Government Bond Market Integration of New EU Member States

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***Abstract*—In this paper we examine the level and dynamic of integration of the government bond markets of the new EU member states with the German market. We analyze interest rates on 10-year government bonds during the period 2001–2011 using the same methodology as the European Central Bank, i.e. price-based and news-based indicators. We found out that during times of economic stability the markets converged to Germany, whereas during times of economic slowdown the markets diverged. However, there exist substantial differences among the new EU member states. Basically, Hungarian and Romanian level of convergence was the lowest, whereas the Czech level of convergence was the highest.**

***Index Terms*—Central and Eastern Europe, EU, financial crisis, financial integration, government bonds.**

I. Introduction

Government bonds play an essential role in all developed economies. They serve as a main source of financing for governments and central banks use (short-term) government securities as the primary means of implementing monetary policy. Government bonds are also used as benchmark assets when pricing other securities, as they are perceived (at least before the Greek crisis) as risk-free assets. They also facilitate the financial system function as they are frequently used as collateral in various financial transactions. Government bonds, therefore, create an important asset in portfolios of financial institutions.

During the last few years the world has witnessed how important these assets are for the real economy due to the sovereign debt crisis in European Union (hereinafter referred to as the "EU"). Prior to the US subprime crisis of 2007 spreads on government bonds of euro area (hereinafter also referred to as the "EMU") countries were very narrow as these bonds were broadly considered as safe assets. Unfortunately, risks were significantly underestimated. The US subprime crisis of 2007 revealed the previously accumulated imbalances and miscalculations of risk which put solvency of many banks into question. Moreover, countries were confronted with declines in tax revenues and increased expenditures due to cost of supporting banks. The differences between economies of the EU came to the surface and markets questioned the capacity of the authorities to maintain the sustainability of public finances. Spreads between countries started to increase.

The debt crisis hit the whole EU in 2010 as the financial sector had invested in bonds of Greece and other periphery countries and today, the EU has to face severe crisis as the financial crisis spreads throughout the EU.

Integration of financial markets facilitated the free flow of capital prior to the crisis which helped to fuel the boom-and-bust cycle in some countries [1]. The crisis also revealed that integration was far from complete in many markets and was not matched by the appropriate supervisory structures.

For this reason, the European Central Bank regularly analyses the level of convergence of the government bond markets in the euro area. According to ECB [2], financial markets are perfectly integrated if the law of one price holds and thus, the interest rates equal for bonds of all countries.

However, the integration with euro area is important also for the new EU member states (hereinafter referred to as "NMS") as they are supposed to adopt the euro. In the case of imperfect integration of NMS after the adoption of the euro, the monetary policy of ECB might be ineffective or it can even have negative impact on NMS.

Thus, the aim of this paper is to measure the level of convergence of the NMS government bond markets to the EMU, to analyse the dynamics of the integration process and to identify the main factors that influenced this process. The analysis is based on exactly the same methodology as the one that ECB uses.

II. Literature Review

One of the first studies that investigated the integration of bond markets of the NMS were that of Pungulescu [3] and Dvorak and Geiregat [4]. They analysed the dynamics of interest rate spreads between eight NMS and the euro area and reported continuing decrease of the margins over time. Dvorak and Geiregat [4] also studied the impact of local and common factors as determinants of equity returns in NMS. They found that the role of common factors has increased over time which suggests deeper integration. However, these authors also pointed out that deterioration of the fiscal situation in Poland and Hungary led to widening of interest rate spreads in mid-2003 which is a proof that the integration process is not irreversible.

Reininger and Walko [5] analysed yield spreads and correlations between Czech, Polish and Hungarian bonds and German bonds during the period 2000–2005. They compared the development of yields to that of Greece, Portugal, Italy and Spain before they adopted the euro. They found out that the most integrated is the Czech market as its yields followed the same pattern as that of the Mediterranean countries. The Hungarian market, on the other hand, is the less integrated.

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They also showed that integration between the NMS and the euro area has evolved through three phases: the bull period 2000-2003 characterized by a sharp spread contraction, the bear period 2003-2004 of spread widening, and the second bull period 2004-2005, again marked by spread contraction. This cyclical pattern has also been documented in [4].

Kim et al. [6] analysed time-varying properties of the government bond market integration using dynamic cointegration and time-varying conditional correlation. Contrary to [5], they found only weak linkages between NMS and euro area and, moreover, they showed that those linkages are not strengthening over time. Surprisingly, they report that the Czech Republic is the least integrated due to high currency risks.

