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DETERMINANTS OF SOVEREIGN CREDIT RATINGS: EVIDENCE FROM CEE COUNTRIES

Abstract

The goal of this paper is investigating determinants of the sovereign credit ratings in Central and Eastern European countries (CEEC). Sovereign credit ratings are important to determine a country's financial ability to meet its obligations. It is important to know which determinants affect sovereign credit ratings and consequently the conditions under which a country can borrow on the financial market. The analysis is made on the sample of 11 CEEC countries over a period of 17 years, from 2000 to 2016. The determinants of three main global credit agencies (Standard and Poors's Rating Services, Moody's and Fitch) have been investigated using the linear OLS method for unbalanced panel. The results of the analysis have shown that GDP growth, GDP per capita, inflation, unemployment, public debt to GDP and external debt to GDP variables play a major role in determining sovereign credit ratings.

Keywords: Sovereign credit rating determinants, CEEC, panel data

1. *Introduction*

Sovereign credit ratings are the assessments or relative likelihood of the issuer's home country that a borrower will default on its obligations (Cantor, Packer, 1996). Credit ratings are important to determine a country's financial ability to meet its obligations. According to Afonso, Gomes and Rother (2011), sovereign credit ratings are important in three ways: (1) they serve as a key determinant of the interest rates a country faces in the international financial market and therefore of its borrowing costs, (2) they have a constraining impact on the ratings assigned to domestic banks or companies and (3) some institutional investors have lower bounds for the risk they can assume in their investments so they can choose their bond portfolio composition taking into account the credit risk perceived via the rating notations. There are three main sovereign credit agencies in the world today: Standard and Poors's Rating Services, Moody's and Fitch. The behavior of financial credit agencies has been often criticized in the times of crisis because they were offering overly favorable evaluations of insolvent financial institutions and approving extremely risky mortgage-related securities exacerbating the financial crisis. Furthermore, several downgrades occurred at the sovereign rating levels when the current economic-financial crisis started (Bozic, Magazzino, 2013). Low income countries

have difficult or no access to the international market under relatively favorable conditions while developed countries, on the other hand, can often take international capital market access for granted. For developing countries, access to international capital markets is highly variable across time and sovereign credit ratings play a critical role (Reinhart, 2002).

In order to understand credit rating assignments it is necessary to know which determinants affect sovereign credit ratings. The goal of this paper is testing the determinants of sovereign credit ratings in Central and Eastern European countries (CEEC). The analysis is made on the sample of eleven CEEC countries over a period of 17 years (from 2000 to 2016). Central and Eastern European countries are chosen into the sample because research for this group of countries is lacking. The determinants of three main global credit agencies (Standard and Poors's Rating Services, Moody's and Fitch) have been investigated using the linear OLS method for unbalanced panel. After the introduction, the second chapter provides research on credit rating determinants. The third chapter presents an overview of credit ratings in CEEC and describes the main credit rating determinants. Methodology and data are presented in chapter four, while the empirical analysis is described in chapter five. The final chapter gives the concluding remarks.

2. Economic literature on sovereign credit rating determinants

Many authors have investigated the relation between various macroeconomic variables and credit rating assignments. The first investigation in this field is related to the study by Cantor and Packer (1996). They conducted the first systematic analysis of the determinants and impact of the sovereign credit ratings assigned by the two leading U.S. agencies, Moody's Investor Services and Standard and Poor's. On the sample of 49 countries and eight selected credit rating determinants, six variables appear to play an important role in determining a country's credit rating. It is per capita income, GDP growth, inflation, external debt, level of economic development and default history. Ades et al. (2000) applied the Goldman Sachs Equilibrium Sovereign Spread (GS-ESS) framework for assessing fair value in emerging markets' hard-currency debt. In order to generate GS-ESS estimates, they assembled monthly data for 15 emerging market economies from the year 1996 to 2000. Significant independent variables were GDP growth rate, fiscal balance, exports, total external debt, share of total external amortization in reserves, default history and real exchange rate misalignments.

Afonso (2003) investigated determinants of sovereign credit ratings for the two major agencies (Moody's and S&P), on the sample of 81 countries in the year 2001 using a linear and a logistic transformation of the rating scales. Relevant variables in the regression were GDP per capita, external debt, level of economic development, default history, real growth rate and inflation rate. Afonso, Gomes and Rother (2007) employed panel estimation and a random effects ordered probit model on the sample of 130 countries for the period 1995-2005 using credit ratings from the three main international rating agencies. Statistically significant explanatory variables for a country's credit rating were GDP per capita, GDP growth, government debt, government effectiveness indicators, external debt, external reserves, and default history. Borio and Packer (2004) examined a unified framework for debt intolerance, original sin and currency mismatches finding statistical evidence in favor of all three. The analysis was conducted on the sample of 52 countries in the period from 1996 to 2003. Variables recognized as relevant determinants of credit ratings were GDP per capita, GDP growth, inflation, corruption perception index, political risk score and default history.

Caceres, Guzzo and Segoviano (2010) analysed sovereign spreads and global risk aversion for 10 advanced countries in the period from 2005 to 2010. Significant explanatory variables were Index of Global risk aversion, spillover coefficient, overall balance and debt-to-GDP ratio. Chodnicka-Jaworska (2015) analysed credit rating determinants for European countries. Data were derived from the World Bank and Thompson Reuters databases for the years 2002 to 2012 and divided into two subsamples according to the level of economic development. Credit rating determinants were divided into four groups: macroeconomic variables (GDP per capita, real GDP growth, unemployment, inflation), government variables (government debt, fiscal balance, government effectiveness), external variables (external debt, foreign reserves, current account balance) and other variables (default history, European Union and regional dummies).

