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Factors That Lead To Changes in Country Ratings: A Cross Country Comparison

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ABSTRACT

The ability of a country to borrow cheaply depends on its rating by the major rating agencies (S&P, Fitch, Moody's). Greece today is in the junk category. The questions which raised are will it be able to borrow cheaply again in the open market? What should it accomplish for this to happen? To answer it one has to examine the previous rating behavior of the ratings firms.

More specific, this study examines the determinants of the sovereign credit ratings provided by the three major rating agencies: Fitch Ratings, Moody's and Standard & Poors. Analysis is employed in order to identify the common factors affecting these ratings. The impact of the variables correlated with these factors on ratings is then assessed through linear regression modeling. The study also highlights the importance of corruption which appears as a proxy for both economic development and the quality of country governance.

The sample of this thesis consists of 11 European countries, including Greece and the data that used cover a period of the last 22 years. The models are specified according to variables that identified as significant in the existing literature.

Key Words

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1. Introduction

The objective of this thesis is to study the determinants of the credit ratings of the three major rating agencies. In order to examine the variables which have important influence on the ratings, we use two regression models and two approaches. More specifically, a Panel Data Regression between the Country Ratings and the ten year Government Bond Yields and a second Panel Data Regression between the Country Ratings and eleven (financial and political) variables. The approaches of ratings' level and the changes of the ratings used to confirm the results of the two models.

The conclusions that comes out from the aforementioned models used to answer the current queries regarding the ability of Greece to borrow cheaply again in the open markets and the actions / decisions that it should take in order to accomplish this.

This thesis contributes in the existing literature because it reconfirms, for the first time, the determinants of country ratings with a sample of EU countries and also used data from the recent time period of the last two decades.

2. Credit Rating Agencies

Credit Ratings Agencies and a brief history

A credit rating agency (known as CRA or called a ratings service) is an organization / company that publish credit ratings. A credit rating indicates a debtor's ability to pay back debt by making in time interest payments and the possibility of default. These agencies may rate the creditworthiness of issuers of debt obligations or debt instruments, and only in some cases the servicers of the underlying debt, but in no case individual consumers.

The debt products rated by CRA including CDs, government bonds, municipal bonds, corporate bonds, preferred stock and collateralized securities like mortgage securities and collateralized debt obligations.

The issuers of above obligations or securities may be companies, local governments, special purpose entities, non-profit organizations, states or nations. A credit rating expedite the trading of securities even on secondary markets. These affects the interest rates that a security pays, more specific a higher rating leading to a lower interest rate. The individuals are rated for creditworthiness by credit bureaus (which are also called as a consumer reporting agencies or credit reference agencies) these agencies also issue credit scores.

Billions of existed securities from the higher ratings downgraded to junk category during the global financial crisis of 2007–2008. Many European Union officials blame the rating downgrades, during the European debt crisis of 2010–2012 for accelerating the crisis.

The most reputable and major credit rating agencies are Moody's, Standard & Poor's, and Fitch Group. Fitch's headquarters are located in London and New York City while S&P and Moody's headquarters are located in the US.

The global market shared to the aforementioned agencies in 95%. More specifically Standard& Poor's & Moody's having almost 40% each, and Fitch approximately

15%. Other financial services firms like Morningstar and its ratings subsidiary, have grown its market shares, according to some publications including the Morningstar could raise number of the major rating agencies. The number of rated countries increased mostly during the 1990. By April 2011, 135 countries (45 developed & 90 developing countries) were rated by one of the major three agencies, at least. Additionally, the facts show that sovereign ratings issued by these agencies tend to be highly correlated. The correlation coefficient between the ratings of the three agencies ranges from 0.97 to 0.99.

Moody's

Moody's founded in 1900 by John Moody. Firstly published statistics & general information about bonds, stocks of a variety of industries. 1903 before the stock market crash the Moody's publish in national level the "Moody's Manual". By 1909 Moody's start publishing "Moody's Analyses of Railroad Investments", which include analytical information about the value of securities. In 1914 Moody's create Moody's Investors Service, which in a period of 10 years starts to provide ratings almost for all of the government bond markets. In 1970 Moody's becoming the rating agency that it is today, by expanding progressively its activities in a variety of economical sectors.

Fitch

The Fitch Publishing Company founded in 1913 by John Knowles Fitch. Fitch published The Fitch Bond Book and The Fitch Stock and Bond Manual which including financial statistics for use in the investment industry. By 1924, Fitch introduced a rating system from AAA through D that became the basis for all forthcoming ratings. Having a plan to become a global rating agency, in the 1990s Fitch merged with IBCA a London company, a subsidiary of Fimalac, S.A. a French holding company. Fitch also acquired some of its competitors like Duff & Phelps Credit Ratings Co &Thomson Bank Watch. In 2004, Fitch create subsidiaries specializing in a variety of activities such as data services, enterprise risk management and finance industry training after its acquisition with a Canadian company, called Algorithmics. Also found Fitch Training and Fitch Solutions.

Standard & Poor's

Founded by Henry Varnum Poor. The first publish was the "History of Railroads and Canals in the United States" in 1860, a reporting and securities analysis. In 1906 created the Standard Statistics, which published sovereign debt, corporate bond & municipal bond ratings. Standard and Poor's Corporation formed by the merge of Standard Statistics with Poor's Publishing in 1941 and acquired by The McGraw-Hill Companies in 1966. Standard and Poor's reputation comes from reputable indexes such as the S&P 500, which is a stock market index used as U.S. economic indicator and a tool for investor analysis.

Rating Scales & Definitions

The rating scales and definitions used in international and national scale, the key difference is that the first measures the ability for a country to meet its obligations relative to a global group (international scale), the second measures the credit quality relative to its local peers.

A short term debt rating (up to 12 month period) rates the unsecured creditworthiness. This rating provides an entity's ability to cover the unsecured short term obligations, including, bank lending, banker's acceptances, certificates of deposit etc. Short term ratings apply to issuers and also to the obligations.

(appendix - Table 1)

A long term debt rating(over 12 month period) rates the ability of an entity to cover the unsecured long term obligations. Long term debt ratings and definitions apply to issuers and also to the obligations. Specified that it is possible for a single issuer apply different ratings, depending on the underlying title characteristics (is it a senior debt or a subordinated instrument, secured or unsecured and in case that be secured, the nature of the each security).

(appendix - Table 2)

3. Country risk, country risk ratings and their importance & critiques

Credit ratings are a tool for potential borrowers to have access to loans & debt. High credit ratings allow borrowers to take loans easily from public debt markets or financial institutions. At the level of a consumer, the banks depends the terms of a loan on your credit rating, so the better your credit rating (wealthier you are) the better the terms of the loan. If your credit rating is not good enough, the bank may reject the loan application.

At level of a company, the best interest of depends on a credit rating agency which rate their debt. Investors base part of their decision to buy corporate bonds, or stocks, on the existed credit rating of a company's debt. The major credit agencies, perform their rating service for a significant fee. Potential investors will check the credit ratings given by these international agencies and domestic rating agencies before they invest.

At the country level credit ratings are also important. Many countries use credit ratings given by the major credit rating agencies in order to persuade the potential investors to purchase their debt, the investors rely on the credit ratings to choose their next investment. High credit rating for a country means that being able to have access to international funds and other forms of investment to a country, such as direct investments. A common example concerning an organization which have the plan to open a factory in a foreign country and probably first look the country's credit rating in order to check the country stability before move to the investment.

The globalization of the world economies and also of financial markets, especially in the last 30 years, complicate and expand the investment opportunities which accompanied by new risks. As a result, there is a need in obtaining reliable estimates of the risk of potential investing opportunities.