Capiello et al. [7] used the same sample of countries (i.e. the Czech Republic, Poland and Hungary) and the same period, but analysed GDP-weighted average probabilities of co-movements between these markets and Germany. Their result was that while the Czech Republic exhibits a significant probability increase, the remaining two countries do not, which is in contrast to findings in [6].

Poghosyan [8] used a threshold cointegration methodology to take into account the possibility of discontinuous adjustment to the long-run equilibrium due to market frictions. The author reports that financial markets in NMS became gradually more integrated with the euro area. However, the degree of integration differs across financial segments – whereas money markets are the most integrated ones, loan markets are the least integrated ones.

Baltzer et al. [9] studied spreads between 10-year government bond yields of the Czech Republic, Poland, Hungary, Slovakia, Cyprus, Malta and Slovenia and Germany with the result that for the period 2000–2006 most of the new EU countries have converged to Germany. Also the dispersion in yield spreads decreased over time from 300 basis points at the beginning of 2001 to about 50 basis points in 2006. They also utilized the regression analysis to investigate reactions of these markets to shocks in the German benchmark. They concluded that for the Czech Republic, Hungary and Poland, the slope coefficients fluctuated around one whereas, for the other economies slope coefficients tended to be close to zero.

Gardó and Martin [10] pointed out that after the fall of Lehman Brothers government bond spreads increased throughout NMS. However, this effect differed among NMS. In the course of 2009, spreads have come down considerably but were still clearly above pre-crisis levels. Yield spreads remained at elevated levels, notably in Romania, Latvia and Lithuania whereas spreads on Polish bonds remained relatively compressed.

Abad et al. [11] used an asset pricing model proposed by Bekaert and Harvey [12]. For the period 2004–2009 they investigated relative importance of country components versus other factors in explaining bond returns of both old and new EU member states. Throughout the period, the level of integration of new EU countries was slightly lower than that of the majority of old EU countries. In 2007, markets became more segmentation and the differentiation of country risk factors increased substantially across countries. However, the impact of the financial and economic crisis has been much more harmful for euro area since it has significantly slowed their integration.

Christiansen [13] investigated the time variation in the integration by measuring the explanatory power of European factor portfolios for the individual bond markets for each year. The author concludes that the integration was stronger for EMU than non-EMU members and stronger for old than new EU members.

ECB regularly publishes report on financial integration in EMU which is based on models suggested by Adam et al. [14] and Baele et al. [15]. According to ECB [2] high cross-border co-movements signal the presence of common driving factors among EMU markets prior to 2007. After 2007, the number of factors behind the sovereign yield movements increased. Priced-based measures indicate that for euro area sovereign bond markets country-level effects became more important in driving yield developments. However, the heterogeneity in EMU bond markets is still lower than in the period before the introduction of the euro.

The methodology of the ECB has been adopted by the Czech National Bank (hereinafter referred to as the "CNB") which regularly analyzes the level of integration of the Czech Republic, Slovakia, Hungary and Poland. In [16], the central bank states that till 2008 the speed and convergence to EMU market was relatively high. The following financial crisis, however, led to divergence.

III. Methodology

In this paper the integration of 10-year government bond markets is investigated for the period 2001–2011. The new EU member states analysed are the Czech Republic (CZ), Slovakia (SK), Poland (PL), Hungary (HU), Slovenia (SI), Latvia (LV), Lithuania (LT), Bulgaria (BG) and Romania (RO). As there are no Estonian sovereign debt securities, this country was not included in the analysis. As a benchmark, the German bond market was selected.

The methodology used in this paper is the same as suggested in [14], [15] and [17] and which is used by the ECB for measuring of integration of the euro area. The ECB uses three categories of indicators – price-based, news-based and quantitative-based indicators. In this paper, the price-based and news-based indicators are adopted.

Price-based indicators stem from the law of one price, which as mentioned above, should hold in fully integrated financial markets. The simplest way to prove the validity of the law of one price is to directly compute spreads between national bond interest rates and the benchmark bond interest rate:

$$p_{c,t} = i_{c,t} - i_{b,t} \quad (1)$$

where $p_{c,t}$ is the spread (difference) between the interest rate $i_{c,t}$ in country *c* at time *t* and the interest rate $i_{b,t}$ in benchmark country *b* at time *t*. The higher the difference, the less integrated the market is, and vice versa.

