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Title: CREDIT RATING AGENCIES AND EUROZONE CRISIS

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Abstract

Using a panel framework that allows for cross-sectional dependence, we examine the determinants of credit ratings for the Eurozone countries over the period 2002–2019. We find that government debt and the cumulative current account exert a stronger impact, in contrast to external balance, on ratings post-2008 compared to the period before.

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1. Introduction

Sovereign credit ratings estimate the future ability and willingness of the sovereign governments to service their commercial and financial obligations in full and on time. The process of evaluating the nations and assigning ratings is a business involving various international rating agencies. Governments seek the credit ratings so as to improve their access to the international capital markets. The sovereign credit ratings are an important scale for determining the cost of borrowing to a country. The ratings provide a perception to the lenders about the level of credit risk of the national governments.

During this crisis, most of the attention has focused on the European countries. The three major credit rating agencies (CRAs), Moody's Investor Services, Standard & Poor's and Fitch Ratings (all three account for 95% of the market share) monitored the significant deterioration of public finances post 2008. Many sovereign ratings, particularly for Greece, Ireland, Portugal and Spain became under persistent downgrade pressure, as a result of increased government deficits and debt levels, and weak economic growth.

Earlier work by e.g. Afonso et al. (2011), Cavallo et al. (2013) and e.g. Theodore Panagiotidis et al. (2015) examined sovereign credit rating. However, a wide range of decisions made by the CRAs remain unexplained. As a result, CRAs came under close scrutiny. Many policymakers and commentators, such as Jose Manuel Barroso (the EU Commission's former President), argue that the role played by CRAs in structured finance exacerbated the crisis.

This paper lists the factors that influence rating agencies to evaluate European countries. Our work is divided into three parts based on recent literature. First, we take into consideration the cross-sectional dependence that is present in the data. Second, we examine the role of the cumulated current account and the government

debt. Third, we try to determine if the decisions of the credit rating agencies have been affected from the recent crisis in the euro area.

2. Credit Rating Agencies and Rating systems

The history of the rating credit agencies goes back to the early 20th century when Moody's and Standard and Poor's (S&P) used to publish ratings for corporate securities in America. Later in the 1920s, Fitch also began its business of rating the corporates. Despite this, the initial spread of the rating business was only limited to the US. It is only in the last thirty years that these agencies have spread their services to other nations. Moreover, the process of rating countries began only in the 1970s when S&P and Moody's rated only the US and Canada, Australia being added later by Moody's. The sovereign ratings actually took off in the 1980s and 1990s and by the year 2000, the major companies were rating about 100 nations each e.g. Klein et al. (2004). The international credit rating agencies such as Moody's, S&P, and Fitch have many times faced criticism for being unreliable and non-transparent in providing credit ratings to nations. The recent financial crisis that hits many of the developed nations resulted in a threat to the credit standing of nations such as the US and the UK (see e.g. Reuters, 2009). The credit rating agencies also downgraded the rating of countries such as Greece in April 2010. There have been various opinions regarding this downgrading of Greece and its impact on other European nations by e.g. Paphitis and Pylas et al. (2010) and e.g. Wachman and Fletcher et al. (2010). Two of the agencies, S&P and Fitch, also indicated a threat to the credit standing of India during June, 2008 and stated that they might downgrade (see e.g. The Financial Express et al., 2009).

Credit rating agencies (CRAs) are private companies of financial interest that offer mainly "independent" consulting and reputable services in the secondary market. Assessing the creditworthiness of the borrowers (individuals, companies, states) as well as the bonds issued by the borrowers provide relevant information in favor of the interested parties in order to make safer financing decisions. These are private non-majority regulators of international capital markets with a strong and important role since their credit ratings can affect even the international market.

Credit rating agencies affect both parts of a credit relationship (both the lender and the borrower). As for the lender, it provides information on the credit risk contained in the alternative investment opportunities and provides the borrower with the necessary information to adjust its internal procedures and activities according to the creditworthiness standards.

Valuations are made on long-term liabilities (bonds) and short-term liabilities (foreign exchange) of companies, financial institutions, municipalities and states. The valuation of the security is based on the ability of the borrower to repay the capital and interest in accordance with the existing loan agreement.

The most important international credit rating agencies, as we said, are the so-called Big Three, which control about 95% of the ratings. Moody's Investors Service and Standard & Poor's (S&P) control a total of 80% of the global market, while Fitch Ratings controls an additional 15%.

2.1. Rating Scales

The credit rating agencies use different types of notations to provide ratings to the sovereigns. These notations indicate different levels of rating and hence the level of credit worthiness for different nations. **Table 1** shows different notations and the corresponding grades, levels of credit risk, and the capacity to meet financial commitment for Fitch, S&P's and Moody's. We find from the Table 1 how the interpretations of various ratings are comparable the rating agencies. The agencies use different notations; however, every notation used by Fitch has its counterpart in the S&P and Moody's rating.

2.2. Rating Indicators based on Literature Review

The credit rating of sovereigns is done using indicators that can be both quantifiable and qualitative in nature. The former implies a list of measures of economic and financial performance and the latter indicates the factors such as political stability. The credit rating agencies use the indicators for quantitative analysis through assigning weights to different indicators/variables in order to decide the ratings and update them by monitoring these variables. Moreover, the agencies do not reveal any details regarding the weights they attach to each of these indicators possibly making the process of quantitative analysis vulnerable to subjective biases. However, these agencies do provide a list of indicators that they consider for their analysis by e.g. Moody's et al. (2004).

