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The Impact of Sovereign Credit Ratings on the Issuance of Government Bonds in Central and Eastern Europe

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Abstract. *The current research paper aims to assess the impact of sovereign credit ratings on the issuance of government bonds in Central and Eastern Europe. The personal analysis is performed on a sample of government bonds issued by Turkey, Hungary, Czech Republic, Slovak Republic, Poland, Romania and Russia between 2000-2010. The sample includes issues in several currencies (EUR, USD, GBP, JPY, CHF, CZK, PLN, TRY, RUB, RON, HUF). The research paper consists of two different analyses. The first one assesses the degree in which the variation in the initial yield of government bonds issued in one particular currency can be explained by using explanatory variables such as: inflation, sovereign rating corresponding to the issuing country, and the state of crisis (this analysis is performed for each currency separately). The second analysis assesses the degree in which the variation in the maturity of the government bonds issued by a certain country can be explained by using explanatory variables such as: inflation, sovereign rating on the date of issuance, and the state of crisis.*

Keywords: sovereign credit rating; government bonds; initial yield; maturity.

JEL Codes: G24, G15.
REL Code: 11B.

Introduction

Existing research has approached the general theme of the impact of sovereign credit ratings on the capital markets at multiple levels; multiple studies have focused on the influence of sovereign ratings on stock markets and bond markets (secondary markets), and few on the influence of sovereign ratings on the forex markets and on the derivative instruments. One of the areas least explored so far has been the impact of sovereign ratings on the issuance of government bonds. Therefore, such a research may offer a significant potential for new and interesting results.

Literature review

Most of the previous research in the area concerned with the impact of sovereign credit ratings on bonds markets has focused on the secondary bonds markets (ie the markets in which investors trade previously issued bonds) rather than on the primary bonds markets (ie the markets in which bonds are issued). In general, the research papers from the former category proved that the changes in sovereign ratings have an influence on the price of bonds (for example, Reisen, Maltzan, 1999, have proved this result for emerging markets), that the reaction of the bond prices is stronger in the case of a rating downgrade than in the case of a rating upgrade (Gonzales et al., 2004), and that there can be a contagion effect on the neighbouring countries (Arezski et al., 2010, Gande, Parsley, 2005). Thus, Arezski et al. (2010), in a study performed on a sample of data between 2006-2010 from various european countries, proved that the downgrading of a sovereign rating for a country in the euro zone would have an impact not only on the local market, but also on other capital markets in the euro zone.

The start point for the current research has been De Broeck & Guscina‘s (2011) article “Government Debt Issuance in the Euro area: The Impact of the Financial Crisis” published within the “IMF Working Paper” series. This article analized the way in which the issuance standards for the issuance of government bonds in the euro zone area and Denmark have changed following the financial crisis. The authors used a database including government bonds issued between 2007-2009. The results of their research proved that the issuance standards for the analysed area did change following the financial crisis, and the negative impact of the crisis on the issuance standards has been the strongest in the case of euro zone countries which had huge debt and huge budget deficits, the reason being the fact that such countries had to assume additional risks when trying to refinance their debt after the crisis. Before the

crisis, the issuance standard could be characterized by the following elements: local currency, fixed coupons, long maturities; following the crisis, the new issuance standard is characterized by: shorter maturities, foreign currency denominations and variable coupons. The authors performed their research on a sample of 3,000 government bonds issued by the countries mentioned between 2007-2009.

The personal analysis described below is to a certain extent more complex than the one from the IMF study briefly described above: most of the countries in the sample are not in the euro zone, and for this reason the sample contains a significant number of issuances in currencies other than the euro. Therefore, a differentiated analysis had to be performed for each country separately and for each currency separately.

Description of data

The personal analysis has been performed on a sample which includes issues of government bonds made by Turkey, Hungary, Czech Republic, Slovakia, Poland, Romania and Russia between 2000-2010. Overall, the sample includes 1,306 issues, for which the following data have been collected from Reuters: principal currency, interest currency, issued amount, issue date, maturity date, initial yield etc. (The initial sample from which these issues have been selected included much more data – 3,541 issues – but many of those had incomplete data available). The sample includes issues in several currencies for each country, as follows: Turkey (EUR, JPY, USD and TRY), Hungary (CHF, EUR, GBP, HUF, JPY and USD), Czech Republic (CHF, CZK and EUR), Slovakia (only EUR), Poland (EUR, PLN, USD, GBP, JPY and CHF), Romania (EUR and RON), and Russia (only RUB). The two tables below summarize the total numbers of issuances of government bonds in the sample for each year and each country (the first table) and for each currency and each country (the second table):