However, also the speed of diminishing of these differences can be measured. For this purpose, Goldberg and Verboven [18] proposed to use the unit root test with panel

data. The basic convergence equation can be expressed as:

$$\Delta p_{c,t} = \alpha_c + \beta p_{c,t-1} + \sum_{l=1}^{L} \theta_l \Delta p_{c,t-l} + \varepsilon_{c,t} \quad (2)$$

where $\Delta p_{c,t}$ is the first difference of the spread of country *c* at time *t*, α_c is the country specific constant which captures country *c* fixed effects that account for non-time dependent differences across countries, β denotes the speed of convergence and $\varepsilon_{c,t}$ is the time dependent error term. The number of lags *L* was determined by top-down approach starting with 8 lags. The equation was then repeatedly re-estimated until t-statistic of the longest lag equaled 1.96.

Under the null hypothesis of non-convergence, the parameter β equals zero as the shock to $\Delta p_{c,t}$ is permanent. On the other hand, large and negative β implies convergence as the shock vanishes over time. The larger the β coefficient, the faster the shock vanishes and the higher the speed of convergence is. Moreover, the approximate half-life of shock can be calculated as $-ln(2)/ln(1+\beta)$.

News-based measures are based on the assumption that bond interest rates should react only to news common to the whole market because local shocks can be easily diversified by investing in assets from other countries and therefore do not constitute a systematic risk. The news-based measures, therefore, measure the proportion of interest rates' changes that can be explained by common news. Changes in interest rates of a benchmark asset serve as a proxy for the common news. These changes should therefore explain the changes in interest rates in national markets.

To measure this relation, the ECB uses the following regression equation suggested in [15]:

$$\Delta i_{c,t} = \alpha_{c,t} + \gamma_{c,t} \Delta i_{b,t} + \varepsilon_{c,t} \quad (3)$$

where $i_{c,t}$ represents a change in interest rates of asset for the country *c* at the time *t*, $i_{b,t}$ is the change in interest rates of the benchmark asset at the time *t*, $\alpha_{c,t}$ is a constant and $\varepsilon_{c,t}$ represents a specific shock for the country *c* at the time *t*.

In a fully integrated financial market, a) $\alpha_{c,t}$ should equal to 0, b) $\gamma_{c,t}$ should equal to 1 and c) a proportion of variance:

$$VR_{c,t} = \frac{\gamma_{c,t}^2 Var(\Delta i_{b,t})}{Var(\Delta i_{c,t})} \quad (4)$$

also equal to 1 as the proportion of the variance should be fully explained by the common factor.

If values of the sensitivity coefficient $\gamma_{c,t}$ are higher than 1 then interest rates of local assets react stronger to common news than interest rates of the benchmark asset. If the value of $\gamma_{c,t}$ is negative, then the response of local interest rates is converse. However, perfect convergence presupposes identical systematic risks across countries. This presumption is strong for government bond markets as differences in credit and liquidity risks persist in individual markets. Thus, the slope coefficients $\gamma_{c,t}$ may differ from one even under full integration.

The proportion of local variance explained by the common factor $VR_{c,t}$ can serve as another measure of integration. However, the variance ratio $VR_{c,t}$ is not only positively related to gamma but also to the relative size of volatility in the benchmark and local bond market. Therefore, if the variance ratio is close to one, the reason might be that the benchmark bond interest rate changes are not of similar magnitude which can be result of differences in liquidity of these markets. Low liquidity is often problem of NMS markets.

In this paper, data from the ECB Statistical Data Warehouse were used. Information on changes in credit ratings was drawn from the database of Fitch Ratings.

IV. Analyses and Results

A. Price-based Indicators

First, spreads between German 10-years government bond and NMS bonds were investigated. These spreads (smoothed by the Hodrick-Prescott filter for monthly data) are presented on fig. 1 and 2.

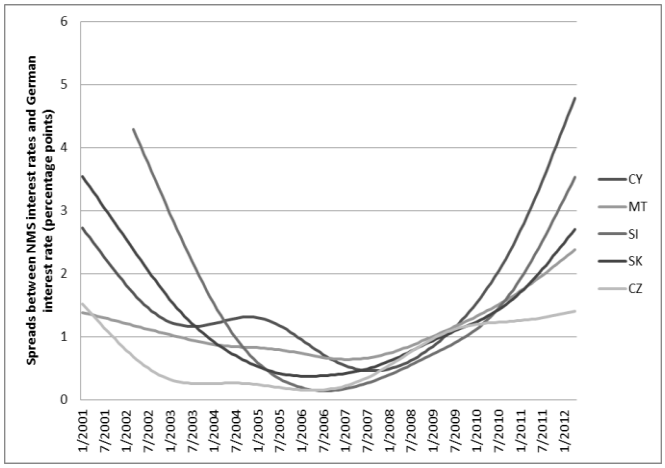

Fig. 1. Spreads between interest rates on German and NMS 10-years government bonds smoothed by the Ho drick-Prescott filter for monthly data (λ = 144,000).

