

MF Working

Paper

Series



Agnieszka Szczypińska

Does the halo effect still hold?
The (post-) crisis perspective for the euro candidates.

Does the halo effect* still hold? The (post-) crisis perspective for the euro candidates.

Agnieszka Szczypińska[†]

January 30, 2014

Abstract

The euro area bond yield spreads have largely converged since the EMU creation. However, during the crisis most eurozone members reported a dramatic rise in government bond yield differentials to German bonds due to deteriorating public finance and liquidity conditions as well as increase in investors' risk aversion. This paper provides an empirical analysis of determinants of government bond yield spreads in the euro area in time of the crisis and the aftermath. It indicates the significance of countries' fiscal performance and liquidity risk in explaining the evolution of bond differentials. It also demonstrates the significant role of country perception reflected in forecasts and rating changes. Sovereign debt crisis led to a change in the perception of EMU sovereign debt market. Nowadays, euro adoption does not automatically imply the lower profitability of new EA members' bonds. The "euro area level of interest rate" does not exist anymore. It seems to be more conditional on countries' macroeconomic policy. However, on the basis of panel estimation, it turned out that in case of almost all euro-candidates the theoretical values of the EMU convergence criterion bond yields (as if they were the euro area members) would be significantly lower than the empirical ones. This suggests fiscal benefits from euro adoption might be substantial thus most countries with derogation should reassess their scale.

JEL Classification: C23, E43, F34, H63

Keywords: euro area, sovereign bond yield spreads, convergence criteria, panel data

*The halo effect - overvaluing certain attributes while undervaluing others. In this case it means overvaluing benefits from UE/EA membership while undervaluing the general condition of the country economy.

[†]The Ministry of Finance in Poland, Bureau of the Government Plenipotentiary for Euro Adoption in Poland, The Financial Policy, Analyses and Statistics Department. PhD candidate at Warsaw School of Economics, Collegium of Economic Analyses. To correspond with the author, mail to agnieszka.szczypinska@mofnet.gov.pl This Working Paper is an updated version of the working paper *Does the halo effect still hold? Implications for the euro candidates from the analysis of the EA bond market*. The views expressed are those of the authors and do not necessarily reflect those of the Ministry of Finance in Poland.

1 Introduction

The financial crisis that started in 2007 had a great impact on the government bond market in the euro area (EA). Euro area yield spreads largely converged since the Economic and Monetary Union (EMU) creation and were relatively close until mid-2008 (see Appendix 1). However, since September 2008 the long-term government bond yield spreads to Germany have widened remarkably in the most euro area countries. In March 2009, spread of the Greek 10-year sovereign bonds to the benchmark German bonds (Bund) increased from 30 bps to 270 bps.

Most euro area countries reported a dramatic rise in government bond yields differentials to Germany as well. Sovereign yield spreads widened due to deteriorating public finance and liquidity conditions in international markets, as well as an increase in general investors' risk aversion. This in turn influenced the countries' capacity to meet their future debt obligations and made investors less willing to provide sovereign borrowers with funding.

The evolution of sovereign bond spreads vis-à-vis Germany was widely commented as a reassessment and differentiation of country risks. This is an important issue in the context of the European fiscal framework. Not only did the Stability and Growth Pact indicate the concept of peer pressure, i.e. European Union (EU) forces some member states suffering from excessive deficits to correct them, but also stressed the idea of financial markets' pressure on countries with unsustainable fiscal position. However, the differentiation of country risk across the euro area members was not considered before the financial crisis. The free rider problem¹ has been observed in the euro area.

The economic literature has responded very actively to the euro area sovereign debt crisis but most existing studies do not capture the most recent and intense phase of the eurozone crisis (2009 onwards) and do not place emphasis on the bond profitability during the crisis and afterwards. The previous empirical studies usually did not take into account all euro area countries at once and match fiscal variables with credit and liquidity risk or market perception of the country's performance.

The purpose of this study is to identify the determinants of yield spreads in euro area taking into account both crisis period and the aftermath and test empirically their influence on government bond yields in the euro area and countries with derogation – NMS-7². Panel estimation will let calculate the theoretical values of interest rates of the candidate countries as if they were the euro area members. This, in turn, would enable to reassess most of the fiscal benefits from accessing the common currency area.

