# Beyond the macroeconomic determinants of sovereign credit ratings in developing economies: a panel data analysis considering different dimensions.

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## Abstract

Sovereign credit ratings play an important role in determining the terms and the extent to which countries have access to international capital markets, mainly for developing countries. With this in mind, this study analyzes the determinants of sovereign ratings of developing countries given by Standard & Poor's, Moody's and Fitch for the period 1994-2013. Regarding the econometric model, besides usual OLS method for panel data analysis, we make use of dynamic panel data framework (D-GMM and S-GMM). Our findings show that there is a basic set of macroeconomic variables that affect sovereign ratings: GDP growth, per capita GDP, inflation, foreign reserves, government budget balance and external debt. Moreover, the adoption of the inflation targeting, greater financial openness and democratic accountability enhance the ratings of three agencies, while exchange rate stability, law and order and less corruption increase the ratings of at least one agency.

**Keywords:** sovereign rating; inflation targeting; financial openness; democracy; corruption.

## Resumo

Notas de crédito soberano possuem um importante papel para determinar os termos e a magnitude com que os países têm acesso aos mercados de capitais internacionais, especialmente os países em desenvolvimento. Com isso em mente, esse estudo analisa os determinantes das notas de crédito soberano da Standard & Poor's, Moody's e Fitch de países em desenvolvimento. Quanto ao modelo econométrico, além do usual método MQO para dados em painel, empregamos uma análise de dados em painel dinâmicos (D-GMM e S-GMM). Nossos achados mostram que existe um conjunto básico de variáveis macroeconômicas que afetam as notas das agências: crescimento do PIB, PIB per capita, reservas internacionais, orçamento do governo e dívida externa. Além disso, a adoção de metas para inflação, maior abertura financeira e responsabilidade democrática elevam as notas das três agências, enquanto que inflação, estabilidade da taxa de câmbio, cumprimento da lei e da ordem e menos corrupção aumentam as notas de pelo menos uma das agências.

**Palavras-chave**: risco soberano; meta para inflação; abertura financeira; democracia; corrupção.

# 1. Introduction

Sovereign credit ratings play an important role in determining the terms and the extent to which countries have access to international capital markets. According to Reinhart (2002), while developed countries take international capital market access for granted, on the other hand, many low income countries have no access to international lending even under relatively favorable conditions. In turn, regarding developing countries, access to international capital markets is highly variable across time. It is for these developing economies that the sovereign credit ratings play their most critical role.

Sovereign ratings are a condensed assessment of a government's ability and willingness to repay its public debt on time. A rating is a forward-looking estimate of the default probability, i.e., sovereign credit ratings are supposed to serve as a summary measure of a country's likelihood of default (Cantor and Packer, 1996; Reinhart, 2002). Such measures of the probability of default are particularly relevant for international financial markets, economic agents, and governments (Bissoondoyal-Bheenick, 2005; Afonso, Gomes and Rother, 2011).

In recent years, the demand for sovereign ratings has increased mainly due to the inevitable globalization of markets. Investors and particularly managed funds are increasingly focused on international diversification. A change in sovereign ratings can be a major input in the re-weighting of international portfolios (Bissoondoyal-Bheenick, 2005). Therefore, governments and investors have the need to understand what factors rating agencies put more emphasis on when attributing a rating score.

The main private credit risk rating agencies are Moody's Investors Service, Standard & Poor's (S&P), and Fitch ratings. These agencies use a combination of several quantitative and qualitative variables (economic, social, and political) in order to assign a credit rating to a debtor. Because they do not announce their methodologies explicitly, an important issue is to identify the factors behind their assignment of sovereign credit ratings. Although there are studies on the determinants of sovereign ratings (Cantor and Packer, 1996; Afonso, 2003; Altenkirch, 2005; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother 2011), the literature that addresses solely the category of developing countries is still scarce (Archer, Biglaiser and DeRouen, 2007; Biglaiser and Staats, 2012; Erdem and Varli, 2014).

This study investigates the determinants of sovereign risk ratings in developing countries. Some of the economic relationships studied in this paper have already been investigated in the literature. Therefore, in addition to the economic aspects[1] traditionally addressed in studies of this nature, the present study contributes to the literature by adding other important economic aspects which have not yet been analyzed and which have guided economic policy decisions in many countries from the 1990s. Among the new aspects analyzed in this study is the effect caused by the adoption of inflation targeting. The adoption of this economic policy framework by a number of countries (developed and developing) from the 1990s redefined the way to conduct monetary and fiscal policies. Moreover, it attributed greater importance to the commitment made by the governments in relation to their goals and therefore to the issues related to credibility, reputation and transparency. In this sense, the adoption of inflation targeting may have contributed to improving sovereign risk ratings, since the countries that have adopted this strategy had to increase the level of accountability and commitment to the established (fiscal and monetary) objectives. Also with regard to

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[1] These economic aspects are: GDP per capita, GDP growth, inflation, unemployment, budget balance/GDP, reserves/GDP and foreign debt service/exports.

economic aspects, due to the fact that developing countries are strongly influenced by disorders that affect the international liquidity, the behavior of exchange rates and the mood of financial markets, we added the effects of financial openness, exchange rate stability and the subprime crisis. In this sense, we contribute to the literature by providing new findings about the economic determinants of sovereign risk ratings.

In turn, since we are looking at developing countries, institutional and governance aspects must also be considered. These aspects are likely to affect the sovereign risk ratings because they act on the institutional design of governments and on the way that governments operate. In this sense, the study also contributes to the literature since it analyzes the effects of corruption, law enforcement and the degree of democratic accountability on such ratings. The idea is that countries will receive better sovereign ratings once they present lower levels of corruption, stronger legal courts and higher law enforcement, as well as higher levels of democratic accountability. Hence, due to the fact that the present study also considers such aspects, the findings regarding the effects of these variables on sovereign credit ratings represent novelties to the literature.

Unlike other studies, which mostly use one or two ratings in the analysis (usually Moody's and/or Standard & Poor's ratings), in this study, we use the three main ratings (Moody's, Standard & Poor's, and Fitch's). We have compiled a panel data set on sovereign risk ratings, economic data, and governance and institutional variables for 41 developing countries[2] from 1994 to 2013. A feature of the sample is that approximately 60% of the countries in the analysis, at some point of time, ceased to pay its debts, i.e., have default history. Hence, default history is a characteristic of the sample.

## 2. Literature review

The literature regarding the study of sovereign credit rating is vast in different directions. Some works analyze the influence of changes in sovereign ratings on the domestic financial sector and on the inflows of international capital. This is the case of Kim and Wu (2008), which restricted their investigation to developing countries during 1995-2005. They found evidence that long-term foreign currency sovereign credit ratings are important for encouraging financial intermediary development and for attracting capital flows. Other studies aim to measure the accuracy of the rating agencies. For instance, Gaillard (2013) analyzed the accuracy of the three main agencies from January 2001 to January 2013. His findings suggested that ratings issued by Fitch, Moody's and S&P became less accurate after the default of Greece in 2012, however, regarding regulatory purposes, credit ratings can be more suitable than market-based indicators. On the other hand, Schumacher (2014) shed some light to the self-fulfilling aspect of sovereign ratings. The results provide evidence for a significant two-way interaction between the macroeconomic environment and changes in sovereigns' ratings. Thus, rating changes are able to exacerbate a country's boom–bust cycle.

There are also studies that tried to identify the factors behind the assessment of sovereign ratings. This literature shows that there is a basic set of macroeconomic variables which affect sovereign credit ratings. These variables are: per capita income, inflation, GDP growth, external debt, fiscal balance and sovereign default history. The work of Cantor and Packer (1996) investigates the main determinants of sovereign credit ratings given by S&P and Moody's. Their findings indicate that per capita income, GDP growth and, economic development positively affect sovereign credit

[2] The classification of countries as developing countries follows the classification of the International Monetary Fund (World Economic Outlook – WEO).
See, http://www.imf.org/external/pubs/ft/weo/2015/01/weodata/groups.htm

ratings while inflation, external debt and default history have a negative influence on ratings. Using the rating classifications of S&P and Moody's, Afonso (2003) expanded the analysis for a universe of 81 developed and developing countries in June 2001. He finds significant results for the same group of independent variables as Cantor and Packer (1996) for both agencies, however, external debt as a percentage of exports is relevant only for developing countries.