Teker, Pala and Kent (2013) composed a factor based ordered probit model for panel data analysis modelling framework for 23 developed and emerging countries. With the help of factor analysis, five of the initial eleven determinants of sovereign credit ratings were eliminated by factor analysis. They used specific dummy variables to investigate structural breaks, namely pre-crisis, post-crisis, BRICK, EU and OPEC membership, shipbuilder country and platinum reserved country. Eliasson (2002) described sovereign credit ratings in static and dynamic frameworks using macroeconomic indicators as explanatory variables. Random-effects panel data was applied as it allowed for country-specific omitted variables such as the soundness of banking sector, social and political factors. Rating adjustments appeared to be pro-cyclical compared to crisis index and economic fundamentals. Ferrucci (2003) investigated the determinants of emerging markets sovereign bond spreads using ragged-edge panel. Important determinants of market spreads appeared to be debtor country's fundamentals and external liquidity conditions. Hu, Kiesel and Perraudin (2002) derived estimates of transition matrices for sovereign credit ratings widely used in credit portfolio management and for the calculation of future loss distributions for pricing purposes. They showed that estimates of transition matrices can be combined with information in rating transition matrices calculated from the population of Standard and Poor's ratings histories. Mellios and Paget-Blanc (2006) analysed the determinants of sovereign credit ratings for three major rating agencies employing a principal component analysis in order to identify the main factors affecting these ratings. Sovereign credit ratings were influenced by income per capita, government income, inflation changes, exchange rate deviations and default history. In addition, the importance of corruption is highlighted as proxy for the level of economic development and governance quality.

Monfort and Mulder (2000) showed, on the sample of 20 emerging economies in the period from 1995 to 1999, that sovereign ratings react procyclically to crisis indicators. Using the static model, sovereign ratings in emerging market economies could be explained by investment to GDP ratio, inflation, export growth, crisis indicators and real exchange rates, but the relation was not stable, displaying a severe autocorrelation problem. On the other side, in the dynamic error correction model, ratings follow a random walk in which the change responds to innovations. Novotna (2012) focused on three methods for estimating credit rating models: discriminant analysis, logistic regression and decision trees. The variables identified and confirmed for having the strongest impact on credit ratings are return on assets, interest coverage and ratio of equity to total assets.

De Oliveira and Montes (2016) investigated macroeconomic determinants of sovereign credit ratings in developing countries for the period from 1994 to 2013 using OLS panel and dynamic panel data (D-GMM and S-GMM). They found the basic macroeconomic variables that affect sovereign credit such as GDP growth, GDP per capita, inflation, foreign reserves, government budget balance and external debt stock. Reusens and Croux (2016)[1] investigated sovereign credit rating determinants for the period before and after the European debt crisis in 2009 on the sample of 90 countries. They estimated a multi-year ordered probit model for three major credit agencies. After the start of the European debt crisis, macroeconomic variables such as financial balance, economic development and external debt gained importance, forcing credit rating agencies to change their sovereign credit rating assessments.

3. *Overview of sovereign credit ratings for CEEC*

In Table 1 sovereign credit ratings of Central and Eastern European countries at the end of 2017 for three main credit rating agencies (Moody's, Standard and Poor's and Fitch) are presented. The countries included in the analysis are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Moldova, Montenegro, Romania, Serbia, Slovenia and Turkey. The reason why these countries from Central and Eastern Europe are the subject of research is the lack of investigations in this field for this region. Data for various sovereign credit determinants for CEE countries are also hard to collect compared to, for example, European Union countries. Furthermore, data for sovereign credit ratings for some CEE countries are lacking, due to the fact that credit rating agencies do not assign credit ratings to some CEE countries.[2]

Table 1 Sovereign credit ratings for CEE countries, 2017, end of year

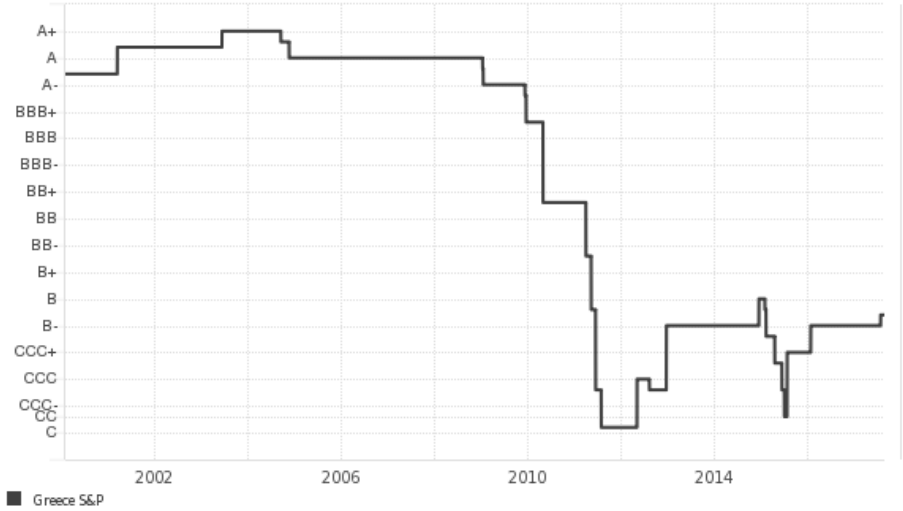
Country	Rating Moody's	Rating S&P	Rating Fitch
Albania	B1 stable	B+ stable	-
Bosnia and Herzegovina	B3 stable	B stable	-
Bulgaria	Baa2 stable	BBB- stable	BBB stable
Croatia	Ba2 negative	BB+ sta	BB+ sta
Greece	Caa2 positive	B- positive	B- positive
Moldova	B3 stable	-	-
Montenegro	B1 stable	B+ stable	-
Romania	Baa3 stable	BBB- stable	BBB- stable
Serbia	Ba3 stable	BB stable	BB stable
Slovenia	Baa1 stable	A+ stable	A- stable
Turkey	Ba1 negative	BB negative	BB+ stable

