85	0.00	1.69
Probability	0.436	0.8254	1.00	1.00	0.1740	1.00	0.10
H ₀ :	Accept	Accept	Accept	Accept	Accept	Accept	Accept
PANEL C: Results							
Individual Effect	⊗	⊗	⊗	⊗	⊗	⊗	-
Time Effect	⊗	-	-	-	-	-	⊗
Pooled OLS	⊙	⊙	⊙	⊙	⊙	⊙	⊙

Notes:

- (1) For LR test H₀: standart errors of the individual and time effects are zero (H₀: $\sigma_{\mu} = \sigma_{\lambda} = 0$)
- (2) For F test H₀: all individual effects are zero (H₀: $\mu_i = 0$)
- (3) For LR test and (6) for Score Test H₀: standart errors of individual effects are zero (H₀: $\sigma_{\mu} = 0$)
- (4) For LM Test and (5) for ALM Test H₀: Variances of individual effects are zero (H₀: $\sigma_{\mu}^2 = 0$)
- (7) For LR Test H₀: standart errors of time effects are zero (H₀: $\sigma_{\lambda} = 0$)

The findings depicted in table no. 5, show that all the tests applied suggest the best suitable estimator for the model (Eq. 1) is pooled OLS method. Panel A part of table no. 5 includes F or Chi² statistics which show the capability of the selected set of independent variables in explaining the dependent variable in the panel data regression models. Panel B includes the statistics for analysing the hypotesis of the 7 tests mentioned above. Panel C summarizes and shows the final decision of suitable model detemining whether unit or time effects exist in Eq. 1. All the test results reveal that the best suitable method is pooled OLS estimator. Therefore, we will employ pooled OLS in our analysis.

3.2. Heteroskedasticity and Autocorrelation (HAC) Tests

If there are problems of either correlation between the values of time series (autocorrelation) or non-constant variance of error terms (heteroskedasticity), the results of the models can be misleading, biased and inconsistent. The results shown in table no. 6, disclose that there is no autocorrelation in the model analysed by pooled OLS method. However, the tests indicate the models do have the problem of heteroskedasticity.

The estimators can be decided in the light of the test results shown in table no. 6. The estimators producing heteroskedasticity-robust standard errors or another regression models which can produce consistent results under the problem of heteroskedasticity are suitable in analysis. Considering the results of HAC tests, we employed robust standart error estimators of Newey and West (1987; 1984), Long and Ervin (2000), Rogers (1994), Beck and Katz (1995) and Driscoll and Kraay (1998) as well as GEE population-averaged regression models.

Table no. 6. Heteroskedasticity and autocorrelation (HAC) tests

Tests	(1) Breusch-Pagan and Cook-Weisberg Test	(2) White Test	(3) Wooldridge Test
Regression Models	Pooled OLS Regression	Pooled OLS Regression	Linear Model
PANEL A: Model Statistics			
F-Stat.	7.30	7.30	7.30
Probability	0.00	0.00	0.00
PANEL B: Test Statistics			
F stat.	-	-	0.031
Chi ² Sat.	41.66	192.21	-
Probability	0.002	0.480	0.8622
H ₀ :	Reject	Accept	Accept
PANEL C: Results			
Heteroskedasticity	✓	✗	-
Autocorrelation	-	-	✗

Notes:

(1) For Breusch-Pagan (1979) and Cook-Weisberg (1983) Test and (2) White (1980) test H₀: No heteroskedasticity (3) for Wooldridge (2002) test H₀: No autocorrelation.

3.3. Empirical Results and Discussion

Table no. 7 shows the estimation results of the parameters of variables included in the analysis, utilizing 6 different methods.

The results of all the methods reveal that coefficient estimations of EU, TRDt-1, GDPt-1, and CRIS2012 are statistically significant (Table no. 7). The findings produced by some of the models show that the variables of MCAP (The variable of MCAP became statistically significant when CRIS2008 and CRIS2009 variables are omitted, while the results for other variables remain unchanged in both cases), BRD, CH and EAST have statistically significant effect on the integration between the stock markets of Romania and other EU members. The interpretation of F and Chi² statistics support that our set of independent variables have the ability of explaining our financial integration variable. R² statistics show that the independent variables employed in the model can explain the 48% of the correlation.

The results for MCAP indicate that the increase in the ratio of the sums of the stock market capitalization of Romania and the country “i” to the sum of their GDP, has a positive impact on the integration of the two stock markets. Market capitalization weight in GDP is an indicator of financial development. Maudos and de Guevara (2015) state that financial development leads and encourages financial integration, confirming our results.