Table 1

Total number of issues of government bonds per countries and per years

	Turkey	Hungary	Czech Republic	Slovakia	Poland	Romania	Russia
2000	2.0	-	-	-	-	-	-
2001	9.0	2.0	12.0	4.0	2.0	-	-
2002	1.0	1.0	15.0	2.0	5.0	-	1.0
2003	4.0	3.0	1.0	3.0	5.0	-	9.0
2004	9.0	4.0	23.0	3.0	6.0	-	1.0
2005	11.0	5.0	29.0	1.0	14.0	10.0	3.0

2006	16.0	4.0	80.0	2.0	5.0	7.0	2.0
2007	34.0	5.0	6.0	2.0	11.0	8.0	2.0
2008	70.0	3.0	44.0	1.0	13.0	9.0	5.0
2009	113.0	51.0	39.0	4.0	42.0	11.0	9.0
2010	190.0	144.0	11.0	7.0	50.0	31.0	7.0
2011	8.0	40.0	-	1.0	7.0	8.0	4.0

Table 2

Total number of issues of government bonds per countries and per currencies

	Turkey	Hungary	Czech Republic	Slovakia	Poland	Romania	Russia
EUR	11	11	6	30	15	4	-
USD	28	2	-	-	8	-	-
CHF	-	-	-	-	8	-	-
JPY	-	-	-	-	12	-	-
GBP	-	-	-	-	1	-	-
CZK	-	-	254	-	-	-	-
PLN	-	-	-	-	116	-	-
HUF	-	249	-	-	-	-	-
RON	-	-	-	-	-	80	-
TRY	428	-	-	-	-	-	-
RUB	-	-	-	-	-	-	43

Moreover, additional data has been collected from Reuters on the following economic indicators for all the countries in the sample: CPI, Consumer confidence index, and sovereign credit ratings issued by the three largest rating agencies in the world (S&P, Moody's and Fitch) for the countries in the sample and the period analyzed.

In the next pages we will perform a statistical analysis of the data in the sample, including the assessment of the government bonds from each country with regard to: the average maturity for each year (and how the average maturity of government bonds issued changed over the period analyzed in each of the countries), the number of issues per each year (and to what extent this number has suffered changes over the period analyzed), and the average initial yield for the issues from each year. The average number of issues for each year and the average initial yield for each year have been calculated for each currency separately, in order to obtain comparable results.

With regard to the average maturity of the government bonds issued by the countries in the sample, we noticed that in all situations there is a difference between the average maturity of the government bonds issued before 2008 (between 2000-2008) and the average maturity of the government bonds issued between 2009-2011: Turkey (average maturity approx 10 years between 2000-2008; average maturity below five years after 2008); Hungary (average

maturity between 7.5-13 years in the period 2000-2008; average maturity between 0.6-1.3 years after 2008); Czech Republic (average maturity between 10-20 years during the period 2000-2007; average maturity between 0-6 years after 2008); Slovakia (average maturity between 10-18 years during the period 2008-2011; average maturity below six years after 2008); Poland (average maturity between 9-17 years during the period between 2000-2008; average maturity below four years after 2008); Romania (average maturity of 10-16 years between 2000-2008; average maturity below 1 year after 2009); Russia (average maturity of 10-23 years between 2000-2007; average maturity of 3-7 years after 2008).

This trend has also been noticed by De Broeck & Guscina (2011) in their study on the government bonds issued by euro zone countries and Denmark between 2007-2009. De Broeck and Guscina (2011) have noted that after the inception of the financial crisis in Europe, the trend in the primary market of government bonds has been of sharp decrease in the average maturity, this fact being generated by the increased uncertainty in the capital markets and by the increasing reluctance of investors to place money in long-dated instruments.

Few of the countries in the sample have witnessed a reversal of this trend in 2011: for example in Turkey, the average maturity of the government bonds issued before the publication date for this article has been greater than five years. The table below presents further details on the statistical analysis related to the average maturity of the government bond issuances included in the sample.

Table 3

The average maturity for the government bond issued by each country in the sample in each of the years between 2000 – 2010

	Average maturity (# years)		Czech Republic	Slovakia	Poland	Romania	Russia
	Turkey	Hungary					
2000	20.0						
2001	8.8	13.0	12.0	10.0	10.0		
2002	10.0	11.1		10.0	11.9		10.1
2003	9.5	9.2	10.7	10.0	8.4		19.9
2004	11.3	10.9	10.0	11.7	16.7		14.0
2005	8.1	9.0	9.8	7.0	14.5	10.8	13.8
2006	7.0	8.2	17.9	17.5	11.2	15.4	23.0
2007	5.1	8.2	20.2	10.0	11.1	16.2	8.5
2008	4.1	7.5	5.0	3.0	9.1	14.8	6.6
2009	3.3	1.1	5.8	4.2	2.1	13.4	3.6
2010	3.9	0.6	1.9	5.4	2.6	1.1	3.3
2011	7.8	1.3	1.1	1.0	4.2	0.9	2.8

With regard to the currencies of the issuances included in the sample, we have noticed several particularities, as follows.