The paper is structured as follows: Section 2 reviews the determinants of yield spreads in the euro area indicated in the economic literature; Section 3 describes the methodology, data and presents the results of empirical study;

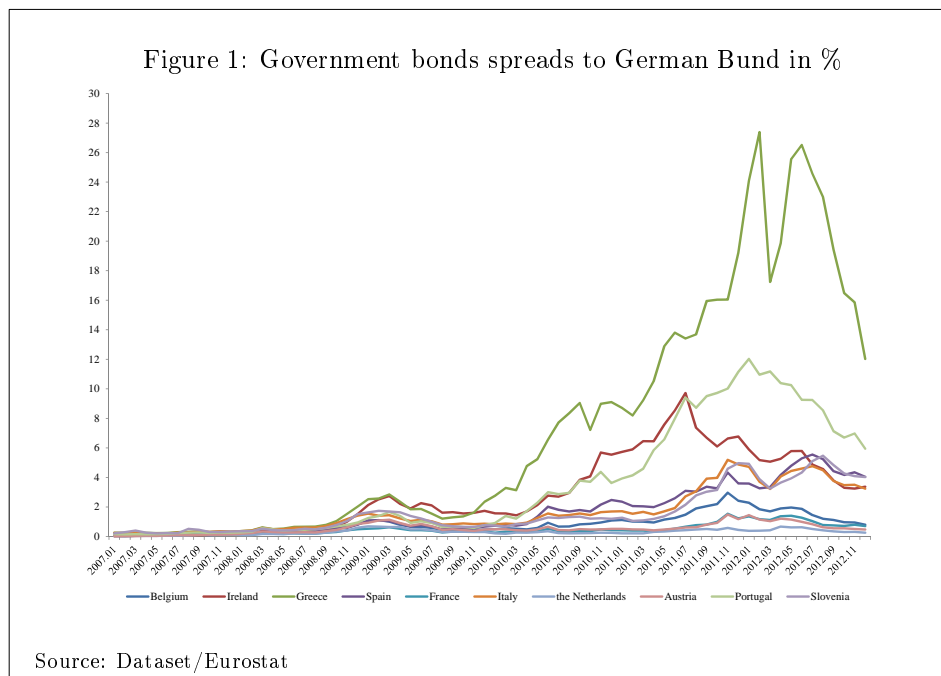
¹The free rider problem (aka the halo effect) – benefitting from resources, goods or services without paying for their costs.

²NMS-7 – New Member States: Bulgaria, Lithuania, Poland, The Czech Republic, Latvia, Romania and Hungary, which did not belong to EA until 2013)

Section 4 shows the implications for euro-candidates and Section 5 summarizes main findings, discusses the implications of the results and indicates fields for future research.

2 Determinants of yield spreads in the euro area - literature review

The seminal paper concerning the empirical analysis of government bond yields was published by Edwards in the American Economic Review (1984) – “LDC Foreign Borrowing and Default Risk: An Empirical Investigation, 1976-80”. He related then sovereign spreads to the market perception of countries’ default risk. However, the euro area sovereign debt crisis brought forward in discussion the more pronounced role of the solvency risk in countries with weak fiscal fundamentals and the risk of contagion among euro area countries’ sovereign bonds. Figure 1. presents the range of the government bond spreads to German Bund in 2007-2012:



Previous studies suggest that sovereign bond spreads may be explained by a set of financial, fiscal or other macroeconomic variables as well as investors’ assessment of a country’s creditworthiness. Studies conducted so far analysed both euro area-wide and country-specific characteristics that exert a significant impact on the sovereign bond spreads in the EA. Most researchers indicate

similar factors which contribute to fluctuations of bond yield spreads to German Bund, which are presented below.

Credit risk. There are three types of credit risk:

- default risk – the probability that the issuer fails to meet the obligations on coupon payments or repayment of principal at maturity,
- credit spread risk – the probability that the market value of the bond will decline more than the value of other comparable bonds,
- downgrade risk – the possibility of a downgrade by a credit rating agency.

As Barrios et al. (2009) point out, the financial crisis has had a significant impact on all three types of credit risks. The deterioration of fiscal position brought forward in discussion the importance of the public finance sustainability. Not only government debt and deficit but also high current account deficit in some euro area countries intensified market perception as those countries were identified as vulnerable to reversals in international flows of funding. In addition, credit rating agencies downgraded the debt of several euro area sovereign issuers. This might have directly influenced the institutional investors' decisions in terms of portfolio allocation due to the managers' limits on investment depending on the credit rating. Moreover, during the crisis governments have taken on large liabilities which are likely to affect their perceived creditworthiness. Credit risk premium depends on each issuer's specific factors but is also determined by the degree of investors' risk aversion and global uncertainty concerning international financial markets. In times of lower risk appetite the global risk premium tends to increase. This contributes to an increase in the yield spreads of countries which are assessed as having a higher default risk in comparison to lower risk countries. The financial crisis intensified the risk of those countries that report long periods of a slow economic growth and sudden stops in external financing. Countries suffering from higher current account deficits have experienced sharper increases in bond yield spreads versus Germany.

