The Integration of Romanian Stock Market in European Union: An Empirical Analysis

ELENA RADU (GRIGORIE) PhD Candidate, School for Advanced Studies of Romanian Academy National Institute of Economic Research "Costin C. Kiritescu", Romanian Academy helena222@yahoo.com

Abstract: This paper uses a dynamic conditional correlation model to depict the degree of integration of Romanian stock market with other 22 stock markets from the European Union. Analyzing the results, we noticed that the dynamics of Romanian stock market integration varies, both in the analyzed periods and in relation with other markets. Also, the degree of Romanian stock market integration with other EU markets is quite low. In the case of most markets, the trend of Romania's integration follows a similar pattern. More exactly, the integration starts from low values in 2004-2007, reaches higher values during the global financial crisis and the sovereign debt crisis and, after 2012, descends and stabilizes around equilibrium values. The results obtained in this study are useful for investors and for the supervisory authorities, in order to adopt measures necessary to increase the degree of integration of the financial market in Romania.

Key-words: Romanian stock markets, integration, crisis, development, developed markets. *JEL Classification:* D53, G12, G23

1 Introduction

The global financial crisis and the European sovereign debt crisis have exacerbated financial, economic, and social disparities between the Member States of the European Union (EU). Of all the problems facing the EU in the post-crisis years, the most worrying and dissatisfying is the substantial development differences between emerging and developed countries. In addition, in the last decade, the financial system faced risks that have significantly diminished the degree of stability. In this context, financial integration has become increasingly important within the EU.

In this study, I intend to analyze Romania's financial integration with other EU member states over the last two decades. Assessing the degree of financial integration is important for several reasons. First, knowing the degree of integration allows us to correctly assess market risk, credit risk, counterparty risk, and systemic risk. Second, the integration of financial markets is relevant for investors and authorities. For example, financial integration is important from the perspective of portfolio diversification and risk management, with the degree of financial integration allowing investors to adjust their trading strategies and manage risks. Third, assessing the integration of financial systems is important from a financial stability perspective. Fourth, the assessment of the degree of integration of the financial market in Romania will allow us to identify the viability of adopting the single European currency. A single currency can only function when the financial systems are integrated. Fifth, the degree of financial integration of Romania will allow us to evaluate the sustainable development of the Romanian financial system. Finally, in addition to those mentioned above, my analysis will show both the current degree of integration of Romania and how the global financial crisis and the European sovereign debt crisis have influenced the degree of integration.

The importance of financial integration is also highlighted by the fact that studies that have analyzed the synchronization and interconnection of financial systems have grown exponentially in the last decade. In the analysis of the existing literature, I'll focus on studies investigating the integration of stock exchanges, and, in particular, those from the Central and Eastern Europe (CEE).

Gilmore and McManus (2002) examined the short- and long-term relationships between the US stock market and three emerging CEE markets (Hungary, Poland, and Czechia) in the period of 1995-2001. They found that there were short-term correlations between the CEE and US markets, while the application of the Johansen cointegration procedure indicated that there is no long-term relationship between these markets. In addition, Scheicher (2001) determined a limited interaction between some CEE markets and major markets in terms of daily stock market volatility. Using daily data from 2006 to 2011, Horváth and Petrovski (2013) analyzed the correlations of stock markets in both the CEE (Czechia, Hungary, and Poland) and South-Eastern Europe (Croatia, Macedonia, and Serbia) and their correlations with euro area countries. Their results indicate a high degree of integration between the CEE countries and the euro area (correlation values fluctuate around 0.6) and a low degree of integration between the South-Eastern Europe countries and the euro area (correlations fluctuate around 0). Among the CEE markets, Croatia is showing an increasing trend in stock market correlations. Finally, their results suggest that the financial crisis has not substantially altered the degree of stock market correlations.

