Emerging European Stock Markets Integration by Means of Volatility

Iulia Lupu
Romanian Academy
Center for Financial and Monetary Research – Victor Slăvescu
13, Calea 13 Septembrie
Bucharest, 050711
Romania
e-mail: iulia.lupu@gmail.com

Abstract
The analysis of the comovements of stock market returns was approached with many modeling techniques ranging from the simple and GARCH style dynamic conditional correlation to multivariate GARCH and studies of the bivariate distribution. The importance of the standardized concept of international integration and the effect on the phenomenon of contagion motivated the use of all these techniques. This paper intends to analyze the dynamics of the volatilities of the returns of the stock market indices from a series of developed and emerging European countries (Germany, France, UK, Spain, Switzerland, Italy, Portugal, Ireland, Austria, Poland, Czech Republic, Hungary, Romania and Slovenia), using different forms of computation for different frequencies (intra-day 5-minute returns, 60 minutes and daily returns). The dependence structure of the computed volatilities is first analyzed using a Vector Autoregression for all the stock markets involved, for all types of frequencies described. A Markov switching analysis on these correlations intends to provide information on the moment when changes occur in the comovements of the volatilities, throwing light on the regime shifting in the dynamics of the volatilities.

Keywords: European capital markets, dynamic conditional correlations, GARCH models, Markov switching models
JEL codes: G15, F36

1. Introduction

Over the years, many papers have contributed to the very important debate on the interaction across international stock markets, looking at volatility spillovers, correlation breakdowns, trends in correlation patterns. The integration of the financial markets wore down much of the gains from international diversification which rely on low correlations across international stock markets. The intensity of the comovements and spillovers effects driven by the financial integration may increase the risk of global financial instability.

Comovements had been divided in two categories (Forbes and Rigobon, 2001, 2002): interdependence, defined as linkages that exist in all states of the world and when the comovement do not increase significantly and contagion, which is centered on episodes of financial crises and is represented by significant increase in cross-market linkages after the shock. Contagion first appeared in financial language in financial turbulent decade of the 1990s when many policy makers and writers in the financial press accepted that financial contagion exists.

If we compere the periods of financial instability with waveless periods, we will observe that the assets price movements and comovements across markets noticeable increased. This is why appeared the idea that these two different kinds of periods can be interpreted as different regimes for the international transmission of the shocks.

In the turbulent periods, some comovements of the assets prices are a result of the market interdependences. When the observed pattern of the asset prices comovements is too strong, we can have contagion.

The degree of capital market integration depends on the periods of analysis because there are distinct economic environments and policies, whereas the unexplained changes are also important.

This paper intends to analyze the dynamics of the volatilities of the returns of the stock market indices from a series of developed and emerging European countries (Germany, France, UK, Spain, Switzerland, Italy, Portugal, Ireland, Austria, Poland, Czech Republic, Hungary, Romania and Slovenia), using different forms of computation for different frequencies (intra-day 5-minute returns, 60 minutes and daily returns). The dependence structure of the computed volatilities is first analyzed using a Vector Autoregression for all the stock markets involved, for all types of frequencies described. A Markov switching analysis on these correlations intends to provide information on the moment when changes occur in the comovements of the volatilities, throwing light on the regime shifting in the dynamics of the volatilities.

The remainder of the paper is organized as follows. The following section reviews the related literature. Section III discusses the methodology used and contains a description of our data. The fourth section presents our empirical results, and is followed by our conclusions in Section V.

2. Literature review

If the issue of international financial integration has important implications for economic theory and policy debates, there is not a general consensus regarding the degree of financial integration during different periods of time. In this sense, there is considerable literature attempting to understand the phenomenon of financial markets integration in different periods of time. There is a group of studies that sustain the idea that the financial markets were more integrated during the pre-World War I age. This is the position of Quinn (2003), Bordo and Flandreau (2003), and Bordo and Murshid (2006). In their studies, Mauro et al. (2002), and Quinn and Voth (2008) suggest that the markets are more integrated post-Bretton Woods. Obstfeld and Taylor (2003; 2004) discovered that financial integration follows a U-shape and hence there is an equal amount of integration before 1914 and after 1970. Goetzmann et al. (2005) agree with the U-shape of the stock markets correlations in time and suggest that the reason of not having a larger comovement of today's stock markets with average correlations is the fact that the number of world markets available for the international investor is larger.