First of all, the main currencies in which the countries included in the sample have issued government bonds have been the local currencies (each country's own local currency, except for Slovakia), EUR and USD. The countries have also issued occasionally government bonds in other currencies, such as GBP, JPY, CHF. All the countries in the sample, except for Russia, have issued government bonds denominated in EUR, but we could not identify any trend in the evolution of the number of such issues. Fewer countries have issued government bonds denominated in USD (Turkey, Hungary and Poland). All the countries in the sample, except for Slovakia, have issued government bonds denominated in the local currency. The maximum number of issuances in local currency has not been reached by all countries in the sample in the same year (Turkey – 2010, Hungary – 2010, Czech Republic – 2006, Poland – 2010, Romania – 2010, Russia – 2003). Moreover, the issues in local currencies have had a high weight out of the total number of issues in most countries: Hungary, Czech Republic, Turkey, Poland and Romania.

Table 4

The issues of government bonds denominated in local currency – as a % of the total number of issues per country per year during 2000-2010

Local currency	Issues denominated in the specified currency - % of the total number of issues each year						
	Turkey	Hungary	Czech Rep.	Slovakia	Poland	Romania	Russia
2000							
2001	100.0%	50.0%	100.0%		50.0%		
2002		100.0%	100.0%		40.0%		100.0%
2003	25.0%	33.3%			20.0%		100.0%
2004	44.4%	50.0%	95.7%		66.7%		100.0%
2005	27.3%	40.0%	100.0%		28.6%	100.0%	100.0%
2006	81.3%	75.0%	100.0%		40.0%	100.0%	100.0%
2007	91.2%	80.0%	83.3%		63.6%	100.0%	100.0%
2008	92.9%	66.7%	95.5%		76.9%	100.0%	100.0%
2009	97.3%	98.0%	97.4%		85.7%	81.8%	100.0%
2010	97.4%	99.3%	100.0%		88.0%	93.5%	100.0%
2011	87.5%	100.0%			71.4%	100.0%	100.0%

Regarding the trends in the evolution of the number of issues denominated in local currency, we have noticed an increasing trend only in a few situations: Turkey; Hungary (only 2009-2011); Poland (only in 2006-2010). The number of issues denominated in local currency in each country as a percentage of the total number of issues in the country also had a different evolution from one country to another. Thus, this percentage has been relatively higher in 2009-2010 compared to 2000-2008 in most countries; one exception was Romania, where the percentage has been lower in 2009 and 2010.

Table 5

The number of issues of government bonds denominated in local currency for each country in the sample and each year between 2000-2010

Local currency	Number of issues per year in local currency			Slovakia	Poland	Romania	Russia
	Turkey	Hungary	Czech Rep.				
2000							
2001	9	1	12		1		
2002		1	15		2		1
2003	1	1			1		9
2004	4	2	22		4		1
2005	3	2	29		4	10	3
2006	13	3	80		2	7	2
2007	31	4	5		7	8	2
2008	65	2	42		10	9	5
2009	110	50	38		36	9	9
2010	185	143	11		44	29	7
2011	7	40			5	8	4

Among the particular situations identified, we would like to mention Slovakia (which issued government bonds denominated only in EUR during the period analyzed. This result may be due to the fact that Slovakia entered the euro zone on the 1st of January 2009, which would explain why all interest for Slovak debt in the years before joining the euro zone has been for debt in EUR) and Russia (which issued all the government bonds included in the sample in RUB, the local currency).

The average initial yields for the government bonds issued in EUR by the countries in the sample have not had a uniform behavior during the period analyzed and from one country to another. Between 2000-2003 we have noticed very large differences between the average initial yields calculated for government bonds issued by different countries (for example 9.6% for Turkey in 2003 vs. 4.3% in Hungary during the same year). This situation may be generated by the structural economic differences existing between the two countries at the specified moment (inflation, sovereign credit rating). The average initial yields for the government bonds denominated in EUR vary in a much narrower interval between 2004-2006 (3.5%-5%), and after 2007 there have been again very large differences among countries. We have noticed that same phenomenon in relation to the government bonds issued in USD.

The average initial yields for the government bonds denominated in the local currency exhibited different trends from one country to another; the maximum values for each country have been recorded in different years (2007 – Turkey, 2004 – Hungary, 2001 – Czech Republic, 2001 – Poland, 2009 – Romania and 2003 – Russia).