Reasons of default

The above concerns have led to the development of country risk evaluation via country risk ratings by various agencies. There are many definitions that have been proposed for country risk e.g. the risk that a country defaults on its obligations. The existing literature on the topic recognizes both financial / economic and also political components of country risk. In case that some of these components have strong present, country risk is examined from financial/economic view only, or from a combination of financial / economic and political perspectives.

There are two basic approaches to the interpretation of the reasons for defaulting:

The first one has to do with the debt service capacity, these approach focuses on the deterioration of fiscal solvency of a country, which prevent sit from fulfilling its commitments. For instance, Bourke and Shanmugam (1990) define country risk as "the risk that a country will be unable to service its external debt due to an inability to generate sufficient foreign exchange". By this view the country risk is a function of various financial and economic country parameters.

The second one is the cost-benefit approach which means that a default on commitments or a rescheduling of debt is a deliberate choice of the country. This country may prefer the alternative of default instead of repayment, despite of its possible negative effects. Given that the deliberate decision of default comes from a political decision, the political parameters of a country are included in country risk modeling with the financial and economic parameters. This approach is strongly recommended by the studies of Brewer & Rivoli (1990, 1997) and Citron & Neckelburg (1987), which examine the impact of the political stability on country risk ratings.

Rating influence

Sovereign risk ratings impact countries in a numerous ways:

The major significance of ratings comes from their influence on the interest rates at which countries borrow from the international financial markets: better ratings, lower the risk of default, and as a consequence lower the interest rate. *Following its rating downgrade, Greece's rates became higher so more expensive to borrow, reflecting the higher chance of default which deteriorates even more the situation of the heavily indebted Greece government and economy.*

Have an impact in credit ratings of companies and national banks, because they affect the possibility foreign investors, lend money to them. Ferri et al. (2001) call sovereign ratings the "pivot of all other country's ratings". Similarly, Erb et al. (1995) underline that raters have historically shown a reluctance to give a company a higher credit rating than that of the sovereign where the company operates. *For example, after Moody's downgraded Japan in 11/1998 (from Aaa to Aa1), all other Aaa Japan issuers have been downgraded (Jüttner & McCarthy, 2000). This led sovereign ratings to be named "sovereign credit risk ceilings".*

Institutional investors sometimes are restricted from contracts on the degree of risk that they can afford, implying more specific that they restricted to invest in a lower level of a debt from a prescribed one Ferri et al. (2001) refine this analysis, pointing out the contrast between the ratings of banks operating in high- and low-income countries, and show that ratings of banks operating in low income countries are significantly affected by variations in sovereign ratings, while the ratings of banks operating in high-income countries do not seem to depend significantly on country ratings. Similarly, Kaminsky and Schmukler (2000) as well as Larrain et al. (1997) note that sovereign ratings are crucial for developing economies, which have a very high sensitivity to rating announcements.

Critiques of present rating systems

The ratings compressing a variety of information about a country into one parameter which can be easily understood therefore used in a decision making process involving comparisons among different countries. As a result, ratings provide aggregations of diverse indicators into a single metric and can be viewed as a kind of "commensuration" (Kunczik, 2000). The interpretation of ratings is complicated by the heterogeneity of indicators (political stability, inflation, etc.) which may have been used in deriving them.

Unknown factors: It is generally assumed that economic / financial and / or political variables determine country ratings, however it is not clear which ones of the possible factors actually influence the payback ability of a country. *Haque et al. (1998) claims that it is sufficient to restrict the scope of analysis to economic/financial factors only, while others (Brewer and Rivoli,1990) claim that both economic/financial and political factors impact country risk ratings.*

Comprehensibility: The real content and meaning of the country risk ratings that published by the major rating agencies is hard to understand, since rating agencies do not specify the factors which are taken into consideration in determining their ratings and the combination procedure of multiple factors into a single rating. *This raised the discontent of Japan's Prime Minister, Junichiro Koizumi, who was "railed at being rated in the same neighborhood as African countries to which Japan is providing assistance" Officials of Japan's Ministry of Finance added that big rating agencies are "making unfair qualitative judgments", while Moody's denied and claimed that the motives for the downgrade lie in the "increased debt load" of Japan. In view of such controversy, uncovering both the factors which are taken into account by these black boxes, and the mechanisms of deriving ratings, are essential for ascertaining the consistency of a country rating system.*

Rating failures: Some failures to predict future crisis have challenged the trustworthiness of country risk ratings. *The criticisms intense especially after the Asian crises (1997-1999).*

Regional bias: Many explanations have been provided for the failure of rating agencies to predict crisis emergencies in a variety of cases. There are claims that certain rating agencies favor certain countries. *For instance, Haque et al. (1997) note that Euromoney usually gives higher ratings to Asian and European countries than to Latin or Caribbean countries, while the Institutional Investor is more generous to Asian and European countries than to African ones.*

Overreactions: IMF many times criticizes rating agencies claiming that they reacted in panic during the European crisis. *After they had missed to predict the European crisis, they reacted by downgrading countries thus accelerating the crisis impacts. An example is the Greek crisis in which rating agencies gave the impression of overreacting instead of being a stabilizing force.*

Latency: Another criticism is the time taken by the rating agencies to react to new facts or news, *according to The Economists, "rating agencies may have been too slow to downgrade Japan Markets have already moved ahead of them".*

3. Related Literature

The potential determinants of sovereign default and sovereign ratings selected by different empirical models were derived from theoretical models on sovereign default and previous empirical evidence or rating agency's reports. These sources taken together suggest that sovereign credit risk can be explained by a relatively small number of economic and political variables. These variables do not differ significantly from one study to another.

Most of the existing theoretical models dealing with sovereign debt and sovereign default can be separated in two main groups:

The first one make the question why do sovereign debtors repay their debt, since, if they default, the lender may not have recourse to a legal procedure to enforce payment. Eaton and Gersovitz (1981) suggested that the willingness to maintain a good reputation and to preserve future access to credit markets constitutes an incentive for countries to repay their debt. The rationale behind this result is that a country decides to honour its debt obligation only if the future cost of unavailable loans is greater than the short-term benefit of higher consumption. However, countries pay their external debt for three main reasons. First, foreign creditors may seize the foreign assets if a country does not pay its debt. Second, a country may not have access in the future to foreign markets. Finally, default may have a negative impact on trade with other countries (e.g. Gibson and Sundaresan, 2001 and Rose, 2002).

The second approach to sovereign default risk is described by Haque et al.(1996) as the debt-servicing capacity approach. In this approach, it is the unintended deterioration of the country's capacity to service its debt that could cause its default. Countries may be unable to repay their debt because they are either insolvent or illiquid.

A number of the economic variables are common to the two approaches, since they affect the opportunity cost of a country to make debt payments and similarly its capacity to service its debt.

Although, the impact of the political risk on the probability of default is different in the two approaches. In the first one, political risk has an impact not only on the ability but also on the willingness of a country to pay its debt. In the second, political risk relies on the quality of economic management and influences the debt-servicing ability of a country.

The existing studies dealing with sovereign debt ratings and also are more related to the analysis of the present thesis, can be broadly grouped into papers that try to uncover the determinants of sovereign debt ratings with the approach of ordinary least square regression models or logistic models *(ConstaninMelios and Eric Paget Blanc2004, Afonso, 2003,Bissoondoyal-Bheenick 2005 and Afonso, Gomes and Rother 2011, for developing countries)*. These studies conclude that the ratings are mainly explained by economic and political variables such as the level of GDP per capita, GDP growth, external debt, the public debt level, the government budget balance etc. Also, there are studies that address the explanatory power of sovereign ratings to the volatility of government bond spreads *(*Haque, et al 1996, *Clark E 1999, Afonso & Strauch 2007)*.

