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## The Degree of Integration of the Bulgarian and Croatian Equity Markets into the Eurozone Share Equity Market

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**Abstract:**

**Purpose:** This paper attempts to answer the question to what degree the equity markets of two countries aspiring to join the eurozone are integrated into the zone's share exchange market.

**Design/Methodology/Approach:** An econometric model based on the model of increased impact of the common news component on stock market yields by means of GARCH is applied to the analysis of the degree of integration of the Bulgarian and Croatian equity markets into the eurozone equity market. Monthly data on the yields on CROBEX (Croatia), SOFIX (Bulgaria), DJ EUROSTOXX (the euro area), DJ COMPOSITE AVERAGE (the United States) are used.

**Findings:** Both the Bulgarian and Croatian equity markets are integrated into the eurozone equity market to a low degree, which means idiosyncratic shocks play a dominant role in determining yields on the indices in these countries.

**Practical Implications:** The results presented in this paper can be employed by economists, politicians, and business practitioners who deal with the integration of financial markets including equity markets.

**Originality/Value:** This study addresses two countries that are aspiring and closest to joining the eurozone, hence research into the degree of integration of the equity markets of both these countries into the eurozone market is important.

**Keywords:** Degree of integration, equity market, shocks, GARCH model.

**JEL codes:** G10, F15, C10.

**Paper type:** Research article.

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## **1. Introduction**

Tendencies towards the integration of financial markets, including equity markets, can be observed on both the global and regional scales. The establishment of the monetary union and the associated introduction of a shared currency and standardisation of the monetary policy have been the processes with a major impact on the development and integration of the financial markets in European countries. The eurozone members have reached a relatively high degree of the financial markets integration, its degree in the countries aspiring to join the euro area is conditioned by a variety of barriers.

The factors limiting the degree of integration include a range of transaction costs of capital flows, the different realisation of fiscal policy, the variety of tax systems, the diverse levels of competitiveness and development of financial markets in institutional, behavioural, and economic respects, restrictions on foreign capital inflows, varied regulatory environments, different access to domestic and foreign financial markets or the asymmetry of information between foreign and domestic investors. Some more barriers relate to the multiplicity of currencies and the absence of international harmonisation of financial instrument transactions (Jappelli and Pagano, 2008; Adam *et al.*, 2002).

The weak degree of the integration of equity markets into the eurozone market may be characteristic not only of the countries intending to join the euro area but also those that have just joined it. The size and level of development of the stock market of a given country as well as the rate at which the new eurozone members undergo adjustment processes may be decisive factors in this respect. The degree of integration of the financial markets in the particular countries into the global and eurozone markets may vary due to a range of legal and economic restrictions.

The law of one price is the starting point for an assessment of the degrees and processes of financial markets integration. This means financial markets are integrated if, in two different countries or regions, assets generating identical cash flows earn the same rate of return and are subject to an identical risk (Adam *et al.*, 2002). As far as the equity markets are concerned, the price of capital raised by means of a share issue in two different countries should be the same. Such an approach to the integration of financial markets ignores deviations from that law on the international scale that preclude trading in some financial instruments.

The law of one price is complimented with a definition advanced by Baele, L., Ferrando, A., Hordahl, P., Krylova, E., and Monnet C., (2004). Accordingly, financial markets, including equity markets, are fully integrated if all potential market participants of identical characteristics:

- Are subject to the same rules of trade in financial instruments and/ or services in these markets,

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- Enjoy equal access to these financial instruments and/ or services,
  - Are treated identically when operating in the market.

If the law of one price is not fulfilled when the above assumptions are met, this provides conditions for arbitrage, which restores the law's validity (Baele *et al.*, 2004).

It is the aim of this paper to answer the question, to what degree are the equity markets of two countries aspiring to join the euro zone integrated into the zone's equity market.

