Financial Integration of the European Frontier Emerging Markets

Jussi Nikkinen , Vanja Piljak and Timo Rothovius

This paper investigates the financial integration of the European frontier emerging markets (Croatia, Estonia, Romania, Slovakia and Slovenia). By using vector-autoregressive (VAR) methodology we examine the sensitivity of the stock returns to the global market risk factor, as well as the interdependences across the frontier emerging markets. The results indicate that the stock markets of Croatia, Estonia and Slovenia show considerable degree of financial integration with respect to the world market portfolio, while the stock markets of Romania and Slovakia appear to be segmented. Furthermore, the variance decomposition analysis reveals limited interactions between the investigated frontier emerging markets, suggesting very weak linkages among them. The empirical findings of this study have important implications for international investors, reflected in potential benefits from international portfolio diversification through investing in the European frontier emerging markets.

Field of Research: European Financial Markets

1. Introduction

Emerging markets finance has evolved into a challenging research issue over the past two decades (for a survey, see Bekaert & Harvey, 2003). The significance of the emerging markets is reflected in the fact that they have become a relevant driver of the global economic growth in the recent years, providing very high returns for investors at the same time. The degree of the financial market integration is important because of its implications on international capital budgeting and investments (Li & Majerowska, 2007; Tai, 2007; Middleton, Fifield & Power, 2008). Such financial markets that are not integrated into the world capital markets may provide opportunities for international investors in obtaining diversification benefits. This study investigates the question of financial integration by focusing on a special subcategory of emerging markets - namely frontier emerging markets. This subcategory, which was introduced in 1996 by the International Finance Corporation, represents small markets characterized by relatively thin trading activity. Those markets have also provided high returns in the past few years.

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Research into emerging market stock returns emphasizes the importance of features of those markets for the investment purposes. The starting point in explaining relationship between emerging market stock returns and investors' asset allocation decisions is a generally accepted finding that emerging markets exhibit high expected returns and higher volatility compared to the developed markets, but inclusion of emerging market assets to the investment portfolio significantly enhances portfolio opportunities as a result of low correlations between emerging and developed equity markets (see Harvey, 1995). The purpose of this study is two-fold. First, we investigate whether the European frontier emerging stock markets have become integrated into the world capital markets by examining the sensitivity of the stock returns to the world-wide market risk factor, and second, we study the interdependences across these markets. It is hypothesized that the European frontier emerging markets represented by the five selected countries (Croatia, Estonia, Romania, Slovakia and Slovenia) are not yet fully integrated into the world capital markets. This is to be expected, given that those markets are small and illiquid with relatively short history.

This study contributes to the literature by investigating frontier emerging markets as a one special subcategory of emerging markets. This subcategory is worth researching since the international stock markets have become increasingly interdependent since the 1987 U.S. Stock Market Crash, implying decreased benefits from international diversification (Bessler & Yang, 2003; Wongswan, 2006). Emerging markets have attracted attention from international fund managers, and there is evidence of increased degree of integration between new emerging markets and developed countries (Tai, 2007). In the situation where emerging markets are increasingly becoming integrated into the world markets, the alternative for any future benefits of international diversification could lie in the subcategory of the frontier markets. In addition, the use of the European frontier emerging markets is motivated by the fact that although several studies (Mateus, 2004; Dvorak & Podpiera, 2006; Maneschiöld, 2006; Middleton, Fifield & Power, 2008) examine financial integration by using some of the European frontier emerging markets in the sample, neither of them adopted a unique frontier emerging markets group perspective based on Standard & Poor's classification. The remainder of the paper is organized as follows. Section 2 provides the literature review; section 3 presents the data and methodology; section 4 reports results and discusses their implications and section 5 concludes.

2. Literature Review

The finding of Harvey (1995) that inclusion of emerging market assets to the investment portfolio significantly enhances portfolio opportunities has generated a growing body of literature that investigates the features of emerging market equity returns including two important research areas: the risk–return tradeoff within emerging markets (Harvey, 1991; Bekaert & Harvey, 1997) and the potential gains arising from international portfolio diversification through combining investments in emerging markets with investments in developed stock markets (Bekaert & Urias, 1996; Li & Majerowska, 2007). Regarding the literature about risk–return relationship in the emerging markets the main focus is on the global market risk and currency risk (De Santis & Imrohoroglu, 1997; Pajuste, Kepitis

& Högfeldt, 2000; Mateus, 2004), but particular attention is given also to certain specific risk factors such as political risk (Diamonte, Liew & Stevens, 1996) and country risk (Erb, Harvey & Viskanta, 1996).