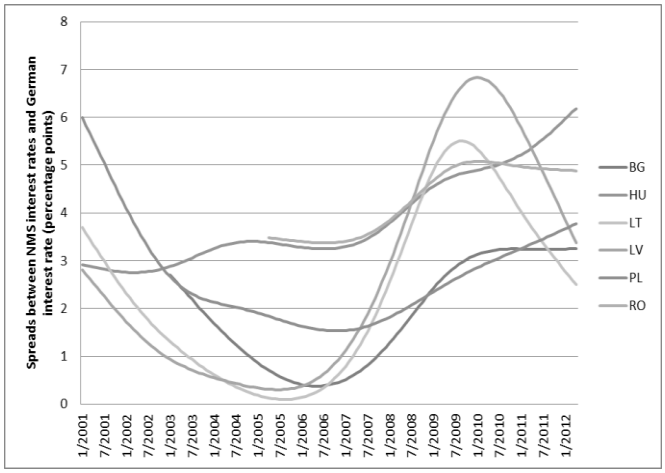

Fig. 2. Spreads between interest rates on German and NMS 10-years government bonds smoothed by the Hodrick-Prescott filter for monthly data (λ = 144,000).

For the period of 2001–2006, the convergence trend is apparent for all countries except for Hungary and Romania. The narrowing of spreads took place during the whole period and in the year 2006 spreads did not exceed 1 % for all countries except for Hungary, Poland and Romania. This implies strong convergence trend during the whole period of economic growth.

Table I presents the estimation results of (2) which shows the speed of convergence during the period prior to mid-2007. Please note, that Romania, Bulgaria and Slovenia were excluded from this estimation due to lack of data.

TABLE I: PANEL DATA ESTIMATION OF THE SPEED OF CONVERGENCE DURING 2001-2007

	Coefficient	Std. error	t-ratio	p-value	
α	0.0721	0.0171	4.2146	<0.0001	***
β	-0.0664	0.0098	-6.7501	<0.0001	***
θ	0.3119	0.0373	8.3612	<0.0001	***

TABLE II: COUNTRY SPECIFIC DUMMIES FOR 2001-2007

	Coefficient	Long-term differentials
CY	0.05905	0.88931
MT	0.05550	0.83584
SK	0.05414	0.81536
CZ	0.01199	0.18057
HU	0.19206	2.89247
LT	0.02801	0.42184
LV	0.04324	0.65120
PL	0.13260	1.99699

The coefficient estimate for β equals to -0.0664 with a t-statistic of -6.7501. According to [19], the critical values for t=100 and N=10 equal to -2.48 at 1% level of confidence. Based on this result, the null-hypothesis of non-convergence can be rejected. The half-life of a shock is approximately 10 months.

Table II displays country specific dummies α_c . By dividing these values by $-\beta$, the long-term systematic differentials can be obtained. These differentials are shown in third column of the table. These results confirm that prior to mid-2007 significant long-term differentials from the German market persisted on markets of Hungary and Poland.

As is apparent from fig. 1 and 2, the convergence trend reversed in mid-2007 and the spreads started to diverge. This was the time when the US sub-prime crisis broke out and creditworthiness of sovereigns came to question. On the contrary, German interest rates gradually decreased due to relative stability of its economy compared to other European economies.

However, the pattern of the turn-over was different among the NMS. According to the development of the spreads, the NMS can be divided into two groups. Bulgaria, Latvia and Lithuania witnessed jump in government bond interest rates and sharp increase was observed also in Hungarian, Polish and Romanian government bond interest rates as is apparent from fig. 2. Rest of NMS witnessed much smoother increase in spreads.

Sharpe increase in spreads of Baltic States was direct effect of the crisis, as they were among the worst hit by the global financial crisis of 2008. Especially the Latvian economy underwent severe downturn in its GDP and in February 2009 the Latvian government asked the International Monetary Fund (hereinafter refer to as "IMF") and the EU for an emergency bailout loan. This was a result of high capital outflow following the subprime crisis in the USA which led to crisis in Latvian banking sector. These factors in combination with high external debt led the rating agencies to downgraded Latvia's credit rating to non-investment grade.