## 2. A Review of Empirical Results

Buttner and Hayo (2011), analyse the determinants of the integration of equity markets in three groups of countries, namely, the eurozone members, those outside the euro area, and new European Union member states. They use the variables of the exchange rate risk, interest rate spreads, market capitalisation, and timing of economic cycles. They apply the DCC-MGARCH econometric model. Their results indicate distinct tendencies towards the integration of equity markets, reinforced primarily with relative and absolute market capitalisation, are present in all the country groups. The exchange rate risk, on the other hand, is the key determinant limiting the degree of integration in the countries belonging to the European Union (Buttner and Hayo, 2011).

Bukowski and Gowers (2016), study the degree of integration of the equity markets in the new eurozone member states into the equity markets of the euro area, the United Kingdom, and the United States (as the representatives of the global equity market). They employ the GARCH econometric model (1.1). Their results suggest the equity markets of the countries studied, that is, Poland, Hungary, and the Czech Republic, are more integrated into the equity markets of the United Kingdom and the United States than into the euro area. They point to the attractiveness of the American economy, characterised by a high competitiveness and economic freedom, workforce mobility, market flexibility, and the relatively high dynamics of economic growth, as well as a high technological level, as the causes of this situation. Investors in local equity markets have a similar view of the London stock market. The attractiveness of both the equity markets translates into good yields on financial instruments (Bukowski and Gowers, 2016).

Interesting conclusions are reached by Bekaert, Harvey, Lundblad, and Siegel (2016). They base their research on linear regression models and the results point to a growing degree of integration of the financial markets of new and old European Union members. Interestingly, their analysis fails to show joining the eurozone and the adoption of the single currency enhance the integration of the financial markets of countries in the euro area, including its new members. The study also demonstrates the integration benefits from the European membership diminish a

little in the end of the study period, while the segmentation among the eurozone countries increases a little (Bekaert *et al.*, 2016).

Nardo, Osso, and Papanagiotou (2021), undertake more extensive research into the integration of equity markets. They begin with exploring how the degree of integration of the European financial markets changed on the introduction of the single euro currency and at the time of the financial and fiscal crisis. Their results imply the integration of particular countries' financial markets grows and is less varied in a crisis. This is evidence of a heterogeneity of integration indicators in the countries and regions surveyed before and after the crisis. The authors proceed to examine the factors affecting the integration indicators. These include macroeconomic variables, market capitalisation, the development standard of a financial market, political uncertainty, and technological development. Factors determining the composition of investment portfolios in European countries is the final object of study. The research shows benefits from diversifying investment portfolios decline at times of a high degree of financial markets' integration, which is corroborated by other authors as well (Nardo *et al.*, 2021).

Kurach (2011), confirms an increasing degree of integration among the equity markets in the countries explored, namely, Bulgaria, the Czech Republic, Estonia, Germany, Poland, Romania, Ukraine, Slovenia and regions like the eurozone, emerging markets, and global markets. The countries and regions of maximum liquidity and high volumes of stock turnover display the greatest extent of equity market. A dependence between a degree of integration of equity markets and benefits from an international diversification of investment portfolios, which seem limited, is another important conclusion (Kurach, 2011).

### **3. Statistical Data and Methods**

The research period covers the years 2003-2021. Two countries, Bulgaria and Croatia, are studied. Monthly figures about the yields on CROBEX (Croatia), SOFIX (Bulgaria), DJ EUROSTOXX (eurozone), and DJ COMPOSITE AVERAGE (the United States) are utilised, all from the *EBC Statistical Data Warehouse* and *www.stooq.pl*. The model is estimated by means of GARCH (1.1).

The econometric model of the increased impact of the common news component on stock market yields is applied (Bukowski, 2020). The model estimation consists of three stages. The formula of yields on the US (global) equity market is estimated first:

$$R_{US,t} = \mu_{US,t} + \varepsilon_{US,t} \quad (1)$$

where:

$R_{US,t}$  - yield on the United States equity market over a time  $t$ ,  
 $\mu_{US,t} = \alpha_{US,t} + \gamma_{US} R_{US,t-1}$  - the expected yield element,

$\varepsilon_{US,t}$  – the unexpected yield element.

The conditional variance for the United States equity market is estimated next.

$$E(\varepsilon_{US,t}^2) \equiv \sigma_{US,t}^2 \quad (2)$$

where:  $E(\cdot)$  – the expected value operator.