Kasch-Haroutounian and Price (2001) investigated the interdependence between four stock markets in the CEE, using two different multivariate GARCH approaches - the constant conditional correlation (CCC) and the BEKK model from 1994 to 1998. Using the CCC model, the authors found a coefficient of a positive and statistically significant correlation between the Czech and Hungarian stock markets (0.22), and between the Hungarian and Polish stock markets (0.13). For the other pairs, the correlations were very small and statistically insignificant.

Scheicher (2001) examined the components between three emerging European markets (Czechia, Poland, and Hungary) in 1995-1997, using a vector autoregression model (VAR) - the CCC model. The results indicated externalities both regionally and globally in terms of yields, but only regional externalities in terms of volatilizers. This result suggests that global shocks are transmitted to CEE stock markets through yields rather than volatility shocks.

Syllignakis and Kouretas (2011) used a DCC model with weekly data from 1997 to 2009 to investigate the correlations of the stock market between CEE (Czech Republic, Estonia, Hungary, Poland, Romania, Slovakia and Slovenia) compared to the USA, Germany and Russia. The authors noted that the correlation of the stock market increases over time and argued that this increase reduces the benefits of diversification in CEE markets. The authors suggested that the change in correlation coefficients could be explained mainly by a greater degree of financial openness, followed by an increased presence of foreign investors in the region and, finally, entry into the EU.

Syriopoulos (2004) documented the existence of a long-term relationship between the USA, Germany and four CEE stock markets (Hungary, Poland, Czechia, and Slovakia), using the Johansen cointegration methodology from 1997 to 2003, arguing that in the CEE tend to have stronger ties with their mature counterparts than with their neighbors.

Voronkova (2004) showed the existence of long-term links between the United Kingdom, Germany, France and the stock markets in three CEE countries (Hungary, Poland and Czechia), using daily data for the period 1993–2002, provided that, structural changes to be properly accounted for. In a similar vein, Syriopoulos (2004, 2007) documented the existence of a long-term relationship between the USA, Germany and four CEE stock markets (Hungary, Poland, Czechia and Slovakia), using the Johansen cointegration methodology from 1997 to 2003, he argud that EEC markets tend to have stronger links with their mature counterparts than with their neighbors.

Other relevant studies in the literature with similar objectives are those of: Hamao et al., 1990; Theodossiou and Lee, 1993; Longin and Solnik, 1995; Meric and Meric, 1997; Goetzmann et al., 2001; Cappiello et al., 2006; Kim et al., 2005, Bekaert, 1995; Bekaert and Harvey, 1995; Chen et al., 2002; Yang, 2005; Chiang et al., 2007; Phylaktis and Ravazzolo, 2005.

As we can see, most studies in the literature have highlighted the financial integration of the EEC countries that joined the EU in 2004. In fact, to our knowledge, the Romanian stock exchange has not been studied as a unit in relation to the stock exchanges in the EU member states. Under these conditions, our approach, to study the integration of the Romanian stock exchange, is an innovative one and completes the literature.

2 Methodology and Data

To study the integration of the Romanian stock market with EU member states, I will use a DCC-MIDAS model, conceptualized by Colacito et al. (2011). The model will be applied to stock market returns. The main advantage of this model is that it allows the extraction of a short-term and long-term component for the series of correlations. In order to estimate the DCC-MIDAS model, in general, two steps must be completed. First, using a uni-varied GARCH-MIDAS model, volatility is estimated. Second, to obtain standardized residues, observations are deflated using average volatility. The GARCH-MIDAS model is estimated using the specifications proposed by Engle et al. (2013).

The integration of the Romanian stock exchange, in relation to that of the EU member states, will be investigated by separately estimating a series of bivariate DCC-MIDAS models. More precisely, each model will include Romania, on the one hand, and on the other hand, in turn, one EU member state. In this way, one can obtain a degree of synchronization of the Romanian capital market with the other EU member states.