Research and results overview

The big variety of the data in the sample has allowed us to run several regressions. These regressions can be divided into two distinct categories, as follows:

- Regressions which determine for the government bonds issued in one certain currency to what extent the average initial yield can be explained by using explanatory variables such as inflation, sovereign rating corresponding to the country who issues the bonds and to the year of issuance, and the crisis/non-crisis state.
- Regressions which determine for the government bonds issued in a certain country (regardless of the currency) to what extent the variation in maturity can be explained by using explanatory variables such as inflation, sovereign rating at the issue date, and the crisis/non-crisis state. For these sub-sets of bonds we could not run regressions aiming to determine to what extent the same explanatory variables can explain the initial yield, because in most countries, the bonds have been denominated in various currencies, and for this reason the initial yields were not comparable numbers.

Following the results of the research performed by De Broeck and Guscina (2011) with regard to the issues of government bonds by the countries in the euro zone and Denmark, and following the results of other pieces of research concerned with the influence of sovereign ratings on the evolution of the bond markets (Raisen, Maltzan, 1999, Hertelius et al., 2008), we have identified the following elements which may help explain the most important parameters of the issues of government bonds included in our sample (the initial yield and the maturity): inflation, sovereign rating corresponding to the country which is issuing the bonds and for the moment when the issue is made, crisis/non-crisis state (quantified through a dummy variable which has a value equal to 1 if the year belongs to a crisis period and zero otherwise).

In order to explain the relationship among the above mentioned variables, we have firstly grouped the data into new smaller samples, each of them containing government bonds issued in a certain currency (in order to ensure the comparability of the data), regardless of the issuing country. We have therefore created the following samples:

1. Sample – Government bonds denominated in USD
2. Sample – Government bonds denominated in EUR
3. Sample – Government bonds denominated in PLN
4. Sample – Government bonds denominated in HUF
5. Sample – Government bonds denominated in CZK

6. Sample – Government bonds denominated in RUB
7. Sample – Government bonds denominated in TRY.

We have created no samples for GBP, JPY and RON because the number of issues with complete data available was too small in order to be able to generate a set of significant results through running a regression.

We will now present in detail the results of this first set of regressions. The correlations among the variables that we will refer to are summarized in Annex 1. Moreover, the table below is summarizing the results of all regressions ran during this first stage.

Table 6

Summary of the results of the first set of regressions

	1(a) USD	1(b) USD	2(a) EUR	2(b) EUR	3(a) PLN	4(b) HUF	5(a) CZK	6 RUB	7(a) TRY	7(b) TRY
R Square	0.8663	0.8687	0.4042	0.3956	0.6166	0.5240	0.5244	0.2005	0.4600	0.4420
Coefficients										
Intercept	8.8094	8.9236	4.6377	4.4557	32.9703	- 3.3432	- 11.3010	23.5963	- 32.8563	- 25.1006
Inflation	0.1029	0.1007	0.1856	0.2015	1.0984	- 0.1341	0.4880	- 0.4497	2.1926	1.9386
Sovereign rating at issue date	- 0.2657	- 0.2669	- 0.0612	- 0.0639	- 1.9718	0.7671	0.9523	- 0.7285	2.8451	2.3726
Crisis dummy	na	- 0.2244	- 0.3145	na	- 2.9183	0.5279	- 3.3125	na	1.9763	na
P-values										
Intercept	0.0000	0.0000	0.0038	0.0045	0.0005	0.0507	0.0335	0.0101	0.1206	0.2074
Inflation	0.0000	0.0000	0.0060	0.0018	0.0001	0.0753	0.0015	0.0374	0.0000	0.0000
Sovereign rating at issue date	0.0004	0.0004	0.4893	0.4686	0.0022	0.0000	0.0058	0.2094	0.1592	0.2294
Crisis dummy	na	0.4968	0.4406	na	0.0000	0.1264	0.0000	na	0.2675	na

1) Sample – Government bonds denominated in USD:

This sample includes 30 government bonds denominated in USD, issued between 2000-2010 by the following countries: Poland, Turkey, Hungary.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in USD can be explained by using the explanatory variables: sovereign rating at issue date, Inflation, and crisis dummy. We have ran two versions of regressions: (1a) the first regression uses only inflation and sovereign rating at issue date as explanatory variables; (1b) the second regression uses all three available variables as explanatory variables.

Both regressions have high R-square values (0.8663 and 0.8687), which means that 86.63% (and 86.87%) of the variation in the Initial yield of the government bonds issued in USD can be explained by using the selected explanatory variables. However, the large p-value (0.5) associated with the

coefficient of the crisis dummy explanatory variable in the second regression indicates that that coefficient is not statistically significant.