The first systematic study on sovereign credit ratings can be attributed to Cantor and Packer (1996). They concluded that ratings can largely be explained by a small set of macroeconomic variables: Per capita income, GDP growth, inflation, fiscal balance, external balance, external debt, economic development and default history are able to explain to a large extent (up to 92%) of variation in credit ratings. The study examines a group of industrial countries and emerging markets.

Haque, Mark and Mathieson (1998) focus on the relative importance of economic and political variables in determining a country's credit rating. Explanatory variables are categorized into four classes. Measures of external shocks, measures of domestic economic performance, measures of external economic performance and political variables. They used three different measures of creditworthiness as a dependent variable: Institutional investors, Euromoney and the Economic Intelligence Unit. They concluded that political variables do not add additional information if economic factors have been accounted for.

Bheenick (2003) used two different scales to describe rating grades. First, from 1 to 9 and second from 1 to 21. Furthermore, he estimated an ordered response model for the full sample of 95 countries, then another one for the 20 high rated countries and then another for the 75 low rated countries. An important result was that economic variables do not play an important role for the high rated sample of countries. For the full sample GNP per capita and inflation are the most significant factors. Apart from them, for the low rated countries, current account balance and the level of foreign reserves do play an important role in the determination of sovereign ratings.

Afonso (2003) used both a linear and a logistic transformation of rating grades to examine the determinants of sovereign credit ratings. The results of the estimations using the logistic transformation turned out to be better for the overall sample, especially for the countries placed on the top end of the rating scale. GDP per capita, external debt, economic development, default history, real growth rate and the inflation rate explained a significant part of the variability of credit ratings.

As the importance of CRAs has grown for capital markets, emphasis was given not only to macroeconomic variables but also to other determinants. Bautler and Fauver (2006) were the first ones to deal not only with the usual set of macroeconomic variables, but also with qualitative variables such as political institutions and legal environment. The theoretical background behind these qualitative variables is that the legal environment and political institutions affect a country's willingness to repay its debt. Legal environment was found to be statistically significant and its marginal effect in sovereign credit ratings was much stronger than macroeconomic variables.

Garcia, Valle and Marin (2014) tried to explain rating agencies behavior by using not only macroeconomic variables but also 6 World Bank Indicators. Surprisingly, only 3 explanatory variables were found to be statistically significant, namely External Balance, Economic Development Indicator and Regulatory Quality Index. A worth mentioning result was that a model with these 3 variables seemed to explain a high percentage of credit rating variation.

Following the existing literature, we use a set of macroeconomic variables often used in the previous studies, such as:

GDP per capita – positive impact: GDP per capita is supposedly a measure of the country development and can be seen as an indicator of the tax basis available in the economy. Also, countries high lower GDP per capita may be less able to solve debt service problems by implementing austerity measures. Therefore, the bigger GDP per capita the more likely is the attribution of a higher rating level.

GDP growth rate – positive impact: A higher GDP growth rate decreases government debt, as percentage of GDP. Therefore, it suggests the country's ability to service debt becomes easier over time.

Government debt – negative impact: The higher the stock of government debt, the higher interest rates should be paid to service it. Therefore, more resources are required. Moreover, a higher government debt corresponds to a higher risk of default.

Cumulated current account balance – positive impact: It is the sum of current account surpluses and deficits. It is an alternative measure of external debt. A lower accumulated current account balance (a higher external debt) indicates a higher risk of default.

Unemployment rate – negative impact: A country with lower unemployment has a well-functioning labor market. In addition, the lower is the unemployment, the greater is the number of the people with income. As a result, lower unemployment increases the potential tax base and reduces the fiscal burden for unemployment subsidies.

Inflation rate – uncertain impact: Inflation rate has two opposite effects on the existing stock of government debt. On the one hand, an increase of inflation improves the public debt dynamics by reducing the real value of government debt, on the other hand a rise in inflation contributes negatively to the debt dynamics because it makes it necessary for the government to pay higher nominal interest rates by e.g. Antonio Afonso et al. (2002).

External balance – uncertain impact: On the one hand, a higher external deficit could reflect a country's tendency to over-consume, undermining long-term prosperity. On the other hand, it could signal rapid accumulation of fixed investment, which should lead to higher growth and improved prosperity over the short term.

Regulatory Quality – positive impact: A higher value of regulatory quality index reflects the ability of the government to formulate and implement regulations that private sector development and increase investments and as a result of GDP. Moreover, it is qualitative measure of government's willingness to repay its debt.

Reserves – positive impact: Total reserves includes gold.

3. Eurozone debt Crisis

The European debt crisis (often also referred to as the eurozone crisis or the European sovereign debt crisis) is a multi-year debt crisis that has been taking place in the European Union since the end of 2009. Several eurozone member states (Greece, Portugal, Ireland, Spain and Cyprus) were unable to repay or refinance their government debt or to bail out over-indebted banks under their national supervision without the assistance of third parties like other eurozone countries, the European Central Bank (ECB), or the International Monetary Fund (IMF).