Liquidity risk. National bond markets in the euro area are diverse in terms of liquidity. To the factors that determine liquidity belong the issuing volume, the national issuing policy and the existence of sufficiently liquid futures markets that offer hedging possibilities to investors. Liquidity risk and credit risk are interconnected. On the one hand, an increased supply of government bonds, as observed in 2009, should put downward pressure on liquidity premia. On the other hand, high supply is also associated with increased public deficit and debt and thus a higher credit risk premium. The return demanded by investors is expected to be lower in case of bonds that can be traded quickly, at low cost and without major price changes because less liquid assets imply higher trading costs. Barbosa and Costa (2010) concluded that in times of increased macroeconomic uncertainty

and greater volatility in financial markets, there is a higher likelihood of the need to unwind an investment position quickly. This should increase the demand for assets that can be traded at low cost. In these periods, higher liquidity risk contributes to an increase in liquidity premia, suggesting the existence of a positive correlation between liquidity and credit risk premia. According to Schwarz (2010), determining the component that plays the greater role is important for policymakers and investors. If default risk is the main component, only appropriate measures aiming at improvement of the issuer solvency are likely to be successful. Whereas if the market liquidity is the main driver, approach resulting in better market functioning is the most effective.

General investors' risk aversion. In times of financial uncertainty, investors rebalance their portfolio and tend to invest in less risky securities as their risk aversion increases. In principle, all government bonds should benefit from that because in comparison to other assets they are considered as less risky ones. However, among euro-area sovereign issuers, the German Bund is perceived to be the "safest haven" both in terms of credit quality ("default-free") and liquidity. Therefore, in times of high risk aversion, the "flight-to-safety" and "flight-to-liquidity" flows to the German government bond market are more pronounced than in case of other sovereign bonds. Liquidity conditions alter the impact of changes in risk aversion on current prices and yields. According to Bernoth and Erdogan (2010), in periods of high global risk aversion, the interest rate differentials of EMU countries versus Germany rose. Two years before the fall of Lehman Brothers, the impact of the global risk factor on euro area yield differentials increased continuously and became again significant. Thus, financial markets started to worry about the countries' creditworthiness long before the outbreak of the financial crisis.

Fiscal rules. Fiscal rules do not have a significant explanatory role regarding sovereign bond yields as such. However, as Iara and Wolff (2010) underline, they are highly relevant when investors become risk averse. In periods of increased global risk aversion, countries with better fiscal rules witness lower increases in sovereign bond yields referring to Germany. Better fiscal rules can thus effectively reduce sovereign bond spreads in times of turbulences in international markets. Under extreme circumstances, better fiscal rules can reduce sovereign bond spreads between euro area member states and Germany. The European Commission computes a proxy variable for fiscal rules which is a compilation of statutory base of the rule, room for revising objectives, mechanisms of monitoring compliance with the enforcement of the rule, existence of pre-defined enforcement mechanisms and media visibility of the rule. This index does not have any economic interpretation but turned out to be significant in numerous analyses concerning the issue of sovereign bond yield spreads.

Deterioration of the fiscal position (in terms of debt and deficit). Before the crisis, financial markets paid no attention to government deficit ratio, while they almost continuously monitored the (projected) debt to GDP ratio of the individual countries as it is also the most relevant variable to assess fiscal sustainability. Fiscal development is also taken into consideration while assessing growth prospects of an economy and the government commitments to repay (De Santis, 2012). Growth prospects are in turn relevant for the rating agencies while the economic condition assessments.

Country’s financial sector soundness and its price competitiveness. As Dötz and Fischer (2010) indicate, the combined effect of both variables has proved to be important for spread developments during the crisis. This suggests that price competitiveness moved into investors’ focus as financial sector soundness weakened. Effect of country’s financial sector soundness and its price competitiveness is expressed by country rating.

Risk of a break-up of the Economic and Monetary Union. Studies conducted in the recent period find, according to Di Cesare et al. (2012) and Canofari , the divergence in sovereign bond spreads in EA cannot be fully explained by weak macroeconomic fundamentals, especially in the last phase of the crisis. The authors prove their hypothesis by indicating the lack of some risks that should have been taken into consideration while analysing the evolution of bond yields in the common currency area. Di Cesare et al. (2012) point out that euro area sovereign bond spreads are significantly affected by investors’ concerns of a break-up of the Economic and Monetary Union. The greatest divergence of the sovereign spreads emerged in the time of the highest volatility in financial markets as a result of market players’ conviction of the risk of euro area break-up. However, from a time perspective, after implementing rescue packages for some periphery countries and institutional reforms in the whole EU, this kind of risk seems not to be a driving factor of the bond spreads evolution.

3 Empirical study

3.1 Methodology and data description

Estimation is conducted via panel-data model by feasible generalized least squares method (GLS). It is also assumed that model specifies a heteroskedastic error with cross-sectional correlation.

The GLS results are given by:

$$\hat{\beta}_{GLS} = (X'\hat{\Omega}^{-1}X)^{-1}X'\hat{\Omega}^{-1}y$$

$$\hat{Var}(\hat{\beta}_{GLS}) = (X'\hat{\Omega}^{-1}X)^{-1}$$

In the estimation we used monthly data that cover the period 2007-2012.