As suggested by Goetzmann et al. (2005), in the case of long time series, cross country correlation structure of the world equity markets varied considerably over the past 150 years and was generally higher in periods of deeper economic integration. They also find that while capital market integration does embed a prediction about the correlations between markets, the periods of free capital flows are associated with high correlations. Their findings show that the Great Crash was associated with a structural change not only in the volatility of world markets, but in the international correlations as well, the average correlations reaching a peak in the 1930's and haven't been unequaled until the modern era.

Market integration (Marashdeh and Shrestha, 2010) refers to a situation where there are no impediments such as legal restrictions, transaction costs, taxes and tariffs against the trade in foreign assets or the mobility of portfolio equity flows. Also there is evidence that the presence of strong economic ties and policy coordination among respective countries can indirectly link their stock prices over time. In the same time, the development of stock markets enhances the degree of integration among them (Masih and Masih, 2002 and Choudhry et al., 2007).

Economists have been studying why there is propagation of volatility from one market to another, since a long time. Grubel (1968) is a most sited paper representing the start of researches in the field of stock market returns comovement. Since that, the analysis of the benefit of international portfolio diversification and of the stock market synchronization received a special attention in international finance.

Bekaert and Harvey (1995), Forbes and Rigobon (1999) are only some important paper that investigate the cross-country linkages between stock markets. As a matter of fact, a growing body of literature has emerged more recently on the issue of international stock prices comovement (King et al., (1994), Lin et al. (1994), Longin and Solnik (1995, 2001), Karolyi and Stulz (1996), Forbes and Rigobon (2002), Brooks and Del Negro (2005, 2006)). In particular, most of those studies have found that the comovement of stock returns is not constant over time. Evidence of increasing international comovement of stock returns since the mid-90s among the major developed countries, was found by Brooks and Del Negro (2004) and Kizys and Pierdzioch (2009).

The comovement of stock returns was evaluated usually through the correlation coefficient while the evolving properties have been investigated either through a rolling window correlation coefficient as in the study of Brooks and Del Negro (2004) or by considering non-overlapping sample periods like in the paper of King and Wadhwani (1990) and Lin et al. (1994). Morana and Beltratti (2008) found strong linkages across European, the US and the Pacific Basin stock markets, involving comovements in prices, returns and volatility over the period 1973–2004. Their results show that the heterogeneity between Europe and the US has steadily reduced, these markets being currently strongly integrated.

Applying a new technique, the wavelet analysis, that allow for time and frequency simultaneous characterization, Rua and Nunes (2009) focused on Germany, Japan, UK and US stock markets over the last four decades. A noteworthy finding of their paper is that the strength of the comovement of international stock returns depends on the frequency. The authors argue that the comovement between markets is stronger at the lower frequencies suggesting that the benefits from international diversification may be relatively less important in the long-term than in the short-term and that the strength of the comovement in the time-frequency space varies across countries as well as across sectors. Taking into account that the United States was the crises epicenter, Didier and all (2010) analyzed the factors driving the comovement between US and 83 countries stock returns, differentiating the periods before and after the collapse of Lehman Brother. The authors have argued that there is evidence of a "wake-up call" or "demonstration effect" in the first stage of the crisis where investors became aware that certain vulnerabilities present in the US context could put other economies at risk, because countries with vulnerable banking and corporate sectors exhibited higher comovement with the US market, the main transmission channel being the financial one.

Most studies into comovements in stock markets have focused on developed economies. Lately there has been a growing body of empirical research on emerging capital markets, partly in response to the diversifying activities of multinational enterprises in these markets, and as a result of the growing interest shown by private and large institutional investors seeking to diversify their portfolios in international capital markets. International differences in the institutional framework of emerging market economies may play an important role on the magnitude of shocks transmitted across countries.

