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Joanna Bukowska[1]

THE DEGREE OF INTEGRATION OF THE GOVERNMENT BOND MARKET OF SELECTED EUROPEAN UNION COUNTRIES INTO THE EUROZONE GOVERNMENT BOND MARKET

Abstract

Many studies indicate an increase in the degree of financial markets integration with the accession of a given country to the eurozone. This also applies to the degree of integration of the government bond market. There are studies that also indicate an increase in the level of integration as early as the stage of the country's accession to the European Union.

The article analyzes the degree of integration of the selected European Union countries government bond markets into the eurozone government bond market. The research refers to two countries from the same region, namely the Czech Republic and Hungary, whose socio-economic conditions show quite large similarities. Moreover, these countries joined the European Union at the same time.

In the study an econometric model was applied based on the model of the evolution of the beta coefficient estimated using GARCH (1.1). Monthly data on the redemption rates for 10-year treasury bonds of the surveyed countries were used, while the yield for the redemption of 10-year treasury bonds in Germany was used as a benchmark. The analysis conducted indicates a clear disintegration of the Czech and Hungarian government bond markets into the eurozone government bond market. This is indicated by both the beta coefficient evolution and the analysis of the intercept evolution.

[1] Ph.D., associate professor of the Casimir Pulaski Radom University, Faculty of Economics and Finance, Department of Economic Policy and Banking.

Keywords: government bond market, degree of integration, beta coefficient model, GARCH.

JEL Classification: G10, F15, C10

Introduction

The accession of a given country to the European Union is the first step into deepening of the level of financial markets integration. Another, more advanced step is the moment of this country's accession to the eurozone. International integration of financial markets is a demanding and multidimensional process, and the road to achieving it is quite long. On the one hand, the elimination of various types of barriers related to the accession of a given country to the eurozone, in the form of limited freedom of capital movement, different regulations, or the existing asymmetry of information, has a positive impact on the increase in the degree of financial markets integration, but on the other hand, it should be remembered that it is not it is an irreversible process.

The countries that are joining the European Union differ in their potential and level of economic and financial development, or even in the level of debt. This may significantly affect the process of financial markets integration, including the integration of the government bond market, the effects of which may appear after quite a long time. Accession to the eurozone significantly accelerates the international financial markets integration, for example by eliminating the exchange rate risk caused by the adoption of a common currency or implementing a single monetary policy. The increased degree of financial markets integration, including the government bond market, accelerates financial development in individual economies, increases the synchronization of business cycles, which determines the efficient functioning of the monetary union and the implementation of an effective monetary policy (Bukowski, 2011), as well as releases the allocative function of financial markets and the mechanism for absorbing economic shocks.

The law of one price is the starting point in assessing the degree of financial markets integration, including the government bond market. Full financial markets integration occurs when assets generating identical cash flows in two different countries or regions bring the same rate of return and are characterized by the same risk (Adam et al. 2002). The assumption of the law of one price is complemented by the fulfilment of several assumptions according to which potential market participants with identical characteristics are subject to the same rules for trading in financial instruments and/or services on these markets, have equal access to these instruments and/or financial services, and are treated equally when they operate on the market. Fulfilment of the above assumptions and failure to meet the assumptions of the law of one price creates conditions for arbitration, which restores the validity of this law (Baele et al. 2004).

Two countries were selected to analyze the degree of the government bond market integration of selected European Union countries into the eurozone government bond market, namely the Czechia and Hungary. These are countries belonging to the Visegrad Group, whose location in one region makes them show many socio-economic similarities. Often treated by investors as one market. Both joined the European Union on May 1, 2004. They constitute an important reference point for examining any differences, also those related with degree of government bond market integration in these countries, which is the subject of the following study.

The aim of this article is to answer the question to what extent the Czech and Hungarian government bond markets are integrated into the eurozone government bond market.

1. A Review of Empirical Results

Leschinski Ch., Voges M., Sibbertsen P. in their research showed that the government bond markets in the eurozone were not consistently integrated. The periods of disintegration and integration of each country's government bond markets in the eurozone mainly coincided with periods of stock market booms and busts, respectively. In addition, their research indicates that the markets of central Europe and its peripheral countries were characterized by a high degree of integration until the advent of the financial and fiscal crisis, when a flight to capital characterized by a high degree of safety is clearly evident.