The eurozone crisis was caused by a balance-of-payments crisis (a sudden stop of foreign capital into countries that had substantial deficits and were dependent on foreign lending). The crisis was worsened by the inability of states to resort to devaluation (reductions in the value of the national currency). Debt accumulation in some eurozone members was in part due to macroeconomic differences among eurozone member states prior to the adoption of the euro. The European Central Bank adopted an interest rate that incentivized investors in Northern eurozone members to lend to the South, whereas the South was incentivized to borrow (because interest rates were very low). Over time, this led to the accumulation of deficits in the South, primarily by private economic actors. A lack of fiscal policy coordination among eurozone member states contributed to imbalanced capital flows in the eurozone. A lack of financial regulatory centralization or harmonization among eurozone states, coupled with a lack of credible commitments to provide bailouts to banks, incentivized risky financial transactions by banks. The detailed causes of the crisis varied from country to country. In several countries, private debts arising from a property bubble were transferred to sovereign debt as a result of banking system bailouts and government responses to slowing economies post-

bubble. European banks own a significant amount of sovereign debt, such that concerns regarding the solvency of banking systems or sovereigns are negatively reinforcing.

3.1. CRA and European crisis

European crisis brought increased attention to the role of credit rating agencies (CRAs) and the interdependence between financial markets during crisis. IMF stated that sovereign default was the most pressing risk facing the global economy. Many sovereign ratings, particularly for Greece, Ireland, and Portugal, became under persistent downgrade pressure, as a result of increased government deficits and debt levels, and weak economic growth. Sovereign bond and credit default swap spreads widened, and stock markets were deflated, not only in the worst-affected countries, as market concerns spread to other indebted states in the euro-zone and to the USA. The crisis was also accompanied by exchange rate volatility, including the US\$ versus the Euro.

During this crisis, CRAs came under close scrutiny. Many policymakers and commentators argue that the role played by CRAs in structured finance exacerbated the crisis. For example, the high-level group chaired for the European Commission by Jacques de Larosiere stated that when rating agencies evaluated the credit risk associated with collateralized debt obligations (CDOs), there were ‘flaws in their rating methodology’.⁵ CRAs have also been criticized recently on the basis of inherent conflicts of interest within their business model, lack of transparency, poor communication, cliff effects and related overreliance on ratings by users.

In response to the perceived role of CRAs in the financial crisis, several policy actions have already occurred and new legislation has been passed in the United States and Europe. The International Organization of Securities Commissions (IOSCO) revised

the Code of Conduct Fundamentals for Credit Rating Agencies in 2008 to address issues of independence, conflict of interest, transparency and competition. Also, a formal regulation on CRAs was approved by the European Parliament and entered into force in December 2009. This requires CRAs operating in Europe to register with the Committee of European Securities Regulators (CESR). The responsibility for the regulation of CRAs was handed to the European Securities and Markets Authority (ESMA) in July 2011. CRAs are now subject to legally binding rules that are based on the IOSCO Code.⁶ Many other G-20 countries have introduced or are in the process of introducing new regulatory oversight for CRAs. Further, the Basel Committee of the Bank for International Settlements reviewed the role of external ratings in the capital adequacy framework, mainly to incorporate the IOSCO Code into the committee's eligibility criteria. The Financial Stability Board published a set of principles for reducing reliance on CRA ratings in standards, laws and regulations.

CRAs are currently accused of precipitating the sovereign debt crisis by downgrading the ratings of euro-zone sovereigns too far and too fast. Politicians across the EU have called for further regulation to improve quality and transparency in sovereign ratings. Proposals from European politicians have generated a mixed response, including the notion of a publicly owned rating agency, and a suggestion that CRAs should notify sovereigns 3 days in advance of a rating event (rather than the normal 12 h). The criticisms are largely unjustified since rating downgrades reflect the seriousness of the problems faced by euro-zone sovereigns. This report also encourages legislative changes to enhance the quality of national statistical data, and advocates that sovereigns should cooperate closely with CRAs.

4. Data description and Methodology

Our database includes annual data from 2002 to 2019 for 19 Eurozone countries, such as Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovak Republic, Slovenia, Spain (342 observations in total). The cross-section data for the indicators is collected from different sources. The data on GDP per capita, external balance, total reserves and regulatory quality are obtained from World Bank Open Data. The data on GDP growth rate, government debt, current account, unemployment rate and inflation rate are obtained from International Monetary Fund. **Table 2** presents the data employed and their sources.

For the purpose of analysis, it was required to convert the ratings of these agencies into the numeric form. This was done on the basis of the method used by Cantor and Packer (1996) to convert the ratings of these three agencies in the year 1995. For the present analysis, the numeric conversion starts from the lowest level rating as theoretically defined by the three agencies, i.e., 'C', 'SD' and 'DDD' for Moody's, S&P and Fitch respectively. These ratings are equated to 1 and moving on to the highest rating for 'Aaa' (Moody's), 'AAA' (Standard and Poor's) and 'AAA' (Fitch) which would be equivalent to 21. (see Table 1)

The model specification we adopt takes into account the cross-sectional dependence that is present in the sample. We examine whether CRA have changed their behavior during the crisis (see e.g. Theodore Panagiotidis, 2015). The general model to estimate is as follows:

$$CRA_{it} = \alpha_0 + \mu_i + \sum_{i=1}^9 \alpha_i * x_{it} + \sum_{i=1}^9 b_i * \bar{x}_i + \sum_{i=1}^3 c_j * D_{crisis} * x_{jt} + error_{it}$$

Where CRA_i is the dependent variable and x_i includes nine explanatory variables such as GDP per capita, growth rate of GDP, government dept, inflation rate, unemployment rate, current account, external balance, log reserves and regulatory quality. \bar{x}_i includes the cross-section averages (cavg) of these variables. D_{crisis} takes the value of 1 for years 2009 to 2013 and 0 otherwise. Government dept, current account and external balance interact with the crisis dummy in line with Gros (2011) who argues that the external sector was of vital importance during the crisis.