The data, consisting of the daily closing prices of the most liquid stock indices in our sample countries are fully denominated in euro, for which daily logarithmic returns were calculated. The adjustment of the price series, in order to maintain an equal number of observations, was made by repeating the price from the previous day. The data set used includes daily observations for capital market indices, for the period January 3, 2001 - July 3, 2018, which involves a total of 4565 observations. The first three years correspond to the MIDAS period. Consequently, the dynamics of the integration stages in the European Union is analyzed between January 5, 2004 and July 3, 2018.

The selected sample comprises 22 EU countries, grouped into two sub-categories based on economic and regional criteria, as follows: old EU Member States (Germany, France, Belgium, the Netherlands, Austria, Finland, Greece, Spain, Italy, Portugal, Ireland, UK, Sweden, and Denmark), and new EU Member States (Czech Republic, Hungary, Poland, Estonia, Latvia, Lithuania, Bulgaria and Croatia). The degree of financial integration of Romania will be investigated in relation to each of these countries. Due to the lack of data availability during the analyzed period, I did not include in the estimates the stock exchanges of Cyprus and Slovenia. For these markets, data were available from 2004. Also, due to very low liquidity, I did not include in the analysis the stock exchanges in Slovakia and Malta. Finally, given the particular nature of the financial system in Luxembourg, I have chosen to give up this country.

3 Results

The estimated model allowed me to obtain a dynamic conditional correlation (DCC) for Romania, in relation with other 22 EU states. Table 1, Graphs 1, and 2 list the findings. Table 1 presents the average of the conditional dynamic correlations of the Romania's stock market, in relation with other EU Member States, by time intervals.

The results indicate a number of particularly interesting aspects. Throughout the analysis range, i.e. January 5, 2014 - July 3, 2018, the correlations vary between 0.12 and 0.35. Although the positive values of the correlations indicate a positive synchronization, they reflect a low level of integration, given that, in general, the values of the correlations of developed markets in the EU exceed 0.70 (Virk and Javed, 2017). The level of integration is low, if we compare it with other CEE countries. Analyzing the average correlations, we can see that, in general, the more developed the markets, the higher the correlations.

	Total	05 jan./04	09 aug. 07	09 aug/07	05 nov. 09	27 jul. 12					
	sample	08 aug.'07	26 jul.'12	2 apr.'09	26 jul.'12	3 jul.'18					
Germany (DE)	0.30	0.07	0.40	0.32	0.42	0.36					
Netherlands (NL)	0.31	0.07	0.41	0.35	0.44	0.37					
Austria (AT)	0.33	0.11	0.44	0.37	0.47	0.38					
France (FR)	0.30	0.07	0.40	0.33	0.43	0.35					
Belgium (BE)	0.31	0.08	0.42	0.33	0.46	0.36					
Finland (FI)	0.28	0.07	0.38	0.28	0.43	0.33					
Italy (IT)	0.28	0.06	0.40	0.33	0.41	0.31					
Spain (ES)	0.28	0.08	0.38	0.32	0.39	0.32					
Ireland (IE)	0.28	0.07	0.37	0.29	0.41	0.32					
Portugal (PT)	0.29	0.10	0.40	0.36	0.41	0.30					
Greece (EL)	0.24	0.07	0.41	0.40	0.39	0.21					
United Kingdom (UK)	0.28	0.11	0.37	0.33	0.38	0.31					
Sweden (SE)	0.25	0.04	0.37	0.29	0.40	0.27					
Denmark (DK)	0.29	0.08	0.43	0.37	0.46	0.30					
Estonia (EE)	0.24	0.11	0.31	0.26	0.35	0.27					
Lithuania (LT)	0.20	0.06	0.31	0.26	0.32	0.19					
Latvia (LV)	0.12	-0.02	0.17	0.13	0.19	0.15					
Poland (PL)	0.30	0.12	0.41	0.31	0.46	0.32					
Czechia (CZ)	0.35	0.12	0.47	0.39	0.49	0.39					
Hungary (HU)	0.30	0.11	0.41	0.32	0.46	0.31					
Bulgaria (BG)	0.16	0.09	0.24	0.19	0.26	0.14					
Croatia (HR)	0.26	0.13	0.41	0.35	0.42	0.21					
Mean	0.27	0.08	0.38	0.31	0.40	0.29					
No.obs.	3782	938	1296	431	711	1548					