Source: Authors' compilation from https://tradingeconomics.com (Accessed on: May 15, 2018)

From Table 1 it can be seen that some countries such as Slovenia, Bulgaria and Romania have higher credit ratings compared to others such as Moldova, Bosnia and Herzegovina and Greece which had the lowest credit rating in 2017 among all CEE countries. The question that arises is what determines the quality assignment of credit rating from credit rating agencies.

In Figure 1 the sovereign credit rating of Greece in the period from 2000 to 2017 is shown, with a sudden fall in the country's credit rating after the beginning of the global crisis. It dropped from grade A in 2009 to grade C at the beginning of the year 2012. It will be interesting to investigate which variables had the biggest impact on this fall in the period after the outbreak of the global economic crisis.

Figure 1 Greece credit rating 2000 - 2017



Source: available at: https://tradingeconomics.com/greece/rating (Accessed on: May 15, 2018)

4. *Methodology and data*

In this section methodological issues and data sources will be described and presented. In Table 2 credit rating agencies' systems and linear transformations are presented. According to characterization of debt and issuer, the quality of sovereign credit ratings can be divided into the speculative and investment grades. The speculative grade includes default, very high credit risk, high credit risk, likelihood to fulfill obligations, ongoing uncertainty. Theinvestment grade includes adequate payment capacity, strong payment capacity, high quality and highest quality. Linear transformation is made according to the grade from the default taking value 1 to the highest quality taking value 21 or 22, depending on the chosen credit rating agency. Furthermore, notches for positive and negative trends have been included taking values +/- 0.4.

Table 2 Credit rating agencies' systems and linear transformations

Characterization of debt and issuer		Rating Moody's	Rating S&P	Rating Fitch	Linear transformation
Default	Speculative grade	C	D	D	1
		Ca	C	C	2
Very high credit risk		Caa3	CCC-	CC	3
		Caa2	CCC	CCC-	4
		Caa1	CCC+	CCC	5
High credit risk		B3	B-	CCC+	6
		B2	B	B-	7
		B1	B+	B	8
		Ba3	BB-	B+	9
Likely to fulfill obligations, ongoing uncertainty		Ba2	BB	BB-	10
		Ba1	BB+	BB	11
Adequate payment capacity	Investment grade	Baa3	BBB-	BB+	12
		Baa2	BBB	BBB-	13
		Baa1	BBB+	BBB	14
Strong payment capacity		A3	A-	BBB+	15
		A2	A	A-	16
		A1	A+	A	17
High quality		Aa3	AA-	A+	18
		Aa2	AA	AA-	19
		Aa1	AA+	AA	20
Highest quality		Aaa	AAA	AA+	21
				AAA	22

Source: Authors' according to Afonso et al., Moody's, S&P, Fitch

In Table 3 the description of explanatory variables and expected relationship with credit rating assignment is given.

Table 3 Description of explanatory variables and expected relationship with credit ratings

Variable	Unit of measurement	Expected relationship
GDP growth	Percent	+
GDP per capita	Current USD	+
Inflation	Percent	-
Unemployment	Percent	-
Current account to GDP	Percent	+
Fiscal balance to GDP	Percent	+
Public debt to GDP	Percent	-
External debt to GDP	Percent	-

Source: Authors

Variables included as determinants of sovereign credit ratings are growth of GDP, GDP per capita, inflation, unemployment, current account balance to GDP, fiscal balance to GDP, public debt to GDP and external debt to GDP. Expected signs of regression are positive for growth of GDP, GDP per capita, current account balance and fiscal balance to GDP while they are negative for inflation, unemployment, public debt to GDP and external debt to GDP.

In order to investigate the sovereign credit rating determinants for CEE countries, a panel regression model is formulated including cross-section data for 11 CEE countries over the period from 2000 to 2016. The panel regression analysis is used in order to take advantage of cross-section and time-series property of data. The dependent variable in regression model is sovereign credit rating variable while explanatory variables are growth of GDP, GDP per capita, inflation, unemployment, current account balance to GDP, fiscal balance to GDP, public debt to GDP and external debt to GDP. The model is in linear form. The data for regression are calculated or provided from various Internet sources. The proposed cross-country panel regression model is formulated as follows:

$$Creditrating_{it} = \beta_0 + \beta_1 GDPgrowth_{it} + \beta_2 GDPpercapita_{it} + \\ + \beta_3 Unemp_{it} + \beta_4 Infl_{it} + \beta_5 CAB_{it} + \\ + \beta_6 GBB_{it} + \beta_7 PUBD_{it} + \beta_8 EXTD_{it} + \varepsilon_{it} \quad (1)$$

$Creditrating_{it}$ - variable denoting sovereign credit rating appointed by S&P, Moody's and Fitch credit agency for an individual CEEC country i. Credit ratings are transformed using linear transformation in the period t from 2000 to 2016[3].

$GDPgrowth_{it}$ - variable representing annual growth of GDP for an individual CEEC country i expressed in percentages of change relative to previous year[4].