Description of the potential explanatory variables

From the above mentioned existing literature select a set of variables that are the most common used and affecting the probability of sovereign default and as a result the sovereign ratings. The first criterion of the selection was the significance of variables for estimating a country's creditworthiness. An extensive literature review performed which played an important role in defining the set of variables for inclusion in the model. The second criterion was the availability of complete and reliable statistics. In order to avoid difficulties related to missing data that could reduce the statistical significance and the scope of our analysis. The third criterion was the uniformity of data across the selected countries.

Below explain the relationship between each variable and the ability or willing of a country to pay its debt. For theoretical predictions, a sign (+), (-) means that the theory predicts a positive or a negative relation respectively, between the explanatory variable and the risk of default.

Macroeconomic Variables:

- GDP per capita (-): Richer economies are expected to have more stable institutions to prevent government over-borrowing and to be less vulnerable to exogenous shocks.
- Real GDP growth (-): Higher real growth strengthens the government's ability to repay outstanding obligations.
- Per capita income (-), an increase of the per capita income implies a larger potential tax base and a greater ability for a country to repay debt.
- Gross Domestic product (GDP) growth (-), an increasing rate of economic growth tends to decrease the relative debt. Moreover, it may help in avoiding insolvency problems.
- Unemployment (-): A country with lower unemployment tends to have more flexible labour markets. In addition, lower unemployment reduces the fiscal burden of unemployment and social benefits while broadening the base for labor taxation.

- Inflation (+/–): On the one hand, it reduces the real stock of outstanding government debt in domestic currency, leaving more resources to cover foreign debt obligations. On the other hand, it is symptomatic of problems at the macroeconomic level.

- Ratio reserves/imports (-), the higher this ratio is, the more reserves are available to service foreign debt.

- Ratio investment/GDP (-), this ratio captures the future growth ability of a country and it is a decreasing function of default.

- Economic development (-), developed countries are integrated within the world economy and are less inclined to default on their foreign debt in order to avoid sanctions from the lenders.

- Ratio debt/GDP (+), the higher this ratio is, the greater the occurrence of a liquidity crisis.

Government variables

- Government debt (+): A higher stock of outstanding government debt implies a higher interest burden and should correspond to a higher risk of default.

- Fiscal balance (+): Large fiscal deficits absorb domestic savings and also suggest macroeconomic disequilibria. Persistent deficits may signal problems with the institutional environment for policy makers.

- Government effectiveness (-): High quality of public service delivery, competence of bureaucracy, and lower corruption should improve the ability to service debt obligations.

- Regulatory quality, accountability, rule of law (-). These indicators provide a means of evaluating the governance of a country and affect a country's willingness to pay.

External variables:

- External debt (+): The higher the external indebtedness, the higher the risk for additional fiscal burden, either directly due to a sell-off of foreign government

debt or indirectly because of the need to support over-indebted domestic borrowers.

- Foreign reserves (-): Higher (official) foreign reserves should shield the government from having to default on its foreign currency obligations.

- Current account balance (+/-): A higher current account deficit could signal an economy's tendency to over-consume, undermining long-term sustainability. Alternatively, it could reflect rapid accumulation of investment, which should lead to higher growth and improved sustainability over the medium term.

- Foreign debt/GDP (-), this ratio is negatively related to default risk.

- Real exchange rate (+), the real exchange rate assesses the trade competitiveness of the economy.

Other variables.

- Default history (+): Past sovereign defaults may indicate a great acceptance of reducing the outstanding debt burden via a default.

- European Union (-): Countries that join the European Union (EU) improve their credibility as their economic policy is restricted and monitored by other member states.

- Regional dummies (+/-): Some groups of countries of the same geographical location may have common characteristics that affect their rating.

4. Empirical Analysis

4a. Regression models – Level of country rating approach

In this chapter confirm the determinants of sovereign debt rating notations via the estimation of aforementioned approaches in the chapter of related literature with the approach of the ratings' level.

The first step in our empirical analysis is to convert the letters of foreign currency ratings from the three major agencies **Moody's, Standard and Poor's and Fitch** into a numerical equivalents.

In our scale, 20 denotes the highest rating (corresponding to AAA for Standard &Poor's and Fitch, Aaa for Moody's) and 1 denotes the lowest (CC for Standard & Poor's and Fitch all CA for Moody's).

(appendix - table 3)

The sample was selected by the EU countries and consists of the below **11** countries:

- **Austria**
- **Belgium**
- **Denmark**
- **France**
- **Germany**
- **Netherlands**
- **Sweden**
- **Portugal,**
- **Italy**
- **Greece**
- **Spain**

(the last four known lately as PIGS)

These countries selected under the view of examine the determinants factors of less wealthy countries and the same time the wealthier ones, when all its part of EU.

The country ratings of the above mentioned countries, as of the latest data, recorded in the table 4:

(appendix - table 4)

Our data was derived from DataStream, starts from March of 1995 and includes quarterly data. The form of Panel was used for the data analysis. Panel data is a dataset in which the behavior of entities (in our case the 11 countries that we mentioned earlier) are observed across time.

Firstly, the relation between the country ratings and the 10 year government bond yields examined with the below model:

Model 1

$$COUNTRYRATINGSit = a + b * BONDYIELDSit$$

Where

– α unknown intercept

– COUNTRYRATINGS$_{it}$ is the dependent variable where i = country and t = time.

– b is the coefficient of the independent variable BONDYIELDS

With the second model examined the relation between the country ratings and 10 economical variables, more specifically

- Government Debt
- Industrial Production
- Unemployment
- Gdp
- Consumer Confidence
- Fixed investment
- Inflation
- Current account
- Fiscal Balance

- Income per capita
- a political variable (with the term "political" mean the Corruption).

The above variables have been selected so that there were at least one of each category of economical / political variables, according to the related literature. Also an extensive literature review performed which played an important role in defining the set of variables for inclusion in the model. Another criterion was the availability of complete and reliable statistics in order to avoid difficulties related to missing data that could reduce the statistical significance and the scope of our analysis. The last criterion was the uniformity of data across countries.

Model 2

$$COUNTRYRATINGSit$$
$$= a + b1 * GOVERMENTDEBTit + b2$$
$$* INDUSTRIALPRODUCTit + b3 * UNEMPLOYEMENTit + b4$$
$$* GDPit + b5 * CONSUMERCONFIDENCEit + b6$$
$$* FIXEDINVESTMENTit + b7 * INFLATIONit + b8$$
$$* CURRENTACCOUNTit + b9 * CORRUPTIONit + b10$$
$$* FISCALBALANCEit + b11 * INCOMEPERCAPITAit$$

Where:

- a is the unknown intercept
- COUNTRYRATINGS$_{it}$ is the dependent variable where i = country and t = time.
- bi is the coefficient of each independent variable

Panel Data Regression between Country Ratings and 10 Year Government Bond Yields (Model 1)

At first the relation between the country ratings and the 10 year government bond yields examined. In order to specify correctly the panel model we had to decide if we should include random or fixed effects in our models or if we should exclude them both.

- We test the Null Hypothesis of Valid Random Effects using the Hausman Test.
  The p-value is <5% so we reject the null Hypothesis. This means that we must not include random effects in our models.

- Then we estimated the models using Fixed Effects. We test the Null Hypothesis of Groups having a common intercept
  The p-value is <5% so we reject the null Hypothesis.

Since we rejected the null Hypothesis, we included fixed effects in our models.

Misspecification Testing

- Test for autocorrelation: Durbin-Watson test is close to 2 which indicates no autocorrelation.

- Test for Normality of residuals: We tested for Normal errors with the Jarque Berra statistic. The Null hypothesis of Jarque Berra statistic is that the errors are normally distributed. The p-value is > 5%, thus we do not reject the null of normality.

- Testing for time invariability: One side effect of the features of fixed-effects models is that they cannot be used to investigate time-invariant causes of the dependent variables. Technically, time-invariant characteristics of the individuals are perfectly collinear with the person [or entity] dummies. Substantively, fixed-effects models are designed to study the causes of

changes within a person [or entity]. A time-invariant characteristic cannot cause such a change, because it is constant for each person.