Table	1: /	Averages	of the	DCC	between	Romania	and	other	EU	Member	States
		I CI CI CI CO		200	Nee II Cell	Tround the		U UIUI		1110111001	Nº44000

Source: Author's analysis

In order to have a more accurate picture of how integration has evolved, I have chosen to highlight the average correlations over several time intervals: the period before the global financial crisis (05 Jan.'04: 08 Aug.'07); the period of the global financial crisis and the European sovereign debt crisis in the euro area (09 Aug.'07: 26 Jul.'12); the period of the global financial crisis (09 Aug'07: 02 Apr.'09); the period of the European sovereign debt crisis in the euro area (05 Nov.'09: 26 Jul.'12); and, finally, the period following the European sovereign debt crisis (27 Jul.'12: 03 Jul.'18). Time intervals reflect disparities in correlation values. In the run-up to the financial crisis, the average correlation indicates extremely low integration.I can also explain this result by the fact that Romania joined the EU only in 2007. During the global financial crisis and the European sovereign debt crisis, I see a significant increase in correlations, more pronounced during the latter. After the European sovereign debt crisis, the correlations decreased significantly, approaching the equilibrium values, reflected by the macroeconomic fundamentals.

Graphs 1 and 2 reflect the dynamics of the DCC, in the short term - daily and in the long term - quarterly, of the Romanian stock market, with each Member State included in the analysis. I have chosen to present the results for the old EU Member States and new EU Member States separately. Graph 1 depicts the DCC of the Romanian stock market wih old EU Member States stock markets. The first figures reveal the DCC with the core euro area Member States, i.e. Germany, Netherlands, Austria, France, Belgium and Finland. The findings show that the integration of the Romanian capital market is low in the first period. Until 2007, I noticed low correlations between 0 and 0.1 which reveal the lack of integration. In some situations, daily correlations are negative, revealing financial divergence. During the global financial crisis and European sovereign debt crisis, the correlations increased to about 0.50. These were times when investors traded similarly in all markets, for reasons related to fear, panic, herd behavior, not meaning an increase in the integration of Romania's stock market. After the sovereign debt crisis, I observed a slow decrease of the correlations (0.30) and a return to equilibrium values, determining the fundamentals of the markets. In my opinion, they are determined by the increase of Romania's integration in the EU.





Notes: the blue line reflects short-term, daily correlations; the red line reflects long-term, quarterly correlations; the gray hatched period corresponds to the period of the international financial crisis (August 2007 - April 2009); the period shaded in yellow corresponds to the sovereign debt crisis in the euro area (November 2009 - July 2012) Source: Author's own analysis

Compared to core euro area countries, the short-term correlations of the Romanian market with Italy, Spain and Ireland are more volatile. I noticed many episodes that follow an evolution in the shape of the letter "V", with ample movements. In my opinion, these developments were determined by the internal crises that the three

countries had gone through. The same is true for Portugal and Greece. Analyzing the charts, one may observe a high volatility, both of short-term correlations and of long-term correlations. In fact, at the beginning of the analysis period, one may observe negative daily correlations, signaling divergence between the Romanian market and Portugal and Greece. During the two crises, one may observe a significant increase in correlations. However, unlike the previous graphs, I noted that during the sovereign debt crisis, correlations decreased in the second half of the crisis. This decrease is much more visible in the case of Greece. The findings for the United Kingdom, Sweden and Denmark follow a pattern similar to those highlighted for euro area developed countries.