$GDPpercapita_{it}$ - Gross Domestic Product per capita for country i (in current USD)[5].

$Unemp_{it}$ - variable representing unemployment in country i. The unemployment rate measures the number of people actively looking for a job as a percentage of the labor force[6].

$Infl_{it}$ - variable representing the inflation rate in country i measured by the consumer price index, reflecting annual percentage change[7].

CAB_{it} - variable representing the current account balance as a percentage of GDP of country i[8].

GBB_{it} - variable representing the general government balance as a percentage of GDP of country i[9].

$PUBD_{it}$ - variable representing public debt as a percentage of GDP of country i[10].

$EXTD_{it}$ - variable representing external debt as a percentage of GDP of country i[11].

β_0, β_1, β_2, β_3, β_4, β_5, β_6, β_7 and β_8 are regression coefficients while ε_{it} is the error term. A cross-country panel regression analysis for CEE countries is conducted using the Pooled OLS (POLS), Fixed effects

(FE) and Random effects (RE) model. The Hausman test is used in order to choose between the fixed effects and random effects model. In the next section the main results of the analysis and brief discussion are presented.

5. *Empirical analysis and discussion*

In Table 4 are presented the descriptive statistics of independent variables used in the analysis on individual samples[12].

Table 4 *Descriptive statistics of independent variables*

	DGDP	GDPPC	INF	UNEMP	CURRENT	BUDGET	PUBD	EXTD
Mean	3.13035	8547.988	6.922021	13.17018	-7.267751	-3.423943	53.64110	76.03858
Median	3.71000	6353.826	3.600000	11.42400	-6.102213	-3.000000	43.11000	70.50000
Maximum	10.65790	31997.28	95.00523	31.10000	6.230768	8.460000	224.7500	251.1000
Minimum	-9.13249	354.0037	-1.735902	3.860000	-49.94587	-23.90000	12.30000	21.45000
Std. Dev.	3.80675	7214.718	11.79947	6.517393	7.501648	3.593157	35.91373	40.77665
Skewness	-0.87236	1.276245	4.445686	0.760154	-1.872599	-1.359939	2.035791	2.089697
Kurtosis	3.72151	3.843793	26.85304	2.661889	9.954852	9.151429	8.060362	8.881667
Jarque-Bera	26.88369	54.50509	4887.180	18.29348	470.5734	341.1685	318.1455	392.6293
Probability	0.000001	0.000000	0.000000	0.000107	0.000000	0.000000	0.000000	0.000000
Sum	566.5940	1547186.	1252.886	2383.802	-1315.463	-619.7336	9709.040	13762.98
Sum Sq. Dev.	2608.442	9.37E+09	25060.93	7645.754	10129.45	2323.941	232163.3	299292.4
Observations	181	181	181	181	181	181	181	181

Source: Authors' calculations

There are 181 observations in the sample including 11 CEE countries in the period from 2000 to 2016. The data about all independent variables are presented in the Appendix in Figures 2 to 9. GDP growth mean is -3.13, while median is at 3.71. The highest GDP growth rate was in Montenegro in 2007 with 10.65% while the lowest GDP growth rate was -9.13% in Greece in 2011. Gross domestic product per capita mean is 8,547.98 and median is 6,353.82. The maximum value of GDP per capita was reported for Greece in 2008 (31,997.28) while the minimum value was 354.003 for Moldova in 2000. Inflation mean is 6.92 and median 3.6. Almost three-digit inflation (95%) was recorded in Serbia in 2001; on the other side, deflation of -1.73% was present in Greece in 2015. Unemployment mean is 13.17 and median is 11.42. The highest unemployment was reported in Bosnia and Herzegovina with 31.1% while the lowest was in Moldova – 3.9% in 2014. Current account mean is negative (-7.26), as well as its median (-6.10). The highest current account surplus was reported in Slovenia in 2014 with 6.2 percent while the highest current account deficit was present in Montenegro in 2008 with a staggering -49.94 percent of GDP. General government balance mean is also negative (-3.42) as well as median (-3.0). The highest general government surplus was present in Montenegro in 2007 with 8.5% percent while the highest deficit was recorded in Turkey –23.9% in 2001. Public debt mean is 53.64 % of GDP and median is 43.11%. The country with the highest ratio of public debt to GDP was Serbia in 2000 with 224.8% while the lowest was in Romania in 2006 with 12.3%. External debt mean is 76.03 % of GDP and median is 70.5%. The country with the highest ratio of external debt to GDP was Greece in 2015 with 251.1% while the lowest was in Albania in 2004 with 21.5%. In Table 5 cross-country panel regression analysis for CEEC, in the period from 2000 to 2016 with the dependent variable S&P credit ratings is presented.

Table 5 Cross-country panel regression analysis for CEEC, 2000-2016, S&P credit ratings