Therefore, the variation in the Initial yields of the government bonds issued in USD between 2000 – 2010 can be explained best by using the explanatory variables inflation and sovereign rating at the issue date. Both coefficients resulted from this regression are statistically significant.

2) Sample – Government bonds denominated in EUR:

This sample includes 46 government bonds denominated in EUR, issued between 2000-2010 by the following countries: Slovakia, Poland, Czech Republic, Hungary, Turkey and Romania.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in EUR can be explained by using the explanatory variables: sovereign rating at issue date, inflation, and crisis dummy. We have ran two versions of regressions: (2a) the first regression uses all three available variables as explanatory variables; (2b) the second regression uses only inflation and sovereign rating at issue date as explanatory variables.

None of the two regressions have high values for the R-square indicator (0.4042 and 0.3956), which means that only 40.42% (and 39.56%) of the variation in the initial yield for the government bonds issued in EUR can be explained by using the chosen explanatory variables. Moreover, the p-values associated to most of the coefficients (0.49 and 0.44 for the first regression; 0.47 for the second regression) show that the corresponding coefficients are not statistically significant.

3) Sample – Government bonds denominated in PLN:

This sample includes 48 government bonds denominated in PLN, issued between 2000-2010 by Poland.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in PLN can be explained by using the explanatory variables: sovereign rating at issue date, inflation, and crisis dummy. We have ran only one regression: (3a) the regression uses all three available variables as explanatory variables.

The regression has a relatively large R-square (0.6166), which means that 61.66% of the variation in the initial yield of the government bonds issued in PLN can be explained by using the chosen explanatory variables. Moreover, the

p-values associated to the coefficients resulted from running the regression show that all the coefficients are statistically significant.

Therefore, the variation in the initial yields of the government bonds issued in PLN between 2000 – 2010 can be explained best by using the explanatory variables inflation, crisis dummy and sovereign rating at the issue date.

4) Sample – Government bonds denominated in HUF:

This sample includes 78 government bonds denominated in HUF, issued between 2000-2010 by Hungary.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in HUF can be explained by using the explanatory variables: sovereign rating at issue date, inflation, maturity (#years) and crisis dummy. We have ran two versions of regressions: (4a) the first regression uses all four available variables as explanatory variables; (4b) the second regression uses only sovereign rating at issue date, inflation and crisis dummy as explanatory variables.

Both regressions have high values for the R-square indicator (0.5634 and 0.5240), which means that 56.34% (and 52.40%) of the variation in the initial yield for the government bonds issued in HUF can be explained by using the chosen explanatory variables. Moreover, the p-values associated to the coefficients resulted from running both regressions show that all coefficients are statistically significant.

Therefore, the variation in the initial yields of the government bonds issued in HUF between 2000-2010 can be explained best by using the explanatory variables inflation, crisis dummy, maturity (#years) and sovereign rating at the issue date.

5) Sample – Government bonds denominated in CZK:

This sample includes 54 government bonds denominated in CZK, issued between 2000-2010 by the Czech Republic.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in CZK can be explained by using the explanatory variables: sovereign rating at issue date, inflation, maturity (#years) and crisis dummy. We have ran two versions of regressions: (5a) the first regression uses only sovereign rating at issue date, inflation and crisis dummy

as explanatory variables; (5b) the second regression uses all four available variables as explanatory variables.

Both regressions have high values for the R-square indicator (0.5244 and 0.5966), which means that 52.44% (and 59.66%) of the variation in the initial yield for the government bonds issued in CZK can be explained by using the chosen explanatory variables. Moreover, the p-values associated to the coefficients resulted from running both regressions show that all coefficients are statistically significant.

Therefore, the variation in the initial yields of the government bonds issued in CZK between 2000 – 2010 can be explained best by using the explanatory variables inflation, crisis dummy, maturity (#years) and sovereign rating at the issue date.

6) Sample – Government bonds denominated in RUB:

This sample includes 25 government bonds denominated in RUB, issued between 2000-2010 by Russia.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in RUB can be explained by using the explanatory variables: sovereign rating at issue date, and inflation.

The regression has a very low R-square (0.2005), which means that only 20.05% of the variation in the initial yields of the government bonds issued in RUB can be explained by using the chosen explanatory variables. All coefficients resulted from the regression are statistically significant, but given the low R-square, the value of the analysis performed is anyway very reduced. Therefore the variation in the Initial yields of the government bonds issued in RUB during 2000-2010 can be explained only to a small extent by using the chosen explanatory variables.

7) Sample – Government bonds denominated in TRY:

This sample includes 42 government bonds denominated in TRY, issued between 2000-2010 by Turkey.