In the literature on the financial integration between the emerging and developed markets less attention is given to the frontier emerging markets. Mateus (2004) shows that the conditional asset-pricing models fail, on average, to price correctly the assets in the thirteen European Union (EU) accession countries which belong to the group of the emerging markets, indicating their partial integration with the world. Dvorak & Podpiera (2006) suggest that a dramatic rise in stock prices observed in the eight EU accession countries (Estonia, Latvia, Lithuania, Slovakia, Slovenia, Czech Republic, Hungary and Poland) after the announcement of the EU enlargement towards those countries was due to the integration of accession countries into the world market. The recent study of Maneschiöld (2006) investigates financial integration between Baltic countries (Estonia, Latvia and Lithuania) and international capital markets. The results suggest that international investors can obtain diversification benefits given a long-term investment horizon because of the low degree of integration between the Baltic and international capital markets. Further evidence of potential benefits from diversifying into the emerging markets in Central and Eastern Europe is provided in Middleton, Fifield & Power (2008) who show that optimal portfolio comprising of the stocks from eight European emerging markets (Croatia, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania and Russia) significantly outperformed its developed market counterparts in UK and the US over the period 1998-2003.

3. Methodology

The sample is selected according to the Standard and Poor's classification of the frontier emerging markets. It consists of five of the nine European countries in the S&P/IFCG Extended Frontier 150 Index. The selection of only five countries is limited by the availability of data based on the chosen time period length of ten years. The sample period extends from September 24, 1997 to September 26, 2007. All index data used in the study are extracted from the Thomson Datastream database. The data consist of daily observations of the stock indices and the Morgan Stanley Capital International (MSCI) World equity market index which is widely accepted benchmark index used to proxy the world market portfolio. The daily returns in each market are computed as the natural logarithmic differences: $ln\ (p_t / p_{t-1})$ where p_t is either the stock index of the frontier emerging market or MSCI World Index at time t.

Table 1 shows market highlights for the five investigated European frontier emerging markets.

Table 1
Market highlights

Country	Index	Stock market established	Market capitalization*
Croatia	CROBEX	1991	48.1 bill.EUR
Estonia	OMXTallinn	1995	4.5 bill.EUR
Romania	BET	1995	27.7 bill.EUR
Slovakia	SAX	1991	2.7 bill.EUR
Slovenia	SBI 20	1989	18.9 bill.EUR

Notes: * = Market capitalization at the end of October 2007

Figure 1 presents the return indexes during the period under study. The indexes of the frontier emerging markets follow a relatively similar movement, while the MSCI World index exhibits a different pattern. The frontier emerging markets started to have an upward trend in the middle of 2001, while the world market was moving downwards reaching the bottom at the end of 2002. This time point coincides with the announcement of the EU enlargement towards Central and Eastern European countries. The observation of sharp stock price increases in the post-2001 period might be explained by the possibility that announcement of the EU enlargement accelerated integration of the frontier emerging stock markets with respect to the developed European and the world markets. This arises from the fact that clear prospects for the EU accession and removal of all restrictions on movement of capital associated with enlargement may decrease political, liquidity and legal system risks that were often perceived in those countries prior to the EU membership. Estonia, Slovenia and Slovakia joined the EU in 2004, Romania joined in 2007, while Croatia still has a status of a candidate country.