The dependent variable is represented by 10-year EMU convergence criterion concerning bond yields published by the Eurostat.

The most commonly used indicators of a country's fiscal position are the general government debt and deficit ratio to GDP. The deterioration of fiscal position informs investors about increasing risk of sustainability of a country's fiscal policy. The expected sign of these variables is positive, i.e. increasing deficit/debt should raise the bond yields.

5-year CDS spreads relative to Germany, published by Bloomberg, were applied to measure the credit risk. However, movements in sovereign CDS premia may not only reflect changes in the assessment of the credit quality but also changes in global risk perception. As credit risk may be influenced by large current account deficits in some EA countries, the current account balance relative to GDP was also included in the analysis.

To assess liquidity risk, 10-year bid-ask spreads of treasury bonds (published by Reuters) were included in line with the literature. Bid-ask spreads are better indicators for gauging liquidity conditions in bond markets than traded volumes because volume data may be affected by multiple operations between bank's affiliates to meet balance sheet requirements. Thus, big variations in traded volumes might have little bearing on actual liquidity.

In this analysis, we applied the rating changes (including perspectives) reported by Moody's. This indicator is a proxy of both country's financial sector soundness and sovereign credit risk.

We used also European Commission's forecasts of GDP growth because this indicator delivers information about possible recoveries or slowdowns in the analysed economies which investors pay much attention to.

The additional variable is fiscal rule index (European Commission's forecast for 2011 and 2012). This index has been constructed by the fiscal policy unit of the European Commission's Directorate-General for Economic and Financial Affairs on the basis of information concerning fiscal governance obtained from the EU member states via the Economic Policy Committee of the Ecofin Council of the EU. The index improvement is achieved by strengthening one or several existing numerical fiscal rules either by introducing new numerical fiscal rules or extending the coverage of general government rules.

In order to include the diversity of countries the estimation covers, there were dummies applied which indicate if a given country belonged to the EA in the whole period sample or if it's considered as a EA core-country. To the EA core belong: Belgium, Germany, France, the Netherlands, Austria and Finland.

3.2 Estimation results

The model covered 15 euro area countries (balanced panel). Estonia and Luxembourg were excluded. For Estonia there were numerous missings in the data, especially in terms of long-term interest rates. Luxembourg was not taken into account due to widely developed financial sector which distorted the estimation. The results of estimation are presented in Table 1.

Table 1: Results of panel estimation

Estimated covariances	120	Number of obs	1080
Estimated autocorrelations	0	Number of groups	15
Estimated coefficients	9	Time periods	72
		Wald chi2 (8)	2285.12
		Prob > chi2	0.0000

EMU criterion	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
bid-ask	0.0116356	0.0005354	21.73	0.000	0.0105863 0.0126849
fiscal rule	-0.0038881	0.0001305	-29.80	0.000	-0.0041438 -0.0036324
debt	0.011499	0.0006063	18.96	0.000	0.0103106 0.0126874
cds	0.0011745	0.000541	21.72	0.000	0.0010685 0.0012805
rating change	-0.0005416	0.0001058	-5.12	0.000	-0.000749 -0.0003343
f. GDP growth	-0.0463383	0.0062135	-7.46	0.000	-0.0585166 -0.03416
EA	-0.0033044	0.0004007	-8.25	0.000	-0.0040897 -0.002519
core	-0.0104582	0.0004593	-22.77	0.000	-0.0113585 -0.009558
cons	0.0430569	0.0005844	73.67	0.000	0.0419114 0.0442024

Source: Author's estimations based on Stata 11 (only significant variables included)

Looking at the results, debt (as fiscal variable) proved to be a significant determinant in explaining bond yields evolution. The positive sign of the coefficient suggests an increase in bond yield spreads in case of rising general government debt. It is worth underlining that before the crisis, financial markets paid no attention to government deficit ratios, while they almost continuously monitored the (projected) debt to GDP ratio of the individual countries (Bernoth et al., 2012). In this analysis, covering the crisis period and the aftermath, the influence of the deficit ratio turned out to be of less importance as well.

The results also reveal an important role of credit risk in driving yield spreads up as proved by the significance of CDS variable in the estimation. An increase of 1 basis point in the CDS spread (i.e. a relative rise on the insurance costs of 1,000 euro per 10 million euro of government debt compared to Germany) leads to an increase of 0.001 in the 10-year government bond yield spread.

Liquidity seems to play a meaningful role in explaining the evolution of yield spreads. The positive coefficient means that an increase in the bid-ask spread, which means that the market is less liquid, leads to an increase in the yield spread.

In line with the literature, the estimation results indicate that better

fiscal rules reduce sovereign bond spreads in times of turbulences in international markets.

