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Master thesis:

On the determinants of sovereign credit ratings: Evidence from the Euro zone

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Abstract

In the following study, we investigate the determinants of sovereign credit ratings. The ratings dataset used attributed by the three main rating agencies and consists of the Eurozone countries for the period 2002-2013. The methodology followed controls for cross sectional dependence between countries by including cross sectional averages as additional regressors. Moreover, we investigate the role of some variables considered to be extremely significant for the recent Eurozone debt crisis. Apart from this, we split the data into two groups for low and high ratings and examine the different way low and high sovereign ratings affected by the explanatory variables. The results show a general good performance of the procedure and reveal that changes on a set macroeconomic variables are responsible for a large part of the variability of sovereign credit ratings.

1. Introduction

Over the past few years, the debate for sovereign credit ratings has increased rapidly, as a result of their considerable role in the recent financial and Eurozone debt crisis. Sovereign credit ratings are forward-looking estimates of the probability of default put forward by rating agencies. In other words, they are a qualitative measure of a governments ability and willingness to repay its public debt and its interests on full and on time. It is important to mention government's willingness to pay, because it is something that is not obvious to everyone and sometimes is as significant as governments' ability. For instance, Argentina in 2013 refused to compensate an American fund which holds governments bonds and refused to take part in the previous haircut . Sovereign credit ratings are primarily determined by the three main credit rating agencies, Fitch , Standard and Poors and Moodys, that control more than 90% of the market. Sovereign ratings are considered to be a credible qualitative measure of a country's general performance. As a result, they are a key factor of sovereign spreads a country faces in the international financial markets and consequently of its borrowing cost. The most characteristic example is the case of Greece. Between the months of April and May 2010, the three leading rating agencies (Standard & Poor's (S&P), Moody's, and

Fitch) downgraded Greece a cumulative total of six notches. At the same period, sovereign spreads increased rapidly and drive the Greece Government to sign a memorandum with International Monetary Fund, European Central Bank and European Commission to refinance its public debt. Another interesting example is that European Central Bank when

conducting open market operations accepts only as collateral bonds that have at least BBB attributed by at least one of the major rating agencies.

In this study, I perform the behavior of the Eurozone countries from the beginning of the euro area in 2002 until the end of 2013. The purpose of this study is to look into the macroeconomic variables that determine the sovereign credit ratings and investigate their role in the recent Eurozone debt crisis. Therefore, I use a set of macroeconomic variables often used in the previous literature. Apart from this, I add one of the six aggregate governance World Bank indicators in order to capture a part of the impact of the qualitative factors that are accounted for by the rating agencies, which cannot be determined by the quantitative variables.

The main contribution to the existing literature is the control for cross sectional dependence between countries, by including cross sectional averages as additional explanatory variables (Pesaran.2006.). This approach enable me to get a clear view of the effect of the regressors on the depended variables. Another innovation is the use of the set of Eurozone countries, as it is the first study investigating that special sample. That sample gives me the opportunity to examine the difference after 2009 especially for some macroeconomic variables, thought to be more powerful for the recent debt crisis. Moreover, I substitute the external debt with a new explanatory variable, accumulated current account balance, that is considered to play a significant role in Eurozone debt crisis.

The study is organized as follows. In section two is presented the previous literature dealing with this topic. In section three, I explain the rating dataset and the explanatory variables used. In section four, I analyze the methodology that is followed. In section five, I present and discuss the empirical results and finally section six summarizes the study's main findings.

2. Literature Review

The first systematic study on sovereign credit ratings was provided by Cantor and Packer (1996). They concluded that ratings can largely 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(92%) of credit ratings. The study is performed for a group of industrial countries and emerging markets.

Haque, Mark and Mathieson (1998) examine 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 dependent variable. Institutional investors, Euromoney and Economic Intelligence Unit. They concluded that political events and variables do not add additional information if economic factors have been accounted for.

Elliason (2002) used both a static and a dynamic panel model to describe sovereign credit ratings. They include the same explanatory variables as chosen by Cantor and Packer (1996).The main result is that the explanatory power of the dynamic model was higher than the static one. Using static panel data model both spreads and short-term debt to reserves are important factors. Dynamic Panel Data Model gave the result that rate of change of inflation and growth GDP per capita enter significantly and with expected sign. One surprising result was that current account was entered in both models with an unexpected sign but it was statistically significant only in the dynamic model.

Bissoondoyal-Bheenick(2003) used two different scales to describe rating grades. First, from 1 to 9 and second from 1 to 21. Furthermore he estimated first 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. The most 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.

Rating grades are discrete. The appropriate way to deal with discrete dependent variables is an ordered logistic model. The idea underlying the use of a logistic transformation is that at the middle of the scale, ratings can rise rather quickly, as the sovereigns deliver some improvements. Both at the bottom and top end of the rating scale, however, the increase of an additional notch is slower, since the requisites of sovereign debt quality are more demanding. For this reason at the same year Mellios and Paget-Blanc (2003) examine the determinants of sovereign credit rating using not only OLS but also an ordered logistic model. They examined the importance of 13 explanatory variables. OLS suggest that eleven of them are statistically significant. In contrast ordered logistic model suggest only nine. Another point of this study to bear in mind is that the logistic model behaves better than the OLS model.

Logistic transformation of rating grades scales concerns ,also, Afonso (2003) who wrote several papers dealing with the determinants of sovereign credit ratings. In his first study the author 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 big part of the variability of credit ratings.

Rowland (2005) follows the same econometric framework as used by Cantor and Packer. His study differs mainly in the data set used. He estimated different regressions for sovereign credit ratings, sovereign spreads and creditworthiness. He found that GDP per capita is a significant explanatory variable in all regressions. Moreover, inflation rate was found to have a significant impact on creditworthiness index, spreads and S&P rating. The most important result was, however, that regression on the determinants of the creditworthiness index has by far the lowest adjusted R-squared value.

A simple but an interesting study was made by Valle and Marin (2005). They estimate only linear regression models, first with 9 explanatory variable and then with 5 and 4. The most significant outcome was that the model with 4 explanatory variables has as much power as the others. Not surprisingly, GDP per capita, GDP growth and inflation found to be statistically significant and with the expected signs.

In recent years, as the importance of CRAs has grown for capital markets, lights shed not only to macroeconomic variables but also to other determinants. Bautler and Fauver (2006) were the first who 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 legal environment and political institutions affects country's willingness to repay its debt. Legal environment is found to be statistically significant and its marginal effect in sovereign credit ratings is much stronger than macroeconomic variables.

Later, Archer, Biglaiser and Derouen (2007) apart from macroeconomic variables examine the importance of political variables and regime type. They used panel-corrected standard errors estimation to deal with problems arising from OLS in a cross-sectional time series. Unfortunately, all political variables, except from executive party tenure, are found to be statistically insignificant. The most interesting outcome was that default history is highly accounted for sovereign credit ratings. As it was expected, inflation, growth rate and trade commitment were the most important among the economic determinants of sovereign credit ratings.

Afonso, Gomes and Rother (2007) made the most complete study about the determinants of sovereign credit ratings. They used a panel with 130 countries from 1995 to 2005 and estimated using pooled OLS, fixed effects, random effects, ordered probit and random effects random effects ordered probit. The most significant adjustment was the use of time year averages as additionally explanatory variables. The large sample let them to differentiate across sub-periods and across rating levels. A core set of macroeconomic variables, including Per capita GDP, real GDP growth rate, government debt, government effectiveness, external debt and external reserves are relevant for the determination of credit ratings.

Including the same set of explanatory variables, Afonso, Gomes and Rother (2009) examined the fit of ordered response models for sovereign credit ratings. They found that random effects ordered probit is preferable than ordered probit and ordered logit for panel data, as it takes into account the additional cross-section error.