The membership of EU contributes to the integration of Bucharest Stock Exchange (BVB) with other stock markets within the union. The correlation of Romanian stock exchange with the stock exchange market of an EU member is 0.04 points higher when compared the correlation with a stock market of a non-EU member [$\text{antilog}(-0.04+0.02) - \text{antilog}(-0.04)$]. Regulations and investor sentiments are one of the important determinants of stock returns and stock market correlations (Baker et al., 2012) besides economic factors. EU membership obviously increases positive investor sentiments contributing financial integration. When the EU variable is omitted from our model, the results reveal that EUZ is statistically significant. Cappiello et al. (2008) show that equity return co-movements of EU markets, both at industry and national level, have significantly increased with the launch of the Euro as single currency. Monetary integration increases stock market return correlations by means of eliminated currency rate volatility, converged inflation and unified monetary policy (Walti, 2011). Common monetary policy and lower volatilities in exchange rates can lead to homogeneous valuations of financial assets and higher correlations in the outputs of these assets. On the other hand, in studies adopting both EUZ and EU membership, it is observed that EU membership has more significant impact on integration, in line with our findings. For example, Bekaert et al. (2013) find that the EU membership improves the stock market integration while Euro adoption as a common currency has no effect.

Table no. 7. Estimation results of the gravity model (Eq. 1)

Dep. Var. LogCOR	Regression with Newey-West Std. Error	Regression with Robust Std. Error (Long and Ervin)	Regression with Robust Std. Error (Rogers)	Regression with Panel- Corrected Standard Error (Beck-Katz)	Regression with Drisc/Kraay Std. Error	GEE Population- Averaged Model with Semirobust Std. Error
MCAP _t				0.000443 ^c (0.0002473)	0.000486 ^b (0.0001782)	
EU	0.0219155 ^b (0.0086783)	0.021916 ^b (0.009216)	0.021916 ^b (0.0092521)	0.0219155 ^b (0.0090471)	0.0211946 ^b (0.0102208)	0.0219155 ^b (0.0087915)
BRD					-0.011347 ^b (0.0050001)	
Log CH _t			0.0051411 ^c (0.0029457)			0.0051411 ^c (0.002799)
TRD _{t-1}	0.0632552 ^a (0.0207306)	0.0632552 ^a (0.0243687)	0.0632552 ^b (0.0279155)	0.0632552 ^a (0.0229669)	0.0649963 ^a (0.0098924)	0.0632552 ^b (0.0265258)
Log GDP _t	-0.6928796 ^a (0.0849968)	-0.6928796 ^a (0.0892982)	-0.6928796 ^a (0.0859082)	-0.6928796 ^a (0.1166439)	-0.7759095 ^a (0.0688314)	-0.6928796 ^a (0.0816315)
Log GDP _{t-1}	0.680647 ^a (0.0853351)	0.680647 ^a (0.0902701)	0.680647 ^a (0.0842488)	0.680647 ^a (0.1117074)	0.7608721 ^a (0.0820989)	0.680647 ^a (0.0800547)
EAST			0.014971 ^c (0.0078372)		0.0180998 ^c (0.009707)	0.014971 ^b (0.0074471)
CRIS2012	-0.0319089 ^a (0.0106674)	-0.031908 ^a (0.0113288)	-0.0319089 ^c (0.0164471)	-0.0319089 ^b (0.0129874)		-0.0319089 ^b (0.0156283)
Constant	-0.0431583	-0.0431583	-0.0431583	-0.0431583	-0.0431583	-0.0431583
F-Statistic	11.95 ^a	10.03 ^a	506.66 ^a		139.9 ^a	
Wald Chi ²				125.22 ^a		11222.77
R ²		0.48 ^b	0.48 ^b	0.48 ^a	0.42 ^b	

Notes:

(1) ^a, ^b and ^c have been used to indicate that the coefficient estimations are statistically significant at 1%, 5% and 10% level, respectively.

(2) Since error terms may have heteroscedasticity and autocorrelation problems, robust methods have been used in the analysis. The values given in brackets under related coefficient estimations are robust standard errors made coherent with autocorrelation and heteroscedasticity.

(3) Because of space limitations, only statistically significant coefficients are included here.