Altenkirch (2005) widened the analysis of the determinants of sovereign ratings by pointing out that a bias in the previous results of the literature might had occurred regarding the adoption of OLS and POLS techniques. In this sense, he combines a general-to-specific model selection with dynamic panel data estimation in order to resolve this issue. The analysis refers to the determinants of sovereign credit ratings given by Moody's to 26 countries. Using a wide range of variables, a model is specified with the following regressors: inflation, the ratio of the current account balance to GDP, the ratio of foreign reserves to GDP, the ratio of domestic savings to GDP, political rights, regional warfare, growth in exports, and the ratio of total debt to GDP. As opposed to the previous studies, inflation had mixed results regarding its significance, and only political rights and the export growth rate showed significant results in all dynamic panel data estimations.

Bissoondoyal-Bheenick (2005) analyzes the determinants of sovereign ratings provided by the two main agencies (Standard and Poor's and Moody's). The analysis also provides a forecast of the ratings to be assigned to the countries based on the model used as well as providing ratings to be assigned to a set of weaker economies which are not actually rated by the rating agencies. The sovereign ratings was discriminated in three different groups, one with the full sample of 95 countries, other with only 25 high rated countries and one last with only 70 low rated countries. The ordered response model estimation was adopted for the period from December 1995 to December 1999. The set of independent variables for the full sample was: per capita income, inflation, fiscal balance, debt-to-GDP ratio, real exchange rate, foreign reserves and the net of exports as percentage of GDP. Furthermore, unemployment and unit labor cost were included in the estimation for the high rated countries, whilst in the case for the low rated countries, the net export/GDP was replaced by current account balance and the external debt was included. Per capita income and inflation rate showed the most significant results for both group of countries. Specifically for the low rated group, current account balance and the level of foreign reserves played an important role to determine the level of sovereign ratings as well. The main finding of the paper is that current economic and financial indicators alone do not determine ratings. In addition, the relevance of economic variables is not the same across the different rating categories. Economic variables do not carry the same importance for the sample of high rated countries with a long financial stability history as compared to the low rated sample of countries that are still undergoing structural changes.

In addition to S&P and Moody's, some works also include Fitch's rating in the analysis regarding the determinants of sovereign credit ratings. Hill, Brooks and Faff (2010) verify the determinants of sovereign ratings of these three main rating agencies by covering a large sample of countries (129 countries) over the period from April 1990 to March 2006. Additionally to the independent variables taken in consideration in Cantor and Packer (1996), the study of Hill, Brooks and Faff (2010) also includes the square of GDP growth, the Institutional Investor country risk, derived from the opinions of financial experts, and the market premium risk. The results showed that six variables are common determinants of all three agencies sovereign ratings: per capita income, GDP growth and its square, default history, the Institutional Investor rating and the risk

premium. Inflation rate, current account balance, external debt and fiscal balance were significant for only two or fewer agencies.

Afonso, Gomes and Rother (2011) also included the three main risk ratings agencies – 66 countries for Moody's, 65 for S&P and 58 for Fitch – in order to identify the determinants of sovereign credit ratings for the period 1995 – 2005. By applying a panel data framework with linear and ordered response models, it is adopted a specification which admitted to distinguish between short- and long-run effects of the explanatory variables. A wide range of potential determinants were used in the estimations embracing macroeconomic, fiscal and external conditions as well as the history of default of the country, whether it joins the European Union and lastly its geographical location. The results pointed out that per capita income, GDP growth, government debt, and the fiscal balance have a short-run effect on sovereign default ratings, whilst government effectiveness, external debt, foreign reserves and the default history are important long-run determinants.

Regarding the literature on the determinants of sovereign credit ratings of developing countries, some works can be underlined. This is the case of Archer, Biglaiser and DeRouen (2007), which extended the discussion by adding a political aspect, i.e., the influence of the so-called "democratic advantage". The sample comprises the three main sovereign credit ratings (S&P, Moody's and Fitch) of 50 developing countries, and the period runs from 1987 to 2003. The study applied a panel data set, with three groups of explanatory variables: (1) regime type and political institutions; (2) macroeconomic conditions; and (3) the default history, natural resource stocks and commitment to trade. The findings indicated that political variables have little impact on sovereign credit default ratings. By the way, merely the length of tenure of the executive's party showed to affect sovereign ratings given by Moody's. On the other hand, economic factors such as GDP growth, inflation, commitment to trade and the default history disclosed to be significant variables to impact sovereign ratings of developing countries.

Biglaiser and Staats (2012) extended the work of Biglaiser and DeRouen (2007) by including institutional and political variables not considered before, such as society's obedience to the rule of law, the presence of a reliable judicial system and the protection of rights. The estimations cover 36 developing countries for the period 1996 – 2006. Beyond the political conditions, Biglaiser e Staats (2012) also control for macroeconomic variables including per capita income, GDP growth, external debt, inflation and current account balance. Their findings indicate that rule of law, strong and independent courts, and protection of property rights have significant positive effects on ratings of developing countries. Finally, Erdem and Varli (2014) tried to determine the factors behind the assessment of sovereign ratings given by S&P of eight developing countries from 2002 to 2011. In addition to the macroeconomic variables selected by Biglaiser e Staats (2012), it was also included in the estimations the fiscal balance, governance indicators, foreign reserves as percentage of GDP, unemployment and exchange rate. The results indicate that the more relevant variables related with credit ratings of developing countries are: budget balance, per capita income, governance indicators and foreign reserves/GDP.

## 3. Data and Methodology

### 3.1 Data description

In this study, we consider sovereign credit ratings produced by Standard and Poor's (S&P's) and Moody's on a total of 41 developing countries (where 13 countries are inflation targeters) for the period 1994 to 2013 (see Table A.1 in the Appendix A for country list). Moreover, we also consider sovereign credit ratings produced by Fitch on a total of 37 developing countries (where 13 countries are inflation targeters) for the period 1994 to 2011.[3] We use yearly data. The choice of this sample period is due to data availability.

In general, the ratings given by S&P, Moody's and Fitch are variations of the scale A, B or C. Conventionally, the AAA is the top rating given by all agencies. The lower the rating indicates the higher probability of default. Governments rated above "BBB" are considered to have "investment grades", while those rated below "BBB" are considered to have "speculative grades". Although the agencies use different symbols, almost every Moody's and Fitch's symbol has its counterpart in the Standard and Poor's rating scale. This correspondence allows a comparison of the sovereign ratings assigned by the three agencies. Table 1 below shows the scales of ratings made by the agencies, where we have an increasing numerical scale of risk going from 1 (highest rating) to 23 (lowest rating). The rating assigned for a country in a specific year is the one that was observed in the end of that year.

**Table 1**
S&P's, Moody's and Fitch's sovereign credit ratings systems, grade classification and numerical scale.

| Numerical Scale | Grade classification | Rating agencies | | |
|:---:|:---:|:---:|:---:|:---:|
| | | S&P | Moody's | Fitch |
| 1 | | AAA | Aaa | AAA |
| 2 | | AA+ | Aa1 | AA+ |
| 3 | | AA | Aa2 | AA |
| 4 | | AA- | Aa3 | AA- |
| 5 | Investment grade | A+ | A1 | A+ |
| 6 | | A | A2 | A |
| 7 | | A- | A3 | A- |
| 8 | | BBB+ | Baa1 | BBB+ |
| 9 | | BBB | Baa2 | BBB |
| 10 | | BBB- | Baa3 | BBB- |
| 11 | | BB+ | Ba1 | BB+ |
| 12 | | BB | Ba2 | BB |
| 13 | | BB- | Ba3 | BB- |
| 14 | | B+ | B1 | B+ |
| 15 | | B | B2 | B |
| 16 | | B- | B3 | B- |
| 17 | Speculative grade | CCC+ | Caa1 | CCC+ |
| 18 | | CCC | Caa2 | CCC |
| 19 | | CCC- | Caa3 | CCC- |
| 20 | | CC | Ca | CC |
| 21 | | C | C | C |
| 22 | | SD | | RD |
| 23 | | | | D |

*Elaborated by the authors*

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[3] The set of countries used in this analysis is the same as shown in Table A.1, however, Jordan, Pakistan, Paraguay and, Trinidad and Tobago are not included due to data availability.