Also Hungary requested financial help from IMF in 2008. Hungary was one of the most heavily indebted countries in the region and the outflow of foreign capital following the fall of Lehman Brothers in 2008 made the financial sector very weak. Therefore, banks gave fewer loans which led to a decrease in investment and further to economic recession. The country also faced political crisis. These factors caused the outflow of foreign capital and the rating agencies worsened their rating making the interest rates increase.

As for Romania, the country witnessed high foreign capital inflow till September 2008. After the bankruptcy of Lehman Brothers, however, the influx stopped and the GDP deteriorated. Thus, the tax revenues decreased and the government faced troubles in paying current expenses so that in March 2009, the government was forced to apply for loan from IMF. Also Romanian rating was downgraded and its government bond interest rates increased substantially.

Much smoother increase in the government bond spreads after 2007 was witnessed by the Czech Republic, Slovakia, Slovenia, Cyprus and Malta. These countries were not hit by the financial crisis directly but rather they were affected by the subsequent economic slowdown.

Since April 2011, interest rates of all NMS except for Hungary, Slovenia and Cyprus have been gradually decreasing. This might signal that the process of convergence has been renewed. However, the German interest rates decrease much faster than interest rates of any other NMS country.

The most dramatic increase in spreads in 2011 has experienced the Cypriot economy as its rating was downgraded below investment grade due to its high exposure to Greek banks, a devastating explosion at its main power plant and slow progress with fiscal and structural reforms. Cypriot government, therefore, has to rely on emergency loan from Russia to cover its budget deficit.

At the end of 2011, credit rating was also downgraded to non-investment grade for Hungarian debt due to its political situation. Hungarian government adopted several controversial measures, e.g. nationalization of pension funds, or limitation of the Hungarian National Bank independence, that threaten economics prospect of the country.

Increase in Slovenian spreads is also result of political factors. Slovenian government collapsed as it was unable to enforce public spending cuts and a new pension scheme. Moreover, Slovenian banks have close ties to Italian banks. This increases the risk that the government may need to provide additional support to Slovenia's banking system.

TABLE III: PANEL DATA ESTIMATION OF THE SPEED OF CONVERGENCE DURING 2007-2011

	Coefficient	Std. error	t-ratio	p-value	
α	0.2535	0.0404	6.2737	<0.0001	***
β	-0.0786	0.0124	-6.3248	<0.0001	***
θ_1	0.2570	0.0399	6.4453	<0.0001	***
θ_2	0.0550	0.0413	1.3328	0.1831	
θ_3	0.1405	0.0499	3.4279	0.0007	***

According to table III, the estimate of β, i.e. the speed of convergence of the group as a whole, equaled to -0.0786 with a t-statistic of -6.3248 for the period of crisis. Therefore, we can reject the null-hypothesis of non-convergence for this period as well. The half-life of the shock is approximately 8.5 months. This may suggest stronger convergence process during this period. However, these results must be viewed in combination with table IV, which reports country specific dummies α_c and long-term systematic differentials. The long-term differentials were substantially higher throughout the period of crisis, which, on the contrary, implies increased market segmentation.

The faster speed of convergence of the whole group, therefore, can be explained by strong divergence after the fall of Lehman Brothers that was followed by strong convergence after 2009. However, as is apparent from table IV, the segmentation still remains higher than in 2006. The most significant differences remain on Latvian, Lithuanian, Hungarian and Romanian market.

TABLE IV: COUNTRY SPECIFIC DUMMIES FOR 2007-2011

	Coefficient	Long-term differentials
CY	0.1961049	2.495862
MT	0.1291057	1.643152
SI	0.1382821	1.759941
SK	0.1318537	1.678126
BG	0.2476633	3.152055
CZ	0.1012396	1.288495
HU	0.4291223	5.461517
LT	0.3546612	4.513837
LV	0.4304608	5.478552
PL	0.2429858	3.092524
RO	0.3873906	4.930390

B. News-Based Indicators

According to responses to changes in German 10-years government bond interest rates, the NMS can be divided into two groups as well, as is apparent from fig. 3-6. These figures present the evolution of slope coefficients $\gamma_{c,t}$ from regression (3) and the variance ratio $VR_{c,t}$ as described by (4). The two groups differ in their level of convergence during the period 2001–2006.