Intuitively, the change of country's rating seems to play an important role in terms of interest rate level. The same concerns forecasts of GDP growth. Both variables deliver information about possible future condition of the economies. The dummy variables application improved the model quality and the variability identification between the countries the sample covers.

The analysis confirms the importance of countries' fiscal performance not only during the crisis but also after this period. Besides, this paper supports the 'convergence trade' hypothesis for the pre-crisis period, described by Arghyrou and Kontonikas (2010), according to which before the credit crunch markets took into consideration only the best-case scenario of full convergence to German fundamentals, even in case of countries suffering from a deterioration of their macro-fundamentals. Neither poor macro-fundamentals nor the very low risk factor were priced. This approach has changed dramatically during and after the crisis period – currently markets are pricing both the international risk factor and individual fiscal performance of a given country. The previous behaviour could be explained by stable global liquidity over the last years as well as expectations that euro adoption would result in growth-inducing reforms in periphery countries. The lack of a mechanism establishing credibility for the “no-bail-out” clause of the Maastricht Treaty might have also been of a great importance in this approach.

It seems that market players were almost certain that investment in EMU sovereign bonds is associated with a very little default risk. In addition, the EMU governments were not efficiently monitored by any EU mechanism in terms of improving macro-fundamentals. This, in turn, resulted in further real divergence within the euro area. In effect, normalization of the global economic outlook did not narrow EMU spreads and bond yield spreads will be expected to remain high as long as intra-EMU imbalances maintain.

The crisis has exposed the necessity of imposing the institutional reforms at the union level especially in two aspects. On the one hand, the eurozone must improve mechanisms of fiscal governance and policy coordination. On the other hand, it is essential to prevent the EMU countries from crisis contagion, if any occurs among the euro area member states. In order to achieve these goals, a permanent mechanism of emergency financing must be created which will reassure investors that there is no default risk associated with the EMU sovereign bonds itself.

4 Implications for euro-candidates

The euro adoption implies significant changes that the joining country faces. First of all, the country-specific nominal exchange rate adjustments against other countries are no longer possible. Secondly, the monetary policy is set by the European Central Bank which may not be optimal for all member states. Moreover, participation in the monetary union will imply adoption of fiscal

stringent measures such as Fiscal Compact. Having that in mind, it is necessary for the euro area candidate countries to reestimate fiscal benefits from euro adoption, when deciding on the timing of euro area accession.

Szczerbak et al. (2009) estimated influence of euro adoption on public debt management. First, lower interest rates in the euro area lead to decrease in debt service costs. Savings stem from the convergence of the market interest rates, measured by swap values, and result in an increase in the issuer's creditworthiness. Second, the national financial market will become a part of a greater and more liquid euro market. The access to this market will decrease the risk of demand barrier and let the debt manager create the risk profile without restraint. The limited issuer's influence on the market prices and the direct competition of other government issuers belong to the supply factors. Third, the strategy of debt management costs minimization in the long term will take place in new external conditions so adjustment of the institutional structure of debt management will be necessary to tackle challenges and opportunities the euro market offers.

In order to estimate the influence of euro adoption on the long-term interest rate level, we calculated the theoretical values of the EMU convergence criterion concerning bond yields for Poland, the Czech Republic, Bulgaria, Hungary, Lithuania, Latvia and Romania. They were assessed on the basis of the estimation results (see previous section) with the assumption of unchanged fundamental factors as well as automatic and uniform effects for the euro candidates that will follow the EA accession. Thus, the disparity between the empirical and theoretical values results only from a different appraisal of debt instruments by the financial markets, when a given country is a EA member state. The benefits from euro adoption are assessed then in the pessimistic scenario, which does not cover the positive changes in other factors implied in this analysis, i.e. lower general government debt.

In case of most euro-candidates the theoretical values are lower than the empirical ones published by Eurostat (see Appendix 2). The Czech Republic is the exception where the theoretical values are lower until mid-2009 but afterwards are higher than the empirical values. This result is not surprising because the Czech Republic used to have "the safe haven status" in this part of Europe due to positive investors' assessments of creditworthiness regardless of its fiscal condition. Besides, the Czech Republic is not willing to become the EA member in the near future. It is also worth underlining that at the end of 2012 Poland reported the lowest interest rates in history. For this period the theoretical value of 10-year interest rates (EMU criterion) is equal to the empirical one.

Lower interest rates resulting from the euro area membership would lead among others to a significant decrease in the cost of public debt service. These results confirm the "halo effect" still exists to some extent which may suggest that fiscal benefits from euro adoption should be reassessed in case of most countries with derogation.

5 Conclusions

The euro area sovereign debt crisis brought forward in discussion the importance of the safe assets, the sovereign solvency risk in countries with weak fiscal fundamentals and the risk of contagion among euro area countries' sovereign bond spreads.