Dependent variable S&P credit ratings			
Independent variables	**POLS**	**FE**	**RE**
Constant	12.19360 (16.20459)	16.07506 (19.60959)	14.75418 (18.94166)
GDP growth	0.184392 *** (3.091805)	0.104580*** (2.650194)	0.128666 (3.315147)
GDP per capita	0.000350*** (8.563117)	0.000171*** (3.606921)	0.000248*** (5.921096)
Inflation	-0.098176*** (-4.399451)	-0.071772*** (-4.157546)	-0.068053*** (-4.103965)
Unemployment	-0.158043*** (-4.067654)	-0.181673*** (-3.641706)	-0.193062*** (-4.651049)
Current account balance	0.006186 (0.290554)	0.005180 (0.211716)	0.007216 (0.351456)
Government budget balance	-0.100613 (-1.549190)	-0.100784*** (-2.382002)	-0.099124*** (-2.358430)
Public debt	-0.044997*** (-5.500078)	-0.049947*** (-5.001789)	-0.039403*** (-4.774728)
External debt	-0.006599 (-0.850023)	-0.024382*** (-3.209481)	-0.025190*** (-3.678570)
Adjusted R-squared	0.735432	0.893743	0.727280
S.E. of regression	1.837686	1.164613	1.293688
Prob. (F-statistic)	0.00000	0.00000	0.00000
Mean dependent variable	10.99859	10.99859	3.313671
S.D. dependent variable	3.572749	3.572749	2.419071
Akaike info criterion	4.116174	3.260631	
Durbin -Watson	0.466747	0.996995	0.817627
Observations	142	142	142
Correlated random effects (Hausman test)	Chi-Sq. Statistic (39.114489), Prob. (0.0000)		
Redundant fixed effects (Likelihood ratio)	Cross-section F (23.017154), Prob. (0.0000) Cross-section Chi-square (139.487044), Prob. (0.0000)		

Source: Authors' calculations

The panel is unbalanced with 142 observations. Results from POLS, Fixed Effects and Random Effects model are presented. The Hausman test is used in order to differentiate between the fixed effects and random effects model while the Likelihood ratio test is used to choose between fixed effects and POLS. According to the Hausman and Likelihood ratio tests, the fixed effects model is appropriate over RE and POLS. The model is well explained with adjusted R-squared 0.893743. Statistically significant independent variables in the regression are GDP growth, GDP per capita, inflation, unemployment, government budget balance, public and external debt under 1 percent of significance. In Table 6 a cross-country panel regression analysis for CEEC, in the period from 2000 to 2016, with the dependent variable Moody's credit ratings is presented.

Table 6 Cross-country panel regression analysis for CEEC, 2000-2016, Moody's credit ratings

Dependent variable Moody's credit ratings			
Independent variables	**POLS**	**FE**	**RE**
Constant	12.14843 (15.62523)	18.18874 (17.43993)	15.43092 (16.45997)
GDP growth	0.068213 (1.047185)	0.033622 (0.686886)	0.040173 (0.829468)
GDP per capita	0.000470*** (13.14301)	0.000192*** (3.018238)	0.000342*** (6.801404)
Inflation	-0.070440*** (-2.797827)	-0.041124* (-1.808970)	-0.036982* (-1.713438)
Unemployment	-0.128393*** (-3.769970)	-0.346901*** (-5.201690)	-0.231424*** (-4.612356)
Current account balance	0.025764 (0.960757)	0.086078*** (2.594006)	0.049308* (1.760097)
Government budget balance	-0.078684 (-1.013908)	-0.044712 (-0.768338)	-0.061146 (-1.059846)
Public debt	-0.033457*** (-3.625932)	-0.058133*** (-4.437321)	-0.038244*** (-3.547211)
External debt	-0.037999*** (-4.795146)	-0.024932*** (-2.431253)	-0.042671*** (-4.988370)
Adjusted R-squared	0.711560	0.847658	0.666712
S.E. of regression	2.194339	1.594726	1.717250
Prob. (F-statistic)	0.00000	0.00000	0.00000
Mean dependent variable	10.06065	10.06065	3.111064
S.D. dependent variable	4.085793	4.085793	2.957664
Akaike info criterion	4.465950	3.885672	
Durbin -Watson	0.449821	0.826882	0.688454
Observations	155	155	155
Correlated random effects (Hausman test)	Chi-Sq. Statistic (31.275752), Prob. (0.0001)		
Redundant fixed effects (Likelihood ratio)	Cross-section F (14.043196), Prob. (0.0000) Cross-section Chi-square (109.943024), Prob. (0.0000)		

Source: Authors' calculations

The results from Table 6 are similar to the ones from Table 5. The fixed effects model is preferable with 155 observations included. Statistically significant independent variables in the regression are GDP per capita, unemployment, current account balance, public and external debt under 1 percent of significance and inflation under 10% of significance. In Table 7 a cross-country panel regression analysis for CEEC, in the period from 2000 to 2016, with the dependent variable Fitch credit ratings is presented.

Table 7 Cross-country panel regression analysis for CEEC, 2000-2016, Fitch credit ratings

Dependent variable Fitch credit ratings			
Independent variables	**POLS**	**FE**	**RE**
Constant	13.59454 (15.56680)	17.49161 (18.50502)	13.80833 (22.93856)
GDP growth	0.157205** (2.419023)	0.091575* (1.906706)	0.127779*** (3.477578)
GDP per capita	0.000329*** (7.148507)	0.000189*** (3.445417)	0.000340*** (10.80851)
Inflation	-0.095679*** (-3.954417)	-0.064964*** (-3.269983)	-0.083170*** (-5.508079)
Unemployment	-0.160175*** (-2.899694)	-0.165808*** (-2.762555)	-0.161446*** (-4.149783)
Current account balance	-0.017580 (-0.533134)	0.017055 (0.485671)	
Government budget balance	-0.073947 (-1.027000)	-0.060083 (-1.152961)	
Public debt	-0.032369*** (-3.370904)	-0.055071*** (-4.680457)	-0.029454*** (-4.711099)
External debt	-0.016130* (-1.883599)	-0.025768*** (-2.846900)	-0.017593*** (0.0030)
Adjusted R-squared	0.710566	0.855265	0.712322
S.E. of regression	1.841977	1.302555	1.836379
Prob. (F-statistic)	0.00000	0.00000	0.00000
Mean dependent variable	12.58070	12.58070	12.58070
S.D. dependent variable	3.423807	3.423807	3.423807
Akaike info criterion	4.135213	3.488612	
Durbin -Watson	0.479753	0.792841	0.436265
Observations	114	114	114
Correlated random effects (Hausman test)	Chi-Sq. Statistic (112.511416), Prob. (0.0000)		
Redundant fixed effects (Likelihood ratio)	Cross-section F (18.495682), Prob. (0.0000) Cross-section Chi-square (85.712530), Prob. (0.0000)		