- Test for Heteroskedasticity: The null is homoskedasticity (or constant variance). Using the Wald test we rejected the null and conclude heteroskedasticity.

  In order to correct our models we applied the White estimation method in gretl. White proposed an estimation procedure, where while keeping the same estimates for the values of the coefficients, corrects the estimates of the variances of the estimators for the presence of heteroskedasticity.

- Pasaran CD (cross-sectional dependence): Pasaran CD (cross-sectional dependence) test is used to test whether the residuals are correlated across entities. Cross-sectional dependence can lead to bias in tests results. The null hypothesis is that residuals are not correlated.

  P- value was > 5% so we accept the null Hypothesis so we conclude that the residuals are not correlated.

Model 1

Use least square regression model and a panel data framework from the 10 year government bond yields as independent variable of eleven EU countries.

$$COUNTRYRATINGSit = a + b * BONDYIELDSit$$

Where

– α unknown intercept

– COUNTRYRATINGS$_{it}$ is the dependent variable where i = country and t = time.

– b is the coefficient of the independent variable BONDYIELDS

(appendix - table 5)

Final Model

$$COUNTRYRATINGS_{it} = 18.02 - 3.44 * BONDYIELDS_{it}$$

The model implies that 1% raise of the bond yields will cause 3,44% decrease to the country ratings.

The independent variable is statistically significant **at the level of 1%.** The coefficient of the variable BONDYIELDS is **negative** which means that when bond yields increase, country ratings decrease and it is also highly statistically significant at 1% implying the strong effect that bond yields have on country rating.

R-squared is 0.59 which means that 59% of the variation of the dependant variable Country Ratings is explained by our model.

The Causality

It is difficult to reject the hypothesis that the credit spread is caused by the country ratings. According to the latest literature in the 50% of cases, we can reject the hypothesis that the credit spread is caused by the rating spread. These results support the conjecture that credit spreads are a relevant variable for explaining rating spreads. This conclusion perhaps comes out from the fact that the markets have already incorporated the changes at the credit spreads before the official announcement of upgrading or downgrading of a country from rating agencies.

Given that the yield spreads are less stable, fluctuating daily and sometimes substantially, characterized by a lack of predictive power, cannot be used to obtain a reliable early warning of country insolvency, as country ratings do or replace them.

Panel Data Regression between Country Ratings and economical / political variables (Model 2)

In this chapter examine the relation between the country ratings and the following economical / political variables from the existing literature, as explanatory variables of country ratings that are expected to affect them.

The variables have been selected so that there were at least one of each category of economical / political variables, according to the related literature. Also an extensive literature review performed which played an important role in defining the set of variables for inclusion in the model. Another criterion was the availability of complete and reliable statistics in order to avoid difficulties related to missing data that could reduce the statistical significance and the scope of our analysis. The last criterion was the uniformity of data across countries.

In order to decide whether we will include random/fixed effects in our models or none,

- we tested the Null Hypothesis of Valid Random Effects using the Hausman Test.
  The p-value is <5% so we reject the null Hypothesis. Thus we will not use random effects in our models.

- Then estimated the models using Fixed Effects and we tested the Null Hypothesis of Groups having a common intercept.
  The p-value is <5%, we reject the null Hypothesis

Since we rejected the null Hypothesis, we included fixed effects in our models.

Misspecification Testing

- Test for autocorrelation: Durbin-Watson test is close to 2 which indicates no autocorrelation.

- Test for Normality of residuals: We will test the Null hypothesis of Jarque Berra statistic is that the errors are normally distributed
  The p-value is > 5%, thus we do not reject the null of normality.

- Test for Heteroskedasticity: The null is homoskedasticity (or constant variance). The p-value was < 5% we reject the null and conclude heteroskedasticity.

In order to correct our models we applied the White estimation method in gretl.

- Pasaran CD (cross-sectional dependence): We test the data using the Pasaran CD test and as shown below p>5% so we accept the null Hypothesis and we conclude that the residuals are not correlated.

Model 2

The equation for the fixed effects model is:

$$COUNTRYRATINGSit$$
$$= a + b1 * GOVERMENTDEBTit + b2$$
$$* INDUSTRIALPRODUCTit + b3 * UNEMPLOYEMENTit + b4$$
$$* GDPit + b5 * CONSUMERCONFIDENCEit + b6$$
$$* FIXEDINVESTMENTit + b7 * INFLATIONit + b8$$
$$* CURRENTACCOUNTit + b9 * CORRUPTIONit + b10$$
$$* FISCAL BALANCEit + b11 * INCOMEPERCAPITAit$$

Where:

- a is the unknown intercept
- COUNTRYRATINGS$_{it}$ is the dependent variable where i = country and t = time.
- b is the coefficient of each independent variable

Use least square regression model and a panel data framework from economical / political variables, as independent, of eleven EU countries.

(appendix – table 6).

It is noted that due to data unavailability the model have imposed to some constraints, specifically data with large gaps or missing observations were omitted from the model.

The R-squared is 0.48 which means that 48% of the variation of the dependant variable Country Ratings is explained by our model. The R-squared is in the range of the R-squared that have been calculated from previous researchers.

All explanatory variables except for fiscal balance are statistically significant.

More specific the government debt, b_1 is -1.88 and the statistical significance at 10%. This means that an increase in government debt leads to higher bond default risk, and thus, lower country rating.

The industrial product, b_2 is +0.04 and statistical significance at 5%, this implies that when the industrial production increases the income of the country and decreases its default risk which leads to higher country rating.

The unemployment, b_3 is +0.004 and statistical significance at 10%, so an increase of unemployment implies a lower potential tax base and a lower ability for a country to repay debt. Thus the country rating is decreasing when unemployment increases.

Gdp, b_4 is +1.92 and statistical significance at 1%. A positive growth in GDP results in lower potential default risk since the country will have more resources to pay back its debt. As we can see the coefficient is relatively high (as a numerical value) and strongly statistical significant. From the above we conclude that the growth of GDP plays a great role in the rating of the country.

Consumer confidence, b_5 is +0.03 and statistical significance at 10%. During the periods that the consumers feel unsafe and pessimistic they tend to save their money. On the opposite side, when the degree of optimism that consumers feel increases, they tend to consume and invest more. The increase in consumption and investments leads to higher GDP and higher tax income for the government. The fact that the country has more available cash to repay its debt increases its country rating.

Fixed investment, b_6 is +0.000083 and statistical significance at 1%. The increase in fixed investments implies an increase in GDP which as mentioned above leads to higher country rating.

Inflation, b_7 is -0.15 and statistical significance at 5%. If the inflation rate is low rate it could send the message to the investors that the government applies the sustainable monetary and exchange rate policies. The increase of inflation affects greatly the country rating as we can see that it statistical significant at 1%

Current account, b_8i s + 0.0000028 and statistical significance at 1%. Potential current account deficit correspond to higher debt default risk so an increase in current accounts sends a positive message to the investors.

Corruption, $b_9$is -6.02 and statistical significance at 5%. The variable corruption has the highest coefficient among all other explanatory variables while it is highly statistical significant at 5%. In our model the negative effect of corruption on the countries rating is clearly depicted in accordance to the findings of previous studies. Corruption index which reflects the development level and the quality of governance of a country, has a strong influence on ratings. It is interesting to mention that the corruption index may be interpreted as an economic variable, since it is an indicator of a country's development level, but also as a political variable, since it reflects the quality of governance.

Fiscal balance, b_{10} is -0.43 but not statistically significant. The coefficient of Fiscal Balance is negative as expected according to previous studies, also conclude that fiscal balance as a % of GDP does not significantly affect the country ratings. This is mainly explained by the fact that it is relatively steady among the years for most countries in our sample. We also checked the log (Fiscal Balance) which was also statistically insignificant.