Effects of border, which often cited as a positive factor, on the stock market integration of Romania are negative contrary to expectations. If country “i” has common border with Romania the correlation between two countries are estimated to be lower for 0.2 points [antilog(-0.04-0.01) – antilog(-0.04)]. On the other hand, the effect of Eastern Europe which indicate regional contiguity and similar backgrounds experiencing transition is positive congruent to the literature. The correlation between Romania and country “i” is 0.02 point higher if country is located in Eastern Europe [antilog(-0.04+0.01) – antilog(-0.04)]. There are two EU members having a border with Romania: Bulgaria and Hungary. Therefore, the results of the BRD can be explained in terms of interactions with these two countries. Surprisingly, the impact of distance on financial integration is insignificant in Romanian case. Some part of this result can be explained attributing technological developments which diminish the effect of distance. However, bilateral policies and relations between Romania and EU members may have significant impact on this outcome. The impact of distance in Romania’s financial integration can be dealt in further studies.

Flavin et al. (2002) stated that overlapping stock market opening hours have positive effect on the correlation which is reasonable for investors monitor and operate in markets simultaneously. We, however, differentiated this variable to observe if variation in stock market opening hours has a significant impact on the correlation. Difference in closing hours of stock markets between Romania and the other country in the dyad has impact on the correlation. The effect is positive. The results show that 1% increase in the difference of closing hours (in minutes) has an impact increasing the correlation about 0.005%. This finding implicates that financial transactions of investors are not restricted by a stock market or time period, and the investors tend to pursue similar goals in different markets.

Macroeconomic factors also have impacts on the stock market integration. But, generally, this effect is lagged for one year. International trade volume, which is an important factor depicting the internationalization of an economy as well as the interaction between the countries, has considered as an avenue transmitting the economic effects between countries. Export of capital usually leads to investments that boost production in receiving countries, which then returns as import of goods or services that are produced utilizing the exported capital. There is an interaction between the flow of capital and flow of goods or services (Egger and Falkinger, 2015). Both international trade in goods and financial assets are expected to increase the level of economic interdependence.

EU is a free trade zone, as well, diverging the movement of goods from non-EU area to the EU area increasing bilateral trade between the members. The parallel movement in financial asset trade is naturally dependent upon the conformance to the law of one price within the union. Lane and Walti (2007) state that correlations of asset returns within EU are significant which may have potential to produce a similar impact in bilateral asset trading like “free trade zone”. EU membership introduction had significant effect on bilateral financial asset holdings and the comovements of the stock returns. Aviat and Coeurdacier (2007) investigated the relation between bilateral trade in goods and bilateral asset holdings utilizing traditional gravity models. Their findings indicate that there is a strong causality running from trade to asset holdings and a weaker causality in the reverse direction. Bakeart et al. (2013), Aviat and Coeurdacier (2007) report that trade and financial integration are positively correlated. Our results support findings of aforementioned studies; if trade volume increases 10% in the year “t-1”, the correlation between the stock market returns increase 0.6% in the following year “t”.

Another variable imposing a lagged effect on the stock market integration is GDP per capita. The results in table no. 7 indicate that, if the GDP per capita of Romania in the year “*t*” decreases or increases relatively lower compared to the county “*i*”, the correlation between the two stock market returns decreases in the year “*t*”. However, the correlation increases in the following year “*t+1*”. In summary, the variation observed in GDP per capita of country pairs has different effects on the correlation for different periods. Schmitz and Hagen (2011) state that GDP per capita is an important determinant of capital flows, which show a pattern flowing from richer countries to poorer countries, in EU zone. This effect is observed with one year lag in our study.

When the effects of the crisis are considered, the sovereign debt crisis of 2012 has a negative effect on correlations while the crisis faced in 2008 and 2009 are insignificant. The sovereign debt crisis of 2012 diminished the correlation of Romania with other EU members about 0.06 points compared to the other years [antilog (-0.04-0.03) – antilog (-0.04)]. Maudos and de Guevara (2015) also state that European sovereign debt crisis of 2012 had adverse effects on financial integration supporting our findings. Financial crisis lead to disintegration as lack of trust in other markets causes a decrease in flow of capital and countries implement protectionist measures. The crisis of 2012 increased fragmentation in EU markets (Maudos and de Guevara, 2015). EU members need to develop synchronized measures rather than national recipes to resolve the consequences of crisis to sustain strong level of financial integration.

3.4. Robustness Check

The study employed the stock market correlation coefficients of Romania and other 23 EU members as dependent variable. The statistically insignificant coefficients are regarded as zero in the analysis. One can wonder what the results would be if the coefficients are employed in the analysis as-is. We performed first robustness check by including the coefficients as given in table no. 2. Another robustness check is performed by dividing the period in two sub-samples; 2002-2006 and 2007-2012, and running the models for each period separately.