The model is estimated using (i) pooled OLS (ordinary least square) method (ii) fixed effects and (iii) random effects (see e.g. Afonso, Gomes and Rother (2007)). The Perasan (2004) cross-sectional independence test can provide evidence that cross sectional dependence exists in model without the cross-section averages (\bar{x} : cavg). In fact, cross sectional dependence would point to the existence of spill-over effects between the Eurozone countries.

5. Empirical Results

Table 3 to 5 provide the empirical results for each one of the three main Credit Rating Agencies. Table 3 reports the results of Fitch, Table 4 the results of S&P and Table 5 the results of Moody's. In each model, the first two columns repost all estimated coefficients and associated p-value (full model with cavg) using pooled OLS, the next two columns using fixed effects and the third using random effects. At a first glance, we can see that GDP per capita, GDP growth rate, current account and total reserves have positive impact on all agencies. To the other hand, government debt, inflation rate, unemployment rate and external balance have negative impact for all agencies. Notice also the positive impact of World Bank's regulatory quality index (this captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit promote private sector development).

Our results (based on the interaction of the post 2008 dummy variable with the regressors) suggests that, for all CRAs, government debt developments and the current account weigh more on credit rating decisions post rather than pre-crisis. For example, the S&P random effects model suggests that the impact of government debt increases from an estimate -0.033 to an estimate of $-0.033-0.011=-0.044$. The fixed effects model suggests, for S&P, an increase in the government debt impact from -0.045 pre-crisis to $-0.045-0.010=-0.055$ afterwards. For Moody's, the fixed effects model suggests an increase in the debt impact from -0.075 pre-crisis to $-0.075-0.017=-0.092$ afterwards. Finally, the impact of the external balance appears insignificant (pre- or post-crisis) based on the fixed effects model. **Table 6**, which reports the result of average ratings, also suggests that the impact of government debt and the current account is stronger post crisis.

Last, but not least, our findings (from the estimated model) for Eurozone's sovereign bond market are that Moody's appears to be placing more weight (compared with the remaining CRAs) on fiscal stance developments. If, indeed, investors value

“more” decisions made by Moody’s, our results arguably suggest that any rating upgrades decided by Moody’s on fiscal related grounds have the potential of accelerating investor faith in Eurozone’s troubled peripheral market, therefore triggering a rapid reduction in peripheral sovereign bond yields which remained stubbornly elevated during the (recent) financial crisis.

6. Conclusions

We examine the determinants of credit ratings for the Eurozone countries over the period 2002–2019 in a panel data model which allows for cross-sectional dependence as a form of spillover effects within Eurozone. Our analysis provides evidence that government debt and current account exert stronger impact, than the external balance, on credit ratings post rather than pre-crisis. Thus, the present results raise doubts regarding the consistency of the rating decisions by the credit rating agencies. Even in terms of communication of facts, the reliability of these ratings is questionable. Finally, given that this small-scale research focus on Credit Rating Agencies in Eurozone countries pre- and post-crisis, it may prompt exploration of CRAs impact using this examined model with more reliable variables and extended data.

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Table 1: Rating Scales/Grades used by credit rating agencies

	<u>Fitch</u>	<u>Moody's</u>	<u>S&P</u>	<u>Rating grades (1-21)</u>
Highest quality	AAA	AAA	Aaa	21
High quality	AA+	AA+	Aa1	20
	AA	AA	Aa2	19
	AA-	AA-	Aa3	18
Strong payment Capacity	A+	A+	A1	17
Capacity	A	A	A2	16
	A-	A-	A3	15
Adequate payment Capacity	BBB+	BBB+	Baa1	14
Capacity	BBB	BBB	Baa2	13
	BBB-	BBB-	Baa3	12
Likely to fulfill obligations, ongoing	BB+	BB+	Ba1	11
Uncertainty	BB	BB	Ba2	10
	BB-	BB-	Ba3	9
High credit risk	B+	B+	B1	8
	B	B	B2	7
	B-	B-	B3	6
Very high credit Risk	CCC+	CCC+	Caa1	5
	CCC	CCC	Caa2	4
	CCC-	CCC-	Caa3	3
Non default with possibility of recovery	CC	CC	Ca	
	C			2
Default	DDD	SD	C	
	DD	D		
	D			1

Table 2: Data definitions

<u>Variable</u>	<u>Description</u>	<u>Source</u>
Fitch rating	Sovereign rating attributed at 31st December of each year	Fitch
S&P rating	Sovereign rating attributed at 31st December of each year	S&P
Moody's rating	Sovereign rating attributed at 31st December of each year	Moody's
GDP per capita	Log GDP per capital, US dollars, constant 2010 prices	World Bank
GDP growth rate	Annual percent change of GDP	IMF WEO
Government debt	General government gross debt as a percent of GDP	IMF WEO
Accumulated current account	Sum of current account balances as a percent of GDP from 1995	IMF WEO
Unemployment rate	Unemployment rate as a percent of total labor force	IMF WEO
Inflation rate	Annual growth rate of Consumer Price Index	IMF WEO
External Balance	External balance on goods and services as a percent of GDP	World Bank
Reserves	Log of total reserves (includes gold, constant 2005 prices)	World Bank
Regulatory Quality	Aggregate Government Indicator	World Bank