Income, $b_{11}$is +0.0014 and statistical significance at 5%. Higher income levels reduce debt burdens over time, lessening the bond default risk and thus increasing country rating.

Final Model 2

$$COUNTRYRATINGSit$$
$$= 18.15 - 1.88 * GOVERMENTDEBTit + 0.04$$
$$* INDUSTRIALPRODUCTit - 0.004 * UNEMPLOYEMENTit$$
$$+ 1.92 * GDPit + 0.03 * CONSUMERCONFIDENCEit$$
$$+ 0.000083 * FIXEDINVESTMENTit - 0.15 * INFLATIONit$$
$$- 0.0000028 * CURRENTACCOUNTit - 6.02$$
$$* CORRUPTIONit + 0.0014 * INCOMEPERCAPITAit$$

4b. Regression models – Change of country rating approach

In this chapter reconfirm the determinants of sovereign debt rating notations using the same sample and data via the approach of change in ratings though, in other words, we create a scale that no change in country ratings denotes as 0, one drop in rating as -1, two drop in rating as -2, one notch increase in rating as +1 etc.

At first examine the relation between the country ratings and 10 below mentioned economical variables, specifically Government Debt, Industrial Production, Unemployment, Gdp, Consumer Confidence, Fixed investment, Inflation, Current account, Fiscal Balance, Income per capita and Corruption.

 (appendix – table 7)

The R-squared is 0.5526 which means that 55,26% of the variation of the dependant variable Country Ratings is explained by our model. The R-squared is in the range of the R-squared that have been calculated with previous approach.

Statistically significant explanatory variables remains the Government Debt, Industrial Production, Unemployment, Gdp, Consumer Confidence, Fixed investment, Inflation, Current account, Income per capita and Corruption while the Fiscal Balance variable is statitistically insignificant. Also, the coefficients' signs (+,-) of the variables remain the same as the previous approach, however with different amounts.

Second the relation between the country ratings and the 10 year government bond yields examined.

(appendix – table 8)

The independent variable is statistically significant at the level of 5%. The coefficient of the variable BONDYIELDS is negative which means that when bond yields increase, country ratings decrease and it is also statistically significant at 5% implying the strong effect that bond yields have on country rating.

R-squared is 0.307 which means that 30,7% of the variation of the dependant variable Country Ratings is explained by our model. The above results are in consistency with the previous approach that have also shown the significance of the impact of the bond yields on country ratings.

Importance of political variables

The existed literature has already examined the importance of political and economic variables in country's ratings. The researchers showed that there is a significant persistence overtime, between economic variables and changes in country ratings. Although, the major rating agencies refers that also political factors have an influence in determining country ratings.

As a consequence an unanticipated political event (such as continuous riots) potentially could lead to a revision of country rating. If the political variables are important in the credit rating process, excluding them from a regression that designed to explain the determinants will reduce the model effectiveness.

However, the political variables (events) do not add any additional information once economic factors have already accounted for. There are three possible explanations for this:

First, the rating agencies are primarily concerned about the ability of country to service the debt and as a result are concerned with political events, only in case that they affect this variable.

Second, the political events such as riots, crises, revolutions and strikes may contribute some information to the extent that they have not already been reflected in economic variables.

Thirdly, such political events is difficult to quantified and also measure their effect in the economic variables.

5. Greece

5a. Greece's decisions

Greece, according to the results of our analysis have to improve a variety of sectors (public/private), tax / fiscal / monetary policies in order to succeed a credit rating upgrade and be able again to borrow cheaply in the financial /open markets, specifically:

Minimizing the level of corruption.

This it would be achieved by the reform of public administration and finance management, the strengthening of the role of auditing agencies, the promotion of transparency and the increase of that access to information. Also, Greece should empower its own citizens to demand and comply with anti-corruption policies.

Focus on the growth of the GDP.

There multiple ways to promote economic growth. The main ones are to focus on developing innovations, increasing productivity, improving the taxation system for the companies and also by increasing investments.

Apply policies that minimize the government debt in the long term.

The above can be achieved by reducing government spending, increasing governance efficiency and by increasing taxes / tax ratesrationally.

Use the appropriate monetary policy.

Changes in the monetary policy could have multiple effects to the economy. So any monetary policies should be carefully examined before the implementation since they can have seriously negative effects on the economy.

Increase industrial production *by increasing productivity and investments.*

Increase consumer confidence *by creating a feeling of security to the Greek citizens.*

Decrease unemployment *by applying policies that affect the side of job supply and job demand.*

5b. Greece - recent developments

In 2017 Greece planned to return to the financial markets for the first time since 2014, with a sell of new five-year bonds to investors, when the existing five-year bonds trading at 3.6%, compared with 63% at the time of the Greek financial crisis in 2012. Following the announcement that Greece returning to the market, the yield fell to 3.4%.

The Greek finance ministry has set a goal of a 4.2% interest rate on the new 5 year bond. But banking sources believed that level will be hard to achieved and say that the most likely interest rate it would be between 4.3% to 4.5% . Finally the interest rate reached at the level of 4,75%.

This market test was crucial to Greece for judging sentiment of the market, from which it has been exiled since the start of its economic crisis.

After the bond issue was announced, the EU's economy commissioner, Pierre Moscovici said that "if the issue is successful, it could help Greece, which is still coping with a debt to GDP ratio of 180%, to exit its long cycle of austerity and rescue packages".

There are already signs that Greece turning a corner as the economy projected to grow by 2.1% in 2017 (after no growth in 2016). Unemployment has fallen 1.9 % in a year but still the 21.7% in June of 2017 is very high.

5c. Greece and Contagion

The European sovereign debt crisis became evident in 2010, starting with the reporting by the European Commission on January 8th that evidence had been found of severe irregularities in the Greek Excessive Deficit Procedure notifications. The research shows that throughout 2010 Greek interest rates rose to levels that made fiscal policy unsustainable, and were much higher than those of other euro area countries that got into trouble later on. As a result, in May 2010 the financial problems of Greece became so severe that the euro countries agreed to provide bilateral loans for a total amount of EUR 80 billion to be disbursed over the period until June 2013. In addition, the International Monetary Fund financed EUR 30 billion under a stand-by arrangement. An important motivation to provide financial support to Greece, despite the no-bailout clause in the Maastricht Treaty, was fear of contagion (see, for instance, Constâncio, 2011).

It was feared that a restructuring of Greek debt could lead to a new banking crisis in the EU as several banks, notably in France and Germany, had a high exposure to Greece. In an April 2010 interview with the German magazine Der Spiegel, the German minister of Finance, Schäuble argues: "We cannot allow the bankruptcy of a euro member state like Greece to turn into a second Lehman Brothers. Greece's debts are all denominated in euros, but it isn't clear who holds how much of those debts. For that reason, the consequences of a national bankruptcy would be incalculable. Greece is just as systemically important as a major bank." In addition, policymakers were afraid that a Greek default would spillover to other highly indebted countries in the euro area. According to Cochrane (2010), however, the threat of contagion is greatly exaggerated: "we're told that a Greek default will lead to 'contagion.' The only thing an investor learns about Portuguese, Spanish, and Italian finances from a Greek default is whether the EU will or won't bail them out too. Any 'contagion' here is entirely self-inflicted. If everyone knew there wouldn't be bailouts there would be no contagion." There is, as yet, surprisingly limited research on contagion in the current euro area debt crisis. Notable exceptions include Arezki et al. (2011), Missio and Watzka (2011), Afonso et al. (2011), and De Santis (2012). Arezki et al. (2011) examine contagion effects of sovereign rating news on European financial markets during the period 2007–2010. They find that sovereign rating downgrades have