Central European countries (i.e. the Czech Republic, Slovakia, Poland and Hungary) witnessed a process of steep convergence during the period prior to their accession in May 2004 as is presented on fig. 3. At that time, the most sensitive to German market news was the Czech Republic whose bonds even over-reacted during 2004. Slovak interest rates, on the other hand, remained almost insensitive prior to November 2005, which corresponds to the date of accession to European Exchange Rate Mechanism II (hereinafter refer to as "ERM II"). Since then, sensitivity of Slovak interest rates to news from Germany increased substantially till 2007.

The variance ratio on Fig. 4 confirms these results. However, only for the Czech Republic the proportion of the variance that can be explained by the common factor exceeded 50%.

The rest of the NMS did not converge to German market prior to 2004, as is apparent from Fig. 5. The group, however, was not homogenous - Malta, Slovenia and Lithuania became gradually more sensitive to movements in German rates between 2004 and 2008, whereas the rest of the countries remained insensitive throughout the whole period.

The reason for increasing convergence of Maltese, Slovenian and Lithuanian bonds might be the accession of ERM II as the beginning of the convergence process corresponds with date of joining the ERM II, i.e. June 2004 for Lithuania, July 2006 for Slovenia and July 2007 for Malta. Increasing sensitivity on Fig. 4 along with diminishing spreads on Fig. 2 denote increasing convergence of these countries after joining the ERM II till September 2008.

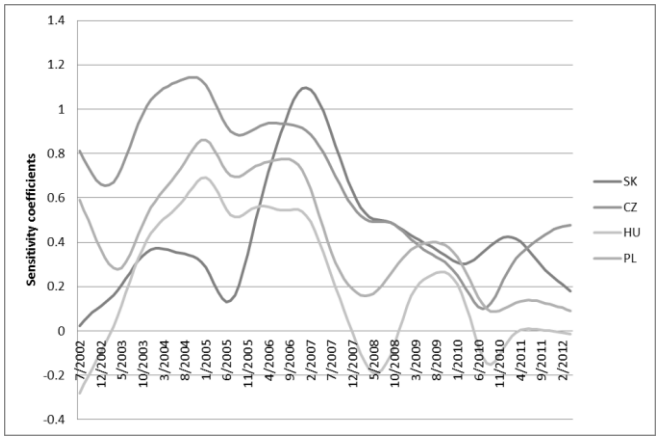

Fig. 3. Evolution of sensitivity coefficients smoothed by the Hodrick-Prescott filter (λ = 444) using Germany as benchmark.

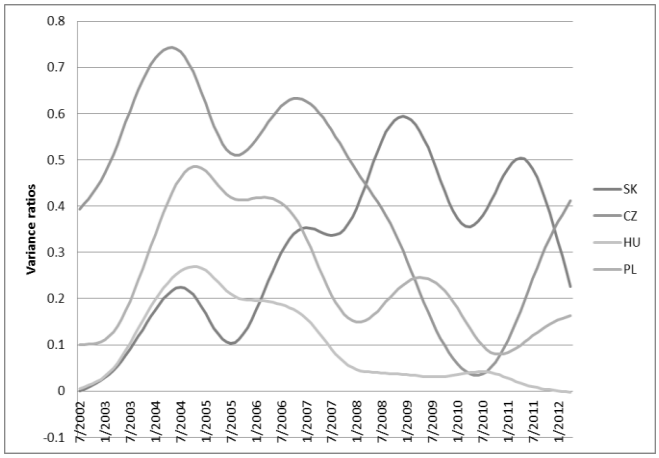

Fig. 4. Evolution of the proportion of variance explained by news from Germany smoothed by the Hodrick-Prescott filter (λ = 444).

As shown on Fig. 5, after the fall of Lehman Brothers in September 2008, all the markets of NMS gradually diverged and tended to react conversely to the development in the German market (except for Malta and Slovenia). The reason of this opposite reaction is the decreasing trend in German interest rates. This opposite reaction was remarkable

especially for Bulgaria during 2009. Decreasing sensitivity corresponds with increasing spreads on Fig. 2 and therefore, the period after September 2008 was marked with the process of divergence from the German market.