Since one of the main goals of the present study is to respond whether the adoption of inflation targeting (IT) is important to improve sovereign credit ratings in developing countries, we must define the IT dummy variable, $IT_{i,t}$. This dummy variable equals to 1 if country $i$ is an inflation targeter in period $t$ and 0 if not. The existing literature diverges on when to date the adoption of IT, whether with the start of partial inflation targeting (e.g., Corbo Landerretche and Schmidt-Hebbel (2002) and Gonçalves and Salles (2008)), or only when full-fledged IT was adopted (e.g., Mishkin (2000), IMF (2006), Batini and Laxton (2007) and Brito and Bystedt (2010)). Because most of the studies works with Batini and Laxton's (2007) IT adoption dates, we follow Brito and Bystedt (2010) and also justify our choice based on Mishkin (2000). In addition to a public announcement of numerical targets for future inflation, an inflation targeting economy has to fulfill requirements of institutional subordination of other goals, information disclosure and accountability. Hence, in the present study, the dummy variable considers the dates of adoption of IT based on conservative classification[4] (this is the case where there exists an explicit inflation target and full-fledged IT was adopted).

In turn, the set of key macroeconomic fundamentals which we employ as the determinants of sovereign credit ratings from selected developing countries were determined based on the empirical literature, i.e., these variables are present in most of the empirical literature regarding the determinants of sovereign credit ratings (e.g., Afonso (2003), Bissoondoyal-Bheenick (2005) and Erdem and Varli (2014)). This set of macroeconomic variables will comprise our baseline model. The baseline model consists of the following variables: (GBB) central government budget balance as a percentage of GDP; (FDSE) foreign debt service as a percentage of exports of goods and services; (GDPP) per capita GDP; (GDPG) GDP growth; (INF) inflation; (RESERVES) reserves as percentage of GDP; (UNEMP) rate of unemployment, and; (SUBPRIME) dummy variable for the effect from the subprime mortgage crisis. Furthermore, we have included other control variables which were not analyzed in the literature yet. Therefore, we analyze other dimensions which can influence the ratings. Also in relation to the economic dimension, the contribution we bring is the inclusion of the inflation targeting regime (IT dummy variable), as well as the effects of financial openness (FOI) and exchange rate stability (ERSI). Regarding the institutional dimension, we will analyze the effect of democratic accountability (DEMOC) as well as the effect of law and order (LAW). Finally, in the governance dimension, we will analyze the effect of corruption (CORRUP).[5]

## 3.2 Methodology

This study uses panel data analysis. Besides usual OLS method for panel data analysis, we make use of dynamic panel data framework (D-GMM and S-GMM). As pointed out by Arellano and Bond (1991), an advantage of using the dynamic panel data method (GMM) over others (Ordinary Least Squares – OLS and Generalized Least Squares – GLS) is that besides eliminating the non-observed effects on the regressions, the estimates are reliable even in the case of omitted variables. In particular, the use of instrumental variables allows the estimation of parameters more consistently, even in

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[4] For more details about the dates of adoption of IT based on conservative classification, see de Mendonça and de Guimarães e Souza (2012).

[5] Table A.2 in the Appendix provides details about the variables that we use. Furthermore, Tables A.3 and A.4 present the descriptive statistics of the variables for the panel data.

the case of endogeneity in explanatory variables and the occurrence of measurement errors (Bond, Hoeffler and Temple, 2001).

Traditional econometric models hypothesize that the error term is not correlated with its estimators. In cases where the estimators are correlated with the error term there is an endogeneity problem and thus the result of regressions is inconsistent. Wooldridge (2001) presents three hypotheses for the existence of endogenous variables: omitted variables, measurement error, and simultaneity in regressions. Variables can be omitted when, for example, they are not known or not available. Measurement error can occur when one needs to measure the partial effect of a variable. Finally, simultaneity occurs when one of the explanatory variables is concomitant with the dependent variable.

The empirical model developed in this study is subject to the above-mentioned problems. In short, not all explanatory variables of the model are known and measurable. In addition, the growth rate of real GDP can be influenced by sovereign credit ratings, which, in turn, suggests a simultaneity problem. Furthermore, regarding the endogeneity problem, for example, a macroeconomic shock affects sovereign credit ratings and thereby the growth rate of real GDP.

A general solution to the problem of endogeneity is the use of instrumental variables. In particular, GMM models allow the use of instruments that are sequentially exogenous, thereby avoiding the endogeneity problem. The model proposed by Arellano and Bond (1991) consists of the estimation of first-difference GMM panel data as a way of eliminating non-observed effects. However, Alonso-Borrego and Arellano (1998), and Blundell and Bond (1998) showed that the first-difference GMM has a bias (for large and small samples) and low accuracy. Moreover, the use of lags can generate weak instruments (Staiger and Stock, 1997).

Blundell and Bond (1998) found results that sustain the use of the system GMM panel data estimation method instead of first-difference GMM. In the model proposed by Arellano and Bover (1995) and Blundell and Bond (1998) regressions in levels and first differences are combined (see Bond, Hoeffler, and Temple, 2001).

While D-GMM and S-GMM estimation approaches are suitable for a small number of time periods (t) and a large number of individuals (i) in small samples, when the instruments are too many, they tend to over-fit the instrumented variables and bias the results (Roodman, 2009). Hence, with the objective of avoiding the use of an excessive number of instruments in the regressions and thus lose the power of tests, the number of instruments/number of cross-sections ratio must be less than 1 in each regression. Moreover, in order to confirm the validity of the instruments in the models, the test of over-identifying restrictions (J-test) was used as suggested by Arellano (2003). In addition, tests of first-order (AR1) and second-order (AR2) serial correlation were performed. Moreover, White's heteroskedasticity consistent covariance matrix was applied on regressions. It is important to highlight that one premise of system GMM models is the non-correlation of the first difference of endogenous regressors, which implies that it is not necessary to perform unit root tests.

Based on the variables described above, the baseline model is given by:

$$Y_{i,t} = \beta X_{i,t-1} + \varphi_1 SUBPRIME + \varepsilon_{1,i,t} \tag{1}$$

Where $Y_{i,t}$ is the dependent variable, and it represents the numeric rating assigned by the agencies to the respective country at time $t$. The subscript $i$ is the index of the country, $\beta$ is a vector of unknown parameters, $\varphi_1$ is a parameter, $X_{i,t-1}$ represents the vector of macroeconomic explanatory variables of the baseline model for country $i$ one year ago ($t-1$), and $\varepsilon_{1,i,t}$ is the disturbance.

The next four specifications include the variables of each dimension:

$$Y_{i,t} = \beta X_{i,t-1} + \varphi_2 SUBPRIME + \theta_0 IT_{i,t} + \varepsilon_{2,i,t} \tag{2}$$

$$Y_{i,t} = \beta X_{i,t-1} + \varphi_3 SUBPRIME + \theta_1 FOI_{i,t-1} + \theta_2 ERSI_{i,t-1} + \varepsilon_{3,i,t} \tag{3}$$

$$Y_{i,t} = \beta X_{i,t-1} + \varphi_4 SUBPRIME + \theta_3 DEMOC_{i,t-1} + \theta_4 LAW_{i,t-1} + \varepsilon_{4,i,t} \tag{4}$$

$$Y_{i,t} = \beta X_{i,t-1} + \varphi_5 SUBPRIME + \theta_5 CORRUP_{i,t-1} + \varepsilon_{5,i,t} \tag{5}$$

All explanatory variables (except the dummy variables, *SUBPRIME* and *IT*) are lagged ($t$–1) because the ratings are not assigned at the end of the year, i.e., agencies can assign different notes to a country in the same year, and along it. Therefore, it is reasonable to think that agencies make use of known information about the countries, i.e., the information of one year ago.