Table 3: Credit rating models-Fitch

<i>Variable</i>	<u>Pooled</u>		<u>Fixed</u>		<u>Random</u>	
	<u>OLS</u>		<u>Effects</u>		<u>Effects</u>	
	<i>Coefficient</i>	<i>Prob.</i>	<i>Coefficient</i>	<i>Prob.</i>	<i>Coefficient</i>	<i>Prob.</i>
Log GDP per capita	7.86E-05	0.0000	-6.18E-05	0.0396	2.33E-05	0.2557
Log GDP per capita cavg	0.000442	0.0278	0.000379	0.0192	0.000311	0.1097
GDP growth rate	0.031967	0.4285	0.023113	0.3175	0.003617	0.8955
GDP growth rate cavg	-0.087890	0.2317	-0.088387	0.0305	-0.072333	0.1418
Government debt	-0.020539	0.0000	-0.060747	0.0000	-0.041189	0.0000
Government debt cavg	-0.167400	0.0723	-0.118230	0.0221	-0.140674	0.0249
Inflation rate	-0.173498	0.0337	-0.185817	0.0001	-0.199556	0.0004
Inflation rate cavg	0.247224	0.1964	0.154414	0.1716	0.187200	0.1733
Unemployment rate	-0.260302	0.0000	-0.357081	0.0000	-0.363046	0.0000
Unemployment rate cavg	1.043457	0.0096	0.863434	0.0018	0.908867	0.0067
Current account	0.182712	0.0000	-0.082616	0.0116	-0.019232	0.6069
Current account cavg	0.245442	0.6111	0.350906	0.1940	0.305768	0.3527
External balance	-0.175039	0.0000	0.078656	0.0209	0.006478	0.8658
External balance cavg	-0.169534	0.7703	-0.325281	0.3026	-0.261511	0.4962
Log reserves	1.45E-11	0.0000	-6.72E-12	0.0681	1.38E-12	0.7273
Log reserves cavg	-3.11E-12	0.9355	4.03E-11	0.0765	3.24E-11	0.2398
Regulatory quality	2.505973	0.0000	2.807843	0.0000	2.833918	0.0000
Regulatory quality cavg	1.352337	0.7477	-5.132152	0.1957	-4.792668	0.3208
Current account*dcrisis	-0.134919	0.0322	-0.001600	0.9647	-0.043328	0.3123
Government debt*dcrisis	-0.011428	0.0315	-0.009129	0.0019	-0.010977	0.0021
External balance*dcrisis	0.035638	0.2803	-0.012130	0.5364	0.005327	0.8144
<i>R-squared</i>	0.770157		0.938206		0.797102	
<i>PerasanCross sectional independence test</i>			-0.639436	0.5225	-0.669838	0.5030

Table 4: Credit rating models-S&P

<i>Variable</i>	<u>Pooled</u>		<u>Fixed</u>		<u>Random</u>	
	<u>OLS</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>
	<i>Coefficient</i>		<i>Coefficient</i>		<i>Coefficient</i>	
Log GDP per capita	8.52E-05	0.0000	-4.88E-05	0.0899	2.42E-05	0.2312
Log GDP per capita cavg	0.000400	0.0463	0.000342	0.0275	0.000280	0.1185
GDP growth rate	0.029800	0.4597	0.011971	0.5894	-0.004006	0.8748
GDP growth rate cavg	-0.066685	0.3632	-0.066664	0.0887	-0.051791	0.2536
Government debt	-0.023591	0.0000	-0.045299	0.0000	-0.033007	0.0000
Government debt cavg	-0.161663	0.0820	-0.140181	0.0048	-0.152608	0.0084
Inflation rate	-0.217490	0.0078	-0.238752	0.0000	-0.247662	0.0000
Inflation rate cavg	0.318122	0.0962	0.253383	0.0198	0.273603	0.0312
Unemployment rate	-0.226253	0.0000	-0.367328	0.0000	-0.361374	0.0000
Unemployment rate cavg	0.921098	0.0219	0.845505	0.0014	0.857159	0.0056
Current account	0.192065	0.0000	-0.063911	0.0416	-0.016063	0.6442
Current account cavg	0.271042	0.5738	0.374725	0.1485	0.340638	0.2613
External balance	-0.194051	0.0000	0.044630	0.1709	-0.008006	0.8230
External balance cavg	-0.088635	0.8784	-0.226541	0.4543	-0.182439	0.6063
Log reserves	1.21E-11	0.0000	-9.07E-12	0.0105	-2.55E-12	0.4937
Log reserves cavg	2.57E-12	0.9467	5.23E-11	0.0169	4.46E-11	0.0796
Regulatory quality	2.618099	0.0000	2.884226	0.0000	2.944441	0.0000
Regulatory quality cavg	2.398635	0.5678	-4.249450	0.2641	-3.999253	0.3686
Current account*dcrisis	-0.091347	0.1455	0.029747	0.3918	-0.004071	0.9181
Government debt*dcrisis	-0.010985	0.0383	-0.010821	0.0001	-0.011942	0.0003
External balance*dcrisis	0.043298	0.1891	-0.012228	0.5161	0.004653	0.8246
<i>R-squared</i>	0.769371		0.942694		0.800141	
<i>PerasanCross sectional independence test</i>			-0.424695	0.6711	-0.378534	0.7050