The second step involves an estimation of a formula of yields on the eurozone equity market:

$$R_{EU,t} = \mu_{EU,t} + \varepsilon_{EU,t} \quad (3)$$

where:

$R_{EU,t}$  – yield on the euro area equity market over a time  $t$ ,

$\mu_{EU,t} = \alpha_{EU,t} + \gamma_{EU} R_{EU,t-1}$  – the expected yield element,

$\varepsilon_{EU,t} = \beta_{i,t}^{US} \varepsilon_{US} + e_{EU,t}$  – the unexpected yield element,

$e_{EU,t}$  – pure local shock.

In this case, the conditional variance for the eurozone equity market becomes:

$$E(e_{EU,t}^2) \equiv \sigma_{EU,t}^2 \quad (4)$$

A yields formula and the proportion of variance for the Croatian and Bulgarian equity markets are estimated then:

$$R_{i,t} = \mu_{i,t} + \varepsilon_{i,t} \quad (5)$$

where:

$R_{i,t}$  – yield on a local equity market over a time  $t$ ,

$\mu_{i,t} = \alpha_{i,t} + \gamma_i R_{i,t-1}$  – the expected yield element,

$\varepsilon_{i,t} = e_{i,t} + \beta_{i,t}^{US} \varepsilon_{US} + \beta_{i,t}^{EU} \varepsilon_{EU}$  – the unexpected yield element,

$e_{i,t}$  – pure local shock.

The conditional variance for the equity market in a country  $i$  is:

$$E(e_{i,t}^2) \equiv \sigma_{i,t}^2 \quad (6)$$

The variance ratios for the euro area and the United States are calculated next:

$$\begin{aligned} VR_{i,t}^{US} &= \frac{(\beta_{i,t}^{US})^2 \sigma_{US,t}^2}{\sigma_{i,t}^2} = \rho_{i,US,t}^2 \\ VR_{i,t}^{EU} &= \frac{(\beta_{i,t}^{EU})^2 \sigma_{EU,t}^2}{\sigma_{i,t}^2} = \rho_{i,EU,t}^2 \end{aligned} \quad (8)$$

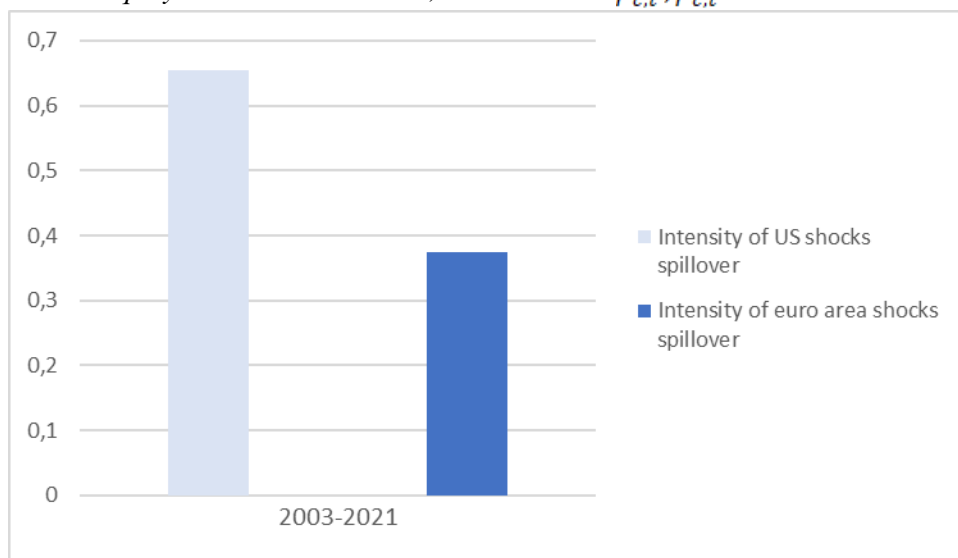
The conditional variances for both the United States, the euro area, and local equity markets are derived from the standard asymmetrical GARCH (1.1) model.