## 4. Estimation results

In this section, we evaluate the findings of the estimates. Tables (2), (3) and (4) show the estimates obtained through OLS with cross-country fixed effects (FOLS), D-GMM and S-GMM for the five models adopted, and for the three rating agencies (S&P, Moody's and Fitch, respectively). Regarding the baseline model, our estimations show very consistent outcomes. Whatever the method used or model employed, an increase in the GDP growth improves the ratings of all agencies. This result is confirmed by many studies (e.g., Afonso, 2003; Cantor and Packer, 1996; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother, (2011).

Furthermore, per capita income, inflation, foreign reserves and external debt showed significant results for 44 of 45 estimations. Then, increments in per capita income and in foreign reserves enhance the bond ratings, while the same occur through reductions in inflation and in external debt. Similar results are also found in the literature regarding per capita income (e.g., Cantor and Packer, 1996; Afonso, 2003; Bissoondoyal-Bheenick, 2005; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother, 2011; Erdem and Varli, 2014), foreign reserves (e.g., Bissoondoyal-Bheenick, 2005 – for low rated countries only; Afonso, Gomes and Rother, 2011; Erdem and Varli, 2014), inflation (e.g., Cantor e Packer, 1996; Afonso, 2003; Altenkirch, 2005 – for S-GMM estimations only; Bissoondoyal-Bheenick, 2005; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother, 2011; Erdem and Varli, 2014) and external debt (e.g., Cantor and Packer, 1996; Afonso, 2003; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother, 2011; Erdem and Varli, 2014).

Additionally, an increase in budget balance appeared to improve the bond ratings in 41 estimations. The significance of the budget balance is also found in the literature (e.g., Afonso, 2003 – for Moody's in 2 specifications of the linear estimations and for S&P in one specification of the logistic estimation; Hill, Brooks and Faff, 2010; Afonso, Gomes and Rother, 2011; Erdem and Varli, 2014). Finally, unemployment showed mixed results regarding its significance, but still, in all estimations it exhibits the expected signal. However, the statistic insignificance of unemployment is common in the literature (e.g., Bissoondoyal-Bheenick, 2005 – applied this variable only for high

rated countries; Afonso, Gomes and Rother, 2011 – only the three-year average was significant; and Erdem and Varli, 2014).

Now let us turn to the variables that are our main contribution into the economic dimension. First, the adoption of inflation targeting appears to be an important factor in order to improve sovereign ratings of all the three agencies. Moreover, the adoption of this policy framework shows to be able to enhance sovereign ratings. Therefore, this outcome might shed some light to the concern that credit rating agencies put on commitment and accountability of the government with its macroeconomic stability, as well as, the relevance of this policy to halt this worry. Second, financial openness showed significant results in both dynamic panel data approaches for all the three agencies. Especially for S&P and Fitch, this variable has a stronger effect on its bond default assessment, since a one-point increase is capable to improve their sovereign ratings between one and three notches. These results should be expected mainly for developing countries, once a more open capital account brings liquidity and helps the government to fulfill its obligations. Third, exchange rate stability showed more significant results for S&P, although it exhibits the expected signal in 6 of 9 estimations, i.e., a more stable exchange rate raises the sovereign credit ratings. Although the stability of exchange rate variable has never been used in the literature, the result regarding its significance is opposed to the studies that used the real exchange rate as independent variable (e.g., Bissoondoyal-Bheenick, 2005; Erdem and Varli, 2014). Fourth, whatever the method applied or model employed, the subprime crisis deteriorated the bond ratings of all agencies. The 2008-2009 period has been marked by a great international financial instability and credit restrictions, which affect practically all the countries around the globe and forced the ratings agencies to revise their beliefs regarding foreign debt payments.

Concerning our contributions into the institutional and governance dimensions, our estimations also show interesting results. First, enhance the democratic accountability seems to improve the sovereign ratings of the three agencies, since all estimations showed the negative signal and in 6 of 9 estimations this variable was significant. This result demonstrates that credit rating agencies pay a special attention into the political aspect by improving the sovereign ratings of more democratic countries. This outcome goes in opposite direction to some studies that found no importance of the government's regime type into the determination of sovereign ratings (e.g., Archer, Biglaiser and DeRouen, 2007). Second, the obedience to the law, proxy here by the law and order index, shows to be an important factor especially for S&P, although it showed mixed results for Moody's and no significance at all in the case of Fitch. Even though this variable has not been used before, other studies that work with rule of law found significance results for all the three agencies (e.g., Biglaiser and Staats, 2012). Still, an increase in law and order raises the bond ratings in all estimations. Finally, in relation to the governance aspect, our estimations indicate that less corrupt countries receive better ratings. In both dynamic panel data estimations for S&P and Fitch, corruption exhibits statistical significance, albeit it does not happen for Moody's estimates.

**Table 2 – Estimation results (dependent variable: S&P's rating)**

| | Estimator: | FOLS | | | | | DGMM | | | | | SGMM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Regressors: | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| | c | 17.089*** (1.394) | 16.327*** (1.334) | 17.828*** (1.655) | 19.826*** (1.906) | 17.446*** (1.611) | | | | | | | | | | |
| | LAGGED RATING | | | | | | -0.012 (0.051) | 0.287*** (0.056) | 0.198*** (0.038) | 0.155*** (0.054) | -0.232** (0.095) | 0.474*** (0.055) | 0.500*** (0.037) | 0.492*** (0.048) | 0.438*** (0.036) | 0.587*** (0.041) |
| Economic dimension: Macroeconomic conditions | GDPG(-1) | -0.069*** (0.017) | -0.070*** (0.016) | -0.066*** (0.016) | -0.066*** (0.017) | -0.069*** (0.017) | -0.067*** (0.005) | -0.051*** (0.006) | -0.044*** (0.008) | -0.073*** (0.007) | -0.068*** (0.009) | -0.035*** (0.010) | -0.039*** (0.009) | -0.034*** (0.009) | -0.059*** (0.007) | -0.034*** (0.007) |
| | GDPP(-1) | -0.0003*** (0.0001) | -0.0002*** (0.0001) | -0.0003*** (0.0001) | -0.0003*** (0.0001) | -0.0003*** (0.0001) | -0.0002*** (0.0001) | -0.0001* (0.0001) | -0.0002*** (0.0001) | -0.0002*** (0.0001) | -0.0008*** (0.0002) | -0.0001*** (0.00003) | -0.0001*** (0.00003) | -0.00006* (0.00004) | -0.0003*** (0.0001) | 0.00008*** (0.00003) |
| | INF(-1) | 0.012*** (0.003) | 0.009*** (0.003) | 0.009*** (0.003) | 0.013*** (0.003) | 0.013*** (0.003) | 0.017** (0.009) | 0.018** (0.008) | 0.020* (0.012) | 0.014* (0.008) | 0.044** (0.020) | 0.030*** (0.005) | 0.017*** (0.004) | 0.014*** (0.004) | 0.011* (0.006) | 0.028*** (0.005) |
| | UNEMP(-1) | 0.097** (0.047) | 0.132*** (0.045) | 0.083* (0.047) | 0.088* (0.049) | 0.095** (0.047) | 0.186*** (0.032) | 0.111*** (0.038) | 0.056* (0.034) | 0.095*** (0.033) | 0.156* (0.092) | 0.044* (0.024) | 0.035** (0.017) | 0.041* (0.022) | 0.014 (0.032) | 0.030** (0.015) |
| | RESERVES(-1) | -4.264** (1.886) | -4.456** (1.801) | -4.345** (1.821) | -4.900** (1.911) | -4.313** (1.895) | -12.117*** (0.929) | -9.690*** (1.730) | -2.47*** (0.606) | -6.265*** (1.396) | -7.241*** (1.932) | -2.932*** (0.657) | -2.904*** (0.584) | -4.018*** (0.820) | -2.229*** (0.770) | -2.270*** (0.750) |
| | FDSE(-1) | -0.393*** (0.104) | -0.370*** (0.105) | -0.392*** (0.102) | -0.412*** (0.098) | -0.397*** (0.105) | -0.262*** (0.059) | -0.057 (0.038) | -0.240*** (0.075) | -0.255*** (0.050) | -0.080** (0.038) | -0.197*** (0.041) | -0.194*** (0.036) | -0.176*** (0.032) | -0.289*** (0.040) | -0.202*** (0.024) |
| | GBB(-1) | -0.201** (0.088) | -0.174* (0.090) | -0.190** (0.088) | -0.209** (0.085) | -0.202** (0.088) | -0.132** (0.053) | -0.238*** (0.045) | -0.118** (0.046) | -0.141*** (0.049) | -0.206*** (0.070) | -0.195*** (0.032) | -0.192*** (0.032) | -0.186*** (0.045) | -0.194*** (0.043) | -0.140*** (0.032) |
| Economic dimension: Monetary regime | IT | | -0.920** (0.393) | | | | | -0.618** (0.249) | | | | | -0.426* (0.223) | | | |
| Economic dimension: Financial openess and exchange rate stability | FOI (-1) | | | -0.613 (0.602) | | | | | -3.302*** (0.560) | | | | | -1.596*** (0.387) | | |
| | ERSI (-1) | | | -0.606 (0.593) | | | | | -0.367** (0.178) | | | | | -0.612*** (0.155) | | |
| Institutional dimension | DEMOC (-1) | | | | -0.106 (0.118) | | | | | -0.198* (0.106) | | | | | -0.075* (0.040) | |
| | LAW (-1) | | | | -0.496** (0.227) | | | | | -0.221** (0.111) | | | | | -0.085** (0.043) | |
| Governance dimension | CORRUP (-1) | | | | | -0.094 (0.196) | | | | | -0.320* (0.169) | | | | | -0.140** (0.056) |
| Crisis | SUBPRIME | 0.798*** (0.191) | 0.876*** (0.180) | 0.762*** (0.197) | 0.781*** (0.178) | 0.787*** (0.190) | 0.735*** (0.090) | 0.665*** (0.116) | 0.587*** (0.102) | 0.733*** (0.121) | 0.951*** (0.195) | 0.598*** (0.088) | 0.639*** (0.083) | 0.613*** (0.074) | 0.654*** (0.079) | 0.497*** (0.060) |
| | N. Obs. | 671 | 671 | 643 | 671 | 671 | 513 | 537 | 475 | 500 | 535 | 485 | 481 | 477 | 474 | 501 |
| | Adj. R$^2$ | 0.852 | 0.856 | 0.850 | 0.858 | 0.852 | | | | | | | | | | |
| | N. Inst./N. cross sec. | | | | | | 0.951 | 0.951 | 0.902 | 0.951 | 0.829 | 0.829 | 0.878 | 0.927 | 0.951 | 0.902 |
| | J-stat. | | | | | | 32.912 | 26.882 | 22.918 | 23.452 | 23.073 | 29.672 | 30.324 | 27.770 | 33.234 | 32.183 |
| | p-value | | | | | | 0.326 | 0.578 | 0.638 | 0.710 | 0.515 | 0.237 | 0.254 | 0.423 | 0.227 | 0.225 |
| | AR(1) | | | | | | -2.946 | -7.173 | -2.430 | -2.537 | -2.532 | -0.439 | -0.450 | -0.446 | -0.431 | -0.457 |
| | p-value | | | | | | 0.003 | 0.000 | 0.015 | 0.011 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | AR(2) | | | | | | -1.598 | -0.961 | -1.132 | -1.615 | -1.445 | -0.079 | -0.070 | -0.073 | -0.078 | -0.071 |
| | p-value | | | | | | 0.110 | 0.337 | 0.258 | 0.106 | 0.149 | 0.103 | 0.151 | 0.136 | 0.118 | 0.144 |