Source: Authors' calculations

The number of observations is somewhat lower (114) due to Fitch's not assigning credit ratings to some CEE countries. The random effects model is corrected by the exemption of two variables (CAB and GGB) which were not significant in earlier models, because random effects estimation required a number of cross sections greater than the number of coefficients for the estimate of RE innovation variance. Similarly to previous results, the FE model is preferable with statistically significant independent variables GDP growth, GDP per capita, inflation, unemployment, public and external debt.

6. Conclusion

The goal of this paper was the investigation of the sovereign credit rating determinants in Central and Eastern European countries (CEEC). The analysis is made on the sample of eleven CEEC countries over a period of 17 years (from 2000 to 2016). The model

was constructed using a cross-country panel regression analysis where fixed effects model was chosen as the most appropriate. The results of the analysis have shown that GDP growth, GDP per capita, inflation, unemployment, public debt to GDP and external debt to GDP variables play the major role in determining the sovereign credit ratings of CEE countries. The collected results are in line with the expected correlation and provide a clear overview of selected variables which influence a country's economic outlook. Those facts are very important and significant for many reasons. First of all, the sovereign credit rating gives the first point of reference for potential foreign investors who intend to invest in a country. Also, it gives a good picture of the country's fiscal condition which implies business consistency and stable legal framework. Therefore, it is a signal for future development and rising/falling competitive environment. According to the above considerations, sovereign credit rating is an unavoidable segment in the field of economic diplomacy that implies foreign direct investment, the importance of export and the establishment of a stable economic framework, especially in this globalized, computerized, interconnected and vulnerable world circumstances. Further, the presented results will be helpful to all stakeholders in CEE countries, especially those who are in charged of economic policy. The limitations of the research can be related to missing data for credit ratings for some CEE countries and probably to the selection of variables. Suggestions for further investigation should be made taking into account other countries and time periods, a process of transformation of credit ratings other than the linear (logistic) one, and constructing a dynamic panel data specification.

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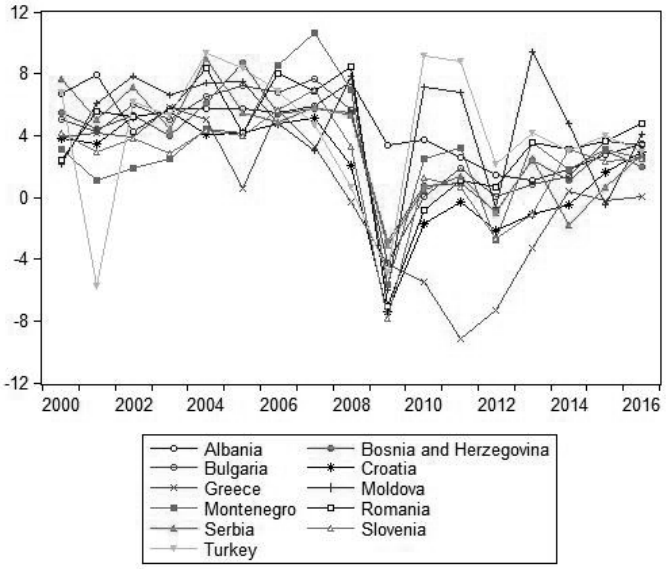
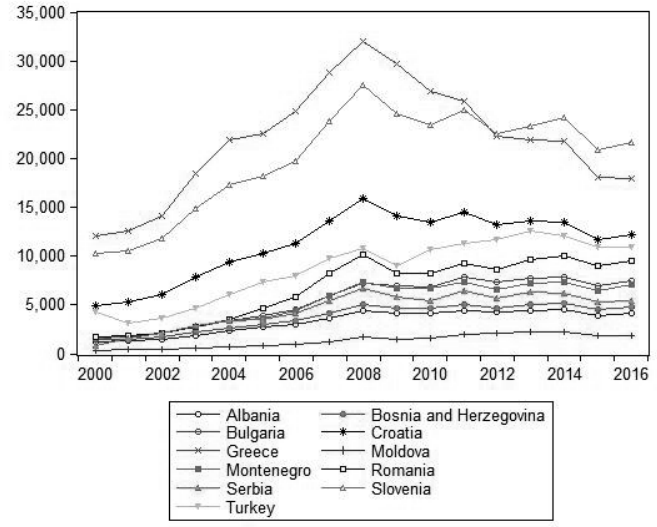
Appendix