The results of analysis for the period of 2007-2012 (not presented here due to space restriction) indicate that the factors having effects on the integration of BVB are consistent with the factors revealed for the period of 2002-2012.

The findings for 2002-2006 indicate that statistically significant factors that have an impact on stock market correlations are bilateral trade and GDP per capita. These two variables are statistically significant for all of the periods.

When the results of robustness checks are considered, effects of the following factors on the integration between BVB and other EU stock markets are robust; (i) EU membership, (ii) bilateral trade, (iii) GDP per capita and (iv) 2012 sovereign debt crisis and (v) East European location. The results implicate that intensifying economic relations with EU members can contribute to the integration of Romanian stock market with other EU members. At this stage, figure no. 1, which illustrates the Romanian share in the international trade of EU members, can provide useful information on the countries that should be focused in terms of bilateral trade. As seen in figure no. 1, the share of bilateral trade in total trade is highest for Bulgaria while it is the lowest for Estonia. Romania needs to implement policies aimed at increasing bilateral trade to support financial integration level with other EU members.

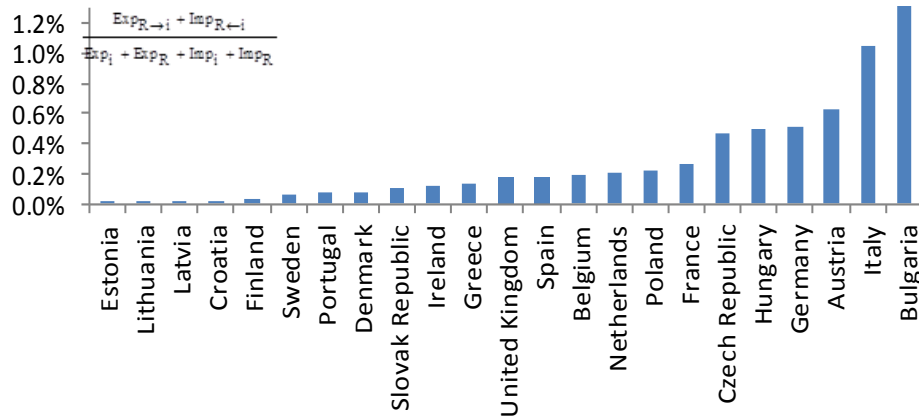


Figure no. 1. Bilateral trade volume of Romania and pair country "i" over total international trade volume of two countries (2002-2012)

Conclusion

Majority of studies on stock market integration consider correlation coefficients between the stock returns as indicator of integration between the two markets. This study, aiming at determining the significant factors for the integration of BVB with other EU markets, has adopted variables mostly derived from the literature. A standard gravity model is established using the data for variables of distance between markets, stock market capitalization, EU and EMU membership, difference between market opening/ closing hours, common border, bilateral trade, GDP, regional contiguity, differences in tax rates, Schengen membership and crisis. The analyses are performed with panel data pooled-OLS regression analysis.

Robust findings of the study indicate that (i) EU membership, (ii) bilateral trade, (iii) GDP per capita, (iv) sovereign debt crisis of 2012 and (v) East European location are principal factors having impact on integration.

The success of integration process involves the efforts of both the union and newly-accessed country. Grossman and Leblond (2011) state that the progress in the level of financial integration largely dependent on national regulations rather than EU-level regulations. Therefore, relatively new members need to draw out the process of EU financial integration and develop policies in line with their own integration capacity, weaknesses and strengths. The EU membership is an important driver of integration, offering opportunities for new members, but the success and speed of the process are mainly up to the newly-accessed members. Future studies can compare the processes of new members, providing benchmark and expanding best practices.

The results of the study may suggest some policy implications for authorities. First of all, increasing bilateral financial integration with EU countries will contribute to the capability of integration in the union level. Therefore, improving bilateral economic relations with member countries is important. Some members may be more suitable for such partnership while some impediments may be observed with some others and selection of a partner can accelerate the progress. Economic cooperation with neighbouring countries and promoting

cross-border trade in goods and assets seem to be an area for improvement. In sum, strengthening economic relations with EU members is important for the success of integration process of Romanian stock market with other EU members. Financial integration can enhance the development of the country as it increases the flow of capital and alternatives for funding investments.

Extension of this study covering all EU countries, studies on determining factors of integration of other newly-accessed members or in-depth studies considering two-country integration factors in future researches can contribute to understanding dynamics of financial integration within EU.

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