Afonso, Gomes and Rother (2011) implemented again time year averages as additianaly explanatory variables and estimates random effects and random effects ordered probit models. This innovative approach allows them to differentiate between long and short run effects on credit ratings. Per capita GDP, real GDP growth, government debt, and government deficit have a short-run impact on a country's credit rating. On the other hand government effectiveness, external debt, foreign reserves, and sovereign default dummies have only a long run impact.

Studies have demonstrated the differences among the ratings by the three biggest rating agencies, but little research has been undertaken on the ratings by other agencies. Zheng (2012) fills the gap in the literature by examining the differences between the sovereign credit ratings by S&P and Dagong. Dagong is by 1994 the biggest Chinese credit rating agent. Regression results show that the agencies use similar economic risk indicators: inflation, external balance, and the dummies for economic development and default history come out statistically significant in both agencies' ratings. But the agencies assign different weights to these indicators.

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

The following table summarizes the result of the existing literature concerning this topic.

[Table 1]

3. Data

3.1 Overview of rating systems.

Following the most of the previous studies, I use sovereign credit ratings by the three main international rating agencies, Moody's, Standard & Poor's (S&P) and Fitch Ratings. Fitch and S&P use the same qualitative letters, beginning from the AAA for the highest quality to CCC- for the very high credit risk. There is only a small difference in letters for default and non-default with possibility of recovery. Moody's sovereign credit rating starts from Aaa for the highest quality to C for default. The first and most significant step is to convert letters into numerical data. Several scales has been used in the previous studies. The table below represents the different rating scales. I decided to use the larger rating scale (1-21), because it gives me the opportunity to capture the larger part of the variation between ratings. The following table summarizes the different rating scales, has been used in the previous literature.

[Table 2]

3.2 Clarification of Data

As I mentioned in the introduction, I set a ratings database for Eurozone countries from 2002 to 2013 with sovereign foreign currency rating attributed by the three above-

mentioned main rating agencies. Many researchers have used dummies to investigate how Eurozone influence a country's rating. Nevertheless, this study is the first one that includes only Eurozone countries. Another crucial point is the frequency of the data. Some macroeconomic variables are only available in yearly basis. For this reason, in the existing literature are always used yearly datasets. That frequency of macroeconomic variables arises another problem. In some cases, rating agencies change the rating of a country twice or more times in the same year. This usually happens in periods with great instability. For example, Fitch changed the rating of Greece three times in 2009 and 2012 and four times in 2011. To solve this problem the rating of a particular year is the rating that was attributed at 31st of December of that year.

3.3 Explanatory Variables

Following the existing literature, I use a set of macroeconomic variables often used in the previous literature.

1. GDP per capita – positive impact: A high GDP per capita implies a large potential tax base and, therefore, also a greater ability of the government to repay its debt. This variable can also be used as a measure economic development

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

3. 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 correspond to a higher risk of default.

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

5. Unemployment rate – negative impact: A country with lower unemployment has a well- behaved labour market. In additional, the lower is the unemployment, the greater is the number of people gaining incomes. As a result, lower unemployment increases the potential taxbase and reduces the fiscal burden for unemployment subsidies.

6. Inflation rate – negative impact: A high rate of inflation is a sign of structural problems in the government's finances. (If we were dealing with debt in domestic currency, high inflation reduces the real stock of government debt in domestic currency, make the impact uncertain).

7. 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.

8. Foreign reserves – positive impact: Higher foreign reserves suggest a great liquidity situation and protect from default on its foreign currency obligations.

9. 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 GDP. Moreover it is a qualitative measure of government's willingness to repay its debt.

Government balance is a macroeconomic variable that is often used in the previous literature. It has been examined and surprisingly enough found to be statistically insignificant. A reasonable explanation for this result would be that countries that target to improve their credit rating may opt for conservative fiscal policies, limiting their surplus. According to the previous literature, another significant variable is the ratio of External debt to exports of goods and services. Previous studies (Afonso, Gomes, Rother (2007,2009,2011)) found a negative impact of External debt/ exports of goods and services on sovereign credit rating. The problem is the dataset attributed by the World Bank includes data only for developing countries. It was essentially a slope dummy. Thus, I cannot include that variable in this study. Moreover, I examined all six World Bank Governance Indicators (Government effectiveness, Corruption Index, Political Stability, Rule of Law and Voice and Accountability). The problem is that correlation among the six indicators is more than 95% and there is possibility of multicollinearity. Thus I decided to include only Regulatory Quality for two reasons. First, Regulatory Quality Index found to be more often statistically significant and second reflect the government's willingness to repay its debt. Furthermore, I should clarify how cumulated current account is calculated. Following, Gros (2013) the numerator is the sum of previous current account balances in US dollars and is divided of the GDP of each year. For instance, for 2013 is [current account$_{1995}$+ current account$_{1996}$+…+current account$_{2013}$]/GDP$_{2013}$. The following table summarizes the sources that provide data.

[Table 3]

4. Methodology

4.1 Explanation of Methodology

$$Y_{it} = a_0 + \beta X_{it} + z_i + u_{it} \quad (4.1.1)$$

Where, Y_{it} is the dependent variable, represents the rating assignments linear transformed into numbers. X_{it} is the vector with independent variables, presented above and their cross sectional averages. a_0 is the constant term, z_i accounts for the individual effect for each country i and u_{it} the disturbances that are assumed to be independent across countries and across time. The index i(1,..,18) indicates the country and the index t(2002,…,2013) denotes the period of time.

I estimate this equation using three ways. Pooled OLS, Fixed effects and Random Effects estimation. The key point that should be considered is whether or not the country specific error is uncorrelated with the regressors $E(z_i/X_{it})=0$. If this condition is fulfilled, all estimators are consistent and random effects is more efficient than fixed effects which is more efficient than pooled ols. On the contrary, if this condition does not stand, fixed effects estimation is preferable, due to the fact that random effects and pooled ols estimators are inconsistent. This problem can be controlled by doing a Hausman specification Test.

4.2 Hausmann specification test

Simultaneously incorporating these various theoretical and practical considerations into model choice may seem a daunting task. As a consequence, to decide between a random effects and fixed effects model, previous studies often rely on the Hausman (1978) specification test. The Hausman test is designed to detect violation of the random effects modeling assumption that the explanatory variables are orthogonal to the unit effects. If there is no correlation between the independent variable(s) and the unit effects, then estimates of β in the fixed effects model (β_{FE}) should be similar to estimates of β in the random effects model (β_{RE}). The Hausman test statistic H is a measure of the difference between the two estimates:

$$H = (\beta_{RE} - \beta_{FE})'[Var(\beta_{FE}) - Var(\beta_{RE})]^{-1}(\beta_{RE} - \beta_{FE}) \quad (4.2.1)$$

Under the null hypothesis of orthogonality, H is distributed chi-square with degrees of freedom equal to the number of repressors in the model. A finding that $p < 0.05$ is taken as evidence that, at conventional levels of significance, the two models are different enough to reject the null hypothesis, and hence to reject the random effects model in favor of the fixed effects model.

If the Hausman test does not indicate a significant difference ($p > 0.05$), however, it does not necessarily follow that the random effects estimator is “safely” free from bias, and therefore

to be preferred over the fixed effects estimator. In most applications, the true correlation between the covariates and unit effects is not exactly zero. Thus, if the Hausman test fails to reject the null hypothesis, it is most likely not because the true correlation is 10zero—and, hence, that the random effects estimator is unbiased. Rather, it is that the test does not have sufficient statistical power to reliably detect departures from the null. When using the random effects model, there will still be bias (if perhaps negligible) in estimates of β, even if the Hausman test cannot reject the null hypothesis. Of course, in many cases, a biased estimator (i.e., random effects) can be preferable to an unbiased estimator (i.e., fixed effects), if the former provides sufficient variance reduction over the latter, as just described. The Hausman test does not aid in evaluating this tradeoff. Indeed, in all cases Hausman specification test suggest that fixed effects is more robust than random effects. Afonso Gomes Rother (2007, 2009, 2011) criticize this strategy and support the view that although fixed effects is statistically correct, it is economically wrong. This problem arises from the low variation of a countries rating over time. They follow a different approach, including time year averages as additionally explanatory variables to solve the specification problem. This approach was tested by the author. It is truth that Hausman specification test showed that random effects would be more robust than fixed effects estimates. Nevertheless, all regressions tested, suffered from cross sectional dependence and consequently this approach was rejected. For this reason and for completeness and comparison purposes I present both Pool OLS, Fixed Effects and Random Effects Models.