Unlike the results obtained for old EU Member States, Romania's DCC with new EU Members States are lower. The DCCs paths for Poland, Czechia and Hungary are similar. The pattern follows periods of stagnation, sharp growth and decline. There are differences in the extent of integration. Thus, one may observe, at the end of the analysis period, when the values of the DCC are formed around equilibrium values, the fact that the Romanian market is more integrated with the Czech market and less with the Polish and Hungarian markets. Romania's DCC with the Baltic countries indicate a lower integration. In my opinion, the result is determined by the lower development of these markets. The dynamics of correlations indicate high volatility, especially for short-term correlations for Bulgaria and Croatia, but also for long-term correlations for Croatia. Also, both at the beginning of the analysis interval and at the end of the analysis interval, the results indicated negative correlations. The divergence between Romania, on the one hand, and Bulgaria and Croatia, on the other hand, gives investors the opportunity to optimize their portfolios through diversification. This supports the observation that the less developed the markets, the lower the integration.





Notes: the blue line reflects short-term, daily correlations; the red line reflects long-term, quarterly correlations; the gray hatched period corresponds to the period of the international financial crisis (August 2007 - April 2009); the period shaded in yellow corresponds to the sovereign debt crisis in the euro area (November 2009 - July 2012) Source: Author's own analysis

Analyzing the results, I have noticed that the dynamics of Romanian stock market integration varies, both in the analyzed periods and in relation with other markets. Also, the degree of Romanian stock market integration with other EU markets is quite low. In the case of most markets, the trend of Romania's integration follows a similar pattern. More exactly, the integration starts from low values in 2004-2007, reaches higher values during the global financial crisis and the sovereign debt crisis and, after 2012 it descends and stabilizes around equilibrium values. These equilibrium values reflect real integration, based on fundamental factors. In general, analyzing the graphs, one may observe a higher integration of Romania with the developed markets in the EU.

4 Conclusions

The findings reveal a series of interesting conclusions. First of all, the degree of financial integration of Romania, in relation to the EU member states, is low. Thus, the DCC show patterns of evolution that confirm the hypothesis of different stages of integration of stock markets in the EU, depending on the degree of economic and financial development. Secondly, the graphical analysis of the degrees of synchronization indicates a significant variation of the DCC. Thirdly, the values from 2012-2018 are higher than those from 2004-2007, which may indicate a slight increase in Romania's financial integration. This evolution is normal, if we consider Romania's accession to the EU and the economic effects of this process. However, the level of integration is still low. Fourthly, the economic and financial development gaps between Romania and the EU member states create the premises for some disparities. The lack of risk-sharing mechanisms, such as the tax (fiscal) union, amplifies these disparities. Fifth, despite the efforts of the European authorities, i.e. the project of the capital markets union launched in the last years, we cannot say that we have witnessed a development in line with the expectations of the EU stock markets and, in particular, of the CEE markets. Moreover, in some countries, especially in the CEE, disparities with old EU Member States have widened. Under these circumstances, in my opinion, the stock markets union project will not achieve its objectives, in the absence of specific measures, such as the creation of a pan-European pension fund, the standardization of regulations and market access conditions or the creation of a strong financial center. General support measures are also needed like the banking union, the fiscal union and the political union. As many anchors as possible are needed to reduce financial and economic disparities between Member States. The union of stock markets can be such an anchor, but only if other anchors exist.

The results obtained in this study are useful for investors, but also for authorities. From an investor perspective, the results are particularly useful in portfolio risk management and in diversifying investment portfolios. Authorities can improve the supervision of financial systems and reduce systemic risk during crises.