Figure 1
Stock indices

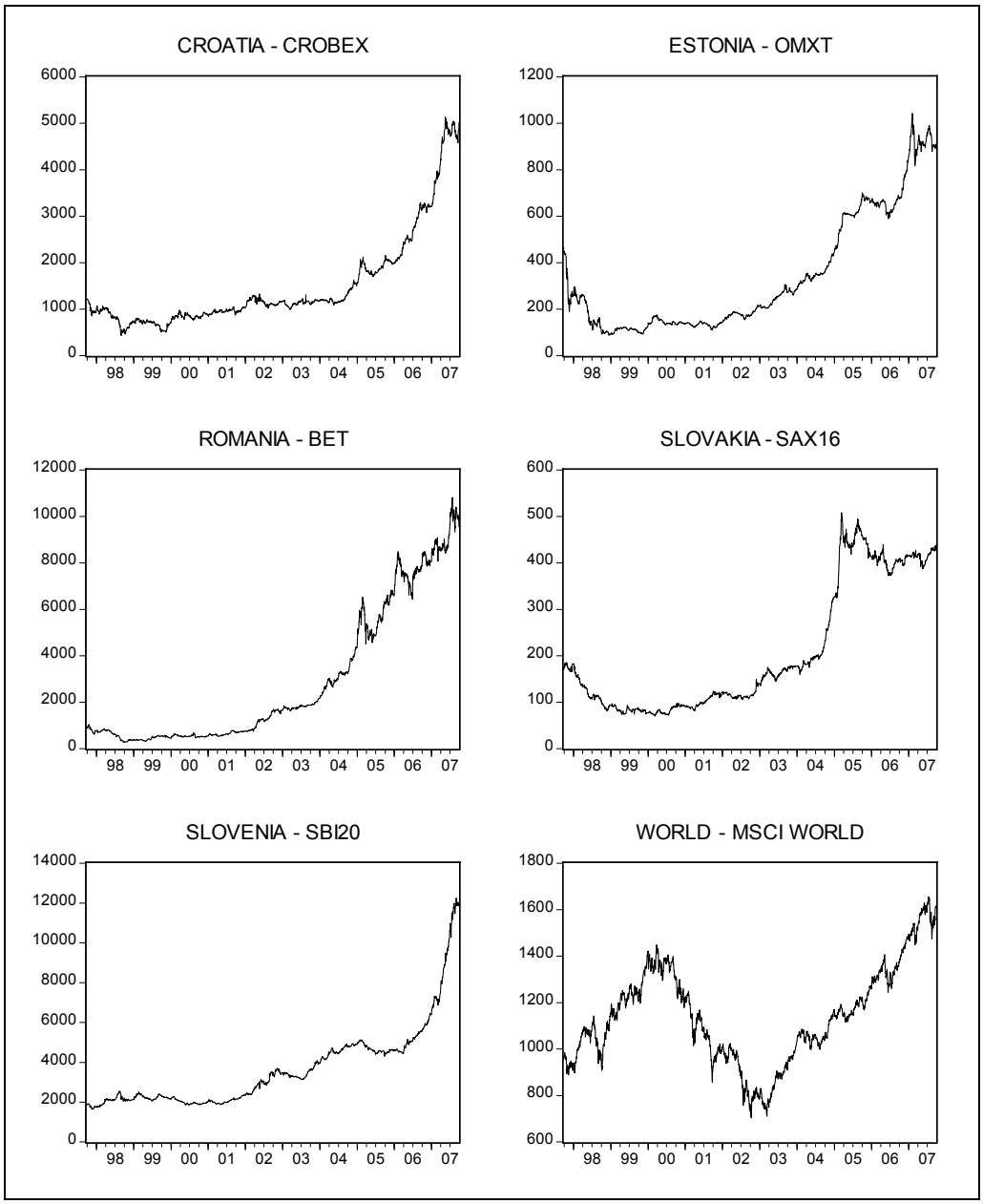

Table 2
Summary statistics
Panel A: The world market and the frontier emerging markets

	World	Croatia	Estonia	Romania	Slovakia	Slovenia
Mean	0.0002	0.0005	0.0003	0.0009	0.0004	0.0007
Median	0.0006	0.0000	0.0006	0.0000	0.0000	0.0002
Maximum	0.0460	0.1747	0.1287	0.1154	0.0957	0.1102
Minimum	-0.0452	-0.1338	-0.2158	-0.1190	-0.1148	-0.1134
Standard Deviation	0.0088	0.0171	0.0172	0.0169	0.0132	0.0084
Skewness	-0.1570	0.0416	-1.4708	-0.0241	-0.4606	0.0473
Kurtosis	5.2318	18.1794	29.4126	9.6758	10.4496	33.7845
Jarque-Bera	552.42	25058.44	76808.26	4846.87	6127.62	103062.00
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2610	2610	2610	2610	2610	2610