Following the assessment of the correlations among variables, we have tested through regression analysis to what extent the variation in the initial yield for the government bonds issued in TRY can be explained by using the explanatory variables: sovereign rating at issue date, inflation, crisis dummy. We have ran two versions of regressions: (7a) the first regression uses all three

available variables as explanatory variables; (7b) the second regression uses only sovereign rating at issue date and inflation as explanatory variables.

Both regressions have high values for the R-square indicator (0.4600 and 0.4420), which means that 46% (and 44.2%) of the variation in the initial yield for the government bonds issued in TRY can be explained by using the chosen explanatory variables. However, many of the p-values associated with the coefficients resulted from the two regressions show that the corresponding coefficients are not statistically significant (sovereign rating at issue date and crisis dummy for the first regression; sovereign rating at issue date for the second regression).

Therefore, the variation in the initial yields of the government bonds issued in TRY between 2000-2010 cannot be explained satisfactorily by using the chosen explanatory variables.

The second part of the current study consists of an analysis of the maturity (in years) the government bonds issued by each separate country:

Following the previously mentioned references and the first part of the current article, we have identified the following elements that may play a role in explaining the maturity of the government bonds issued by a particular country: inflation, sovereign rating at issue date, crisis / non-crisis state (quantified through a dummy variable which equals 1 in case the corresponding year is in a crisis period, and zero otherwise).

In order to assess the relationship between the variables mentioned above, firstly we have grouped the data in the sample so that we have created new samples, each of them containing the government bonds issued by one particular country, regardless of the currency in which they were denominated. We have thus created the following new samples:

8) Sample – Government bonds issued by Turkey
9) Sample – Government bonds issued by Russia
10) Sample – Government bonds issued by Czech Republic
11) Sample – Government bonds issued by Slovakia
12) Sample – Government bonds issued by Poland
13) Sample – Government bonds issued by Hungary.

We have not created a separate sample for Romania, because there were only four government bonds issued by Romania with full data available, and such a small number of observations would not have made a regression analysis possible.

Secondly, we have calculated the correlations among the variables for each of the newly created samples: maturity (# years), inflation, sovereign rating at issue date, crisis dummy.

Afterwards, based on the values of the correlations among the variables in each newly created sample, we have defined several versions of regressions to be run and analysed for each of the samples. The following section presents a detailed analysis of these regressions. One may notice that even if the overall sample contained a larger number of government bonds, the newly created samples have a smaller number of observations, because the data collected for the explanatory variables would have not been complete if all the initial observations had been taken into account. The correlations among the variables (which we will refer to in the paragraphs below) are presented in detail in Annex 2. Moreover, the table below synthesises the results for all the regressions ran during this second part of the research.

Table 7

Results summary for the regressions ran for the second part of the research

	8 Turkey	9 Russia	10 Czech Rep.	11 Slovakia	12 Poland	13 Hungary
R Square	0.1854	0.6685	0.5480	0.4859	0.2778	0.6133
Coefficients						
Intercept	- 20.0204	0.7459	- 18.6882	- 0.6378	37.0507	2.4368
Inflation	0.1914	0.3767	0.7340	0.1387	1.3999	- 0.1353
Crisis dummy	- 4.3216	- 13.7217	- 10.3740	- 7.4215	- 9.3592	- 7.2135
Sovereign rating at issue date	2.8975	0.9890	1.8255	0.7445	- 1.9274	0.5195
p-values						
Intercept	0.1399	0.9630	0.4123	0.9483	0.2417	0.3420
Inflation	0.0080	0.3867	0.1953	0.7409	0.1389	0.3705
Crisis dummy	0.0001	0.0000	0.0001	0.0016	0.0001	0.0000
Sovereign rating at issue date	0.0480	0.3775	0.2168	0.1984	0.3820	0.0031

8) Sample – Government bonds issued by Turkey:

This sample includes 158 government bonds denominated in the following currencies: TRY, EUR, USD.

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Turkey between 2000-2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy. The regression had a very low R-square (0.1854), which means that only 18.54% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. The p-values corresponding to the coefficients resulted from the regression show that all coefficients are statistically significant; however, due to the low R-square, we conclude that the choice of explanatory variables used has not been good enough to explain a significant part of the variation in the maturity (# years).

9) Sample – Government bonds issued by Russia:
This sample includes 33 government bonds denominated in RUB

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Russia between 2000-2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy. The regression had a relatively high R-square (0.6685), which means that 66.85% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. However, the p-values corresponding to the coefficients resulted from the regression show that not all coefficients are statistically significant (the coefficients for the variables inflation and sovereign rating at issue date).

10) Sample – Government bonds issued by Czech Republic:
This sample includes 76 government bonds denominated in the following currencies: CZK, EUR, CHF.