Note: Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1. White's heteroskedasticity consistent covariance matrix was applied in regressions. Standard errors between parentheses. FOLS – OLS fixed effects. D-GMM – uses two-step of Arellano and Bond (1991) without time period effects. S-GMM – uses two-step of Arellano and Bover (1995) without time period effects. D-GMM estimator-tests for AR (1) and AR (2) check that the average autocovariance in first order and second-order residuals, respectively, is zero. S-GMM estimator-tests for AR (1) and AR (2) check for the presence of first order and second-order serial correlation in the first-difference residuals.

# Table 3 – Estimation results (dependent variable: Moody's rating)

| | Estimator: | FOLS | | | | | DGMM | | | | | SGMM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Regressors: | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| | c | 16.455*** (1.184) | 15.662*** (1.182) | 16.458*** (1.357) | 19.046*** (1.534) | 16.864*** (1.447) | | | | | | | | | | |
| | LAGGED RATING | | | | | | 0.493*** (0.058) | 0.252** (0.099) | 0.179*** (0.040) | 0.289*** (0.075) | 0.142** (0.056) | 0.623*** (0.027) | 0.610*** (0.033) | 0.644*** (0.029) | 0.550*** (0.041) | 0.627*** (0.045) |
| Economic dimension: Macroeconomic conditions | GDPG(-1) | -0.041** (0.017) | -0.041*** (0.015) | -0.045*** (0.016) | -0.040** (0.016) | -0.041** (0.017) | -0.013*** (0.004) | -0.016*** (0.004) | -0.012*** (0.004) | -0.010** (0.005) | -0.009** (0.004) | -0.012** (0.006) | -0.010** (0.004) | -0.015** (0.006) | -0.023*** (0.004) | -0.016** (0.007) |
| | GDPP(-1) | -0.0004*** (0.0001) | -0.0003*** (0.0001) | -0.0004*** (0.0001) | -0.0004*** (0.0001) | -0.0004*** (0.0001) | -0.0001** (0.00004) | -0.0002*** (0.00004) | -0.0002*** (0.00004) | -0.0002** (0.0001) | -0.0003*** (0.0001) | -0.00004*** (0.00001) | -0.0001*** (0.00001) | -0.00003*** (0.0001) | -0.00004*** (0.00001) | 0.00004* (0.00002) |
| | INF(-1) | 0.009*** (0.003) | 0.005* (0.003) | 0.007*** (0.003) | 0.010*** (0.003) | 0.009*** (0.003) | 0.017** (0.007) | 0.007* (0.004) | 0.008* (0.004) | 0.015** (0.007) | 0.022*** (0.006) | 0.002** (0.001) | 0.004** (0.002) | 0.004* (0.002) | 0.004** (0.002) | 0.002* (0.001) |
| | UNEMP(-1) | 0.063 (0.049) | 0.105** (0.051) | 0.063 (0.048) | 0.057 (0.050) | 0.060 (0.049) | 0.054*** (0.021) | 0.044** (0.020) | 0.056*** (0.021) | 0.004 (0.016) | 0.010 (0.030) | 0.013* (0.008) | 0.021** (0.009) | 0.003 (0.012) | 0.005 (0.011) | 0.004 (0.011) |
| | RESERVES(-1) | -2.704* (1.558) | -2.791* (1.511) | -2.460* (1.459) | -3.320** (1.568) | -2.768* (1.564) | -4.641*** (0.649) | -6.315*** (0.810) | -6.670*** (0.699) | -6.578*** (1.083) | -6.576*** (0.976) | -5.118*** (0.673) | -1.942*** (0.406) | -4.315*** (0.640) | -6.310*** (0.907) | -5.853*** (0.787) |
| | FDSE(-1) | -0.320*** (0.077) | -0.294*** (0.075) | -0.298*** (0.076) | -0.333*** (0.072) | -0.323*** (0.078) | -0.108*** (0.039) | -0.111* (0.057) | -0.090* (0.051) | -0.154** (0.064) | -0.118** (0.053) | -0.110*** (0.032) | -0.139*** (0.022) | -0.101*** (0.023) | -0.129*** (0.048) | -0.091*** (0.028) |
| | GBB(-1) | -0.134* (0.075) | -0.108 (0.075) | -0.111 (0.077) | -0.146** (0.071) | -0.137* (0.075) | -0.095*** (0.033) | -0.094* (0.055) | -0.049 (0.045) | -0.161*** (0.059) | -0.080 (0.050) | -0.295*** (0.028) | -0.107*** (0.013) | -0.342*** (0.034) | -0.339*** (0.046) | -0.329*** (0.028) |
| Economic dimension: Monetary regime | IT | | -1.162** (0.486) | | | | | -0.940*** (0.240) | | | | | -1.442*** (0.245) | | | |
| Economic dimension: Financial openess and exchange rate stability | FOI (-1) | | -0.804 (0.746) | | | | | -0.953* (0.572) | | | | | -0.221* (0.127) | | | |
| | ERSI (-1) | | 0.211 (0.564) | | | | | -0.251* (0.148) | | | | | -0.117 (0.148) | | | |
| Institutional dimension | DEMOC (-1) | | | | -0.174 (0.127) | | | | | -0.195* (0.105) | | | | | -0.096** (0.040) | |
| | LAW (-1) | | | | -0.419* (0.216) | | | | | -0.034 (0.059) | | | | | -0.088* (0.050) | |
| Governance dimension | CORRUP (-1) | | | | | -0.108 (0.218) | | | | | -0.017 (0.106) | | | | | -0.058 (0.062) |
| Crisis | SUBPRIME | -0.515*** (0.151) | 0.618*** (0.144) | 0.547*** (0.142) | 0.526*** (0.143) | 0.502*** (0.147) | 0.265*** (0.039) | 0.290*** (0.046) | 0.264*** (0.047) | 0.283*** (0.059) | 0.238*** (0.047) | 0.404*** (0.059) | 0.303*** (0.042) | 0.381*** (0.057) | 0.420*** (0.060) | 0.377*** (0.055) |
| | N. Obs. | 652 | 652 | 624 | 652 | 652 | 501 | 491 | 474 | 480 | 482 | 520 | 526 | 491 | 528 | 516 |
| | Adj. R² | 0.867 | 0.872 | 0.867 | 0.872 | 0.867 | | | | | | | | | | |
| | N. Inst./N. cross sec. | | | | | | 0.951 | 0.951 | 0.975 | 0.975 | 0.975 | 0.975 | 0.904 | 0.927 | 0.951 | 0.975 |
| | J-stat. | | | | | | 32.879 | 30.564 | 29.791 | 30.212 | 33.290 | 32.073 | 25.299 | 30.469 | 31.568 | 28.189 |
| | p-value | | | | | | 0.328 | 0.386 | 0.425 | 0.404 | 0.310 | 0.413 | 0.558 | 0.29 | 0.292 | 0.560 |
| | AR(1) | | | | | | -3.184 | -3.548 | -2.347 | -2.828 | -2.411 | -0.384 | -0.384 | -0.391 | -0.370 | -0.385 |
| | p-value | | | | | | 0.002 | 0.000 | 0.019 | 0.005 | 0.016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | AR(2) | | | | | | -1.247 | -0.905 | -0.933 | -1.280 | -1.012 | -0.080 | -0.078 | -0.082 | -0.080 | -0.081 |
| | p-value | | | | | | 0.212 | 0.366 | 0.351 | 0.259 | 0.312 | 0.102 | 0.107 | 0.105 | 0.104 | 0.101 |