4.3 Cross Sectional Dependence

Another methodological issue that should be thoroughly scrutinized is the existence of cross sectional dependence. A growing body of the panel data literature suggests that panel data sets may suffer by substantial cross-sectional dependence, as a consequence of the presence of common factors that are unobserved. One possible explanation for this development may be that during the few decades it has been observed an increasing economic and financial integration between countries as a result of augmenting openness of the development countries. Especially for Eurozone countries, the possibility of cross sectional dependence is much higher because of the common currency, the large trade transactions and the convergence criteria that a country must fulfill to get into. If we assume that cross sectional dependence is created by common unobserved shocks (and as a result, the effect of these components is expressed through the disturbance term) there are two possible states. On the one hand, if the common unobserved shocks are uncorrelated with the included regressors, the standard fixed-effects (FE) and random effects (RE) estimators are not efficient, despite the fact that are consistent, and therefore they are biased. On the other hand, if they are correlated with included regressors, estimators are both inconsistent and inefficient and therefore biased. In this case, it is appropriate to follow the approach proposed by Pesaran (2006) common correlated effects estimator. The CCE estimation deals with the problem of cross sectional dependence with a simple but effective approach. Apart from the intercept and the regressors, this equation now includes the cross-section averages of the independent variables as additional regressors. The cross

section averages can account for the unobserved common factor. The target of this approach is to obtain consistent estimates of the parameters related to the observable variables. Unfortunately, in empirical application, the estimated coefficients of the cross section averages are not interpretable in a meaningful way. They are just included in the regression to show the biasing impact of the unobserved common factor (Eberdhart(2012)). In the following sections, I present the alternative cross sectional dependence tests.
Thus the hypothesis of interest is

$$H_0 : \rho_{ij} = \rho_{ji} = corr(u_{it}, u_{jt}) = 0 \text{ for } i \neq j \tag{4.3.1}$$

And the alternative

$$H_1 : \rho_{ij} = \rho_{ji} = corr(u_{it}, u_{jt}) \neq 0 \quad \text{for some } i \neq j \tag{4.3.2}$$

where ρ_{ij} is the product-moment correlation coefficient of the disturbances and is given by

$$\rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^{T} u_{it}, u_{jt}}{(\sum_{t=1}^{T} u_{it}{}^2)^{1/2} (\sum_{t=1}^{T} u_{jt}{}^2)^{1/2}} \tag{4.3.3}$$

4.3.1 Pesaran's test

Pesaran (2004) has proposed the following test

$$CD = \sqrt{\frac{2T}{N(N-1)}} (\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}) \tag{4.3.1.1}$$

and showed that under the null hypothesis of no cross-sectional dependence $CD \xrightarrow{d} N(0,1)$ for N $\longrightarrow \infty$ and T sufficiently large.
The CD statistic has mean at exactly zero for fixed values of T and N, under a wide range of panel-data models, including homogeneous/heterogeneous dynamic models and nonstationary models. For homogeneous and heterogeneous dynamic models, the standard FE and RE estimators are biased (see Nickell [1981] and Pesaran and Smith [1995]). However, the CD test is still valid because, despite the small sample bias of the parameter estimates, the FE/RE residuals will have exactly mean zero even for fixed T, provided that the disturbances are symmetrically distributed. [For unbalanced panels Pesaran (2004) proposes a slightly modified version of (4)].

4.3.2 Friedman's test

Friedman (1937) proposed a nonparametric test based on Spearman's rank correlation coefficient. The coefficient can be thought of as the regular product-moment correlation coefficient, that is, in terms of proportion of variability accounted for, except that Spearman's rank correlation coefficient is computed from ranks. In particular, if we define

$\{r_{i,1}, \ldots, r_{i,T}\}$ to be the ranks of $\{u_{i,1}, \ldots, u_{i,T}\}$ [such that the average rank is (T + 1/2)], Spearman's rank correlation coefficient equals

$$r_{ij} = r_{ji} = \frac{\sum_{t=1}^{T}[r_{it} - (T+1/2)][r_{jt} - (T+1/2)]}{\sum_{t=1}^{T}[r_{it} - (T+1/2)]^2} \quad (4.3.2.1)$$

Friedman's statistic is based on the average Spearman's correlation and is given by

$$R_{ave} = \frac{2}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{r}_{ij} \quad (4.3.2.2)$$

where $\hat{r}_{ij}$ is the sample estimate of the rank correlation coefficient of the residuals. Large values of R_{ave} indicate the presence of nonzero cross-sectional correlations. Friedman showed that FR = (T − 1) {(N − 1)R_{ave} + 1} is asymptotically χ^2 distributed with T−1 degrees of freedom, for fixed T as N gets large. Originally Friedman devised the test statistic FR to determine the equality of treatment in a two-way analysis of variance.

4.3.3 Frees' test

Frees (1995, 2004) proposed a statistic that is based on the sum of the squared rank correlation coefficients and equals

$$R^2_{ave} = \frac{2}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{r}_{ij} \quad (4.3.3.1)$$

As shown by Frees, a function of this statistic follows a joint distribution of two independently drawn χ_2 variables. In particular, Frees shows that

$$FRE = N[R^2_{ave} - (T-1)^{-1}] \xrightarrow{d} Q = a(T)[x^2_{1,T-1} - (T-1)] + b(T)[x^2_{2,T(T-3)/2} - T(T-3)/2] \quad (4.3.3.2)$$

Where $x^2_{1,T-1}$ and $x^2_{2,T(T-3)/2}$ are independently χ^2 random variables with T − 1 and T (T − 3)/2 degrees of freedom, respectively a (T) = 4(T + 2) /5 (T − 1)2 (T + 1) and b (T) = 2(5T + 6) / {5T (T − 1) (T + 1)}. Thus the null hypothesis is rejected if R^2_{ave}>$(T-1)^{-1}$+Q_q/N, where Q_q is the appropriate quantile of the Q distribution.

Contrary to Pesaran's $_{CD}$ test, the tests by Frees and Friedman have been originally devised for static panels, and the finite-sample properties of the tests have not been investigated yet in dynamic panels.

4.4 Stationarity test

In this section is presented the Levin, Lin, Chu(2002) panel unit root test to examine the stationarity property of the explanatory variables.

The starting point for the Levin–Lin–Chu test is generated by one of the following three models:

$$\Delta y_{it} = \delta y_{it-1} + \zeta_{it} \quad (4.4.1)$$

$$\Delta y_{it} = a_{0i} + \delta y_{it-1} + \zeta_{it} \text{ (includes constant)} \quad (4.4.2)$$

$$\Delta y_{it} = a_{0i} + a_{1i}t + \delta y_{it-1} + \zeta_{it} \text{ (includes constant and time trend)} \quad (4.4.3)$$

In Model 1, the panel unit root test procedure evaluates the null hypothesis H_0: δ= 0 against the alternative H_1: δ<0. The series ,y_{it}, has an individual-specific mean in Model 2, but does not contain a time trend. In this case, the panel test procedure evaluates the null hypothesis thatH_0: δ= 0and α_{oi} = 0, for all i, against H_1: δ<0 and α_{oi} ∈R. Finally, under Model 3, the series ,y_{it}, has an individual-specific mean and time trend. In this case, the panel test procedure evaluates the null hypothesis that H_0: δ = 0 and α_{1i} = 0, for all i, against the alternative H_1: δ<0 and α_{1i} ∈R.