The Central and Eastern European countries stock markets perform in a quite different manner as compared to developed markets. First studies that specified these differences are Barry, Peavy III and Rodriguez (1998), Harvey (1995), Divecha, Drach and Stefek (1992), as well as Bekaert et al. (1998). The literature evidenced a number of empirical regularities: high volatility, low correlations with developed markets and within emerging markets, high long-horizon returns, and more variability in the predictability power as compared to the returns of the stocks traded in the developed markets. It is also well evidenced that emerging markets are more likely to experience shocks induced by regulatory changes, exchange rate devaluations, and political crises.

Pajuste (2002) observes that Central and Eastern European capital markets are quite different in terms of their correlations with European Union capital markets. While the Czech Republic, Hungary and Poland display higher correlations among them and with the European Union market, Romania and Slovenia show inexistent or even negative correlation with the European Union capital market. Analysis in this area are also realized by Horobet and Lupu (2009) and Lupu and Lupu (2009) showing the properties of these correlations with different techniques – cointegration and Granger causality tests on one hand and dynamic conditional correlations performed at the burst of the actual crisis on the other hand.

Harrison B., R. Lupu and I. Lupu (2010) identified in their paper the statistical properties of the Central and Eastern European stock market dynamics. The paper focuses on the stock market indices of ten emerging countries from the Central and Eastern European region – Slovenia, Slovak Republic, Estonia, Latvia, Lithuania, Bulgaria, Czech Republic, Romania, Hungary and Poland –over the 1994-2006 period and present evidence of stationarity for the returns of these indices and identified some common characteristics of these markets taken as a whole.

Kurach (2010) proposed a set of potential determinants of stock market in thirteen Central and Eastern European countries and then empirically verified their importance, employing panel data methodology. The findings has confirmed the positive role of GDP growth, banking sector development, market liquidity, fiscal balance and European Union membership and showed that large budget deficits have affected significantly and adversely the Central and Eastern European countries' stock markets growth.

3. Data and methodology

3.1 Data description

In this paper we used five-minute stock market index returns, 60 minutes and also daily returns, starting from the 3rd of August 2010 and ending the 10th of February 2011. We took into account stock market index from some developed European markets as well as from Central and Eastern European markets: DAX (Germany), CAC (France), UKX (UK), IBEX (Spain), SMI (Switzerland), FTSEMIB (Italy), PSI20 (Portugal) ISEQ (Ireland), ATX (Austria), WIG (Poland), PX (Czech Republic), BUX (Hungary), BET (Romania) and SBITOP (Slovenia). For the five-minute stock market index returns we identified the moments of the day when all the indexes were traded.

3.2 Methodology

3.2.1 General considerations

We computed the volatilities of the log returns for each series using the GARCH (1,1) model for the 5 minutes returns, 1 hour returns and daily returns. Than, we built a vector autoregression sistem with 2 lags consisting in all indexes for each frequancy (3 VAR system resulted) and tried to capture the volatility spilover effect at the international level and analize the differences at these variaous frequances.

We also used another way to capture the conections existing between stock markets by computing the correlations of the volatilties of these markets and than see the changes among different frequances.

In this respect, we computed the rolling correlation for the volatilities of each index with the volatilities of all the other indeces using a window of 100 returns. To avoid the overlaping effects we also computed the inovations of these correlations. Therefore, we have a matrix with innovations of correlations of each moment in time.

We used the Markov switching algoritm with two states to analyze the possible changes in the dynamics of these inovations. The algoritm produces probabilities to keep a certain state, once the inovations are situated in that state. At each computation we save the values of the probabilities that reaching a certain state, the inovations tend to keep that state.

The last point in our analisys is to compare these probabilities accros countries, for each frequancy.