Note: Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1. White's heteroskedasticity consistent covariance matrix was applied in regressions. Standard errors between parentheses. FOLS – OLS fixed effects. D-GMM – uses two-step of Arellano and Bond (1991) without time period effects. S-GMM – uses two-step of Arellano and Bover (1995) without time period effects. D-GMM estimator-tests for AR (1) and AR (2) check that the average autocovariance in first order and second-order residuals, respectively, is zero. S-GMM estimator-tests for AR (1) and AR (2) check for the presence of first order and second-order serial correlation in the first-difference residuals.

## Table 4 – Estimation results (dependent variable: Fitch's rating)

| Estimator: | | FOLS | | | | | DGMM | | | | | SGMM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Regressors: | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| | c | 17.217*** (1.411) | 16.264*** (1.259) | 18.321*** (1.859) | 20.474*** (2.257) | 16.171*** (1.564) | | | | | | | | | | |
| | LAGGED RATING | | | | | | 0.131* (0.068) | 0.096*** (0.033) | 0.101 (0.070) | 0.150** (0.062) | 0.057 (0.036) | 0.622*** (0.037) | 0.749*** (0.018) | 0.535*** (0.043) | 0.492*** (0.019) | 0.676*** (0.030) |
| Economic dimension: Macroeconomic conditions | GDPG(-1) | -0.045*** (0.016) | -0.045*** (0.014) | -0.041** (0.017) | -0.042*** (0.016) | -0.045*** (0.016) | -0.057*** (0.005) | -0.045*** (0.006) | -0.037*** (0.007) | -0.053*** (0.006) | -0.044*** (0.006) | -0.010** (0.005) | -0.015*** (0.005) | -0.039*** (0.007) | -0.037*** (0.006) | -0.042*** (0.005) |
| | GDPP(-1) | -0.0002** (0.0001) | -0.0002** (0.0001) | -0.0002** (0.0001) | -0.0002** (0.0001) | -0.0002** (0.0001) | -0.0001** (0.0001) | -0.0002** (0.0001) | -0.0001* (0.0001) | -0.0001* (0.0001) | -0.0001 (0.0001) | -0.0001** (0.00002) | -0.0001* (0.00002) | 0.0001** (0.00002) | -0.00003* (0.00002) | -0.0004** (0.00002) |
| | INF(-1) | 0.009*** (0.003) | 0.006** (0.003) | 0.004 (0.004) | 0.010*** (0.003) | 0.001** (0.004) | 0.025*** (0.008) | 0.013*** (0.004) | 0.013*** (0.004) | 0.022** (0.009) | 0.006* (0.003) | 0.011* (0.007) | 0.006* (0.003) | 0.006* (0.003) | 0.018*** (0.005) | 0.008** (0.003) |
| | UNEMP(-1) | 0.032 (0.055) | 0.079 (0.051) | 0.021 (0.065) | 0.028 (0.058) | 0.034 (0.053) | 0.082* (0.045) | 0.085** (0.042) | 0.015 (0.023) | 0.049** (0.023) | 0.022 (0.021) | 0.043** (0.018) | 0.019*** (0.007) | 0.006* (0.020) | 0.004 (0.012) | 0.003 (0.021) |
| | RESERVES(-1) | -3.967** (1.914) | -4.313** (1.807) | -4.526*** (1.673) | -4.286** (1.713) | -3.951** (1.906) | -6.614*** (0.776) | -2.800*** (0.545) | -3.720*** (0.624) | -6.387*** (0.932) | -8.273*** (1.692) | -0.978* (0.551) | -0.347 (0.530) | -2.668*** (0.427) | -2.170*** (0.556) | -4.412*** (1.081) |
| | FDSE(-1) | -0.429*** (0.093) | -0.404*** (0.091) | -0.399*** (0.076) | -0.436*** (0.087) | -0.425*** (0.094) | -0.163*** (0.030) | -0.152*** (0.023) | -0.172*** (0.023) | -0.141*** (0.054) | -0.178*** (0.021) | -0.179*** (0.041) | -0.146*** (0.026) | -0.255*** (0.052) | -0.276*** (0.037) | -0.128*** (0.041) |
| | GBB(-1) | -0.217** (0.103) | -0.184** (0.069) | -0.228** (0.095) | -0.227** (0.097) | -0.215** (0.103) | -0.075** (0.030) | -0.047* (0.025) | -0.058** (0.026) | -0.059* (0.030) | -0.092*** (0.034) | -0.108*** (0.026) | -0.069*** (0.018) | -0.125*** (0.033) | -0.137*** (0.038) | -0.068*** (0.026) |
| Economic dimension: Monetary regime | IT | | -1.110*** (0.402) | | | | | -0.733*** (0.270) | | | | | -0.595*** (0.189) | | | |
| Economic dimension: Financial openess and exchange rate stability | FOI (-1) | | | -0.874 (0.889) | | | | | -2.083*** (0.542) | | | | | -1.444** (0.507) | | |
| | ERSI (-1) | | | -1.566* (0.823) | | | | | 0.243 (0.382) | | | | | 0.215 (0.286) | | |
| Institutional dimension | DEMOC (-1) | | | | -0.278* (0.142) | | | | | -0.101 (0.159) | | | | | -0.366*** (0.096) | |
| | LAW (-1) | | | | -0.524 (0.361) | | | | | -0.021 (0.158) | | | | | -0.017 (0.084) | |
| Governance dimension | CORRUP (-1) | | | | | 0.134 (0.181) | | | | | -0.161** (0.072) | | | | | -0.110* (0.061) |
| Crisis | SUBPRIME | 0.547** (0.217) | 0.662*** (0.001) | 0.547** (0.228) | 0.593*** (0.202) | 0.553*** (0.213) | 0.465*** (0.086) | 0.503*** (0.060) | 0.459*** (0.072) | 0.384*** (0.064) | 0.570*** (0.075) | 0.493*** (0.085) | 0.522*** (0.083) | 0.633*** (0.067) | 0.469*** (0.066) | 0.480*** (0.076) |
| | N. Obs. | 507 | 507 | 507 | 507 | 507 | 406 | 430 | 429 | 402 | 398 | 375 | 384 | 336 | 319 | 400 |
| | Adj. $R^2$ | 0.851 | 0.857 | 0.858 | 0.861 | 0.852 | | | | | | | | | | |
| | N. Inst./N. cross sec. | | | | | | 0.811 | 0.837 | 0.892 | 0.919 | 0.946 | 0.811 | 0.919 | 0.864 | 0.891 | 0.838 |
| | J-stat. | | | | | | 20.454 | 24.610 | 22.766 | 21.189 | 27.861 | 22.496 | 25.839 | 22.643 | 24.155 | 20.213 |
| | p-value | | | | | | 0.493 | 0.264 | 0.415 | 0.570 | 0.314 | 0.372 | 0.361 | 0.363 | 0.339 | 0.508 |
| | AR(1) | | | | | | -1.945 | -1.809 | -2.385 | -5.103 | -3.817 | -0.424 | -0.414 | -0.433 | -0.236 | -0.412 |
| | p-value | | | | | | 0.052 | 0.071 | 0.017 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | AR(2) | | | | | | -1.573 | -1.315 | -0.789 | -1.359 | -0.688 | -0.116 | -0.079 | -0.076 | -0.083 | -0.095 |
| | p-value | | | | | | 0.116 | 0.189 | 0.430 | 0.174 | 0.491 | 0.127 | 0.108 | 0.134 | 0.102 | 0.102 |