Due to the fact that ζ_{it} is likely to suffer by serial correlation, Levin Lin Chu augment the model with additional lags of the dependent variable:

$$\Delta y_{it} = \delta_i y_{it-1} + \alpha_{1i} t + \sum_{j=1}^{p} \theta_{ij} \Delta y_{it-j} + \varepsilon_{it} \quad (4.4.4)$$

The LLC test assumes that ε_{it} is independently distributed across panels and follows a stationary invertible autoregressive moving-average process for each panel. If model (2) includes panel-specific means or time trends, then we must assume that N/T → 0 for the t_{stat} statistic to have an asymptotically standard normal distribution. This implies that the time dimension, T, must grow faster than the cross-sectional dimension, N, something that is more possible to happen in macroeconomic datasets as ours.

The following table presents the results for stationarity testing.

[Table 4]

5. *Results*

5.1 Full Sample

[Table 5,6,7,8]

I report the results for each rating agency and for their average of a restricted and an unrestricted model. The unrestricted model contains all variables and the restricted model incorporates only the variables which have a statistically significant impact. In some cases, I keep insignificant variables in the restricted model, since it retain R squared in high level. I generate Pooled OLS, fixed effects and random effects estimations. The results presented by

the three methods are quite similar. Hausmann specification test shows that fixed effects is the most appropriate method. However, I do not stand only to this, but I comment all results for completeness and comparison purposes. In addition, all regressions pass Pesaran cross sectional independence test, which means that explanatory variables do not suffer from cross sectional dependence. Moreover, I should repeat that the estimated coefficients of the cross section averages are not interpretable in a meaningful way. They are just included in the regression to show the biasing impact of the unobserved common factor. A significant step in the specification is the sequence of excluding individual variables in moving from the unrestricted to the restricted regression, because it can have an impact on the final specification. There is no reason to worry about this, since the restricted models presented in the tables are quite robust to alternative exclusion procedures. Lastly, a short view in the tables for R square shows that fixed is the most appropriate method to capture the variation within a country(all within R square in fixed effects are higher than 0,85). On the other side, random effects are more preferable to capture the variation between countries (all within R square are higher than 0,89). In Overall, R square is higher than 0,88 for Pool OLS and random effects models and ranges between 0,45 and 0,70 for the restricted fixed effect models.

The results of restricted models reveal that there is a set of macroeconomic variables that are statistically significant for all rating agencies and with the three used methods. These are, GDP per capita, GDP growth rate, Government Debt, Inflation Rate and Unemployment Rate. External Balance and foreign reserves found to be statistically significant using Pool OLS and random effects, but insignificant using fixed effects (for Fitch foreign reserves are statistically significant using all methods). Fixed effects and random effects (in contrast with Pool OLS) show that Regulatory Quality Index has a statistically significant impact on credit rating. Regarding Slope dummies, Government Debt, External Balance and Cumulated Current Account are statistically significant for the Eurozone Debt crisis period 2009-2013 (the last one is not statistically significant for the full period).

As it was expected, an augmentation in GDP per capital, GDP growth rate, Foreign Reserves and Regulatory Quality Index results in the credit rating upgrade. Another expected result is that an increase in Inflation Rate, Unemployment Rate and Government Debt as percent of GDP drive to a decrease in credit rating.

The results regarding the external balance sign may appear surprising as it suggests that countries with high external balance surpluses would tend to be rated lower than otherwise equal countries without such surpluses. Nevertheless, it is not the first time that result found in the literature [Elliason(2002), Afonso, Gomes, Rother(2007,2009,2011)]. A possible explanation is that an external balance deficit could in fact interpreted as an indicator for the willingness of foreigners to fill the external gap through loans and foreign investment. In this situation, a higher external balance deficit would be related with either higher creditworthiness or good economic performance of the economy and consequently a higher credit rating.

Notable enough is the impact of cumulated current account balance on sovereign credit rating. Despite the fact that there is no relationship for the full period it seems that for the

Eurozone debt crises period (2009-2013) an improvement in the cumulated current account leads to a credit rating upgrade. A reasonable explanation for this result is that cumulated current account considered to be notably important especially for the Eurozone periphery. One of the main targets of the support programs applied in countries with financial problems, such as Greece, Ireland, Portugal, Cyprus and Spain, was the improvement of accumulated current account balance. As a result, sovereign credit rating agencies started to compute cumulated current account in their assesments.

5.2 Differentiation across rating levels

[Table 9,10,11,12]

After presenting the results for the full sample, an interesting idea is to split the overall sample into two groups according to the rating levels. This approximation allows us to estimate the different way explanatory variables affect low and high credit ratings. The special point is the choice of threshold. As was presented above rating grades display in scale from 1 to 21. So someone could think to separate the sample from 1 to 10(D to BB) and from to 11 to 21 (BB+ to AAA). The problem with this differentiation is that the observations in the first part would be much fewer. The sample consists of 206 observations. If I separate it into two equal groups, the high rated with AA- and above and middle-low rated with A+ and below. Due to the fact that countries enjoy different rating levels at different time it is not feasible to classify a country in high or low level of rating. Thus I decided to pool the data and estimate the different rating levels regardless of country and time. The one and only disadvantage is that I cannot regress random and fixed effects and test for cross sectional dependence.

The regressions reveal some interesting results. First of all, the explanatory power of the for the high ratings is greater. R_2 ranges from 0,77 to 0,83 for high ratings and from 0,75 to 0,81 for low ratings. However, the explanatory power of the individual regressions is somewhat lower than that found for the full sample. Secondly, some of the explanatory variables that were found to be statistically significant for the overall sample are found to be insignificant for individual regressions. For instance, GDP growth rate is statistically insignificant in all regressions both for high ratings and low ratings. A set of explanatory variables remain significant in all regressions for high ratings. These are GDP per capita, Government Debt, Cumulated current account, Reserves, External Balance, and Regulatory Quality Index. Unemployment rate considered to influence high ratings only by S&P and inflation rate only for S&P and Moodys.

The most surprising outcome is the negative sign of the coefficient of cumulated current account. A reasonable explanation is that high rated countries were capable of sustaining large cumulated current account deficits (high external debt) without being downgraded.

Regarding 2009-2013, it seems that high rated countries are not influenced by the recent crisis. Crisis dummies found to be important only for S&P.

For low ratings, GDP per capital, Government Debt, Inflation Rate, Unemployment Rate , are statistically significant in all regressions and Reserves and External Balance in three of four. GDP growth rate, cumulated current account and Regulatory Quality Index are statistically unimportant in all regressions for low ratings. Regarding crises dummies, they are statistically significant in all cases and maintain the same sign with the full sample.

6. Conclusion

In this study, I have examined the determinants of sovereign credit ratings using ratings from the three main international rating agencies for the Eurozone for the period 2002-2013. In general, the main results indicate a good performance of the estimated models across agencies and across time.

Concerning the methodological approach, the main contribution to the existing literature is the control for cross sectional dependence by including cross sectional averages as additional regressors. For completeness and comparisons purposes, I have presented both Pool OlS, Fixed and Random Effects, despite the fact that Haussmann specification test have showed that Fixed effects is the best procedure. Apart from this, I have presented different estimates for high and low ratings.

The main results have revealed that GDP per capita, GDP growth rate, Government Debt, Inflation Rate and Unemployment Rate are statistically significant for all rating agencies and with the three used methods. Moreover, Cumulated current account balance found to affect sovereign credit ratings only for the Eurozone debt crisis period (2009-2013). Apart from this, External Balance sign on the first sight seemed to be surprising, but it was not the first time that result found in the literature.