3.2.2 Markov state switching models

Financial crises may determine dramatic breaks in the behavior of many economic time series (Jeanne and Masson, 2000; Hamilton, 2005) or abrupt changes in government policy (Hamilton, 1988; Davig, 2004). Abrupt changes are also a regnant feature of financial data.

Markov state switching models are a type of specification which allows for the transition of states as an intrinsic property of the econometric model. Such types of statistical representations are well known and utilized in different problems in the field of economics and finance.

Consider the following process given by:

$$y_t = \mu_{St} + \epsilon_t \qquad (1)$$

where $St = 1..k$ and ϵ_t follows a Normal distribution with zero mean and variance given by σ^2_{St}. This is the simplest case of a model with a switching dynamic. In the equation (1) the intercept is switching states given an indicator variable S_t. This means that if there are k states, there will be k values for μ and σ^2. If there is only one state of the world ($S_t = 1$), formula 1 takes the shape of $y_t = \mu_1 + \epsilon_t$ and can be treated as a simple linear regression model under general conditions.

If the model in the equation (1) has two states (k=2), an alternative representation is:

$$y_t = \mu_1 + \epsilon_t \quad \text{for State 1} \qquad (2)$$

$$y_t = \mu_2 + \epsilon_t \quad \text{for State 2} \qquad (3)$$

where:

$\epsilon_t \sim (0, \sigma_1^2)$ for State 1 (4)

$\epsilon_t \sim (0, \sigma_2^2)$ for State 2 (5).

This representation implies two different processes for the dependent variable y_t. when the state of the world for time t is 1 (2), then the expectation of the dependent variable is μ_1 (μ_2) and the volatility of the innovations is σ_1^2 (σ_2^2).

The different volatilities (σ_1^2 and σ_2^2) in each state represent the higher uncertainty regarding the predictive power of the model in each state of the world. In general, the S_t variable simply index the states, where the interpretation is given by looking at parameter's values.

For a Markov regime switching model, the transition of states is stochastic (and not deterministic). This means that one is never sure whether there will be a switch of state or not. But, the dynamics behind the switching process is known and driven by a transition matrix. This matrix will control the probabilities of making a switch from one state to the other and it can be represented as:

$$P = \begin{pmatrix} p_{11} & \cdots & p_{1k} \\ \vdots & \ddots & \vdots \\ p_{k1} & \cdots & p_{kk} \end{pmatrix} \quad (6).$$

In the matrix (6), the element p_{ij} controls the probability of a switch from state *j* to state *i*. for example, consider that for some time *t* the state of the world is 2. This means that the probability of a switch from state 2 to state 1 between time *t* and *t+1* will be given by p_{12}. Similar, a probability of staying in state 2 is determined by p_{22}. One of the central points of the structure of a Markov regime switching model is that the switching of the states of the world is a stochastic process itself.

A univariate Markov switching model can be represented in a generalized notation. We consider the following formula:

$$y_t = \sum_{i=1}^{N_{nS}} \beta_i x_{i,t}^{nS} + \sum_{j=1}^{N_S} \Phi_{j,S_t} x_{j,t}^{S} + \varepsilon_t \quad (7)$$

$$\varepsilon_t \sim P(\Phi_{S_t}) \quad (8).$$

This representation can nest a high variety of univariate Markov switching specifications. The terms N_S and N_{nS} simply counts the number of switching (and non-switching) coefficients, respectively.

The variable $x_{i,t}^{nS}$ is a subset of $x_{i,t}$ and contains all explanatory variables which don't have a switching effect. Similar, the variable $x_{j,t}^{S}$ contains all the variables that have the switching effect. The term P(Φ) is the assumed probability density function of the innovations, with its own set of parameters (vector Φ).

4. Results

The results of the VAR analysis are presented in Table 1. The volatilities of one country stock market indices depend almost in all cases on the volatilities with one lag for the same country, for all three kinds of frequencies. The value of the coefficients are usually decreasing, the bigger value being registered for 5 minutes frequencies and then for one hour and for one day.

As expected, the results describing the relation with other countries are different for each category of time frequency. The volatilities are more dependent for the one hour interval and usually for two lags cases.