statistically and economically significant spillover effects both across countries and financial markets. Missio and Watzka (2011) use a dynamic conditional correlation model to study contagion in the euro area. Their results show that Portuguese, Spanish, Italian and Belgian yield spreads increase along with their Greek counterpart. Afonso et al. (2011) examine whether sovereign yields and CDS spreads in a given country react to rating announcements of other countries. They conclude that there is evidence of contagion, especially from lower rated countries to higher rated countries. As pointed out by Corsetti et al. (2011), there is however much disagreement among economists about what contagion is and how it should be tested for empirically. For Kaminsky et al. (2003, p. 55), contagion is "an episode in which there are significant immediate effects in a number of countries following an event – that is, when the consequences are fast and furious and evolve over a matter of hours or days". When the effect of the event is gradual, they refer to this as spillovers rather than contagion. Also in other cases one may question whether the label of 'contagion' is adequate. For instance, in a widely used approach, contagion is inferred by a significant rise in the correlation of asset returns in 'crisis' periods compared to 'tranquil' periods. However, a higher correlation between asset prices does not necessarily imply contagion (see, for instance, Forbes and Rigobon, 2002). If, for instance, a crisis is driven by large shocks to a common factor, the co-movement of different asset prices will increase as well (interdependence). Likewise, failures in one country may cast doubts on solvency of agents with similar asset/liability structures abroad even if there is no new information about these agents. But this is perhaps better labelled as a 'wake-up call': a crisis initially restricted to one country may provide new information prompting investors to reassess the vulnerability of other countries, which spreads the crisis across borders (see Goldstein et al., 2000; Bekaert et al., 2011). To identify contagion it is necessary to identify a country-specific event that affects asset prices other than the sovereign bond price of the country concerned.

This literature classifies the news reports, taken from Reuters, into two categories: news about Greek public finances and news about the willingness (or lack thereof) of European countries to provide financial support to Greece. In this way distinguish the impact of contagion from a potential Greek default, and the impact of the common factor of changes in the European policy stance on a potential Greek bailout. Such changes may also provide information on the governments' general (un)willingness to

bailout private investors, thereby affecting banks and countries which would not be affected by contagion from an idiosyncratic change in the Greek bond price.

In the empirical analysis, many researchers examining the impact of (idiosyncratic) news about Greece on bank stock prices. As pointed out by Davies and Ng (2011), there are several channels through which deteriorating sovereign creditworthiness may affect banks.

First, increases in sovereign risk cause losses on banks' government bond holdings, thereby weakening their balance sheets.

Second, a fall in the market price of Greek sovereign bonds reduces the value of the collateral that banks can use to secure wholesale funding, and can trigger margin calls from counterparties. Both effects hold, of course, for Greek banks that have a large exposure to the Greek government, but potentially also for banks outside Greece which hold significant quantities of Greek debt.

Third, deteriorating creditworthiness of Greece may reduce the value of government guarantees to Greek banks, be they explicit or perceived.

Finally, sovereign downgrades often flow through to lower ratings for domestic banks because banks are more likely than other sectors to be affected by sovereign distress.

News about European governments' (un)willingness to bailout Greece can act as a common shock affecting Greece, European banks and other indebted countries, according to relevant researches. Doubts about governments' willingness to bailout Greece may lead to doubts about governments' willingness to rescue troubled banks or other countries facing financial difficulties. Also they analyzed the impact of this news on banks exposed to other highly indebted countries in the euro area. In addition to the effect of news about Greece and a Greek bailout on banks' stock prices, examine the effect of these news variables on bond prices of other highly indebted countries in the euro area. Worrying news about the economic situation in Greece may lead investors to reconsider the valuation of exposures to other countries facing similar problems (wake-up call), while bad news about governments' willingness to bailout Greece implies that also other highly indebted countries in the euro area may not be bailed out (common shock).

Recent researches using data for 48 European banks included in the 2010 European Stress Test, suggest that only news about the Greek bailout has a significant effect on bank stock prices, even on stock prices of banks without any exposure to Greece or other highly indebted euro area countries. Except for Greek banks, news about the economic situation in Greece does not lead to abnormal returns.

Using an event study approach, they examine the impact of news about Greece and news about a Greek bailout on bank stock prices in 2010 using data for 48 European banks. They first identify the twenty days with extreme returns on Greek sovereign bonds and categorize the news events during those days into news about Greece and news about the prospects of a Greek bailout. Their findings suggest that only news about the Greek bailout has a significant effect on bank stock prices, even on stock prices of banks without any exposure to Greece or other highly indebted euro area countries. Except for Greek banks, news about the economic situation in Greece does not lead to abnormal returns in bank stock prices. These results suggest that financial markets are not very worried about widespread bank contagion from a Greek default, and consider news about the bailout to be a signal of European governments' willingness in general to use public funds to combat the financial crisis.

In contrast, the price of sovereign debt of Portugal, Ireland, and Spain, responds to both news about the economic situation of Greece and news about a Greek bailout. A plausible explanation for the impact of news about Greece on the bond prices of other countries is that there is a 'wake-up call': a crisis initially restricted to one country may provide new information prompting investors to reassess the vulnerability of other countries, which spreads the crisis across borders. The finding that Greek banks are affected by news about Greece while banks from outside Greece are not suggests that the magnitude of banks' exposures to Greece plays an important role. While for Greek banks these exposures are generally a multiple of their capital buffers, for most other banks they are less than ten percent thereof. Even a large haircut on Greek debt would thus only have a small impact on their capitalization.

In addition, Greek banks are more dependent on (implicit) guarantees from the Greek government and are more interconnected with the Greek economy, which further increases their vulnerability to a Greek default. Their analysis focuses on news events about Greece in 2010.

In 2010 the euro crisis really started with the problems in Greece. Greek sovereign bond prices in 2009 did not show the strong spikes that were visible in 2010 and that they have used to identify our event dates. The current situation to some extent resembles the crisis in the European Exchange Rate Mechanism (ERM) in 1992. In both crises there is an asymmetry between the centre of European countries facing overheating, and the periphery facing stagnation and recessionary pressure. Like the current crisis, the ERM crisis was first and foremost a crisis of European cooperation. An important difference is that at that time, there was a new policy framework, a commitment device and price stability which markets deemed credible and thus resolved the crisis, namely the fully institutionalised adoption of a common currency.

The Effect of Ratings and their Constituent Parts on Credit Spreads

Decomposed actual ratings into a predicted part that can be attributed to economic and structural variables and an unexplained or arbitrary remainder. The influence of each part on the credit spread seems that markets do respond also to the arbitrary part, which indicates that rating agencies may indeed exert a discretionary influence on the price that governments pay for credit.

The underlying assumption of this approach, namely the causal effect of ratings on credit spreads, has been frequently employed in the literature (e.g., see Cantor and Packer 1996).

The systematic part is explained by our set of economic and structural variables in a fashion that appears robust over time and across countries. The arbitrary part is what remains unexplained. The results suggest that rating agencies may indeed influence interest rates with rating markups that cannot be attributed to economic fundamentals. For instance, all estimates show that the rating markup for the PIGS countries during the crisis is significant and increases the credit spread for these countries. Also, both the systematic part of the rating, as well as the remaining arbitrary markup or residual, turn out to be highly significant. A structural explanation of sovereign credit ratings that is robust with respect to the statistical methods employed.

Provided evidence that risk premiums in capital markets, represented by credit spreads for government bonds, are affected not only by the systematic part of credit ratings, but by the arbitrary part as well. This has the serious implication that rating agencies do possess some power to drive countries with a significant debt ratio into difficult situations. With respect to the group of PIGS countries, they appear to have played, just such an unfortunate role during the European sovereign debt crisis that unfolded in 2009.

5d. P.I.G.S.