Regarding the differentiation level, the explanatory power of the for the high ratings have been greater. For high ratings, a set of explanatory variables remain significant in all regression in contrast to the crisis dummies that are unimportant. For low ratings, GDP per capital, Government Debt, Inflation Rate, Unemployment Rate, Reserves and External Balance are responsible for the variation.

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Appendix

Table 1

Authors	Dependet Variables	Explnatory Variables	Methodology/Data	Important Results
Cantor and Packer (1996)	Moody's Rating S&P Rating	Per capita income GDP growth Inflation Fiscal balance External balance External debt Economic development Default history	49 countries in 29 September 2001. Moodys and S&P and its average. Cross-section OLS	Per capita income, inflation, external debt, economic developent and Default History explain more than 90% of the variation of credit rating for Moodys, S&P and its average.
Haque, Mark, Mathieson (1998)	Instituitional Investor Euromoney Economic Intelligence unit	**Economic Variables:** Terms of Trade Export Growth Current Account/GDP Reserves/Imports External debt/GDP Real Exchange Rate Growth Inflation	Cross section OLS	Credit rating appears to be determined mainly through the analysis of economic variables. Political variables do not add any additional explanatory power.

Eliasson (2002)	S&P Rating	Per capita income GDP growth Inflation Fiscal balance External balance External debt Economic development Default history Short-term currency debt to foreign reserves Export growth Interest rate spreads	38 emerging countries from 1990 to 1999. Static and dynamic panel model.	Dynamc model is more robust than the static one. Using static panel data model both spreads and short-term debt to reserves are significant variables. Current account entered in both models with an unexpected sign.
Bissoondoyal Bheenick(2003)	S&P Rating Moody's Rating	Per capita income Inflation Govt financial balance/GDP Govt debt/GDP Real exchange rate Foreign reserve Net Exports/GDP Unemployment rate Unit labor cost Current account/GDP Foreign debt/GDP	95 countries from December 1995 to December 1999 Ordered Response Model. First using rating from 1 to 9 and then from 1 to 21. Estimated first full sample, second for high rated countries and third for low rated countries.	Economic variables do not play an important role for the high rated sample of countries. GNP per capita and inflation are the most significant factors for the full sample. Moreover, current account balance and the level of foreign reserves do play an important role for low rated countries.

Mellios and Paget-Blanc (2003)	S&P Rating Fitch Rating Moody's Rating	Per capita income GDP growth Inflation Economic development Current Account Default history Real Exchange Rate Foreign debt/GDP Ratio debt/GDP Ratio reserves/imports Ratio investment/GDP Corruption Index Regulatory quality	86 countries in December 31 2003. Cross section OLS Ordered Logistic Model.	OLS suggest that 11 explanatory variables are statistically significant. In contrast ordered logistic model suggest only nine. logistic model behaves better than the OLS model.
Afonso (2003)	Moody's Rating S&P Rating	Per capita GDP Inflation rate GDP real growth rate Development indicator Default indicator External debt-exports ratio Government deficit as a percentage of GDP	Cross-section OLS using both a linear and a logistic transformation of the data. 81 countries in June 2001.	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 big part of the variability of credit ratings.

Rowland (2005)	Moody's Rating S&P Rating EMBI Global composite Institutional Investor's creditworthiness Index	GDP per capita Real GDP growth rate Fiscal balance as a percentage of GDP Current account balance as a percentage of GDP Debt-to-GDP ratio Debt ratio International reserves as a percentage of GDP Debt-service-to-GDP ratio Openness Inflation rate Default history	49 countries at the end of July 2003. Moodys and S&P OLS regression for sovereign credit ratings, sovereign spreads and creditworthiness.	GDP per capita is a significant explanatory variable in all the regressions. regression on the determinants of the creditworthiness index has by far the lowest adjusted R value.
Valle and Marin (2005)	Moody's Rating Fitch Rating S&P Rating	GDP per capita GDP growth Increase of the CPI Fiscal Balance / GDP Balance of payments on current account / GDP Internal Debt of the State /GDP Liquidity Ratio Industrialized country or not	80 countries dated 28 of March 2003. OLS regression using first 9 explanatory variables and then 4 and 5	The model with 4 explanatory variables has as much power as the others. GDP per capita, GDP growth and inflation found to be statistically significant and with the expected signs.

Bautler and Fauver (2006)	Institutional Investor Moody's Rating S&P Rating Ten year sovereign bond yields.	GDP per capita Inflation Underdevelopment Index Default Dummy Voice of the people Political Stability Government Effectiveness Regulatory quality Rule of law Corruption control Legal enviroment composite Emerging market Dummy Foreign debt/GDP Common Law Dummy	86 countries in March 2004 OLS for th efull sample 2SLS using as instruments for legal enviroment the ethnolinguistic fractialiazation and French civil law origin. Differentiation acrross low and high debt countries.	Using OLS legal environment is found to be statistically significant and its marginal effect in sovereign credit ratings is much stronger than macroeconomic variables. Using 2SLS the effect of legal enviroment on credit rating is smaller than OLS estimates indicate, altgough it is still quite large. Sovereign credit rating are more sensitive in legal enviroment in low-debt countries than high-debt.
Archer, Biglaiser Derouen (2007)	S&P Rating Moody's Rating Fitch Rating	**Political factors:** Presidential ideology Executive party tenure Undivided government Election cycles Honeymoon periods **Economic Variables:** Total external debt Inflation Gdp per capita Current account balance Default history Natural resources	50 developing countries from 1987 to 2003. Panel-corrected standard errors estimation using both annual bond ratings and two year moving average.	All political variables, except from executive party tenure, are found to be statistically insignificant. The measure with the biggest impact is history of bond default in the previous five years. Inflation, Gdp growth rates and trade are highly accounted for the three rating agencies.

Afonso, Gomes, Rother (2007)	S&P Rating Moody's Rating Fitch Rating	Per capita income Real GDP growth Inflation Unemployment Government debt Fiscal balance Government effectiveness External debt Foreign reserves Current account balance Default history	130 countries from 1995 to 2005. Linear panel estimation using pool OLS, fixed effects and random effects. Differentiation across sub periods, 1996-2000 and 2001-2005. Differentiation across rating levels, BBB+ and above. Ordered probit estimation and random effects ordered probit estimation fot the full sample.	Per capita GDP, GDP real growth rate, government debt, government effectiveness, external debt and external reserves relevant for the determination of the sovereign credit ratings. For the low rating levels, external debt and external reserves are more relevant. Inflation plays a bigger role for high rating levels. Moreover, after the Asian crisis, it seems there was a decline in the relevance ofthe current account variable in the specifications for Moody's and S&P.

Afonso, Gomes, Rother (2009)	Moody's Rating S&P Rating	GDP per capita GDP growth Inflation Unemployment Government debt Government effectiveness Government balance External debt Current account Reserves Default history Regional dummies European Union dummy	66 countries from 1996 to 2005 Ordered probit ordered logit and random effects ordered probit model.	The random effects ordered probit estimation is the more efficient method, since a considerable number of variables show up as significant that are not picked up using the other two methods. In the random effects ordered probit, more variables show up as significant: seven for Moody's, and nine for S&P.
Afonso, Gomes Rother (2011)	Fitch Rating Moody's Rating S&P Rating	Per capita income Real GDP growth Unemployment Inflation Government debt Fiscal balance Government effectiveness External debt Foreign reserves Current account balance Default history European Union dummie Regional dummies	130 countries from 1995 to 2005. Linear panel random effects estimation. Ordered probit random effects estimation.	Per capita GDP, real GDP growth, government debt, and government deficit have a short-run impact on a country's credit rating. Government effectiveness, external debt, foreign reserves, and sovereign default dummies have only a long run impact.