Table 1: VAR results

	5 MINUTES		1 HOUR		1 DAY	
AUSTRIA	AUSTRIA(-1)	**0,97**	AUSTRIA(-1)	**0,95**	AUSTRIA(-1)	**0,83**
	PORTUGAL(-2)	-0,02	CZECH REP.(-1)	-0,04	FRANCE(-2)	-4,46

	SWITZERLAND(-1)	0,11	HUNGARY(-1)	-0,01		
			SLOVENIA(-2)	-0,02		
			C	0,00		
CZECH REPUBLIC	CZECH REP.(-1)	**1,00**	CZECH REP.(-1)	**0,64**	AUSTRIA(-1)	-0,08
			HUNGARY(-2)	-0,03	AUSTRIA(-2)	0,09
			POLAND(-2)	-0,38	CZECH REP.(-1)	**0,67**
			C	0,00		
FRANCE	FRANCE(-1)	**0,91**	AUSTRIA(-2)	1,11		
	POLAND(-1)	0,11	CZECH REP.(-1)	0,16		
	POLAND(-2)	-0,11	CZECH REP.(-2)	-0,16		
			FRANCE(-1)	**0,73**		
			C	0,00		
GERMANY	GERMANY(-1)	**1,04**	AUSTRIA(-2)	0,47	GERMANY(-1)	**0,76**
	POLAND(-1)	0,19	GERMANY(-1)	**0,69**		
	POLAND(-2)	-0,18	HUNGARY(-1)	0,01		
	PORTUGAL(-1)	0,06	HUNGARY(-2)	0,01		
			C	0,00		
HUNGARY	HUNGARY(-1)	**1,07**	HUNGARY(-1)	**0,46**	HUNGARY(-1)	**0,57**
	HUNGARY(-2)	-0,08	POLAND(-2)	2,12		
	UK(-1)	-0,06	PORTUGAL(-2)	0,69		
			C	-0,01		
IRELAND	IRELAND(-1)	**1,01**	C	0,00	IRELAND(-1)	**0,63**
	C	0,00				
ITALY	ITALY(-1)	**1,02**	CZECH REP.(-1)	0,10	ITALY(-1)	**0,91**
	POLAND(-1)	0,14	ITALY(-1)	**0,91**		
	POLAND(-2)	-0,12	POLAND(-2)	0,31		
			SLOVENIA(-2)	0,06		
			C	0,00		
POLAND	GERMANY(-1)	0,04	POLAND(-1)	**0,57**	POLAND(-1)	**0,74**
	POLAND(-1)	**1,00**				
	C	0,00				
PORTUGAL	AUSTRIA(-2)	0,12	C	0,00	HUNGARY(-1)	0,12
					PORTUGAL(-1)	**0,65**
					C	-0,03

ROMANIA	ITALY(-1)	0,30	POLAND(-2)	-0,10	CZECH REP.(-2)	-1,15
	ITALY(-2)	-0,31	PORTUGAL(-2)	-0,03	ROMANIA(-1)	**0,60**
	ROMANIA(-1)	**0,60**	SLOVENIA(-1)	0,02		
	C	0,00				
SLOVENIA	IRELAND(-1)	-0,32	CZECH REP.(-2)	0,31	CZECH REP.(-1)	-0,31
			SLOVENIA(-1)	**0,81**	FRANCE(-1)	-1,20
					FRANCE(-2)	1,07
					SLOVENIA(-1)	**0,83**
					UK(-1)	0,51
SPAIN	AUSTRIA(-2)	0,08	HUNGARY(-1)	0,02	SPAIN(-1)	**0,64**
	POLAND(-1)	0,20	HUNGARY(-2)	0,02		
	POLAND(-2)	-0,17				
	SPAIN(-1)	**0,95**				
SWITZERLAND	HUNGARY(-1)	0,04	AUSTRIA(-2)	0,29	SWITZERLAND(-1)	**0,59**
	POLAND(-1)	0,09	HUNGARY(-1)	0,01		
	POLAND(-2)	-0,08	SLOVENIA(-1)	-0,04		
	SWITZERLAND(-1)	**1,00**	SLOVENIA(-2)	0,05		
			C	0,00		
UK	POLAND(-1)	0,10	HUNGARY(-1)	0,03	SLOVENIA(-1)	-0,13
	POLAND(-2)	-0,08	SLOVENIA(-2)	0,07	UK(-1)	**0,56**
	UK(-1)	**0,99**	UK(-1)	**0,86**		
			C	0,00		