Table 5: Credit rating models-Moody's

<i>Variable</i>	<u>Pooled</u>		<u>Fixed</u>		<u>Random</u>	
	<u>OLS</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>
	<i>Coefficient</i>		<i>Coefficient</i>		<i>Coefficient</i>	
Log GDP per capita	9.69E-05	0.0000	-3.57E-05	0.2662	4.13E-05	0.0491
Log GDP per capita cavg	0.000400	0.0505	0.000387	0.0255	0.000330	0.1096
GDP growth rate	0.059286	0.1494	0.039964	0.1070	0.022608	0.4394
GDP growth rate cavg	-0.179680	0.0166	-0.166031	0.0002	-0.153665	0.0035
Government debt	-0.029104	0.0000	-0.075049	0.0000	-0.052738	0.0000
Government debt cavg	-0.240864	0.0112	-0.188588	0.0007	-0.216021	0.0012
Inflation rate	-0.072045	0.3846	-0.123221	0.0123	-0.137201	0.0205
Inflation rate cavg	0.080859	0.6776	0.050026	0.6787	0.086786	0.5519
Unemployment rate	-0.231153	0.0000	-0.308768	0.0000	-0.323671	0.0000
Unemployment rate cavg	1.264017	0.0021	1.140217	0.0001	1.208349	0.0007
Current account	0.185809	0.0000	-0.103912	0.0031	-0.032685	0.4076
Current account cavg	-0.028397	0.9539	0.150348	0.6029	0.096956	0.7814
External balance	-0.234594	0.0000	0.051714	0.1551	-0.031555	0.4345
External balance cavg	0.234768	0.6910	0.007685	0.9818	0.086056	0.8330
Log reserves	1.77E-11	0.0000	7.04E-13	0.8581	8.44E-12	0.0421
Log reserves cavg	9.92E-12	0.7999	4.40E-11	0.0709	3.77E-11	0.1978
Regulatory quality	2.735744	0.0000	3.064391	0.0000	3.047064	0.0000
Regulatory quality cavg	3.124940	0.4652	-1.777689	0.6752	-1.402623	0.7843
Current account*dcrisis	-0.137907	0.0314	-0.026043	0.5016	-0.065428	0.1507
Government debt*dcrisis	-0.019083	0.0005	-0.017208	0.0000	-0.019327	0.0000
External balance*dcrisis	0.040061	0.2330	-0.001724	0.9346	0.012187	0.6123
<i>R-squared</i>	0.802138		0.941063		0.834818	
<i>PerasanCross sectional independence test</i>			2.556032	0.0106	2.681663	0.0073

Table 6: Credit rating models-Average Rating

<i>Variable</i>	<u>Pooled</u>		<u>Fixed</u>		<u>Random</u>	
	<u>OLS</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>	<u>Effects</u>	<i>Prob.</i>
	<i>Coefficient</i>		<i>Coefficient</i>		<i>Coefficient</i>	
Log GDP per capita	8.67E-05	0.0000	-4.87E-05	0.0735	2.71E-05	0.1665
Log GDP per capita cavg	0.000408	0.0344	0.000336	0.0220	0.000275	0.1243
GDP growth rate	0.041228	0.2881	0.025832	0.2184	0.008966	0.7233
GDP growth rate cavg	-0.116947	0.0980	-0.114439	0.0021	-0.100156	0.0272
Government debt	-0.024091	0.0000	-0.059183	0.0000	-0.042810	0.0000
Government debt cavg	-0.179597	0.0449	-0.137311	0.0035	-0.155694	0.0070
Inflation rate	-0.155103	0.0480	-0.183324	0.0000	-0.194410	0.0002
Inflation rate cavg	0.220284	0.2308	0.147689	0.1496	0.174381	0.1674
Unemployment rate	-0.245002	0.0000	-0.350138	0.0000	-0.352890	0.0000
Unemployment rate cavg	1.041043	0.0072	0.876962	0.0005	0.910709	0.0031
Current account	0.187072	0.0000	-0.080648	0.0067	-0.025043	0.4685
Current account cavg	0.170085	0.7138	0.279346	0.2543	0.239151	0.4286
External balance	-0.200540	0.0000	0.056900	0.0651	-0.006188	0.8615
External balance cavg	-0.031496	0.9550	-0.192067	0.5021	-0.136349	0.6992
Log reserves	1.48E-11	0.0000	-4.72E-12	0.1574	2.18E-12	0.5536
Log reserves cavg	-3.04E-12	0.9345	4.13E-11	0.0457	3.42E-11	0.1766
Regulatory quality	2.617626	0.0000	2.885778	0.0000	2.923232	0.0000
Regulatory quality cavg	2.381915	0.5555	-4.370656	0.2245	-4.083553	0.3571
Current account*dcrisis	-0.116352	0.0543	0.004794	0.8839	-0.031277	0.4277
Government debt*dcrisis	-0.013607	0.0078	-0.012216	0.0000	-0.013726	0.0000
External balance*dcrisis	0.040157	0.2056	-0.008154	0.6469	0.007699	0.7124
<i>R-squared</i>	0.796515		0.951209		0.839488	
<i>PerasanCross sectional independence test</i>			0.117256	0.9067	0.212464	0.8317