Comparing estimates of slope coefficients $\gamma_{c,t}$ with the variance ratio $VR_{c,t}$ as presented on fig. 6, however, leads to controversial results for Slovakia, Slovenia and Malta. The variance ratio for these countries increased substantially during the period of crisis, whereas, the slope coefficients remained low. As was said before, the variance ratio depends on the value of the slope coefficient as well as on the volatility of the particular country interest rates and the volatility of the benchmark interest rate. Therefore, the results for Slovenia and Malta are biased as the frequency of data is low and thus also the volatility is lower than the volatility of the German interest rate. This is, however, not the case of Slovakia. It seems that this market became more sensitive to common news after the crisis than before.

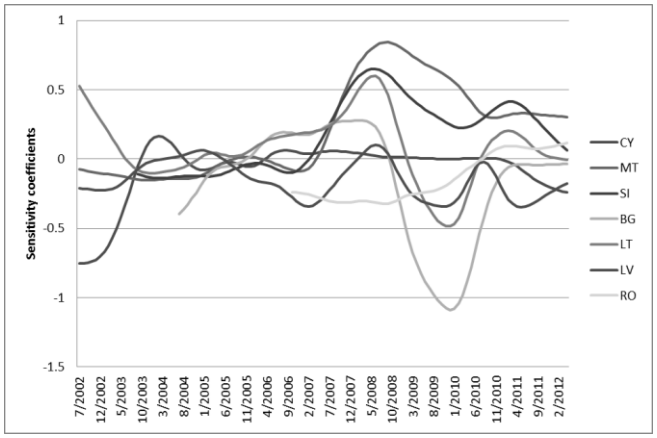

Fig. 5. Evolution of sensitivity coefficients smoothed by the Hodrick-Prescott filter (λ = 444).

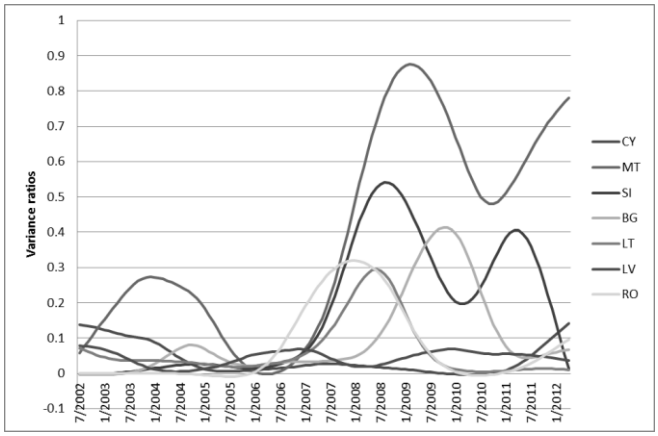

Fig. 6. Evolution of the proportion of variance explained by news from Germany smoothed by the Hodrick-Prescott filter (λ = 444).

Results suggest that for the period of crisis the changes in interest rates were driven purely by local factors, however, alternative explanation can be that the selected benchmark (i.e. German interest rate) did not react to common news. For this reason, in the following analyses the Greek interest rate was used as a possible benchmark. Fig. 7 and 8 display the evolution of slope coefficients and fig. 9 and 10 the evolution of the variance ratio. As is apparent, the results are very similar therefore, Greece can be rejected as a benchmark.

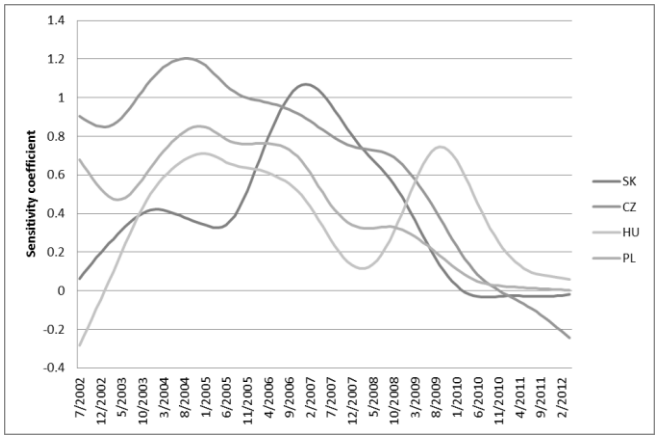

Fig. 7. Evolution of sensitivity coefficients smoothed by the Hodrick-Prescott filter (λ = 444) using Greece as benchmark.