Source: author's calculations

In the Table 2 are presented the results for Markov state switching model. We computed the MS with two states for which we saved the values of the probabilities for the series of the correlations to stay in one of the two states determined by the algorithm. For each national stock market we built a matrix with all the correlations that the respective country has with all the other countries in our sample. For each of these series (country i with all the other countries) we used the MS algorithm provided by Marcelo Perlin in Matlab.

The values of the probabilities for the series to stay in a certain state are recording the level of rigidity of the respective dynamics. Therefore, we computed these probabilities in a matrix in which each column represents the values of these probabilities for the innovations in correlations between the respective country and each of the other countries.

The values of these probabilities were computed for each frequency, which resulted in 42 matrices (14 matrices for each frequency).

Table 2: Markov state switching results

	Mean difference of p11 from 5 min to 60 min	Mean difference of p22 from 5 min to 60 min	Mean difference of p11 from 60 min to daily	Mean difference of p22 from 60 min to daily
Germany	-0,05206716	0,134160292	0,101623209	-0,042826982
France	0,009847283	0,271826247	0,185476253	-0,054717676
UK	0,241188753	0,159523475	-0,095479757	-0,083115177
Spain	0,218987433	-0,088191863	0,047905471	0,330056862
Switzerland	0,305654107	0,063706084	0,03794172	0,058161936
Italy	0,027383532	0,244727114	-0,080332877	-0,236400222
Portugal	-0,073487744	-0,139089096	0,3342572	0,024844041
Ireland	0,432819307	0,070545661	0,104095262	-0,140265789
Austria	0,099593293	0,242047456	-0,03374815	0,002018209
Poland	0,437921199	0,128762983	0,085700403	-0,15957604
Czech Republic	0,481805191	-0,154033162	-0,073125938	0,231507892
Hungary	0,396820014	-0,021171186	-0,077218237	-0,061482841
Romania	0,026297603	0,352426101	0,364482931	-0,303433023
Slovenia	0,128490658	0,284764032	0,097262552	0,060063492

Source: author's calculations

To summarize the results, we computed the averages of each of these probabilities for pair of countries, and we computed the changes in the values of these probabilities when moving from one frequency to another. Therefore, in Table 2 we can see the differences in the values of these probabilities computed as p11 at 60 minutes frequency minus the value of p11 at the 5 minute frequency and then the differences between values of p11 for the daily frequency and the values of p11 at the 60 minute frequency. We made the same computations for the p22 probabilities. The table shows that there are more increases in the values of the probabilities (both p11 and p22) when going from the 5 minute frequency to the 60 minute one, and more decreases when going to the daily frequency. We can conjecture that the values of these correlations tend to stay in the same state more at the 60 minute frequency than on the other two situations, which means that they tend to be more rigid, a sign of persistence, at this frequency.

The changes that we see at the daily level may also be influenced by the fact that at the 60 minute frequency we cross the daily border without taking into account the values at the change of the day, which may be important and are considered in the daily returns.

5. Conclusions

In this paper we analyzed the dynamics of the volatilities of the returns of the stock market indices from a series of developed and emerging European countries, using different forms of computation for different frequencies (intra-day 5-minute returns, 60 minutes and daily returns). The dependence structure of the computed volatilities is first analyzed using a Vector Autoregression for all the stock markets involved, for all types of frequencies described. A Markov switching analysis on these correlations provides information on the moment when changes occur in the comovements of the volatilities, throwing light on the regime shifting in the dynamics of the volatilities.