The variance ratio defines the degree of integration of equity markets. This means the higher the variance ratios, the greater the ratio of the effects of global or eurozone shocks or local shocks, and the greater the integration of equity markets.

#### 4. Empirical Results

The dependence between the changes of yields on the DJ COMPOSITE AVERAGE index in the US and of the EUROSTOXX eurozone index and the changes of yields on the Croatian CROBEX index is positive, like the dependence between the changes of yields on the American and European indices and of yields on the SOFIX index in Bulgaria.

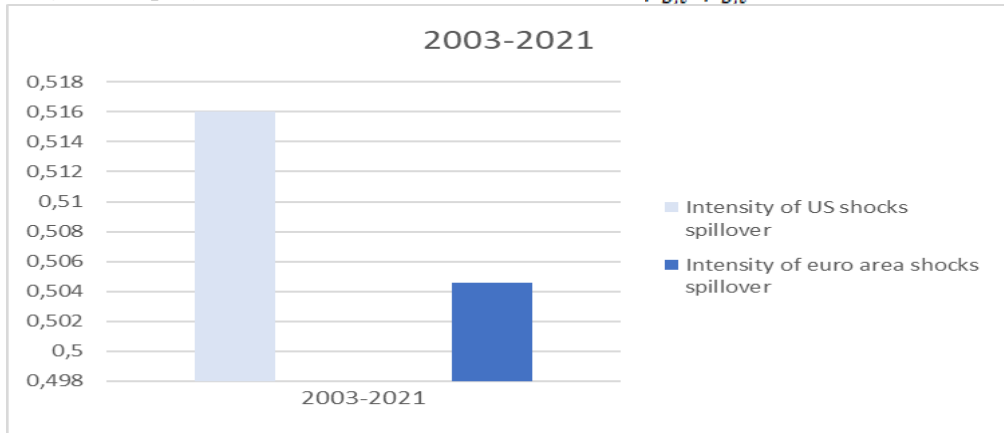
**Figure 1.** The intensity of spreading of global (the US) and eurozone shocks in the Croatian equity market in 2003-2021, measured with  $\beta_{c,t}^{US}$ ,  $\beta_{c,t}^{EU}$



**Source:** The author's compilation based on a model estimation using GRET software – the model of increased impact of the common news component on stock market yields.

In 2003-2021, the correlation between the shocks from the euro area and from the United States and the yields on the CROBEX index has been positive. The intensity of spreading of global shocks (from the US) to the Croatian equity market has been very high, while the same intensity for the shocks from the eurozone has been far lower. The Croatian equity market is much more sensitive to the impact of global than of the eurozone shocks.

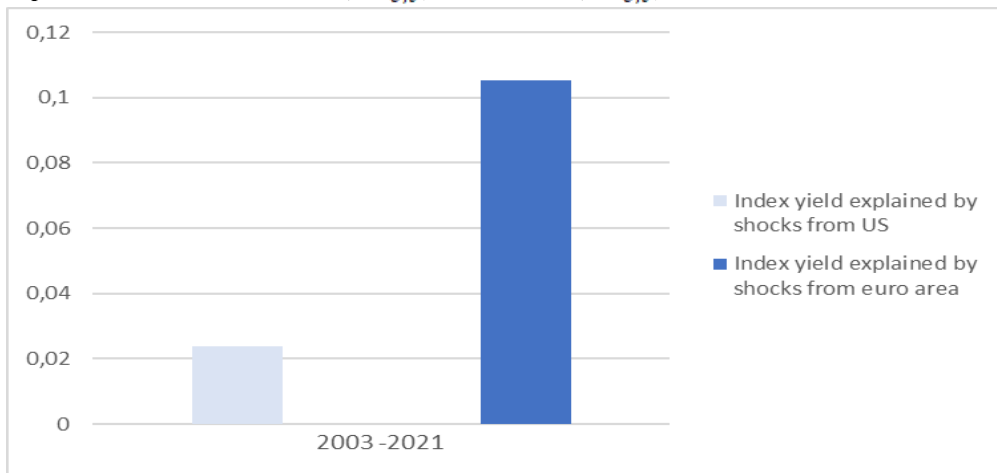
**Figure 2.** The intensity of spreading of global (the US) and eurozone shocks in the Bulgarian equity market in 2003-2021, measured with  $\beta_{b,t}^{US}$ ,  $\beta_{b,t}^{EU}$



**Source:** The author's compilation based on a model estimation using GRETl software – the model of increased impact of the common news component on stock market yields.