Among the Maastricht convergence criteria, the long-term interest rate is a measure of the durability and sustainability of a country's convergence process and a reflection of the market perception of the macro-fundamentals sustainability, in particular regarding the fiscal balance and risk premia.

The panel estimation, analyzing the determinants of the sovereign bond yield spreads, indicates the significance not only of fiscal variables, credit and liquidity risks but also the market perception of the economy condition in explaining movements in yield differentials. However, this does not imply that government balances are not meaningful during the crisis. As Roberto A. De Santis (2012) points out, the euro area countries with the largest government deficit-debt combination and therefore with the highest credit risk were subject to numerous credit rating changes and mostly affected by the crisis.

Theoretical values of the EMU convergence criterion concerning bond yields calculated on the basis of the panel estimation are lower than the empirical ones in most cases of euro-candidates which means that the euro area membership may lead among others to lower costs of public debt service. This suggests fiscal benefits from euro adoption should be reassessed in case of most countries with derogation.

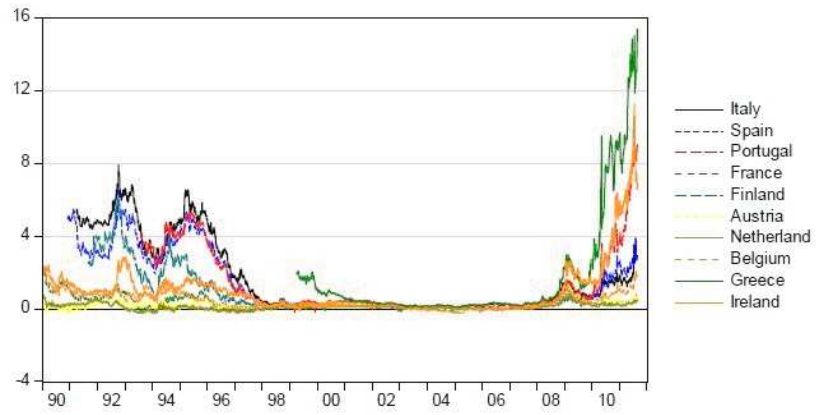
The market must take into consideration the future EA enlargement. So it formulates expectations concerning the date of euro adoption by new countries (euro-day). However, it turned out that the assumptions of euro-day estimations are no longer up-to-date. It is mainly due to the fact that the "euro area level of interest rate" does not exist anymore. In future work it is planned to expand the analysis by indicating the new assumptions for euro-day estimation. From the perspective of countries with derogation it is necessary to create new fundamentals of euro-day estimations because fiscal benefits from euro adoption and the market conviction of the certain date of this event are meaningful for the strategy of general government debt management.

References

- [1] Alexopoulou, I., Bunda, I., Ferrando, A. (2009), *Determinants of government Bond spreads in new EU countries*, Eastern European Economics, Vol. 48.
- [2] Attinasi, M., Checherita, C., Nickel, Ch. (2009), *What explains the surge in euro area sovereign spreads during the financial crisis of 2007-09?*, Public Finance and Management, Vol. 10, No. 4.
- [3] Arghyrou, M., Kantonikas, A. (2010), *The EMU sovereign debt crisis: Fundamentals, expectations and contagion*, Journal of International Financial Markets, Institutions and Money, Vol. 22, No. 4.
- [4] Baltagi, B. (2008), *Econometric Analysis of Panel Data*, John Wiley & Sons, Ltd.
- [5] Barbosa, L., Costa, S. (2010), *Determinants of sovereign bond yield spreads in the euro area in the context of the economic and financial crisis*, Banco de Portugal, WP No. 22/2010.
- [6] Barrios, S., Iversen, P., Lewandowska, M., Setzer, R. (2009), *Determinants of intra-euro area government bond spreads during the financial crisis*, European Commission, Economic Papers No. 388.
- [7] Bernoth, K., Erdogan, B. (2012), *Sovereign bond yield spreads: a time-varying coefficient Approach*, Journal of International Money and Finance, Elsevier, wol. 31(3).
- [8] Borgy, V., Laubach, T., Mesonnier, J., Renne, J. (2012), *Fiscal policy, default risk and euro area sovereign bond spreads*, Banque de France, WP No. 350 .
- [9] Bussiere, M., Chudik, A., Mehl, A. (2011), *How have global shocks impacted the real effective exchange rates of individual euro area countries since the euro's creation*, Federal Reserve Bank of Dallas, WP No. 102.
- [10] Canofari, P., Marini, G., Piersanti, G. (2013), *Expectations and systemic risk in EMU government bond spreads*, University of London, WP No. 112.
- [11] Daras, T., Hegemejer, J. (2008), *The long run-effects of the Poland's accession to the eurozone*, National Bank of Poland, WP No. 70.
- [12] De Santis, R. (2012), *The euro area sovereign debt crisis, safe haven, credit rating agencies and the spread of the fever from Greece, Ireland and Portugal*, European Central Bank, WP No. 1419.