References

- [1] [1] Bekaert, G., 1995, *Market integration and investment barriers in emerging equity Markets*. World Bank Economic Review, 9, 75–107.
- [2] [2] Bekaert, G., & Harvey, C. R., 1995, *Time-varying world market integration*. Journal of Finance, 50, 403–444.
- [3] [3] Cappiello, L., Engle, R., & Sheppard, K., 2006, *Asymmetric dynamics in the correlations of global equity and bond returns*. Journal of Financial Econometrics, 4, 2006, 537–572.
- [4] [4] Chen, G. M., Firth, M., & Rui, O. M., 2002 *Stock market linkages: Evidence from Latin America*. Journal of Banking and Finance, 26, 1113–1141.
- [5] [5] Chiang, T. C., Jeon, B. N., & Li, H.,2007, Dynamic correlation analysis of financial contagion: Evidence from Asian markets. Journal of International Money and Finance, 26, 1206–1228.
- [6] [6] Colacito, R., Engle, R. F. & Ghysels, E., 2011, *A component model for dynamic correlations*. Journal of Econometrics, 164(1), 2011, 45-59.
- [7] [7] Engle, R. F., Ghysels, E. & Sohn, B., 2013, *Stock market volatility and macroeconomic fundamentals*. Review of Economics and Statistics, 95(3), 2013, 776-797.
- [8] [8] Gilmore, C. G., & McManus, G. M., 2002, *International portfolio diversification: US and Central European equity markets*. Emerging Markets Review, 3, 69–83.
- [9] [9] Goetzmann, W. N., Li, L., & Rouwenhorst, K. G., 2005, *Long-term global market correlations*. Journal of Business, vol.78, 1–38.
- [10] [9] Hamao, Y., Masulis, R., & Ng, V., 1990, *Correlations in price changes and volatility across international stock markets*. Review of Financial Studies, 3, 281–308.
- [11] [10] Horváth, R., Petrovski, D., 2013, *International stock market integration: Central and South Eastern Europe compared*. Economic Systems, 37 (1), 81–91.

- [12] [11] Kasch-Haroutounian, M., Price, S., 2001, Volatility in the transition markets of *Central Europe*. Applied Financial Economics 11 (1), 93–105.
- [13] [12] Kim, S. J., Moshirian, F., & Wu, E., 2005, *Dynamic stock market integration driven* by the European Monetary Union: An empirical analysis. Journal of Banking and Finance, 29, 2475–2502.
- [14] [13] Longin, F., & Solnik, B., 1995, *Is the correlation in international equity returns constant: 1960–1990* Journal of International Money and Finance, 14, 3–26.
- [15] [14] Meric, I., & Meric, G., 1997, *Co-movements of European equity markets before and after the 1987 crash.* Multinational Finance Journal, 2, 137–152.
- [16] [15] Phylaktis, K., & Ravazzolo, F., 2005, Stock market linkages in emerging markets: implications for international portfolio diversification. Journal of International Financial Markets, Institutions and Money, 15, 91–106.
- [17] [16] Scheicher, M., 2001, *The comovements of stock markets in Hungary, Poland and the Czech Republic.* International Journal of Finance & Economics, 6(1), 27–39.
- [18] [17] Syllignakis, M.N., Kouretas, G.P., 2011, Dynamic correlation analysis of financial contagion: evidence from the Central and Eastern European markets. International Review of Economics and Finance, 20 (4), 717–732.
- [19] [18] Syriopoulos, T., 2004, *International portfolio diversification to Central European stock markets*. Applied Financial Economics, 14, 1253–1268.
- [20] [19] Theodossiou, P., & Lee, U., 1993, *Mean and volatility spillovers across major national stock markets: Further empirical evidence*. Journal of Financial Research, 16, 337–350.
- [21] [20] Voronkova, S., 2004, Equity market integration in Central European emerging markets: A cointegration analysis with shifting regimes. International Review of Financial Analysis, 13, 633–647.
- [22] [21]Yang, Sheng-Yung, 2005, A *DCC* analysis of international stock market correlations: The role of Japan on the Asian Four Tigers. Applied Financial Economics Letters, 12, 89–93.