It is an acronym used in economics and finance. The PIGS acronym originally refers, often derogatorily, to the economies of the Southern European countries of Portugal, Italy, Greece, and Spain. During the European debt crisis, PIGS or the variant PIIGS were also increasingly used to refer to the economies of Portugal, Ireland, Italy, Greece, and Spain, EU member states that were unable to refinance their government debt or to bail out over-indebted banks on their own during the crisis.

The term originated in the 1990s with the increased integration of the EU economies, and it was often used in reference to the growing debt and economic vulnerability of the Southern European EU countries. It was again popularised during the European sovereign-debt crisis of the late 2000s and expanded in use during this period. In the 1990s, Ireland was not included in this term; the country was still in the midst of its "Celtic Tiger" period, with debt significantly below the Eurozone average and a government surplus as late as 2006. However, taking on the guarantee of banks' debt, the Irish government budget deficit rose to 32% of GDP in 2010, which was the world's largest. Ireland then became associated with the term, replacing Italy or changing the acronym to PIIGS, with Italy also indicated as the second "I".

Important lessons learned from the recent global financial crisis are that the judgment of private rating agencies can have a huge impact on macroeconomic outcomes—and that it can be utterly mistaken. Given these past failings concerning structured products on US mortgage loans, it would be surprising if market participants again rely on the same rating agencies when assessing the default risks of governments in the current European sovereign debt crisis. It could even be cataclysmic if these sovereign debt ratings were driving government bond yields irrespective of the development of the underlying economic fundamentals. This would put the fate of entire nations into the hands of private agencies because bad ratings, which are not in line with economic fundamentals, could be justified ex post via self-fulfilling prophecies. Then, even innocent countries could be turned into, and treated like, pigs.

CONCLUSIONS

The objective of this thesis was to study the determinants of credit ratings from the three major rating agencies, in order to examine the variables that having important influence on the ratings. Level and change of country ratings approaches used to construct the regression models, in order to ensure the reliability of the results.

This thesis results are in the range of past literature findings which prove that there is a significant persistence overtime, between economic variables and changes in country ratings. Moreover, political factors such as corruption have an influence in determining country ratings, as a consequence a political event potentially could lead to a revision of country ratings. The political variables are important in the credit rating process and excluding them from a regression that designed to explain the determinants will reduce the model effectiveness.

More specific from the examined variables the high levels of the government debt, unemployment, inflation, current account and corruption have a negative impact to the ratings of the three major credit agencies, on the other hand there is a positive relation between the country ratings and the industrial production, consumer confidence, fixed investment and income per capita.

Additionaly, government debt, gdp and corruption have the highest coefficient among all other explanatory variables while the variables gdp, fixed investment and current account are the most statistical significant at the level of 1%.

The results of this thesis decomposed the actual ratings into a predicted part that can be attributed to economic and political variables and an unexplained or arbitrary remainder. The systematic part is explained by our set of economic and political variables in a fashion that appears robust over time and across countries. The arbitrary part is what remains unexplained.

Also the results suggest that rating agencies may influenced by interest rates although the fact that frequently employed in the literature (e.g., see Cantor and Packer 1996) the opposite influence. This conclusion perhaps comes out from the fact that the

markets have already incorporated the changes at the credit spreads before the official announcement of a country upgrading or downgrading from the rating agencies.

Finally, the results of our analysis demonstrate the necessity for Greece to improve a variety of policies regarding tax laws, fiscal and monetary decisions, in order to succeed a credit rating upgrade and be able again to borrow cheaply in the financial markets.

FUTURE WORK

Examine the relation between Country Ratings and CDS for the advanced economies

The government debt crises was uncommon in developed countries, as a result the previous work in the literature has focused on the relation between country ratings and Credit Default Swap (CDS) spreads at the emerging and developing economies. So, little work exists regarding the response of yields (CDS) spreads to rating announcements for a large group of advanced economies and EU countries, as a consequence.

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APPENDIX

Table 1 – short term ratings scale

High Grade	
A1+	*Highest certainty of timely payment. Short-term liquidity, including internal operating factors and/or access to alternative sources of funds is high. Risk factors are extremelylow.*
A1	*Very high certainty of timely payment. Liquidity factors are excellent and supported by good fundamental protection factors. Risk factors are minor.*
A1-	*High certainty of timely payment. Liquidity factors are strong and supported by good fundamental protection factors. Risk factors are very small.*
Good Grade	
A2	*Good certainty of timely payment. Liquidity factors and company fundamentals are sound. Although ongoing funding needs may enlarge total financing requirements, access to capital markets is good. Risk factors are small.*
Satisfactory Grade	
A3	*Satisfactory liquidity and other protection factors qualify issues as to investment grade. However, risk factors are larger and subject to more variation.*
Low Grade	
B	*Speculative investment characteristics. Liquidity is not sufficient to insure against disruption in debt service. Operating factors and market access may be subject to a high degree of variation.*
C	*Default is a real possibility*
Default	
LD/DD	*Defaulted on one or more of its obligations, failing to meet scheduled principal and/or Interest payments (LD). Defaulted on all obligations, or is likely to default on all or substantially all of its obligations as they fall due, thus failing to meet all or substantially all scheduled principal and/or Interest payments (DD).*

Source: www.S&P/ratingscale

Table 2 – long term ratings scale

Investment Grade	
AAA	*Highest credit quality. The risk factors are extremely low.*
AA+ **AA** **AA-**	*Very high credit quality. Protection factors are very strong. Adverse changes in business, economic or financial conditions would increase investment risk although not significantly.*
A+ **A** **A-**	*High credit quality. Protection factors are good. However, risk factors are more variable and greater in periods of economic stress.*
BBB+ **BBB** **BBB-**	*Adequate protection factors and considered sufficient for prudent investment. However, there is considerable variability in risk during economic cycles.*
Non-investment Grade	
BB+ BB BB-	*Below investment grade but capacity for timely repayment exists. Present or prospective financial protection factors fluctuate according to industry conditions or company fortunes. Overall quality may move up or down frequently within this category.*
B+ B B-	*Below investment grade and possessing risk that obligations will not be met when due. Financial protection factors will fluctuate widely according to economic cycles, industry conditions and/or company fortunes.*
CCC	*Well below investment grade securities. Considerable uncertainty exists as to timely payment of principal or interest. Protection factors are narrow and risk can be substantial with unfavourable economic/industry conditions, and/or with unfavourable company developments.*
LD/DD	*Defaulted on one or more of its obligations, failing to meet scheduled principal and/or Interest payments (LD). Defaulted on all obligations, or is likely to default on all or substantially all of its obligations as they fall due, thus failing to meet all or substantially all scheduled principal and/or Interest payments (DD).*

Source: www.S&P/ratingscales

Table 3 - Ratings conversion from letters to numeric scale

Standard & Poor's	Fitch	Moody's	Numeric scale	Grade description
AAA	AAA	Aaa	20	Highest credit quality
AA+	AA+	Aa1	19	Very high credit quality
AA	AA	Aa2	18	
AA-	AA-	Aa3	17	
A+	A+	A1	16	High credit quality
A	A	A2	15	
A-	A-	A3	14	
BBB+	BBB+	Baa1	13	Good credit quality
BBB	BBB	Baa2	12	
BBB-	BBB-	Baa3	11	
BB+	BB+	Ba1	10	Non Investment Speculative
BB	BB	Ba2	09	
BB-	BB-	Ba3	08	
B+	B+	B1	07	Highly speculative
B	B	B2	06	
B-	B -	B3	05	
CCC+	CCC+	Caa1	04	High default risk
CCC	CCC	Caa2	03	
CCC-	CCC-	Caa3	02	
CC	CC	Ca	01	Very high default risk

Sources: www.standardandpoor/ratingsscales, www.moodys/ratingsscales, www.ftch/ratingsscales