Panel B: Correlations

	World	Croatia	Estonia	Romania	Slovakia
Croatia	0.13				
Estonia	0.12	0.06			
Romania	0.03	0.05	0.03		
Slovakia	0.05	0.02	0.00	-0.02	
Slovenia	0.05	0.11	0.08	0.10	0.00

Table 2 reports summary statistics for all daily return series. Comparing the performance of the frontier emerging markets with the world market it is notable that all frontier emerging markets have higher average daily returns than the world market. Volatility level is also higher (except for Slovenia), as measured by the standard deviation. The correlations between the frontier emerging markets and the world market are very low. The highest correlation in the group of the frontier emerging markets is between Croatia and Slovenia. That can be explain by their historical and regional links as they are neighboring countries which had been parts of the same country (former Yugoslavia) for more than 40 years and have strong industrial and economic relationships. For instance, Croatia is important trading partner for Slovenia which is illustrated by the fact that in the structure of Slovenian export Croatia takes place with about 9%. Export to the EU countries is 69% of total Slovenia's export, while among countries outside the EU Croatia is major trading partner (source: Statistical Office of the Republic of Slovenia).

In order to analyze interdependences among the investigated markets and get insights into the causal dynamics of index returns, the vector autoregressive methodology (VAR) including Granger causality test (Granger, 1969) and variance decompositions is used (see Lutkepohl, 2005). VAR modeling is appropriate methodology in the case of a stationarity of all index return time-series. The stationarity of the time-series is examined by conducting the augmented Dickey-Fuller (Dickey & Fuller, 1981) and Phillips-Perron unit root tests (Phillips & Perron, 1988). The lag length for the unit root tests is determined by the Schwarz information criterion. Taking into consideration that the unit root tests confirm stationarity of the index returns time-series, VAR modeling is used to

examine the causal dynamics of the index returns. Thus, it is assumed that the index returns of Croatia, Estonia, Romania, Slovakia, Slovenia and the world index returns are described by the following unrestricted VAR (*p*) model:

$$\boldsymbol{X}_t = \boldsymbol{\alpha} + \sum_{i=1}^{p} \boldsymbol{\Phi}_i \boldsymbol{X}_{t-i} + \boldsymbol{\varepsilon}_t, \quad (1)$$

where $\boldsymbol{X}_t = (X_{CROATIA,t}\ ,\ X_{ESTONIA,t}\ ,\ X_{ROMANIA,t}\ ,\ X_{SLOVAKIA,t}\ ,\ X_{SLOVENIA,t}\ ,\ X_{WORLD,t}\ )'$ is a covariance stationary 6x1 vector of index returns X_t, $\boldsymbol{\alpha}$ is a 6x1 vector of intercepts, $\{\boldsymbol{\Phi}_i, i = 1, 2,\ldots, p\}$ is a 6x6 matrix of autoregressive coefficients, $\boldsymbol{\varepsilon}_t$ is a 6x1 vector of random disturbances with zero mean and positive definite covariance matrix, and *p* indicates the lag length, i.e., order of the system. In this study, the order of the VAR is determined by applying Akaike's, Schwartz's, Hannan-Quinn information criteria and modified likelihood ratio test for the selection of appropriate lag length. The residual test confirms an adequacy of the lag length of three. Thus, the further analyses in the study are based on the VAR system described by Equation (1) with p=3.

4. Findings

The empirical results from Granger causality tests, presented in Table 3, show that returns of the world market significantly (at 1% level) Granger cause returns of Croatia, Estonia and Slovenia, but not Romania and Slovakia. These results indicate that the stock markets of Croatia, Estonia and Slovenia seem to be integrated to the world market, while Romanian and Slovakian markets appear to be segmented with respect to the world market. When causalities among the frontier emerging markets are examined, it is notable that Estonia seems to be dominant market Granger causing returns of Croatia, Slovenia and Romania at 1% significance level. Bidirectional causality at 1% level of significance is observed in two cases: Croatia and Estonia, and Croatia and Slovenia. It is interesting to note that Slovakia is not Granger caused by either world or other frontier emerging markets (with exception of weak evidence for direction Romania → Slovakia) and moreover Slovakia does not Granger cause any of the markets. This supports that the Slovakian market is segmented with respect to the world and other European frontier emerging markets.