Figure 2 ***Annual GDP growth rates for CEEC, 2000 - 2016***



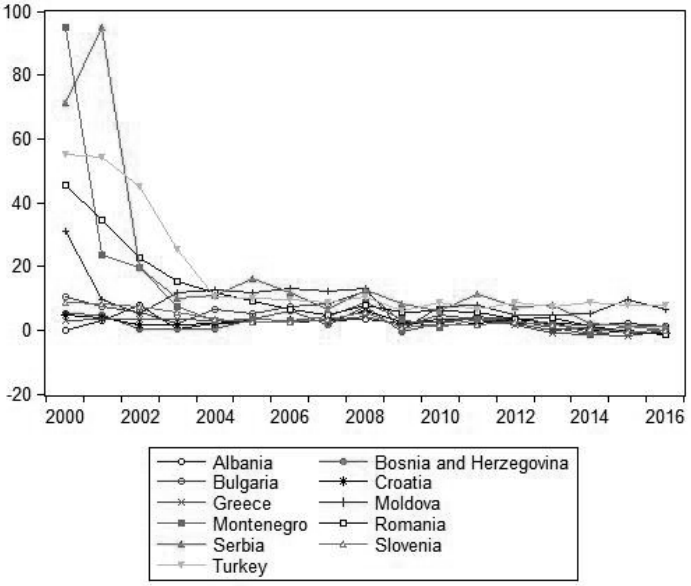
Source: Authors' compilation from various sources

Figure 3 ***GDP per capita for CEEC, 2000 - 2016***



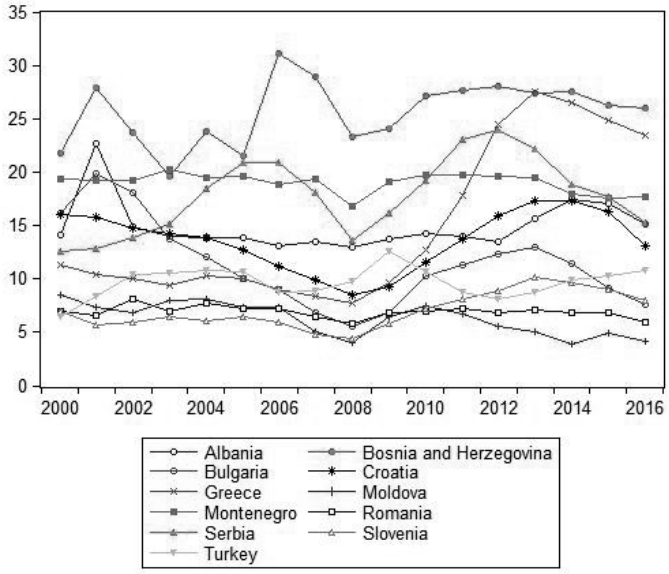
Source: Authors' compilation from various sources

Figure 4 ***Annual inflation rates for CEEC, 2000 - 2016***



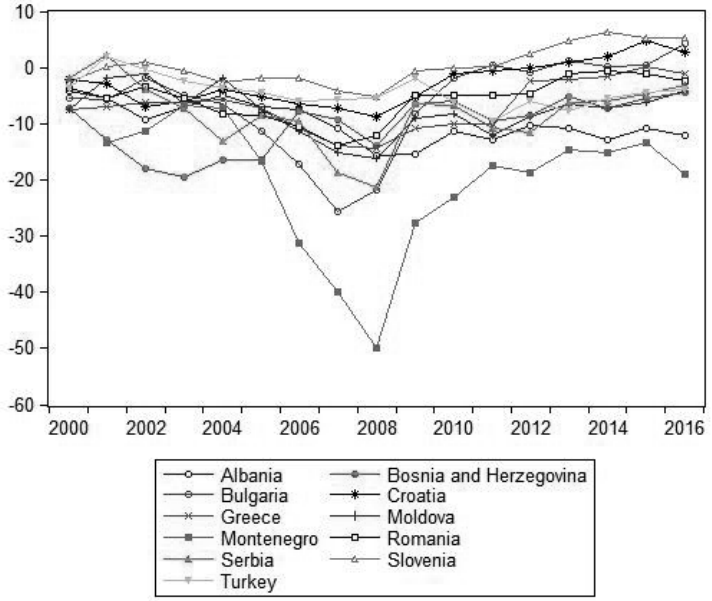
Source: Authors' compilation from various sources

Figure 5 ***Annual unemployment rates for CEEC, 2000 - 2016***



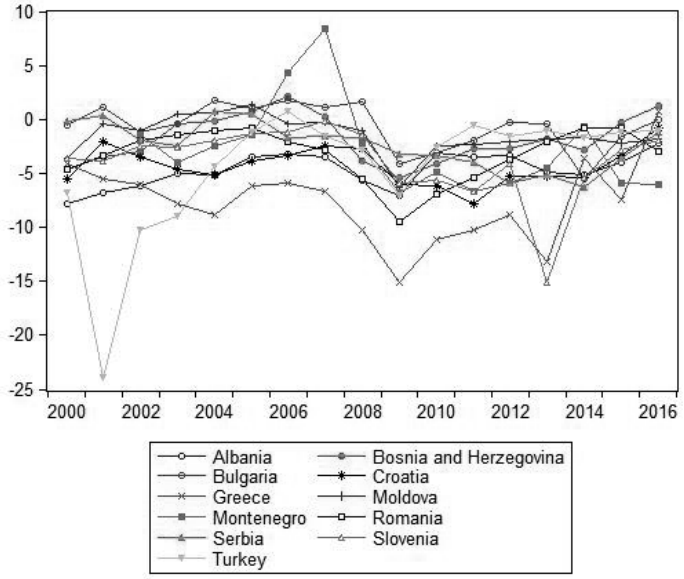
Source: Authors' compilation from various sources