Table 4 – Country ratings of the sample as of the latest data

Country	S&P (as of 6/2017)	Moody's (as of 7/2017)	Fitch (as of 9/2017)
AUSTRIA	AA+	Aa1	AA+
BELGIUM	AA	Aa3	AA-
DENMARK	AAA	Aaa	AAA
FRANCE	AA	Aa2	AA
GERMANY	AAA	Aaa	AAA
NETHERLANTS	AAA	Aaa	AAA
SWEDEN	AAA	Aaa	AAA
PORTUGAL	BBB-	Ba1	BB+
ITALY	BBB	Baa2	BBB
GREECE	B-	Caa2	B-
SPAIN	BBB+	Baa2	BBB+

Source: tradingeconomics.com

Table 5 – Panel Data regression model Bond yields

Fixed-effects, using 988 observations				
Included 11 cross-sectional units				
Time-series length: minimum 78, maximum 91				
Dependent variable: COUNTRYRATINGS				
Robust (HAC) standard errors				
	Coefficient	Std. Error	p-value	Statistical significance
const	18.0204	0.00423799	<0.0001	***
BONDYIELDS	-3.44349	0.0001926	<0.0001	***
Mean dependent var	17.94467	S.D. dependent var	3.447689	
Sum squared resid	4785.379	S.E. of regression	2.214284	
rho	0.994502	R-squared	0.59211	
		Durbin-Watson	2.033064	

Source: DataStream, quarter data for the period from 1995 to 2016 (for the 11 countries of the sample Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, Portugal, Italy, Greece, Spain).
Statistical significance *=10%, **=5%, ***=1%
Description of the variables: Country Ratings = Credit Rating, Average of Fitch, Moody's, S&P ratings, from 20=AAA to 1=CC, BONDYIELDS = Long Term Government Bond Yield 10 Years Nadj /100.

Table 6 – Panel Data regression model Economical / Political Variables

	Coefficient	Std. Error	p-value	Statistical signifcance
Fixed-effects, using 331 observations				
Included 11 cross-sectionalunits				
Time-series length: minimum 28, maximum 31				
Dependentvariable: COUNTRYRATINGS				
Robust (HAC) standarderrors				
const	18.15200	6.08017	0.01370	**
GOVERMENTDEBT	-1.88163	0.00000	0.09440	*
INDUSTRIALPRODUCTION	0.04317	0.02354	0.02640	**
UNEMPLOYMENT	-0.00449	0.00205	0.05380	*
GDP	1.92173	0.00000	0.00140	***
CONSUMERCONFIDENCE	0.03355	0.01713	0.07860	*
FIXEDINVESTMENT	0.00008	0.00002	0.00500	***
INFLATION	-0.15959	0.06912	0.04360	**
CURRENTACCOUNT	-0.00003	0.00005	0.00140	***
CORRUPTION	-6.02058	2.67099	0.04780	**
FISCALBALANCE	-0.04328	0.18457	0.81930	
INCOMEPERCAPITA	0.00142	0.00074	0.08360	**
Mean dependent var	16.39274	**S.D. dependentvar**	4.977154	
Sum squaredresid	310.2406	**S.E. of regression**	1.002005	
rho	0.744979	**R-squared**	0.487053	
		Durbin-Watson	2.439069	

Source: DataStream, quarter data for the period from 1995 to 2016 (for the 11 countries of the sample Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, Portugal, Italy, Greece, Spain). Statistical significance *=10%, **=5%, ***=1%. Description of the variables: Country Ratings = Credit Rating, Average of Fitch, Moody's, S&P ratings, from 20=AAA to 1=CC, GovermentDebt = Log (External Debt - General Government) IndustrialProduction = Log (Industrial Production), Unemployment = Unemployment Rate/100, GDP=%(GDP), ConsumerConfidence = (Survey - Household Confidence Indicator)/100, FixedInvestment = Log (Fixed Investment), Inflation = Annual Inflation Rate Nadj/100, CurrentAccount = Log (Current Account Balance), Corruption= Control Of Corruption: Estimate Of Governance Nadj/100, FiscalBalance = Cyclically Adjusted Balance (% of Potential GDP) Nadj, Income per capita = National Income Per Capita.

Table 7 – Panel Data regression model Economical / Political Variables (Δ approach)

	Coefficient	Std. Error	p-value	Statistical significance
Fixed-effects, using 115 observations				
Included 4 cross-sectional units				
Time-series length: minimum 27, maximum 30				
Dependent variable: ΔCOUNTRYRATINGS				
Robust (HAC) standard errors				
const	0.04151	0.05375	0.09620	*
ΔGOVERMENTDEBT	- 1.10000	0.00000	0.06680	*
ΔINDUSTRIALPRODUCTION	0.03610	0.01110	0.04740	**
ΔUNEMPLOYMENT	- 0.00619	0.00286	0.09900	*
ΔGDP	1.70500	0.00003	0.00910	***
ΔCONSUMERCONFIDENCE	0.01205	0.01129	0.06390	*
ΔFIXEDINVESTMENT	0.00027	0.00004	0.00550	***
ΔINFLATION	-0.08272	0.08116	0.08010	*
ΔCURRENTACCOUNT	-0.00003	0.00001	0.00650	***
ΔCORRUPTION	-2.38577	4.72361	0.04830	**
ΔFISCALBALANCE	-0.22592	0.26721	0.45990	
ΔINCOMEPERCAPITA	0.00250	0.00083	0.05690	*
Mean dependent var	-0.168122	**S.D. dependent var**	0.941626	
Sum squared resid	44.62419	**S.E. of regression**	0.668013	
rho	-0.141886	**R-squared**	0.552654	
		Durbin-Watson	2.273773	

*Source: DataStream, quarter data for the period from 1995 to 2016 (for the 11 countries of the sample Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, Portugal, Italy, Greece, Spain). Statistical significance *=10%, **=5%, ***=1%. Description of the variables: ΔCountry Ratings = ΔCredit Rating, Average of Fitch, Moody's, S&P ratings, from 20=AAA to 1=CC, ΔGovermentDebt = ΔLog (External Debt - General Government) ΔIndustrialProduction = ΔLog (Industrial Production), ΔUnemployment = ΔUnemployment Rate/100, ΔGDP=%(GDP), ΔConsumerConfidence = Δ(Survey - Household Confidence Indicator)/100, ΔFixedInvestment = ΔLog (Fixed Investment), ΔInflation = ΔAnnual Inflation Rate Nadj/100, ΔCurrentAccount = ΔLog (Current Account Balance), ΔCorruption= ΔControl Of Corruption: Estimate Of Governance Nadj/100, ΔFiscalBalance = ΔCyclically Adjusted Balance (% of Potential GDP) Nadj, ΔIncome per capita = ΔNational Income Per Capita.*

Table 8 – Panel Data regression model Bond yields (Δ approach)

Fixed-effects, using 347 observations				
Included 4 cross-sectional units				
Time-series length: minimum 77, maximum 90				
Dependent variable: ΔCOUNTRYRATINGS				
Robust (HAC) standard errors				
	Coefficient	Std. Error	p-value	Statistical significance
const	0.04787	0.00093	<0.0001	***
ΔBONDYIELDS	-0.03104	0.00947	0.04650	**
Mean dependent var	-0.05091		S.D. dependent var	0.59636
Sum squared resid	121.58940		S.E. of regression	0.59626
rho	0.02022		R-squared	0.30713
			Durbin-Watson	1.95928

Source: DataStream, quarter data for the period from 1995 to 2016 (for the 11 countries of the sample Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, Portugal, Italy, Greece, Spain)**.**
Statistical significance *=10%, **=5%, ***=1%.

Description of the variables: ΔCountry Ratings = ΔCredit Rating, Average of Fitch, Moody's, S&P ratings, from 20=AAA to 1=CC, ΔBONDYIELDS = ΔLong Term Government Bond Yield 10 Years Nadj /100