The issue of the degree of integration of the government bond markets of the eurozone countries was dealt with by Sensoy A., Nguyen D.K., Rostom A., Hacihasanoglu E. According to their analysis, in the period before the financial and fiscal crisis, there was perfect integration of government bond markets in the EMU. The advent of the crisis violated the integration structure, which was severely damaged. The variation in the degree of integration of the government bond markets mainly affected the groups of countries that were most heavily indebted, and thus were the main cause of the segmentation of the government bond market. The elimination of fiscal problems did not improve the situation, and this is still reflected in the uneven degree of integration of the government bond markets of these countries.

An analysis on the study of the degree of integration of the government bond markets of selected European Union countries with the government bond market in the eurozone was also conducted by J.E. Bukowska. For the study, she selected two countries that aspire and are closest to joining the eurozone. The study used monthly data on yields to maturity of 10-year government bonds of Bulgaria and Croatia. The yield to maturity of 10-year government bonds in Germany was used as the benchmark. The estimation of the model was done using GARCH (1.1.). The results of the study indicate that both the Bulgarian and Croatian government bond markets are relatively poorly

integrated with the eurozone government bond market. The analysis of the evolution of beta coefficient and the intercept evolution indicated a low degree of integration of both markets into the government bond market in the eurozone for most of the period studied, only for short periods there was a high degree of integration of the government bond market in Bulgaria and Croatia.

The difference in the level of integration between the government bond markets of countries belonging in the eurozone and those newly joining the European Union was addressed in their research by Kim S., Lucey B.M. and Wu E. They used a set of complementary techniques to assess the time-varying level of financial integration, namely the EGARCH model, the Kalman filtering method and cointegration. They pointed out the existence of strong contemporary and dynamic linkages between the Eurozone bond markets and Germany's market. However, in the case of the UK and the three newly acceded countries, including Poland, the Czech Republic and Hungary, the degree of integration of these markets is weak but stable. Pre-accession efforts to achieve economic convergence, which were described by the study's authors as insufficient, are responsible for the reason for this.

Another author dealing with the analysis of the degree of integration of the government bond market of the new European Union member states with the eurozone government bond market is Chaloupka J. The methodology used by the author is based on the use of price-based and news-based indicators. The study adopts two separate periods, namely the period before (2001-2006) and the period of the financial and fiscal crisis (2007-2011). The following countries were analyzed Czech Republic, Slovakia, Poland, Hungary, Slovenia, Latvia, Lithuania, Bulgaria and Romania. The study shows that the process of integration of the government bond market of individual European Union countries with the euro area government bond market differed significantly in the adopted periods. During economic stabilization there was a strong integration of both markets, while during the financial and fiscal crisis their degree of integration decreased. The Hungarian and Romanian government bond markets had the highest degree of integration with the eurozone government bond market, while the Czech market had the highest.

Similar conclusions are presented in his research by Lukic V. The research was based on an analysis of yield spreads and their volatility, as well as the development of the beta coefficient. Strong integration of the government bond markets of individual eurozone countries before 2008 was indicated, while the events related to the emergence of the financial and fiscal crisis led to disintegration of the eurozone government bond market. Disintegration processes were strongly visible especially after 2010.

2. Statistical Data and Methods

The study covered two countries belonging to the European Union, namely the Czechia and Hungary. The research period adopted in the study covers the period from the accession of the two countries to the European Union, up to the current period, namely 2004-2023. Monthly data of yields to maturity of 10-year government bonds of the Czechia and Hungary and Germany were used, which were adopted as benchmarks. The analyzed data came from the OECD Data database. Estimation of the model was done using GARCH (1.1).

A study to examine the degree of integration of the Czech and Hungarian government bond market into the eurozone government bond market constructed the following regression equation (Beale, et al. 2004):

$$\Delta R_{i,t} = \alpha_{i,t} + \beta_{i,t}\Delta R_{b,t} + \varepsilon_{i,t} \quad (1)$$

gdzie:

$\Delta R_{i,t}$ – the yield variation in country *i,* in Czechia and Hungary respectively at time *t*,

$\alpha_{i.t}$ – constant (intercept),

$\beta_{i,t}$ – the beta coefficient at time *t* in country *i* and with reference to beta value adopted as a *benchmark,*

$\Delta R_{b,t}$ – the yield variation adopted as a benchmark,

$\varepsilon_{i,t}$ – the economic (idiosyncratic) shock specific for a given country.