Note: Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1. White's heteroskedasticity consistent covariance matrix was applied in regressions. Standard errors between parentheses. FOLS – OLS fixed effects. D-GMM – uses two-step of Arellano and Bond (1991) without time period effects. S-GMM – uses two-step of Arellano and Bover (1995) without time period effects. D-GMM estimator-tests for AR (1) and AR (2) check that the average autocovariance in first order and second-order residuals, respectively, is zero. S-GMM estimator-tests for AR (1) and AR (2) check for the presence of first order and second-order serial correlation in the first-difference residuals.

## 5. Concluding remarks

Sovereign credit ratings play a very important role in order to attract international capital mainly for developing countries, since these ratings give valuable information to investors concerning the probability of default of sovereign bond ratings. With this in mind, this research put some effort to understand the main determinants of sovereign ratings of developing countries given by S&P, Moody's and Fitch for the period 1994-2013. We extended previous works in the literature by including new economic aspects, as well as, new institutional and governance variables, which had not been included before. These new aspects considered were the adoption of inflation targeting, the level of financial openness, exchange rate stability, the degree of democratic accountability, law enforcement and the effects of corruption. Regarding the econometric model, it was employed OLS with fixed cross-country effects, as well dynamic panel data approaches.

Our findings might shed some light to the key aspects that a developing country should engage or improve, in order to receive better bond ratings, and by consequence, attract more international capital. Regarding the basic set of macroeconomic variables, which is commonly used in the literature, our results exhibit evidence that GDP growth, per capita income, inflation, foreign reserves and external debt are important determinants of sovereign ratings of developing countries. Although the budget balance was not significant in four estimations of Moody's ratings, still, it was a relevant variable in all estimations of S&P and Fitch. Finally, unemployment showed mixed results regarding its significance, but still, in all estimations it exhibits the expected signal.

Concerning the variables that are our main contribution into the economic dimension, the adoption of inflation targeting disclosed to be a very relevant aspect in the sovereign bond default assessment of the three main agencies. The adoption of this policy framework shows to be able to enhance the bond ratings virtually between one and a half and half of a notch (Moody's and S&P SGMM estimations respectively). The level of financial openness was also an important variable in both dynamic panel data approaches for all the three agencies. Especially for S&P and Fitch, this variable has a stronger effect on its bond default assessment, since a one-point increase is capable to improve their sovereign ratings between one and three notches. Finally, exchange rate stability showed more significant results for S&P, although it exhibit the expected signal in 6 of 9 estimations.

Regarding our contributions into the institutional and governance dimension, our estimations also show promising results. The increase of the democratic accountability improves the sovereign ratings of the three agencies. This result demonstrates that credit rating agencies pay a special attention into the political aspect by improving the sovereign ratings of more democratic countries. Furthermore, the obedience to the law shows to be an important factor especially for S&P, although it showed mixed results for Moody's and no significance at all in the case of Fitch. Still, an increase in the rule of law raises the bond ratings in all estimations. Finally, in relation to the governance aspect, in all estimations the corruption variable had the expected negative signal, i.e., less corrupt countries receive better ratings. In both dynamic panel data, estimations for S&P and Fitch ratings corruption exhibited significance, albeit this not happened in the Moody's estimations.

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## Appendix A

**Table A.1 – Country list**

| |
|---|
| Argentina, Bolivia, Brazil, Bulgaria, Chile, China, China (HK, SAR), Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Estonia*, Hungary, Indonesia, Jordan, Kazakhstan, Kuwait, Latvia*, Lithuania*, Malaysia, Mexico, Morocco, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, South Africa, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, RB |

* According to the IMF, Estonia, Latvia and Lithuania are developed countries since 2011, 2014 and 2015 respectively. Due to the fact that, in most of the period analyzed, such economies were considered as developing economies, hence they enter the analysis.

## Table A.2 – Variable list and description

| | |
|---|---|
| GBB | Risk points for the central government budget balance as a percentage of GDP; the estimated central government budget balance for a given year in the national currency is expressed as a percentage of the estimated GDP for that year in the national currency. The risk points are then assigned from 0 to 10, with the highest number (10) indicating the lowest potential risk for that component and the lowest number (0) indicating the highest potential risk. The data was obtained from the International Country Risk Guide (ICRG) and represents the risks associated with general government budget balance. We expect a negative sign for the estimated coefficient. |
| FDSE | Risk points for the foreign debt service as a percentage of exports of goods and services; risk points from 0 to 10 are assigned for the estimated foreign debt service, for a given year, converted into US dollars at the average exchange rate for that year, expressed as a percentage of the sum of the estimated total exports of goods and services for that year, converted into US dollars at the average exchange rate for that year. Once again, the highest number (10) indicates the lowest potential risk for that component and the lowest number (0) indicates the highest potential risk. The data was obtained from the International Country Risk Guide (ICRG). We expect a negative sign for the estimated coefficient. |
| GDPP | Per capita GDP of the country can be understood as a universal measure of economic development. Amounts are expressed in constant 2005 prices (US dollars). The data was obtained from the World Bank. We expect a negative sign for the estimated coefficient. |
| GDPG | This variable measures the growth performances of countries, i.e., the growth rate of real GDP. The data was obtained from the International Monetary Fund (IFS). We expect a negative sign for the estimated coefficient. |
| INFM | This variable refers to the annual percentage change of consumer prices. However, due to the fact that high inflation rates were observed in many developing countries until the mid-1990s, we follow Brito and Bystedt (2010) and use the natural logarithm of inflation, transforming $INF_{n,t}$ into, $$INFM_{n,t} = 100*\ln(1+ INF_{n,t}/100).$$ This procedure is used in order to prevent the results from being biased by a group of countries with high inflation. The data was obtained from the World Bank. We expect a positive sign for the estimated coefficient. |
| UNEMP | This variable corresponds to the rate of unemployment. High unemployment rates are associated with the occurrence of social conflicts, and pressures on the fiscal side, which, in turn, can reduce the government's ability to pay its debts. The data was obtained from the International Monetary Fund (WEO). We expect a positive sign for the estimated coefficient. |
| ERSI | In order to measure exchange rate stability, we use the index of exchange rate stability, (Aizenman, Chinn and Ito, 2010). The index is available in: http://web.pdx.edu/~ito/trilemma_indexes.htm. We expect a negative sign for the estimated coefficient. |
| FOI | In order to measure financial openness, we use the index of capital account openness, (Aizenman, Chinn and Ito, 2010). The index is available in: http://web.pdx.edu/~ito/trilemma_indexes.htm. We expect a negative sign for the estimated coefficient. |
| DEMOC | Democratic accountability was obtained from International Country Risk Guide (ICRG). This is a measure of, not just whether there are free and fair elections, but how responsive government is to its people. The less responsive it is, the more likely it will fall. Even democratically elected governments can delude themselves into thinking they know what is best for the people, regardless of clear indications to the contrary from the people. The highest number of risk points (lowest risk) is assigned to alternating democracies, while the lowest number of risk points (highest risk) is assigned to autarchies. We expect a negative sign for the estimated coefficient. |
| LAW | Law and order was obtained from International Country Risk Guide (ICRG). The variable "Law and Order" form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the "Order" element is an assessment of popular observance of the law. It ranks nations on a scale from 0 to 6. A score of 0 represents a low level of Law and Order, while 6 indicates maximum level. We expect a negative sign for the estimated coefficient. |
| SUBPRIME | In order to capture the effect from the subprime mortgage crisis, we included a dummy variable, which assumes value 1 for the period from 2008 to 2009, and zero otherwise. We expect a positive sign for the estimated coefficient. |
| CORRUP | We use data on corruption from International Country Risk Guide's (ICRG) corruption index compiled by Political Risk Services (PRS). The index indicates the opinion of analysts on each country regarding the extent to which high government officials are likely to demand special payments, and illegal payments generally expected throughout lower levels of government in the form of bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans. It ranks nations on a scale from 0 to 6. A score of 0 represents maximum corruption level, while 6 indicates minimum corruption level. We expect a negative sign for the estimated coefficient. |