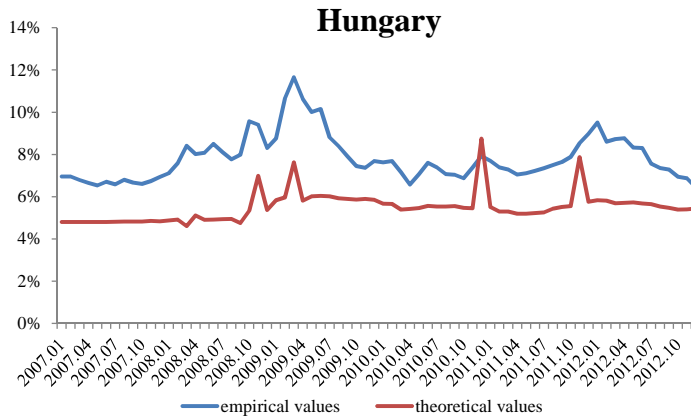
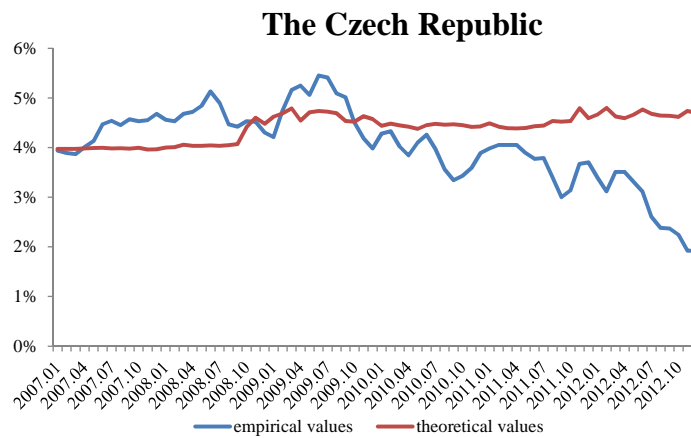
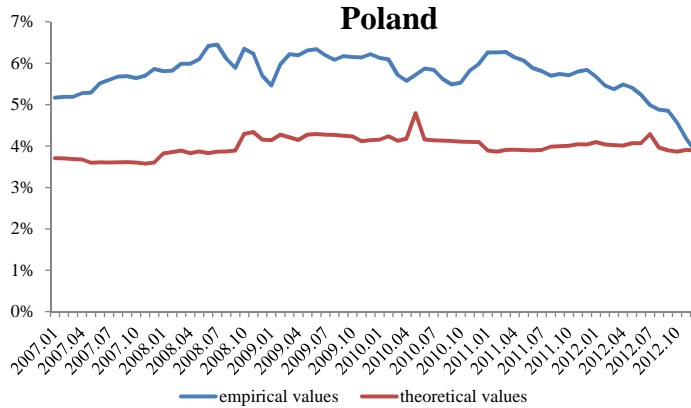
- [13] Di Cesare, A., Grande, G., Manna, M., Tabaga, M. (2012), *Recent estimates of sovereign risk premia for euro-area countries*, Banca d'Italia, OP No. 128.
- [14] Dötz, N., Fischer, Ch. (2010), *What can EMU countries' sovereign bond spreads tell us about market perceptions of the default probabilities during the recent financial crisis?*, Deutsche Bundesbank, Discussion Paper No. 11/2010.
- [15] Favero, C., Missale, A. (2011), *Sovereign Spreads in the euro area. Which prospects for a Eurobond?*, CEPR Discussion Papers 8637.
- [16] Favero, C. (2012), *Modelling and forecasting yield differentials in the euro area. A non-linear global VAR model*, Innocenzo Gasparini Institute for Economic Research, WP No. 431.
- [17] Georgoutsos, D., Migiakis, P. (2010), *European sovereign bond spreads: monetary unification, market conditions and financial integration*, Bank of Greece, WP No. 115.
- [18] Iara, A., Wolff, G. (2010), *Rules and risk in the euro area: does rules-based national fiscal governance contain sovereign bond spreads?*, European Commission, WP No. 433, Bruegel WP 2011/10.
- [19] Schuknecht, L., von Hagen, J., Wolswijk, G. (2008), *Government risk premiums in the bond market. EMU and Canada.*, European Journal of Political Economy, Vol. 25, No. 3.
- [20] Schwarz, K. (2010), *Mind the gap: disentangling credit and liquidity in risk spreads*, University of Pennsylvania.
- [21] Sgherri, S., Zoli, E. (2009), *Euro area sovereign risk during the crisis*, International Monetary Fund, WP No. 09/222.
- [22] Szczerbak, M., Misiórski, J., Pochopień, G. (2009), *Wpływ przyjęcia przez Polskę euro na strategię zarządzania długiem skarbu państwa*, National Bank of Poland.
- [23] Wooldridge, J. (2002), *Econometric analysis of cross section and panel data*, MIT Press.