For the study, the assumption was made that the risk in a country's government bond market is identical to that of the benchmark country.

The coefficient for the government bond market in the country i takes the form:

$$\beta_{i,t} = \frac{cov_{t-1}(\Delta R_{i,t} R_{b,t})}{Var_{t-1}(R_{b,t})} = \rho_{i,b,t}\frac{\sigma_{i,t}}{\sigma_{b,t}} \quad (2)$$

gdzie:

$\sigma_{i,t}$ – the standard deviation for the yields in country *i,*

$\sigma_{b,t}$ – standard deviation for assets adopted as a *benchmark,*

$\rho_{i,b,t}$ – the correlation coefficient between yields on assets in the *i*-th country and in the country adopted as a benchmark.

In this case, the coefficient illustrates the level of integration of the country's government bond market and in relation to the country's government bond market taken as a benchmark, representing the eurozone government bond market. The value of the coefficient means no integration of the local government bond market with the eurozone market, while the closer the value of the beta coefficient to 1, the higher the degree of integration of these markets. A beta coefficient equal to 1 means full integration. At the same time,

in highly integrated financial markets, the intercept should be close to 0. In contrast, the greater the deviation of the value of the intercept from 0, the lower the degree of integration of the country's government bond market and in relation to the eurozone government bond market.

3. Empirical results of the model

Empirical results on the evolution of the beta coefficient and the intercept evolution for both the Czechia and Hungary support the same conclusions.

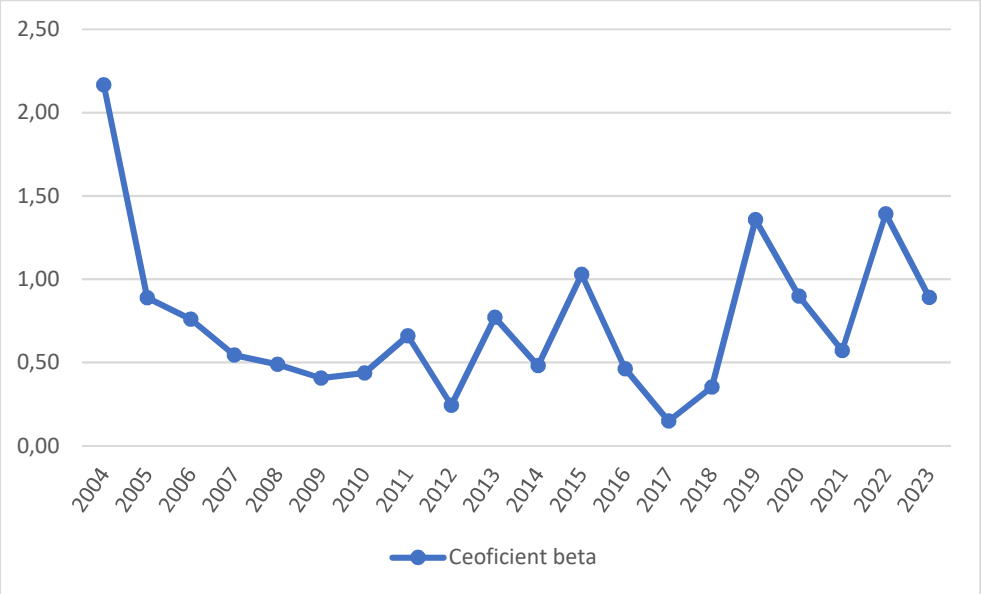

Figure 1. Beta coefficient evolution
Source: based on model estimation using software GRETL (1.1.) – *model beta coefficient evolution*

Analysis of the beta coefficient of the Czech government bond market shows a moderate level of integration of the Czech government bond markets with the eurozone government bond market throughout the period under review. In addition, there was a slight but gradual decrease in the level of integration of the Czech government bond market with the eurozone government bond market between 2004 and 2023.

The analysis of the evolution of the beta coefficient is confirmed by the analysis of the intercept evolution (see Figure 2).