Table 7: Descriptive statistics**7.1:** Indicators

	<u>Log GDP per capita</u>	<u>GDP growth rate</u>	<u>Government debt</u>	<u>Current account</u>	<u>Inflation rate</u>	<u>External balance</u>	<u>Log reserves</u>	<u>Unemployment rate</u>	<u>Regulatory quality</u>
Mean	36014.91	2.203801	65.35643	-0.527778	2.063158	3.060320	3.17E+10	8.976901	1.258927
Median	31633.76	2.200000	62.95000	-0.100000	1.900000	1.379683	8.52E+09	7.900000	1.236696
Maximum	111968.3	25.40000	184.8000	11.80000	15.30000	36.01476	2.49E+11	27.50000	2.047448
Minimum	8008.473	-14.80000	3.800000	-20.90000	-1.700000	-20.68187	1.78E+08	2.500000	0.148387
Std. Dev.	21230.49	3.801861	38.16160	5.749601	1.899402	9.523426	5.23E+10	4.550501	0.369908
Skewness	1.710292	-0.169672	0.665190	-0.524246	2.050538	1.403039	2.171613	1.581292	-0.082882
Kurtosis	6.587840	9.637863	3.417097	3.454893	12.61061	5.975114	6.795878	5.793451	2.412820
Jarque-Bera Probability	350.1651 0.000000	629.5135 0.000000	27.70029 0.000001	18.61427 0.000091	1555.853 0.000000	238.3367 0.000000	474.1302 0.000000	253.7255 0.000000	5.304688 0.070486
Sum	12317098	753.7000	22351.90	-180.5000	705.6000	1046.629	1.08E+13	3070.100	430.5529
Sum Sq. Dev.	1.54E+11	4928.865	496601.0	11272.75	1230.236	30927.22	9.32E+23	7061.108	46.65962
Observations	342	342	342	342	342	342	342	342	342

7.2: Cross-section averages

	<u>Current account cavg</u>	<u>External balance cavg</u>	<u>GDP growth rate cavg</u>	<u>Government debt cavg</u>	<u>Log GDP per capita cavg</u>	<u>Regulatory quality cavg</u>	<u>Log reserves cavg</u>	<u>Inflation rate cavg</u>	<u>Unemployment rate cavg</u>
Mean	-0.558187	3.060320	2.223977	65.35643	36014.91	1.258927	3.17E+10	2.063158	8.976901
Median	-0.884211	2.486366	2.794737	69.90000	35614.98	1.265569	3.42E+10	2.250000	8.521053
Maximum	2.257895	6.893364	5.431579	82.20526	40447.91	1.317946	4.44E+10	5.121053	11.90526
Minimum	-4.352632	-0.605105	-5.873684	47.36316	32279.16	1.195966	1.91E+10	-0.010526	6.389474
Std. Dev.	2.194439	2.572502	2.470862	12.87409	2188.632	0.041471	8.69E+09	1.259177	1.751874
Skewness	-0.345937	0.061514	-1.815553	-0.140650	0.336869	0.040086	-0.217087	0.277047	0.115930
Kurtosis	1.881331	1.512557	6.828137	1.296892	2.531857	1.482639	1.612956	2.970471	1.740431
Jarque-Bera Probability	24.65406 0.000004	31.74365 0.000000	396.7138 0.000000	42.46080 0.000000	9.591408 0.008265	32.90057 0.000000	30.10169 0.000000	4.387456 0.111500	23.37390 0.000008
Sum	-190.9000	1046.629	760.6000	22351.90	12317098	430.5529	1.08E+13	705.6000	3070.100
Sum Sq. Dev.	1642.107	2256.659	2081.859	56518.12	1.63E+09	0.586460	2.58E+22	540.6642	1046.551
Observations	342	342	342	342	342	342	342	342	342

7.3: Credit rating agencies

	<u>Average rating</u>	<u>Fitch's rating</u>	<u>Moody's rating</u>	<u>S&P's rating</u>
Mean	17.16287	17.27193	17.09942	17.20468
Median	17.30000	18.00000	18.00000	18.00000
Maximum	21.00000	21.00000	21.00000	21.00000
Minimum	2.600000	4.000000	1.000000	2.000000
Std. Dev.	3.809326	3.730555	4.090838	3.717941
Skewness	-1.126281	-1.118968	-1.306538	-1.010159
Kurtosis	4.400296	4.290460	4.927105	3.951718
Jarque-Bera	100.2469	95.09944	150.2220	71.07119
Probability	0.000000	0.000000	0.000000	0.000000
Sum	5869.700	5907.000	5848.000	5884.000
Sum Sq. Dev.	4948.238	4745.711	5706.620	4713.673
Observations	342	342	342	342