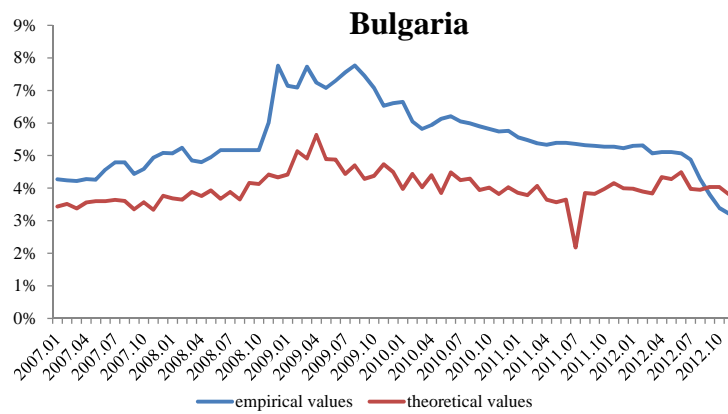
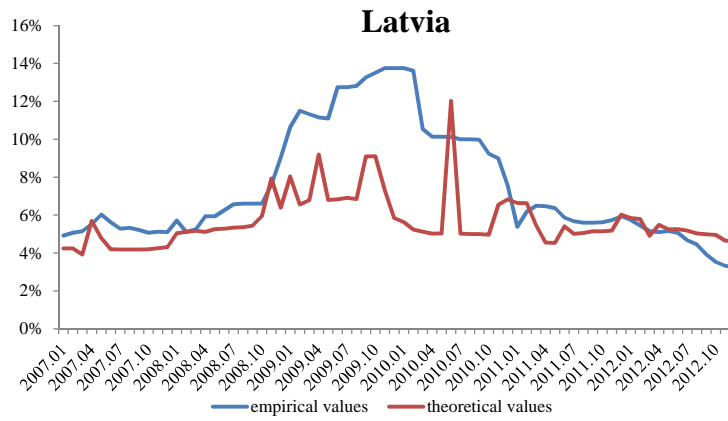
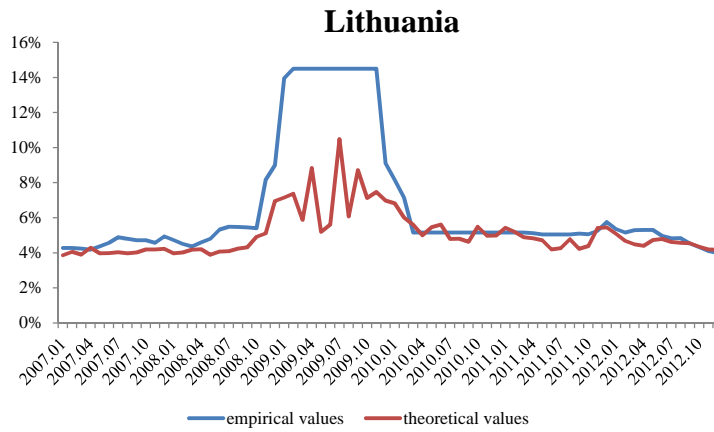
Appendix 1 Government bonds spreads to German Bund before and after the EMU creation: 1990-2010 (in %)

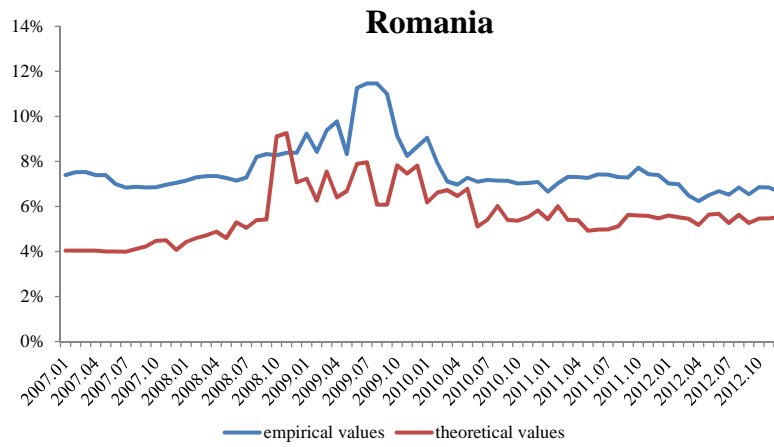


Source: Favero, Missale (2011)

Appendix 2 Empirical and theoretical values of 10-year interest rates (EMU criterion) in NMS-7: 2007-2012







Source: Author's calculations based on panel data estimation