Zheng (2012)	S&P Rating Dagong Rating	GDP per capita Real GDP Growth Inflation Fiscal Balance External Balance External Debt Internal Debt Economic Development Default History	43 countries in 2011. Lineaer regression using Dagong, S&P their average and their difference in both local and domestic currency ratings as dependent variable.	Agencies use similar economic risk indicators. Inflation, external balance, and the dummies for economic development and default history come out statistically significant in both agencies' ratings. But Dagong assigns different weights to these indicators.
Bozic and Magazino (2013)	Moody's Rating Fitch Rating S&P Rating	GNI growth Per capita GNI Current account balance Inflation Unemployment Fiscal balance Government debt Real Interest Rate Reserves Default history EMU Membership Fiscal balance squared Government debt squared	139 countries in the period 1975-2010. Unbalanced Panel using pooled OLS, fixed effects, random effects and panel corrected standard errors. Differentiation across sub-periods 1975-1996 and 1997-2010 and on the development level.	Per capita GNI, inflation, unemployment, fiscal balance, government debt and default history are stattistically significant in almost all regressions and for all rating agencies. EMU membership increases rating and both fiscal balance and government debt square are strongly significant.

Garcia, Valle and Marin(2014)	Moody's Rating Fitch Rating S&P Rating	Per capita income GDP growth Inflation Fiscal balance External balance External debt Economic development Previous payment behaviour Control of corruption Government effectiveness Political stability and absence of violence Regulatory quality Rule of law Voice and accountability	82 countries 2004-2011 OLS First with 14 explanatory variables and then only with the three statisticaly significant of the first regression.	External balance, economic development and regulatory quality are statistically significant.

Table 2

		Rating agencies			Rating grades			
	Fitch	S&P	Moody's	(1-21)	(1-17)	(1-9)	(1-24) (Fitch)	(1-8)
Highest quality	AAA	AAA	Aaa	21	17	9	24	8
High quality	AA+	AA+	Aa1	20	16		23	7,33
	AA	AA	Aa2	19	15		22	7
	AA-	AA-	Aa3	18	14	8	21	6,66
Strong payment	A+	A+	A1	17	13		20	6,33
capacity	A	A	A2	16	12		19	6
	A-	A-	A3	15	11	7	18	5,66
Adequate payment	BBB+	BBB+	Baa1	14	10		17	5,33
capacity	BBB	BBB	Baa2	13	9		16	5
	BBB-	BBB-	Baa3	12	8	6	15	4,66
Likely to fullfill	BB+	BB+	Ba1	11	7		14	4,33
obligations, ongoing	BB	BB	Ba2	10	6		13	4
uncertainty	BB-	BB-	Ba3	9	5	5	12	3,66
High credit risk	B+	B+	B1	8	4		11	3,33
	B	B	B2	7	3		10	3
	B-	B-	B3	6	2	4	9	2,66
Very high credit	CCC+	CCC+	Caa1	5			8	2,33
risk	CCC	CCC	Caa2	4			7	2
	CCC-	CCC-	Caa3	3		3	6	1,66
Non default wih	CC	CC	Ca				5	1,33
possibility of recovery	C			2		2	4	
	DDD	SD	C				3	
Default	DD	D					2	
	D			1	1	1	1	1

Table 3

Variable	Description	Source
GDP per capital	Log GDP per capital, US dollars, constant 2005 prices	World Bank
GDP growth rate	Annual percent change of GDP	IMF WEO
Government Debt	General government gross dedt 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
Infation 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	Aggreagate Government Indicator	World Bank

Table 4

Variable	Adjustet t-stat	p-value
L_GDPpercapital	-4,7914	0,000
GDPgrowthrate	-5,3160	0,000
GovernmentDebt*	-4,6912	0,000
InflationRate	-7,6886	0,000
UnemploymentRate*	-4,3430	0,000
C,Currentaccount*	-4,1859	0,000
ExternalBalance	-5,3986	0,000
L_reserves	-3,3125	0,005
RegulatoryQuality	-2,3750	0,008
* Icludes time trend		

Table 5

	FITCH											
	Pooled OLS				Fixed Effects				Random Effects			
L_GDPpercapital	10,970	0,000	11,086	0,000	4,039	0,247	6,727	0,043	9,195	0,000	9,370	0,000
L_GDPpercapital_cavg	-4,644	0,752			5,716	0,580			-1,586	0,889		
GDPgrowthrate	0,149	0,000	0,149	0,000	0,130	0,000	0,142	0,000	0,152	0,000	0,152	0,000
GDPgrowthrate_cavg	-0,172	0,159	-0,222	0,000	-0,176	0,033	-0,182	0,000	-0,181	0,055	-0,208	0,000
GovernmentDebt	-0,032	0,000	-0,033	0,000	-0,043	0,000	-0,035	0,001	-0,024	0,000	-0,024	0,000
GovernmentDebt_cavg	0,301	0,022	0,270	0,000	0,202	0,028	0,260	0,000	0,251	0,013	0,260	0,000
InflationRate	-0,281	0,000	-0,287	0,000	-0,107	0,030	-0,138	0,002	-0,177	0,001	-0,179	0,001
InflationRate_cavg	-0,381	0,280	-0,247	0,103	-0,323	0,192	-0,416	0,004	-0,408	0,136	-0,372	0,003
UnemploymentRate	-0,142	0,000	-0,143	0,000	-0,218	0,000	-0,225	0,000	-0,180	0,000	-0,174	0,000
UnemploymentRate_cavg	-0,723	0,309	-0,561	0,050	-0,278	0,564	-0,607	0,036	-0,552	0,313	-0,612	0,008
CCurrentaccount	-0,013	0,006	-0,013	0,005	0,000	0,982			-0,002	0,683		
CCurrentaccount_cavg	-0,007	0,851			-0,015	0,556			-0,014	0,620		
ExternalBalance	-0,062	0,002	-0,062	0,002	-0,008	0,720			-0,070	0,001	-0,079	0,000
ExternalBalance_cavg	-0,667	0,083	-0,758	0,003	-0,642	0,014			-0,630	0,033	-0,675	0,001
L_Reserves	1,439	0,000	1,440	0,000	-0,133	0,572	-0,697	0,000	0,845	0,000	0,951	0,000
L_reserves_cavg	-3,421	0,640			-0,955	0,845			-2,527	0,653		
RegulatoryQuality	0,165	0,659			1,716	0,006	1,853	0,005	1,022	0,060	0,867	0,093
RegulatoryQuality_cavg	12,704	0,099	10,963	0,047	8,350	0,111	10,391	0,012	10,791	0,068	10,260	0,019
GovernmentDebt_D_{crisis}	-0,036	0,000	-0,036	0,000	-0,027	0,000	-0,029	0,000	-0,034	0,000	-0,034	0,000
CCaccount_D_{crisis}	0,021	0,000	0,022	0,000	0,009	0,069	0,012	0,001	0,012	0,019	0,010	0,007
ExternalBalance_D_{crisis}	-0,117	0,000	-0,118	0,000	-0,057	0,005	-0,074	0,000	-0,082	0,000	-0,079	0,000
Constant	-1,107	0,919	-63,166	0,000	-28,989	0,691	-29,842	0,046	-17,393	0,836	-50,247	0,000
R squared within					0,877		0,865		0,850		0,845	
between					0,377		0,591		0,882		0,896	
overall	0,901		0,901		0,511		0,662		0,872		0,880	
PesaranCross sectional independence test					-1,19	Pr=1,77	-0,96	Pr=1,66	-1,37	Pr=1,83	-1,33	Pr=1,81
Hausman Specification Test									54,14	Pr=0,00		