Figure 1: Sovereign Rating Grades 2002-2019

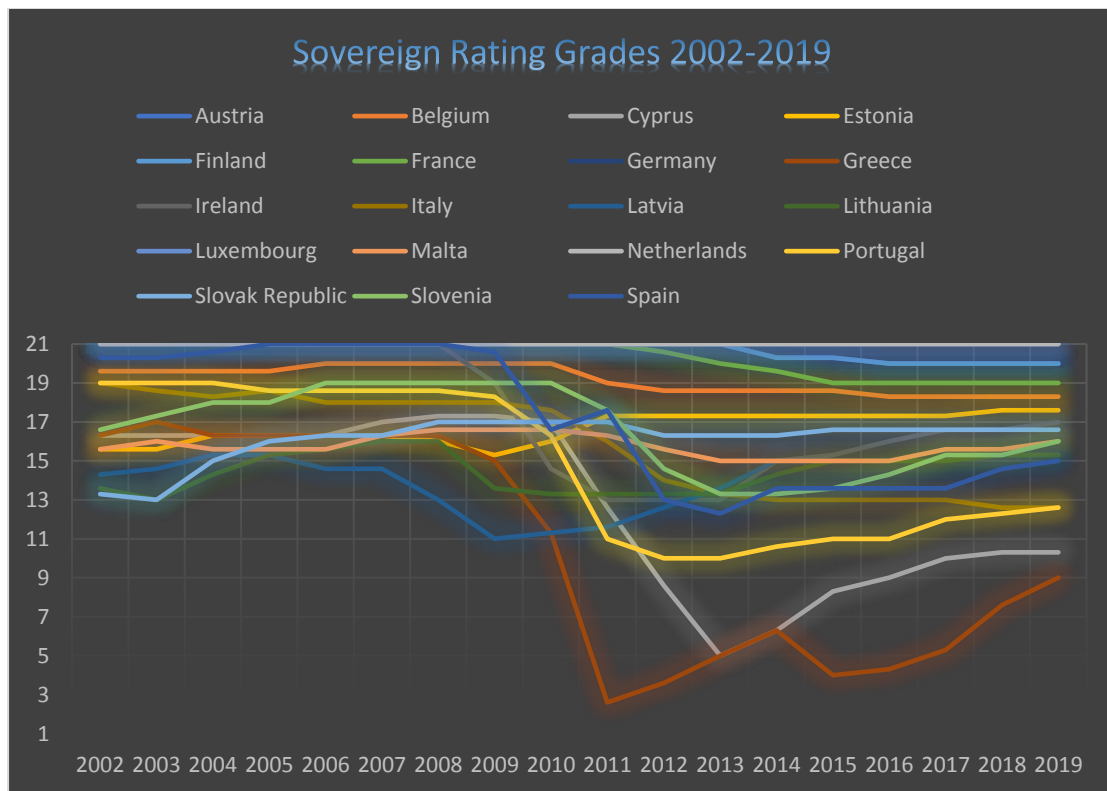


Figure 2: Sovereign Rating Grades of Southern European Countries 2002-2019

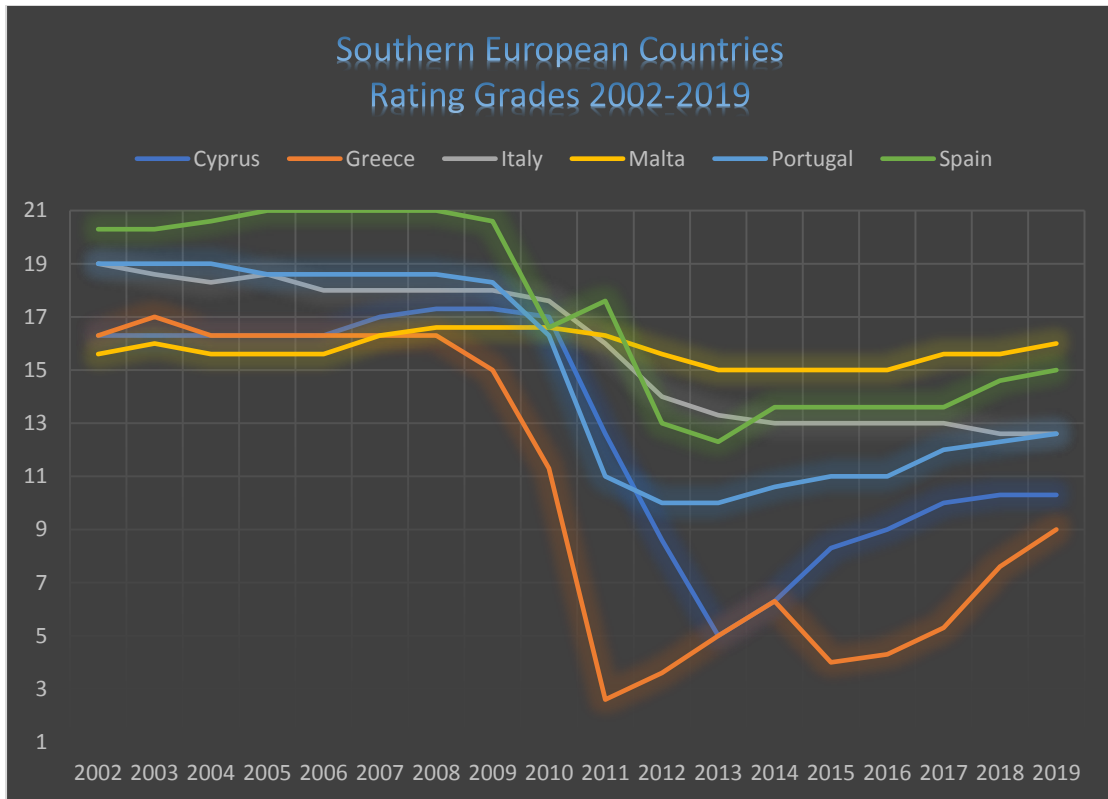


Figure 3: Sovereign Rating Grades of Northern European Countries 2002-2019