The volatilities of one country stock market indices depend almost in all cases on the volatilities with one lag for the same country, for all three kinds of frequencies. As expected, the results describing the relation with other countries are different for each category of time frequency. The volatilities are more dependent for the one hour interval and usually for two lags cases.

The Markov switching analysis shows that there are more increases in the values of the probabilities (both p11 and p22) when going from the 5 minute frequency to the 60 minute one, and more decreases when going to the daily frequency. We can conjecture that the values of these correlations tend to stay in the same state more at the 60 minute frequency than on the other two situations, which means that they tend to be more rigid, a sign of persistence, at this frequency.

As plans for further research we intend to extend the period of study, add a sectors particularization and identify main channels of transmission for different frequencies and sectors.

Acknowledgment

This work was supported by the project "Post-Doctoral Studies in Economics: training program for elite researchers - SPODE" co-funded from the European Social Fund through the Development of Human Resources Operational Program 2007-2013, contract no. POSDRU/89/1.5/S/61755.)

References

BARRY, C. B. - PEAVY III, J. W. – RODRIGUEZ, M. (1998). Performance Characteristics of Emerging Capital Markets. *Financial Analysts Journal*, vol. 54, no.1, pp. 72-80.

BEKAERT, G. - ERB, C. B. – HARVEY, C. R. – VISKANTA, T.E. (1998). Distributional Characteristics of Emerging Market Returns and Allocation. *Journal of Portfolio Management*, vol. 24, no. 2, pp. 102-116.

BORDO, M.D. - FLANDREAU, M. (2003). Core, Periphery, Exchange Rate Regimes, and Globalization (National Bureau of Economic Research Conference Report), in: BORDO, M.D. - TAYLOR, A.M. - WILLIAMSON, J.G. (Eds.) *Globalization in Historical Perspective*. University of Chicago Press, Chicago, pp. 417-472.

BORDO, M.D. - MURSHID, A.P. (2006). Globalization and Changing Patterns in the International Transmission in Financial Markets. *Journal of International Money and Finance*, 25, pp. 655-674.

BROOKS, R. - DEL NEGRO, M. (2004). The rise in comovement across national stock markets: market integration or IT bubble?. *Journal of Empirical Finance*, no. 11, pp. 659–680.

BROOKS, R. - DEL NEGRO, M. (2005). Country versus region effects in international stock returns. *Journal of Portfolio Management*, pp. 67–72.

BROOKS, R. - DEL NEGRO, M. (2006). Firm-level evidence on international stock market comovement. *Review of Finance*, no. 10, pp. 69–98.

CHOUDHRY, T. - LIN, L. – PENG, K. (2007), Common stochastic trends among Far East stock prices: Effects of the Asian financial crisis, *International Review of Financial Analysis*, no. 16, pp. 242-261.

DAVIG, T. (2004). Regime-Switching Debt and Taxation. *Journal of Monetary Economics*, no. 51, pp. 837-859.

DIDIER, T. - LOVE, I. - PERIA, M. S. M. (2010). *What Explains Stock Markets' Vulnerability to the 2007–2008 Crisis?*. The World Bank Policy Research Working Paper 5224.

DIVECHA, A.B. - DRACH, J. - STEFEK, D. (1992). Emerging Markets: A Quantitative Perspective, *Journal of Portfolio Management*, vol. 19, no. 1, pp. 41-50.

FORBES, K. - RIGOBON, R. (2002). No contagion, only interdependence: measuring stock market comovements. *Journal of Finance*, no. 57, pp. 2223–2261.

GOETZMANN, W. N. - LINGFENG, L. -. ROUWENHORST, G. (2005). Long-Term Global Market Correlations, *Journal of Business*, University of Chicago Press, vol. 78, no. 1, pp. 1-38.

GRUBEL, H. (1968). Internationally diversified portfolios: welfare gains and capital flows. *American Economic Review*, vol. 58, no. 5, pp. 1299–1314.