Table 6

	S&P											
	Pooled OLS				Fixed Effects				Random Effects			
L_GDPpercapital	10,601	0,000	10,495	0,000	6,079	0,077	11,657	0,000	10,601	0,000	10,391	0,000
L_GDPpercapital_cavg	-10,763	0,496			-3,815	0,707			-10,763	0,495		
GDPgrowthrate	0,131	0,001	0,113	0,003	0,110	0,000	0,113	0,000	0,131	0,000	0,121	0,000
GDPgrowthrate_cavg	-0,132	0,314	-0,260	0,000	-0,130	0,108	-0,213	0,000	-0,132	0,313	-0,221	0,000
GovernmentDebt	-0,035	0,000	-0,039	0,000	-0,045	0,000	-0,042	0,000	-0,035	0,000	-0,035	0,000
GovernmentDebt_cavg	0,297	0,036	0,089	0,000	0,220	0,015	0,145	0,000	0,297	0,034	0,142	0,000
InflationRate	-0,285	0,000	-0,261	0,000	-0,139	0,004	-0,216	0,000	-0,285	0,000	-0,224	0,000
InflationRate_cavg	-0,365	0,337			-0,332	0,171			-0,365	0,335		
UnemploymentRate	-0,091	0,002	-0,117	0,000	-0,182	0,000	-0,183	0,000	-0,091	0,002	-0,146	0,000
UnemploymentRate_cavg	-0,791	0,300			-0,415	0,380			-0,791	0,299		
CCurrentaccount	-0,006	0,238			0,000	0,952			-0,006	0,236		
CCurrentaccount_cavg	-0,013	0,744			-0,017	0,485			-0,013	0,743	-0,023	0,079
ExternalBalance	-0,074	0,001	-0,089	0,000	-0,024	0,268			-0,074	0,001	-0,082	0,000
ExternalBalance_cavg	-0,561	0,176	-0,536	0,005	-0,559	0,028	-0,760	0,000	-0,561	0,174	-0,663	0,000
L_Reserves	1,309	0,000	1,257	0,000	-0,345	0,137			1,309	0,000	0,521	0,008
L_reserves_cavg	-5,079	0,519			-2,756	0,567			-5,079	0,518		
RegulatoryQuality	0,340	0,398			1,138	0,060	1,482	0,037	0,340	0,397		
RegulatoryQuality_cavg	13,004	0,116			10,245	0,047	9,703	0,028	13,004	0,114	8,668	0,035
GovernmentDebt_D_{crisis}	-0,035	0,000	-0,030	0,000	-0,028	0,000	-0,024	0,000	-0,035	0,000	-0,031	0,000
CCaccount_D_{crisis}	0,020	0,001	0,013	0,001	0,010	0,040	0,015	0,000	0,020	0,001	0,012	0,001
ExternalBalance_D_{crisis}	-0,095	0,001	-0,070	0,003	-0,033	0,095	-0,053	0,008	-0,095	0,001	-0,051	0,010
Constant	34,773	0,767	-39,781	0,000	21,990	0,759	-49,521	0,000	34,773	0,767	-46,452	0,000
R squared within					0,883		0,845		0,818		0,858	
between					0,469		0,700		0,919		0,836	
overall	0,890		0,889		0,580		0,706		0,890		0,845	
PesaranCross sectional independence test					-1,47	Pr=1,85	-0,39	Pr=1,30	-1,35	Pr=1,81	-0,39	Pr=1,30
Hausman Specification Test									36,60	Pr=0,00		

Table 7

MOODYS													
	Pooled OLS				Fixed Effects				Random Effects				
L_GDPpercapital	9,870	0,000	9,909	0,000	-8,231	0,047			8,971	0,000	9,681	0,000	
L_GDPpercapital_cavg	-31,486	0,051	-21,783	0,023	-10,934	0,372	-28,582	0,008	-30,194	0,034	-38,752	0,001	
GDPgrowthrate	0,174	0,000	0,177	0,000	0,144	0,000	0,148	0,000	0,170	0,000	0,160	0,000	
GDPgrowthrate_cavg	-0,119	0,373			-0,103	0,291			-0,115	0,332			
GovernmentDebt	-0,034	0,000	-0,036	0,000	-0,049	0,000	-0,040	0,001	-0,032	0,000	-0,035	0,000	
GovernmentDebt_cavg	0,555	0,000	0,450	0,000	0,515	0,000	0,599	0,000	0,532	0,000	0,608	0,000	
InflationRate	-0,155	0,027	-0,162	0,018	-0,051	0,381			-0,136	0,037	-0,155	0,014	
InflationRate_cavg	-1,059	0,007	-1,327	0,000	-1,063	0,000	-1,385	0,000	-1,049	0,002	-1,319	0,000	
UnemploymentRate	-0,112	0,000	-0,114	0,000	-0,308	0,000	-0,265	0,000	-0,145	0,000	-0,150	0,000	
UnemploymentRate_cavg	-2,179	0,006	-1,541	0,004	-1,814	0,002	-2,277	0,000	-2,089	0,002	-2,416	0,000	
CCurrentaccount	-0,003	0,545			0,007	0,312			0,004	0,550			
CCurrentaccount_cavg	-0,053	0,193			-0,053	0,075	-0,060	0,056	-0,058	0,109	-0,058	0,100	
ExternalBalance	-0,087	0,000	-0,094	0,000	-0,030	0,259			-0,103	0,000	-0,097	0,000	
ExternalBalance_cavg	-0,916	0,030			-0,931	0,003	-0,849	0,001	-0,893	0,017	-0,686	0,018	
L_Reserves	1,541	0,000	1,529	0,000	0,125	0,653			1,318	0,000	1,274	0,000	
L_reserves_cavg	-9,231	0,250	-18,061	0,000	-7,498	0,198	-13,251	0,000	-8,913	0,209	-14,523	0,000	
RegulatoryQuality	0,241	0,556			2,038	0,006	2,142	0,006	0,686	0,199			
RegulatoryQuality_cavg	24,522	0,004	32,347	0,000	21,121	0,001	28,056	0,000	23,733	0,001	29,638	0,000	
GovernmentDebt_D_{crisis}	-0,041	0,000	-0,040	0,000	-0,039	0,000	-0,037	0,000	-0,040	0,000	-0,040	0,000	
CCaccount_D_{crisis}	0,018	0,004	0,016	0,001	0,002	0,689	0,013	0,001	0,012	0,043	0,016	0,000	
ExternalBalance_D_{crisis}	-0,103	0,000	-0,096	0,000	-0,050	0,039	-0,077	0,001	-0,082	0,002	-0,090	0,000	
Constant	152,270	0,203	187,996	0,003	141,851	0,102	230,955	0,000	150,616	0,154	233,458	0,000	
R squared within					0,889		0,874		0,849		0,844		
between					0,022		0,192		0,913		0,914		
overall	0,891		0,887		0,082		0,443		0,886		0,885		
PesaranCross sectional independence test					-0,641	Pr=1,47	-0,623	Pr=1,46	-0,791	Pr=1,57	-0,486	Pr=1,37	
Hausman Specification Test									46,940	Pr=0,00			