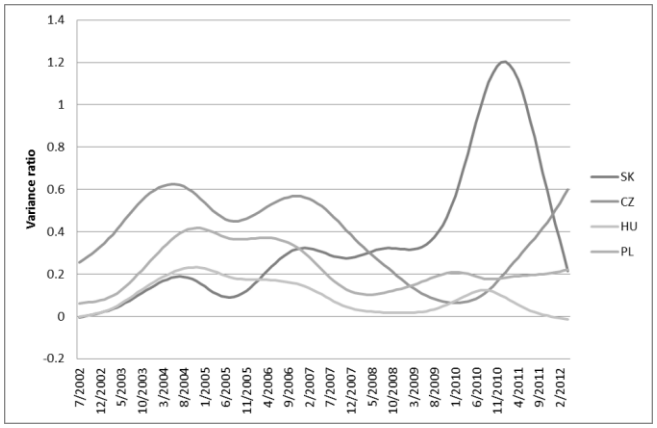

Fig. 8. Evolution of the proportion of variance explained by news from Germany smoothed by the Hodrick-Prescott filter (λ = 444).

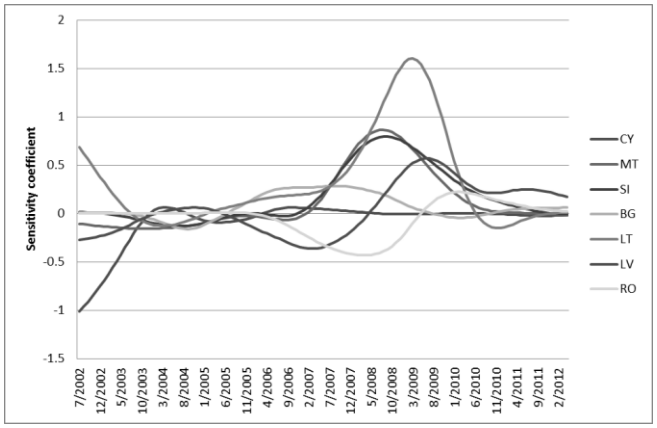

Fig. 9. Evolution of sensitivity coefficients smoothed by the Hodrick-Prescott filter (λ = 444) using Greece as benchmark.

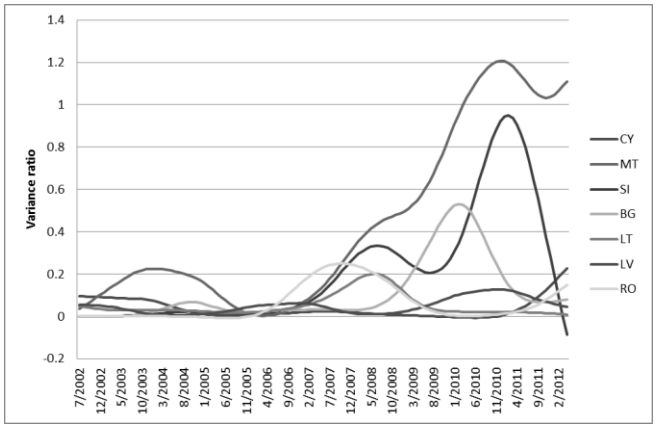

Fig. 10. Evolution of the proportion of variance explained by news from Germany smoothed by the Hodrick-Prescott filter (λ = 444).

V. Conclusion

Comparing the results of price-based and news-based indicators, we can conclude that the integration process differs for times of economic stability (i.e. 2001 – 2006) and for times of economic slowdown (i.e. 2007 – 2011). During the period of economic growth the NMS were converging to Germany, whereas, during the period of crisis the NMS were diverging.

In the period of convergence (i.e. till 2007), the spreads were decreasing for all countries but the sensitivity to news from German market was different among NMS. The Czech Republic and Poland became increasingly sensitive prior their accession to EU in May 2004 and remained relatively sensitive till September 2008. Slovakia, Slovenia, Malta and Lithuania became sensitive after their joining of the ERM II but diverged since the fall of Lehman Brothers. Cyprus, Bulgaria and Latvia were insensitive to news from German market.

After the fall of Lehman Brothers in September 2008, all the NMS diverged from the German market. The spreads were widening and markets became insensitive to changes in German interest rate. The divergence was strongest for countries that were hit by the crisis the most, i.e. Baltic countries, Hungary and Romania. On the other hand, the Czech Republic and Poland were hit just indirectly, but their level of integration decreased substantially as they were already on very high level of integration.

To conclude, the level of integration of Hungarian and Romanian market remained very low for both periods. On the other hand, the level of integration of the Czech Republic was high throughout both periods.

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