HAMILTON, J. D. (1988). Rational-Expectations Econometric Analysis of Changes in Regime: An Investigation of the Term Structure of Interest Rates. *Journal of Economic Dynamics and Control*, no. 12, pp. 385-423.

HAMILTON, J. D. (2005). What's Real About the Business Cycle?. *Federal Reserve Bank of St. Louis Review*, vol. 87, no. 4, pp. 435-452.

HARVEY, C.R. (1995). Predictable Risk and Returns in Emerging Markets, *Review of Financial Studies*, vol. 8, no. 3, pp. 773-816.

JEANNE, O. – MASSON, P. (2000). Currency Crises, Sunspots, and Markov-Switching Regimes. *Journal of International Economics*, no. 50, pp. 327-350.
KAROLYI, G.A. - STULZ, R.M. (1996). Why do markets move together? An investigation of U.S.–Japan stock return comovements. *Journal of Finance*, vol. 51, no. 3, pp. 951–986.
KING, M. - WADHWANI, S. (1990). Transmission of volatility between stock markets. *Review of Financial Studies*, vol. 3, no. 1, pp. 5–33.
KIZYS, R. - PIERDZIOCH, C. (2009). Changes in the international comovement of stock returns and asymmetric macroeconomic shocks. *Journal of International Financial Markets, Institutions and Money*, vol. 19, no. 2, pp. 289–305.
LIN, W.-L. - ENGLE, R. F. - ITO, T. (1994). Do Bulls and Bears Move Across Borders? International Transmission of Stock Returns and Volatility, *The Review of Financial Studies*, vol. 7, no. 3, pp. 507-538.
LONGIN, F. - SOLNIK, B. (1995). Is the correlation in international equity returns constant: 1960–1990?. *Journal of International Money and Finance*, vol. 14. no. 1, pp. 3–26.
LONGIN, F. - SOLNIK, B. (2001). Extreme correlation of international equity markets. *Journal of Financ*e, vol. 56, no. 2, pp. 649–676.
MARASHDEH, H. A. - M. B. SHRESTHA (2010), Stock Market Integration in the GCC Countries, *International Research Journal of Finance and Economics*, Issue 37.
MASIH, R. - M. M. MASIH (2002), Long and short term dynamic causal transmission amongst international stock markets, *Journal of International Money and Finance*, no. 20, pp. 563-587.
MAURO, P. - SUSSMAN, N. - YAFEH, Y. (2002). Emerging Market Spreads: Then Versus Now. *Quarterly Journal of Economics*, no. 117, pp. 695-733.
MORANA, C. - BELTRATTI, A. (2008). Comovements in International Stock Markets. *Journal of International Financial Markets, Institutions and Money*, vol. 18, no. 1, pp. 31-4.
OBSTFELD, M. - TAYLOR, A.M. (2004). *Global Capital Markets: Integration, Crisis, And Growth*. Cambridge University Press, New York/Cambridge.
OBSTFELD, M. - TAYLOR, A.M. (2003). Globalization and Capital Markets, in: BORDO, M.D. - TAYLOR, A.M. -WILLIAMSON J.G. (Eds.) *Globalization in Historical Perspective*. University of Chicago Press, Chicago.
PAJUSTE, A. (2002). *Corporate Governance and Stock Market Performance in Central and Eastern Europe: A Study of Nine Countries 1994-2001*, School of Slavonic and East European Studies, University College London, Centre for the Study of Economic and Social Change in Europe: Working Paper No. 22.
QUINN, D. P. - VOTH, H.-J. (2008). A Century of Global Equity Market Correlations. *American Economic Review*, no. 98, pp. 535-540.
QUINN, D. P. 2003. Capital Account Liberalization and Financial Globalization, 1890-1999: A Synoptic View. *International Journal of Finance and Economics*, no. 8, pp. 189-204.
RUA, A. - NUNES, L. C. (2009). International comovement of stock market returns: A wavelet analysis. *Journal of Empirical Finance*, no. 16, pp. 632–639.