Table 8

AvRating												
	Pooled OLS				Fixed Effects				Random Effects			
L_GDPpercapital	10,481	0,000	10,167	0,000	0,629	0,847	2,740	0,403	9,497	0,000	9,505	0,000
L_GDPpercapital_cavg	-15,631	0,281			-3,011	0,756			-14,005	0,231		
GDPgrowthrate	0,152	0,000	0,147	0,000	0,128	0,000	0,140	0,000	0,152	0,000	0,153	0,000
GDPgrowthrate_cavg	-0,141	0,241	-0,236	0,000	-0,136	0,078	-0,197	0,000	-0,144	0,140	-0,234	0,000
GovernmentDebt	-0,034	0,000	-0,034	0,000	-0,046	0,000	-0,035	0,001	-0,029	0,000	-0,029	0,000
GovernmentDebt_cavg	0,384	0,003	0,278	0,000	0,312	0,000	0,334	0,000	0,354	0,001	0,266	0,000
InflationRate	-0,241	0,000	-0,233	0,000	-0,099	0,032	-0,117	0,009	-0,182	0,001	-0,184	0,000
InflationRate_cavg	-0,602	0,085	-0,320	0,034	-0,572	0,014	-0,539	0,000	-0,619	0,028	-0,381	0,002
UnemploymentRate	-0,115	0,000	-0,118	0,000	-0,236	0,000	-0,254	0,000	0,148	0,000	-0,150	0,000
UnemploymentRate_cavg	-1,231	0,079	-0,658	0,020	-0,836	0,066	-0,910	0,002	-1,122	0,047	-0,619	0,007
CCurrentaccount	-0,007	0,112			0,002	0,660			0,000	0,929		
CCurrentaccount_cavg	-0,024	0,506			-0,028	0,229			-0,030	0,315		
ExternalBalance	-0,074	0,000	-0,086	0,000	-0,021	0,322			-0,090	0,000	-0,090	0,000
ExternalBalance_cavg	-0,715	0,060	-0,794	0,002	-0,711	0,004	-0,900	0,000	-0,687	0,025	-0,757	0,000
L_Reserves	1,430	0,000	1,406	0,000	-0,118	0,595			1,080	0,000	1,075	0,000
L_reserves_cavg	-5,910	0,413			-3,737	0,417			-5,421	0,351		
RegulatoryQuality	0,249	0,500			1,631	0,005	1,797	0,006	0,763	0,114	0,789	0,099
RegulatoryQuality_cavg	16,743	0,028	13,972	0,011	13,239	0,007	14,429	0,000	15,700	0,010	13,295	0,003
GovernmentDebt_D_{crisis}	-0,037	0,000	-0,036	0,000	-0,031	0,000	-0,034	0,000	-0,036	0,000	-0,036	0,000
CCaccount_D_{crisis}	0,020	0,001	0,014	0,001	0,007	0,125	0,012	0,000	0,012	0,016	0,012	0,001
ExternalBalance_D_{crisis}	-0,105	0,000	-0,089	0,000	-0,047	0,015	-0,071	0,000	-0,076	0,001	-0,075	0,000
Constant	58,658	0,585	-62,194	0,000	44,950	0,512	-18,289	0,216	55,772	0,520	-55,905	0,000
R squared within					0,905		0,885		0,869		0,867	
between					0,166		0,405		0,906		0,906	
overall	0,905		0,903		0,375		0,565		0,895		0,894	
PesaranCross sectional independence test					-0,722	Pr=1,52	-0,035	Pr=1,02	-0,989	Pr=1,67	-0,373	Pr=1,29
Hausman Specification Test									79,340	Pr=0,00		

Table 9

	FITCH							
	High rated				Low rated			
L_GDPpercapital	6,287	0,000	6,482	0,000	12,270	0,000	10,676	0,000
GDPgrowthrate	0,004	0,801			0,055	0,186		
GovernmentDebt	-0,027	0,000	-0,027	0,000	-0,050	0,000	-0,052	0,000
InflationRate	-0,020	0,595			-0,311	0,001	-0,303	0,000
UnemploymentRate	-0,019	0,233	-0,022	0,118	-0,126	0,008	-0,184	0,000
C,Currentaccount	-0,006	0,011	-0,005	0,004	0,002	0,840		
ExternalBalance	-0,050	0,000	-0,058	0,000	-0,044	0,201		
L_reserves	0,971	0,000	0,986	0,000	0,586	0,047	0,823	0,003
RegulatoryQuality	0,484	0,015	0,521	0,004	0,742	0,384		
GovermentDebt_D_{crisis}	0,001	0,380			-0,007	0,212	-0,012	0,031
CCaccount_D_{crisis}	0,003	0,510			0,014	0,207	0,015	0,021
ExternalBalance_D_{crisis}	-0,014	0,328			-0,180	0,001	-0,170	0,000
Constant	-16,619	0,000	-17,716	0,000	-36,826	0,000	-30,670	0,000
R squared	0,817		0,807		0,781		0,751	

Table 10

	S&P							
L_GDPpercapital	5,661	0,000	5,690	0,000	12,902	0,000	12,355	0,000
GDPgrowthrate	0,005	0,746			0,033	0,423		
GovernmentDebt	-0,019	0,000	-0,019	0,000	-0,060	0,000	-0,059	0,000
InflationRate	-0,098	0,010	-0,095	0,009	-0,297	0,001	-0,268	0,001
UnemploymentRate	-0,029	0,062	-0,029	0,054	-0,043	0,353	-0,076	0,044
C,Currentaccount	-0,005	0,045	-0,005	0,046	0,000	0,980		
ExternalBalance	-0,043	0,001	-0,043	0,001	-0,055	0,109	-0,048	0,125
L_reserves	0,769	0,000	0,773	0,000	0,076	0,792		
RegulatoryQuality	0,452	0,019	0,447	0,019	-0,348	0,680		
GovermentDebt_D_{crisis}	-0,005	0,002	-0,005	0,001	-0,007	0,209	-0,008	0,103
CCaccount_D_{crisis}	0,008	0,050	0,007	0,050	0,020	0,075	0,018	0,003
ExternalBalance_D_{crisis}	-0,023	0,093	-0,024	0,085	-0,131	0,011	-0,113	0,010
Constant	-11,908	0,000	-12,050	0,000	-33,910	0,000	-30,924	0,000
R squared	0,802		0,801		0,761		0,789	

Table 11

	MOODYS							
L_GDPpercapital	5,344	0,000	5,307	0,000	10,354	0,000	11,621	0,000
GDPgrowthrate	0,002	0,898			0,011	0,833		
GovernmentDebt	-0,020	0,000	-0,020	0,000	-0,058	0,000	-0,067	0,000
InflationRate	-0,083	0,036	-0,085	0,010	-0,320	0,004	-0,301	0,002
UnemploymentRate	0,006	0,702			-0,123	0,034	-0,149	0,003
C,Currentaccount	-0,005	0,054	-0,005	0,010	0,009	0,429		
ExternalBalance	-0,046	0,001	-0,045	0,000	-0,113	0,009	-0,092	0,020
L_reserves	0,738	0,000	0,749	0,000	1,059	0,004	0,923	0,004
RegulatoryQuality	0,780	0,000	0,762	0,000	1,208	0,250		
GovermentDebt_D_{crisis}	-0,002	0,123	-0,002	0,076	-0,012	0,089	-0,013	0,041
CCaccount_D_{crisis}	0,000	0,937			0,014	0,310	0,018	0,017
ExternalBalance_D_{crisis}	0,002	0,878			-0,163	0,011	-0,145	0,010
Constant	-10,771	0,001	-10,633	0,001	-32,961	0,000	-35,118	0,000
R squared	0,773		0,772		0,747		0,782	

Table 12

	AvRating							
L_GDPpercapital	5,764	0,000	5,504	0,000	11,842	0,000	12,201	0,000
GDPgrowthrate	0,003	0,791			0,033	0,430		
GovernmentDebt	-0,022	0,000	-0,022	0,000	-0,056	0,000	-0,061	0,000
InflationRate	-0,067	0,048			-0,309	0,001	-0,290	0,000
UnemploymentRate	-0,014	0,317			-0,097	0,040	-0,124	0,002
C,Currentaccount	-0,005	0,014	-0,004	0,018	0,004	0,691		
ExternalBalance	-0,046	0,000	-0,048	0,000	-0,071	0,043	-0,061	0,059
L_reserves	0,826	0,000	0,818	0,000	0,574	0,054	0,499	0,053
RegulatoryQuality	0,572	0,001	0,722	0,000	0,534	0,533		
GovermentDebt_D_{crisis}	-0,002	0,154			-0,009	0,129	-0,010	0,054
CCaccount_D_{crisis}	0,003	0,313			0,016	0,157	0,017	0,007
ExternalBalance_D_{crisis}	-0,012	0,349			-0,158	0,003	-0,137	0,003
Constant	-13,099	0,000	-12,337	0,000	-34,566	0,000	-34,238	0,000
R squared	0,833		0,821		0,780		0,809	

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