Table 3
Granger causality tests

Markets	F-statistics	p-value
Panel A: The world and the frontier emerging markets		
World → Croatia	20.272	0.000
World → Estonia	29.502	0.000
World → Romania	1.691	0.167
World → Slovakia	1.019	0.383
World → Slovenia	21.175	0.000
Panel B: The frontier emerging markets		
Croatia → Estonia	3.397	0.001
Croatia → Slovenia	5.249	0.000
Estonia → Croatia	8.693	0.000
Estonia → Romania	2.872	0.005
Estonia → Slovenia	3.094	0.003
Romania → Estonia	2.008	0.051
Romania → Slovakia	1.776	0.088
Romania → Slovenia	1.963	0.056
Slovenia → Croatia	5.545	0.000
Slovenia → Estonia	2.269	0.026
Slovenia → Romania	1.775	0.088

Note: Panel B reports only those combinations that reveal significant causality relations among the frontier emerging markets (total number of tests is 20; number of significant tests is 11).

In order to further investigate the interdependence among the investigated stock markets in terms of return, variance decomposition analysis is used. The variance decomposition explains the proportion of forecast variance in each of the return series caused by innovations in the other return series in the system. Table 4 shows results of 1-day, 2-day, 5-day and 10-day ahead forecast error variances of each frontier emerging market's stock indexes. The results demonstrate that returns of the world market make only a minor contribution to the total variances of Estonian, Croatian and Slovenian returns. In the case of Romania and Slovakia, the results show that the fraction of variance explained by the world market returns is less than 0.5% during the whole period of 10 days demonstrating that the forecast variance is solely caused by innovations in itself. This finding clearly indicates that Romanian and Slovakian markets are unique in the sense that they are not affected by returns of the world market. This confirms previous results that those markets are segmented with respect to the world market.

Table 4
Variance decomposition

Country	Percentage of forecast error variance in					
Days	World	Slovenia	Slovakia	Romania	Estonia	Croatia
Croatia						
1	1.24	0.00	0.00	0.00	0.00	98.76
2	3.09	0.23	0.02	0.08	0.13	96.45
5	3.52	1.05	0.02	0.15	0.71	94.54
10	3.52	1.05	0.02	0.16	0.73	94.52
Estonia						
1	1.22	0.00	0.00	0.00	98.76	0.02
2	5.00	0.08	0.01	0.07	94.73	0.11
5	4.99	0.19	0.19	0.17	94.33	0.14
10	4.99	0.19	0.19	0.17	94.32	0.14
Romania						
1	0.07	0.00	0.00	99.81	0.00	0.12
2	0.26	0.02	0.00	99.54	0.01	0.16
5	0.29	0.22	0.09	98.44	0.61	0.35
10	0.30	0.22	0.09	98.42	0.62	0.35
Slovakia						
1	0.15	0.00	99.79	0.05	0.00	0.01
2	0.26	0.00	99.67	0.05	0.02	0.01
5	0.27	0.00	99.43	0.08	0.19	0.02
10	0.27	0.00	99.43	0.08	0.19	0.02
Slovenia						
1	0.07	98.35	0.00	0.54	0.27	0.77
2	2.13	96.17	0.00	0.67	0.28	0.74
5	2.56	94.62	0.01	0.78	0.61	1.42
10	2.56	94.62	0.01	0.78	0.61	1.42

5. Conclusion

In general, the results of this study indicate that the stock markets of Croatia, Estonia and Slovenia show considerable degree of financial integration with respect to the world market portfolio, while the stock markets of Romania and Slovakia appear to be segmented. Regarding the interdependences among the frontier emerging markets, first, there is a significant interdependence between Croatian and Slovenian markets, and second, Estonia can be seen as a leading market. The empirical findings of this study have important implications for international investors, since they can obtain diversification benefits from investing in the European frontier emerging markets.

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