| EXCH | The exchange rate expressed in US dollars enters in the estimates as an instrumental variable. The data was obtained from the International Monetary Fund (IFS). |
|---|---|
| INTERNAL CONFLICT | This variable was obtained from International Country Risk Guide (ICRG). The variable is a measure of political violence in the country and its actual or potential impact on governance. The risk rating assigned is the sum of three subcomponents: Civil War/Coup Threat, Terrorism/Political Violence, and Civil Disorder. It enters in the estimates as an instrumental variable. |
| EXTERNAL CONFLICT | This variable was obtained from International Country Risk Guide (ICRG). The variable is a measure of both the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out war). The risk rating assigned is the sum of three subcomponents: War, Cross-Border Conflict, and Foreign Pressures. It enters in the estimates as an instrumental variable. |
| BUREAUCRACY QUALITY | This variable was obtained from International Country Risk Guide (ICRG). The variable gives high points to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions. It enters in the estimates as an instrumental variable. |
| INVESTMENT PROFILE | This variable was obtained from International Country Risk Guide (ICRG). This measure considers factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents (Contract Viability/Expropriation, Profits Repatriation, and Payment Delays), each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. |
| MILITARY IN POLITICS | This variable was obtained from International Country Risk Guide (ICRG). This is a measure of the military's involvement in politics. Since the military is not elected, involvement, even at a peripheral level, diminishes democratic accountability. Military involvement might stem from an external or internal threat, be symptomatic of underlying difficulties, or be a full-scale military takeover. Over the long term, a system of military government will almost certainly diminish effective governmental functioning, become corrupt, and create an uneasy environment for foreign businesses. Overall, lower risk ratings indicate a greater degree of military participation in politics and a higher level of political risk. |
| MONETARY INDEPENDENCE | In order to measure the degree of monetary independence, we use the index developed by Aizenman, Chinn and Ito (2010). The index is available in: http://web.pdx.edu/~ito/trilemma_indexes.htm. |
| SOCIOECONOMIC CONDITIONS | This variable was obtained from International Country Risk Guide (ICRG). This is a measure of the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction. The risk rating assigned is the sum of three subcomponents: Unemployment, Consumer Confidence, and Poverty. |
| RELIGIOUS TENSIONS | This variable was obtained from International Country Risk Guide (ICRG). A measure of religious tensions arising from the domination of society and/or governance by a single religious group or a desire to dominate in a way that replaces civil law by religious law, excludes other religions from the political/social processes, suppresses religious freedom or expressions of religious identity. The risks involved range from inexperienced people imposing inappropriate policies to civil dissent or civil war. |
| GOVERNMENT STABILITY | This variable was obtained from International Country Risk Guide (ICRG). A measure of both of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents: Government Unity, Legislative Strength, and Popular Support. |
| ETHNIC TENSIONS | This variable was obtained from International Country Risk Guide (ICRG). A measure of the degree of tension attributable to racial, national, or language divisions. Lower ratings (higher risk) are given to countries where tensions are high because opposing groups are intolerant and unwilling to compromise. |

## Table A.3 – Descriptive statistics (S&P and Moody's)

| descriptice statistics | S&P | Moody's | GDPG | GDPP | INF | UNEMP | RESERVES |
|---|---|---|---|---|---|---|---|
| Mean | 10.963 | 10.847 | 4.240 | 5862.466 | 8.661 | 9.171 | 0.182 |
| Median | 11.000 | 11.000 | 4.639 | 4483.058 | 5.137 | 8.356 | 0.142 |
| Maximum | 22.000 | 20.000 | 18.550 | 36040.020 | 307.999 | 28.150 | 1.195 |
| Minimum | 1.000 | 2.000 | -17.699 | 564.244 | -4.027 | 0.658 | 0.007 |
| Std. Dev. | 3.484 | 3.471 | 4.316 | 6067.471 | 16.402 | 4.754 | 0.146 |
| Observations | 600 | 600 | 600 | 600 | 600 | 600 | 600 |

| descriptice statistics | FDSE | GBB | ERSI | FOI | DEMOC | LAW | CORRUP |
|---|---|---|---|---|---|---|---|
| Mean | 8.116 | 6.424 | 0.558 | 0.589 | 4.174 | 3.572 | 2.561 |
| Median | 8.500 | 6.500 | 0.493 | 0.694 | 4.500 | 4.000 | 2.500 |
| Maximum | 10.000 | 10.000 | 1.000 | 1.000 | 6.000 | 6.000 | 5.000 |
| Minimum | 1.000 | 1.583 | 0.012 | 0.000 | 0.000 | 1.000 | 1.000 |
| Std. Dev. | 1.624 | 1.416 | 0.311 | 0.339 | 1.390 | 1.070 | 0.849 |
| Observations | 600 | 600 | 600 | 600 | 600 | 600 | 600 |

## Table A.4 – Descriptive statistics (Fitch)

| descriptice statistics | Fitch | GDPG | GDPP | INF | UNEMP | RESERVES | FDSE |
|---|---|---|---|---|---|---|---|
| Mean | 10.446 | 4.201 | 6320.255 | 8.722 | 9.206 | 0.181 | 8.062 |
| Median | 10.000 | 4.659 | 4765.537 | 5.079 | 8.309 | 0.143 | 8.500 |
| Maximum | 23.000 | 18.550 | 36040.020 | 307.999 | 28.150 | 1.195 | 10.000 |
| Minimum | 2.000 | -17.699 | 908.215 | -4.027 | 0.658 | 0.007 | 1.000 |
| Std. Dev. | 3.405 | 4.410 | 6347.826 | 16.994 | 4.901 | 0.145 | 1.703 |
| Observations | 516 | 516 | 516 | 516 | 516 | 516 | 516 |

| descriptice statistics | GBB | ERSI | FOI | DEMOC | LAW | CORRUP |
|---|---|---|---|---|---|---|
| Mean | 6.495 | 0.540 | 0.580 | 4.279 | 3.616 | 2.586 |
| Median | 6.500 | 0.461 | 0.653 | 5.000 | 4.000 | 2.500 |
| Maximum | 10.000 | 1.000 | 1.000 | 6.000 | 6.000 | 5.000 |
| Minimum | 1.583 | 0.012 | 0.000 | 1.000 | 1.000 | 1.000 |
| Std. Dev. | 1.397 | 0.306 | 0.338 | 1.389 | 1.101 | 0.866 |
| Observations | 516 | 516 | 516 | 516 | 516 | 516 |