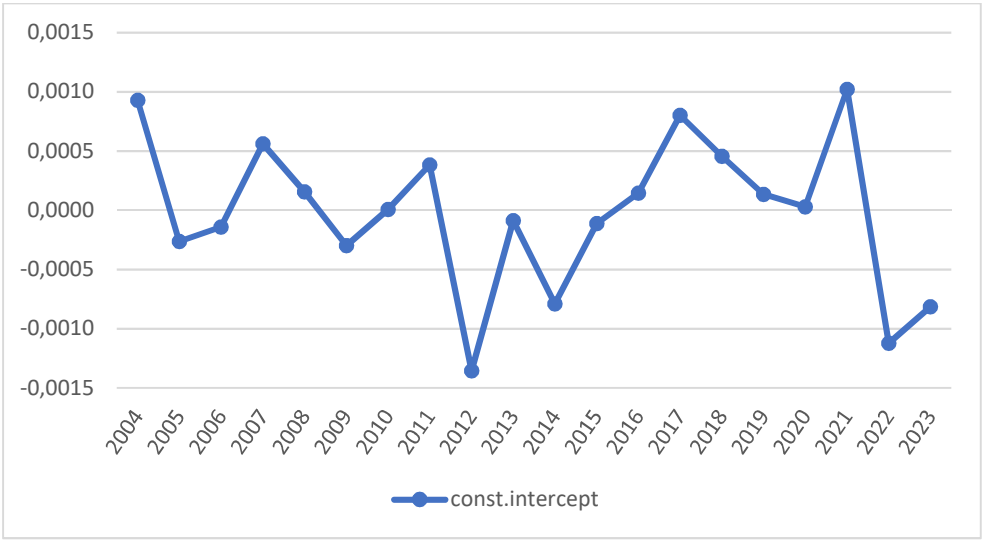

Figure 2. Intercept evolution
Source: based on model estimation using software GRETL (1.1.) – *model beta coefficient evolution*

The results of the analysis of the intercept evolution confirm the conclusions from the analysis of the evolution of the beta coefficient. During the period under review, there was a low degree of integration of the Czech government bond market with the eurozone government bond market.

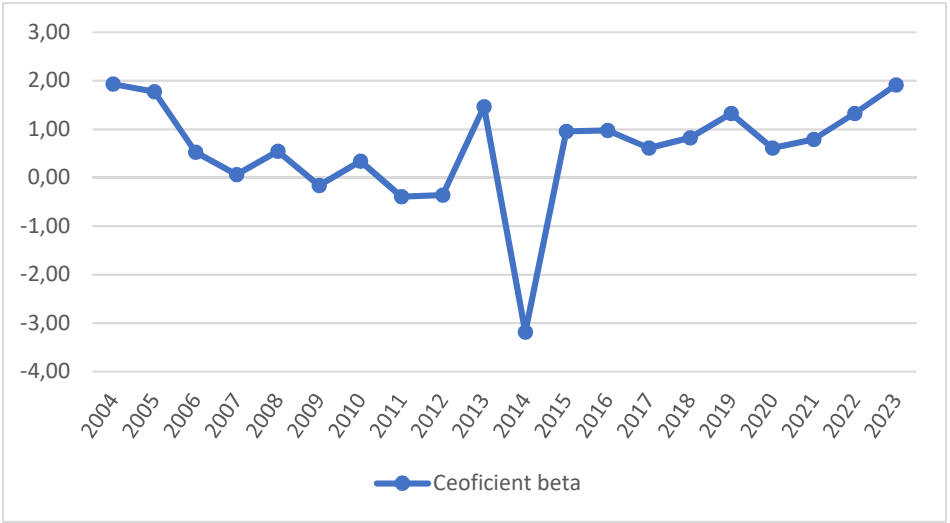

Figure 3. Beta coefficient evolution
Source: based on model estimation using software GRETL (1.1.) – *model beta coefficient evolution*

The value of the beta coefficient for the Hungarian government bond market indicates the disintegration of the Hungarian government bond market into the eurozone government bond market from 2004 to 2014, while from 2015 to the end of the period under review there was a high level of integration of the Hungarian government bond market into the eurozone government bond market.