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Czech Republic between 2000 – 2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy. The regression had a relatively high R-square (0.5480), which means that 54.80% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. However, the p-values corresponding to the coefficients resulted from the regression show that not all coefficients are statistically significant (the coefficients for the variables inflation and sovereign rating at issue date).

11) Sample – Government bonds issued by Slovakia:
This sample includes 29 government bonds denominated in EUR.

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Slovakia between 2000-2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy. The regression had a relatively high R-square (0.4859), which means that 48.59% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. However, the p-values corresponding to the coefficients resulted from the regression show

that not all coefficients are statistically significant (the coefficients for the variables inflation and sovereign rating at issue date).

12) Sample – Government bonds issued by Poland:

This sample includes 125 government bonds denominated in the following currencies: PLN, JPY, USD, CHF, EUR, GBP.

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Poland between 2000-2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy.

The regression had a relatively low R-square (0.2778), which means that only 27.78% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. Moreover, the p-values corresponding to the coefficients resulted from the regression show that not all coefficients are statistically significant (the coefficients for the variables inflation and sovereign rating at issue date).

13) Sample – Government bonds issued by Hungary:

This sample includes 211 government bonds denominated in the following currencies: HUF, JPY, EUR, USD, CHF and GBP.

Following the assessment of the correlations among variables, we have run a regression aimed at determining what portion of the variation in the maturity (# years) of the government bonds issued by Hungary between 2000-2010 can be explained by using the explanatory variables: sovereign rating at issue date, inflation and crisis dummy. The regression had a relatively high R-square (0.6133), which means that 61.33% of the variation in the maturity (# years) can be explained by using the chosen explanatory variables. The p-value for the coefficient of the variable Inflation indicates that this coefficient is not statistically significant; however, all other coefficients resulted from the regression are statistically significant.

Conclusions

The study aimed to assess the impact of sovereign ratings on the issuance of government bonds in the countries in Central and Eastern Europe. The personal analysis has been performed on a sample which included government bonds issued between 2000-2010 by the following countries: Turkey, Hungary, Czech Republic, Slovakia, Poland, Romania and Russia. Various pieces of data

have been collected from Reuters for all the bonds in the sample (the principal currency, the interest currency, the issued amount, the issue date, the maturity date, the initial yield and others). The sample includes bonds denominated in several currencies for each of the countries included in the analysis.

Following a statistical analysis of the data in the sample (which included several elements, such as: the average maturity of the bonds issued for each country, the number of issues made by each country in each year or in each currency, the average initial yield for the bonds issued by each country in each year and for each currency of denomination etc.), several regressions have been ran.

The first set of regressions looked at the government bonds in the sample issued in a particular currency and attempted to determine to what extent the variation in the initial yield can be explained by using explanatory variables such as inflation, sovereign rating at issue date, crisis / non-crisis state, and maturity. For this purpose, we have created seven sub-samples corresponding to each of the currencies in the initial sample for which there have been enough observations in order to allow a regression type analysis, namely: USD, EUR, PLN, HUF, CZK, RUB, TRY. The results have proved that the variation in the initial yield for the government bonds can be explained by using the explanatory variables: inflation, sovereign rating at issue date, and crisis dummy for the sub-samples: PLN, HUF, CZK and TRY; and by using only the explanatory variables inflation and sovereign rating at issue date for the sub-samples USD and EUR. The proportion in the variation of the Initial yield of government bonds in the sample that these combinations of variables could explain (according to the values of R-square) varied between 40% (for the sub-sample of government bonds issued in EUR) and 86% (for the sub-sample of government bonds issued in USD). R-square for the regression run on the sub-sample of government bonds denominated in RUB was only 0.20, therefore in that case the choice of explanatory variables could not explain the variation in the initial yield (more precisely, the choice of explanatory variables could explain only 20% of that variation in initial yields, which is an extremely low and consequently an unsatisfactory level).

The second set of regressions looked at the government bonds issued in a particular country (regardless of the currency) and attempted to determine the extent to which the maturity of the bonds can be explained by using explanatory variables such as inflation, sovereign rating at issue date, and crisis/non-crisis state. For this purpose we have created 6 sub-samples corresponding to each of the countries in the initial sample for which there have been enough observations to allow regression type analysis, namely: Turkey, Russia, Czech Republic, Slovakia, Hungary, Poland. The results showed that the variation in

the maturity (# years) of the government bonds in the sample can be explained by using inflation, sovereign rating at isue date and crisis dummy as explanatory variables in the case of the sub-samples corresponding to the countries Russia, Czech Republic, Slovakia, and Hungary. The proportion in the variation of the maturity (# years) that could be explained by this choice of explanatory variables (according to the values of R-square calculated for each regression) varied between 48% (for the sub-sample corresponding to the government bonds issued by Slovakia) and 69% (for the sub-sample corresponding to the government bonds issued by Russia). R-square had low values (0.18 and 0.27) for the regressions ran on the sub-samples corresponding to the government bonds issued by Turkey and Poland.