Figure 6 ***Annual current account balance for CEEC, 2000 - 2016***



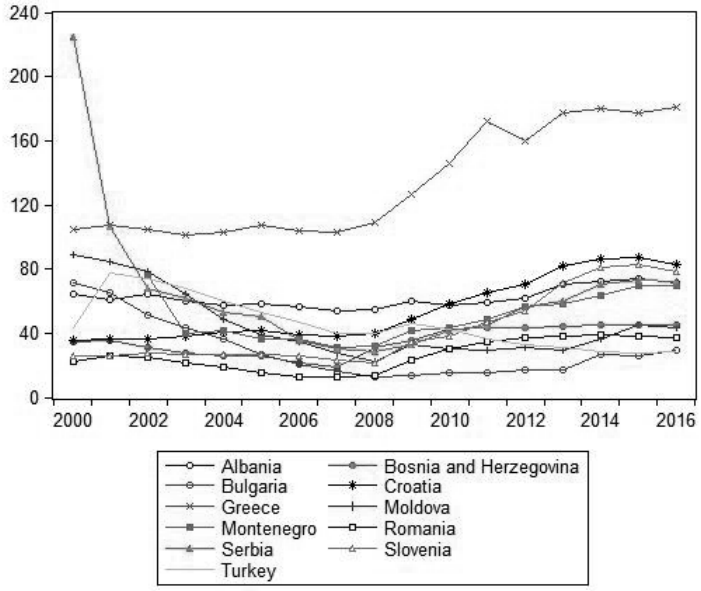
Source: Authors' compilation from various sources

Figure 7 ***Annual government budget balance for CEEC, 2000 - 2016***



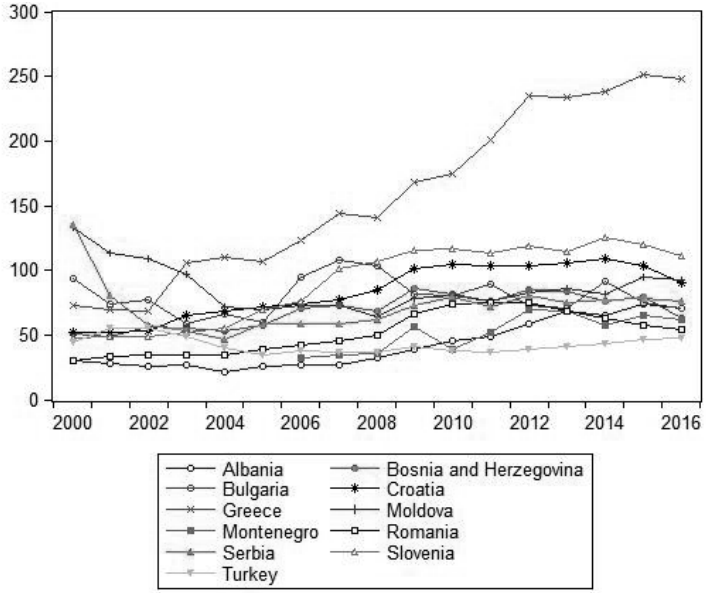
Source: Authors' compilation from various sources

Figure 8 ***Public debt for CEEC, 2000 - 2016***



Source: Authors' compilation from various sources

Figure 9 ***External debt for CEEC, 2000 - 2016***



Source: Authors' compilation from various sources

(Endnotes)

1 Reusens, P., Croux, C. (2016), "Sovereign credit rating determinants: the impact of the European debt crisis", available at: https://lirias.kuleuven.be/bitstream/123456789/540395/1/KBI_1615.pdf (Accessed on: May 15, 2018)

2 Fitch does not appoint credit ratings to Albania, Bosnia and Herzegovina, Moldova and Montenegro while Standard &Poor's does not appoint it for Moldova. Furthermore, credit ratings for some countries are not available for the full-time period; they have been appointed after 2000.

3 Data for sovereign credit ratings for CEE countries are collected from https://tradingeconomics.com

4 Data are available at: https://tradingeconomics.com

5 Data for GDP per capita values can be found at: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=RS-AL

6 Data are available at: https://tradingeconomics.com

7 Data are available at: https://www.statista.com and https://knoema.com

8 Data are available at: https://tradingeconomics.com

9 Data are available at: https://tradingeconomics.com

10 Data are available at: https://tradingeconomics.com

11 Data can be found at: https://www.theglobaleconomy.com and https://www.ceicdata.com

12 If missing values are not present in the sample, there is no *difference between common sample and individual sample*. Otherwise, in common sample are excluded observations where there are one or more missing values, which is not the case for individual sample.

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DETERMINANTE KREDITNIH REJTINGA ZEMALJA SREDIŠNJE I ISTOČNE EUROPE

Sažetak

Cilj je ovog rada istražiti odrednice kreditnih rejtinga zemalja Središnje i Istočne Europe (CEEC). Kreditni rejtinzi su važni prilikom određivanja financijske sposobnosti zemlje da ispuni svoje obveze. U tu svrhu važno je znati odrednice kreditnih rejtinga koje utječu na dodjeljivanje kreditnog rejtinga zemlje, a time i na uvjete pod kojima se zemlja može zadužiti na financijskom tržištu. Analiza je provedena na uzorku od 11 zemalja Srednje i Istočne Europe u razdoblju od 17 godina (od 2000. do 2016. godine). Prilikom određivanja determinanti triju najznačajnijih svjetskih kreditnih agencija (Standard i Poors's Rating Services, Moody's i Fitch) korištena je linearna OLS metoda za nebalansirani panel. Rezultati analize su pokazali da značajnu ulogu prilikom određivanja kreditne ocjene zemlje imaju varijable: rast bruto domaćeg proizvoda, bruto domaći proizvod po glavi stanovnika, inflacija, nezaposlenost, javni dug i inozemni dug zemlje.

Ključne riječi: determinante kreditnog rejtinga, zemlje Središnje i Istočne Europe, panel analiza