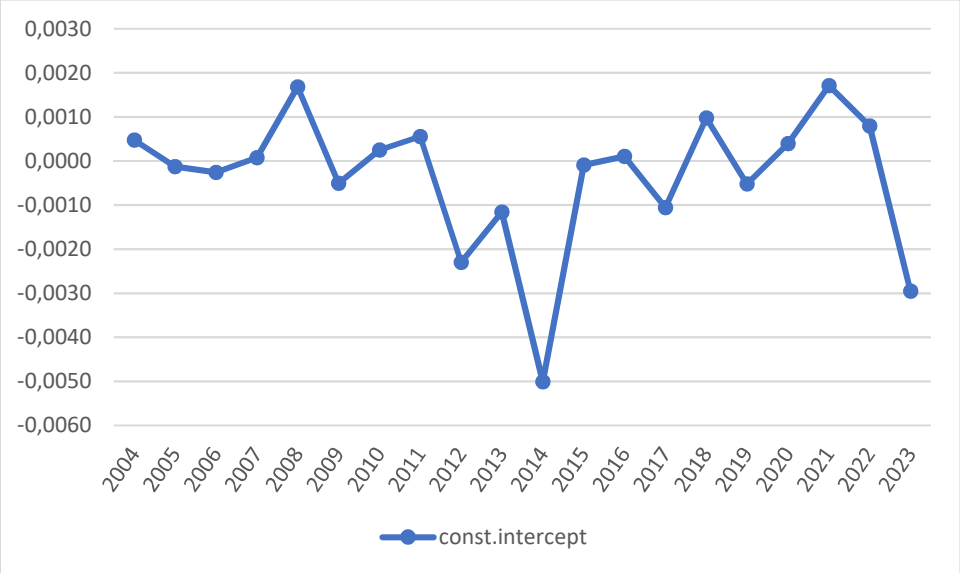

Figure 4. Intercept evolution
Source: based on model estimation using software GRETL (1.1.) – *model beta coefficient evolution.*

Analysis of the intercept evolution indicates a low degree of integration of the Hungarian government bond market with the eurozone government bond market. Only in the 2005-2007 period was the value of the constant close to 0, indicating a significant degree of integration of the Hungarian government bond market into the eurozone government bond market.

Conclusion

The conducted analysis indicates a clear disintegration of the Czech and Hungarian government bond markets with the eurozone government bond market. This is indicated by both the beta coefficient values and the analysis of the intercept evolution.

In the case of the Czechia, the beta coefficient indicates a moderate level of integration of the Czech government bond market into the eurozone government bond market. This is confirmed by the analysis of the intercept

evolution, whose shape deviates quite significantly from the value equal to zero.

However, in the case of the Hungarian government bond market, the beta coefficient indicates a very low level of integration of the Hungarian government bond market into the eurozone government bond market. This is confirmed by the analysis of the intercept evolution, the values of which indicate a low degree of integration of the government bond market in Hungary into the eurozone government bond market.

References:

1. Adam, K., & Jappelli, T., & Menichini, A., & Paduka, M., & Pagano, M., 2002, Analyse, compare, and apply alternative indicators and monitoring methodologies to measure the evolution of capitalmarket integration in the European Union, University of Salermo, Salermo;
2. Baele, L., & Ferrando, A., & Hordahl, P., & Krylova, E. & Monnet, C., 2004, Measuring financial integration in the euro area, European Central Bank Occasional Paper Series, No 14, 6-7;
3. Bukowska J.E., 2021, The Degree of Integration of the Bulgarian and Croatian Government Bond Markets into the Eurozone Government Bond Market, European Research Studies Journal, Volume XXIV, Special Issue 4, 412-420;
4. Bukowski, S.I., Financial Integration in the European Monetary Union, Routledge, London, 2020;
5. Chaloupka J., 2012, Government Bond Market Integration of New EU Member States International Journal of Trade, Economics and Finance, Vol. 3, No. 6, 472-478;
6. Kima S., Lucey B.M. i Wu E., 2006, Dynamics of bond market integration between established and accession European Union countries, Journal of International Financial Markets, Institutions and Money, Volume 16, Issue 1, 41-56;
7. Leschinski, Ch., Voges, M., Sibbertsen, P., Fractional Cointegration and EMU Government Bond Market Integration, Leibniz University Hannover, Hannover;
8. Leschinski, Ch., Voges, M., Sibbertsen P., 2021, Integration and Disintegration of EMU Government BondMarkets, Econometrics, Vol.9, No 13, 1-17;
9. Lukić V., 2016, Integration of Government Bond Market in the Euro Area and Monetary Policy, Journal of Central Banking Theory and Practice, 2016, Issue 1, 71-97;
10. Sensoy, A., Nguyen, D.K., Rostom, A., Hacihasanoglu, E., 2019, Dynamic integration and network structure of the EMU sovereign bond markets, Annals of Operations Research, Vol. 281, Iss. 1, No 14, 297-314;