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Annexes

Annex 1. Correlations among variables used for the first part of the research

Table 8

Correlations among variables corresponding to the sample of government bonds denominated in USD

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	0.06	1.00			
Sovereign rating at issue date	- 0.13	- 0.52	1.00		
Crisis – dummy variable	0.07	- 0.29	0.13	1.00	
Initial yield	0.10	0.89	- 0.71	- 0.29	1.00

Table 9

Correlations among variables corresponding to the sample of government bonds denominated in EUR

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	0.12	1.00			
Sovereign rating at issue date	- 0.04	- 0.68	1.00		
Crisis – dummy variable	- 0.37	- 0.44	0.33	1.00	
Initial yield	0.43	0.62	- 0.49	- 0.36	1.00

Table 10

Correlations among variables corresponding to the sample of government bonds denominated in PLN

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	- 0.64	1.00			
Sovereign rating at issue date	- 0.25	0.65	1.00		
Crisis – dummy variable	- 0.85	0.82	0.48	1.00	
Initial yield	0.62	- 0.37	- 0.41	- 0.66	1.00

Table 11

Correlations among variables corresponding to the sample of government bonds denominated in HUF

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	- 0.10	1.00			
Sovereign rating at issue date	0.62	0.01	1.00		
Crisis – dummy variable	- 0.69	0.03	- 0.75	1.00	
Initial yield	0.55	- 0.13	0.70	- 0.45	1.00

Table 12

Correlations among variables corresponding to the sample of government bonds denominated in CZK

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	0.22	1.00			
Sovereign rating at issue date	- 0.37	- 0.40	1.00		
Crisis – dummy variable	- 0.67	- 0.23	0.69	1.00	
Initial yield	0.67	0.38	- 0.30	- 0.62	1.00

Table 13

Correlations among variables corresponding to the sample of government bonds denominated in RUB

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	0.29	1.00			
Sovereign rating at issue date	- 0.30	- 0.24	1.00		
Crisis – dummy variable	- 0.77	- 0.29	0.61	1.00	
Initial yield	- 0.21	- 0.37	- 0.15	- 0.00	1.00

Table 14

Correlations among variables corresponding to the sample of government bonds denominated in TRY

	Maturity (#years)	Inflation	Sovereign rating at issue date	Crisis – dummy variable	Initial yield
Maturity (#years)	1.00				
Inflation	0.03	1.00			
Sovereign rating at issue date	0.19	- 0.63	1.00		
Crisis – dummy variable	- 0.24	- 0.49	0.17	1.00	
Initial yield	- 0.16	0.65	- 0.30	- 0.23	1.00

Annex 2. Correlations among variables used for the second part of the research

Table 15

Correlations among the variables corresponding to the government bonds issued in Czech Republic

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	0.19	1.00		
Crisis – dummy variable	- 0.52	- 0.17	1.00	
Sovereign rating at issue date	- 0.34	- 0.29	0.76	1.00

Table 16

Correlations among the variables corresponding to the government bonds issued in Turkey

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	0.30	1.00		
Crisis – dummy variable	- 0.38	- 0.46	1.00	
Sovereign rating at issue date	- 0.20	- 0.86	0.47	1.00

Table 17

Correlations among the variables corresponding to the government bonds issued in Slovakia

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	0.47	1.00		
Crisis – dummy variable	- 0.67	- 0.76	1.00	
Sovereign rating at issue date	- 0.30	- 0.76	0.66	1.00

Table 18

Correlations among the variables corresponding to the government bonds issued in Russia

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	0.48	1.00		
Crisis – dummy variable	- 0.81	- 0.52	1.00	
Sovereign rating at issue date	- 0.55	- 0.57	0.73	1.00

Table 19

Correlations among the variables corresponding to the government bonds issued in Poland

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	- 0.28	1.00		
Crisis – dummy variable	- 0.51	0.70	1.00	
Sovereign rating at issue date	- 0.42	0.54	0.74	1.00

Table 20

Correlations among the variables corresponding to the government bonds issued in Hungary

	Maturity (#years)	Inflation	Crisis – dummy variable	Sovereign rating at issue date
Maturity (#years)	1.00			
Inflation	- 0.14	1.00		
Crisis – dummy variable	- 0.77	0.17	1.00	
Sovereign rating at issue date	0.56	0.06	- 0.59	1.00