The situation in the Bulgarian equity market is similar. In 2003-2021, there has been a positive correlation between the shocks from the euro area and from the United States and the yields on the SOFIX index. The Bulgarian equity market is more sensitive to global than to the euro area shocks, too, which is proven by the far greater intensity of spreading of global shocks (from the US) to the Bulgarian equity market than is the case for the shocks from the eurozone in the period studied.

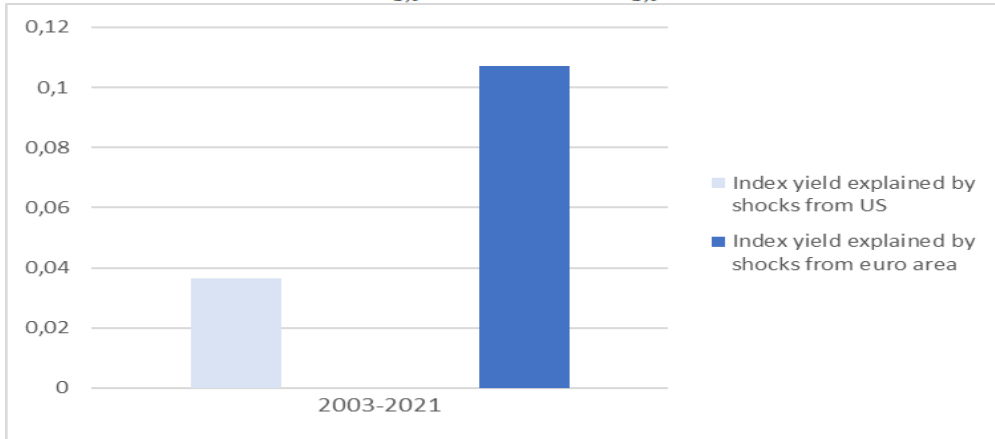
**Figure 3.** The Croatian equity market – the variance ratio of the CROBEX yields explained with the eurozone ( $VR_{c,t}^{EU}$ ) and the US ( $VR_{c,t}^{US}$ ) shocks in 2003-2021



**Source:** The author's compilation based on a model estimation using GRETl software – the model of increased impact of the common news component on stock market yields.

In 2003-2021, the changes of yields on CROBEX have been chiefly explicated with the shocks from the euro area rather than shocks from the United States. However, the combined shocks from the euro area the United States combined merely about 13% of the changes of yields on CROBEX. This means they were chiefly influenced by local (idiosyncratic) shocks.

**Figure 4.** The Bulgarian equity market – the variance ratio of the SOFIX yields explained with the eurozone ( $VR_{b,t}^{EU}$ ) and the US ( $VR_{b,t}^{US}$ ) shocks in 2003-2021



**Source:** The author's compilation based on a model estimation using GRETL software – the model of increased impact of the common news component on stock market yields.

In 2003-2021, the variations of yields on the SOFIX index have been chiefly explained with the impact of the eurozone rather than the United States shocks. However, the combined shocks from the euro area and the US explain more than 14% of the changes in the SOFIX yields. This means the local shocks have played a key role in determining the yields on the Bulgarian stock market index.

## 5. Conclusion

This analysis offers the following conclusions:

The equity markets in Croatia and Bulgaria exhibit similar degrees of integration into the stock markets in the eurozone and the United States (the global market).

The equity market in Bulgaria is more integrated into the euro area market than the Croatian stock market.

Both Croatia and Bulgaria are more integrated into the US (global market) than into the euro area market. This is mainly due to a lower attractiveness to foreign investors of local markets in small countries, the home and local bias, the asymmetry of information, transaction costs, taxation of transactions or income from financial investments abroad, the relatively persistent conviction of investors that news from



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the American market is important and affects yields on financial instruments, chiefly shares.

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