HOW FISCAL POLICIES AFFECT CREDIT RATES: PROBIT ANALYSIS OF THREE MAIN CREDIT RATING AGENCIES' SOVEREIGN CREDIT NOTES

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Abstract

The aim of this study is to identify the relationship between fiscal policy and sovereign credit ratings within a comparative framework for the post-2000 period. In this study, indicators affecting credit notes of three rating agencies through domestic savings, growth, inflation, unemployment, current account balance and public revenues, public expenditures, primary deficits, budget deficits and public debt data for selected countries for the period between 2001 and 2016 are evaluated by using probit analysis under four scenarios.

The study reveals that growth, unemployment, savings, current account deficit and public debt have come to the forefront in the realizations and far estimates, while the main indicators in the public sector, namely the impact of expenditure, deficit, primary balance and debt on rating decisions, are more dominant in the near estimates. These results show that the factors that are differentiating the credit rating evaluation period are the indicators of public finance. It seems that models used by the credit institutions are more likely to show short-term outcomes in the sense of public finance parameters mainly reflecting the macroeconomic responsibility level of the ruling governments.

Keywords: fiscal policy, credit ratings, credit rating agencies, public policy, probit model.

1. Introduction

Credit rating agencies operate in developed countries as watch dogs that inform investors about the credibility and solvency of borrowers so that investors could make sound investment decisions. On the other hand, particularly after 1980s, the attention of credit rating agencies gradually turned to developing countries as neoliberal policies (characterized by the deregulation, privatization and capital account liberalization) gained importance, resulting in developing countries' governments' increased access to global financial markets to finance government debt for public sector deficits. The interconnectivity between the creditors and the borrowers under the neoliberal rhetoric raised new concerns about the sustainability of public finances in developing countries in particular and the risk of default. The economic crises encountered by developing countries in the late 1990s and early 2000s and the global financial crisis surrounding the USA and the Euro zone in 2008 and thereafter raised question marks about the capacity and effectiveness of credit rating agencies to act as early warning mechanisms for the sustainability of financial systems; furthermore, credit rating agencies' calculation methods and approaches begun to be criticized.

Following the Keynesian period, the governments' economic policies were based on three functions: allocation, distribution, and stability (Keynes, 1967; Musgrave, 1984). The first function deals with the resources that need to be allocated to goods and services due to the failure of the market mechanisms. Fiscal policy also covers the social and/or economic transfers to the society under the category of general government expenditures dealing with the inequality problem. The third function concerns the outcomes of public budgets following fiscal policy practices. The objectives of the fiscal policy are to reach stability and the intervention in the economy via the fiscal policy is deemed as a solution for the economic instability as per the Keynesian doctrine; however, it is also seen as a source for instability since such an intervention would destroy the market equilibrium under the circumstances of impartiality in public finance and decrease the production of goods and services as per the neo-classical approach (Musgrave, 1984; Yılmaz, 2007). Despite different views about the role of the state in the economy, the government is already called to ensure stability in the market via fiscal policies. On the other hand, government involvement also runs the risk of excessive spending tendencies emanating from political competitions resulting in growing public debt problems and this risk calls for the involvement of credit rating agencies.

The agencies assess governments in terms of their ability to manage debt and resolve macroeconomic problems. Investment credit ratings indicate the ability to face the shocks of an upcoming crisis scenario which shows the readiness of economic policies against potential threats. Credit ratings are the compass of economic policy-makers which shows the necessity to reduce imbalances and debts in order to take the necessary precautions; credit notes show the availability and productive utilization of a government's policy options. Governments politically or structurally fragile and internally/externally under stress are rated lower by the agencies than those who have strong political and structural stance (Nye, 2014, pp. 192-200).

Academic papers focusing on the factors affecting credit ratings such as Cantor and Packer (1996), Afonso (2002), and Canuto, Santos and Porto (2004) indicated that growth, per capita income, inflation, foreign debt, economic development level and default history of the country are the most prominent factors in determining the credit ratings. Bissondoyal-Bheenick, Brooks and Yip (2006) showed that technologic development is one of the important factors of credit ratings determinants, while Montes, De Oliveira and Mendonça (2016) added some political determinants such as openness, democracy and the rule of law.

In this study the probit model is used to determine the effects of fiscal policy variables on credit scores and fiscal rules. Credit scores of three credit rating agencies, S&P, Fitch, and Moody's, for twelve countries, between 2001 and 2016, are evaluated. In forming those scores, domestic savings, growth, unemployment, inflation, current account deficit, public revenue, public expenditure, budget deficit, primary deficit and public debt to GDP rate are used as determinants. The study consists of three main parts: in the following section the literature is reviewed while in the third part the methodology and data structure are explained. In the fourth section, the results of the study are analyzed and evaluated and in the conclusions the main findings of the study are summarized.

2. Literature review

When the empirical studies about factors determining the credit rating are taken into account, the first notable study is of Cantor and Packer (1996). In the study, 49 countries rated by Moody's and S&P have been investigated for the 1987-1994 period. As a result of the model, where the multiple regression method is applied, growth, per capita income, inflation, foreign debt, economic development level and default history of the country are shown to be the most prominent factors in determining the credit ratings. Ferri, Liu and Stiglitz (1999) investigated Asian countries rated by Moody's and S&P for the 1997-1998 period by applying the multiple regression method; as a result of the study they reached the conclusion that credit ratings are affected by crises periods. Mulder and Perrelli (2001) studied the variables determining the credit rating for 25 countries rated by Moody's and S&P for the 1992-1997 period, by means of panel data analysis; they observed that the ratio of investments to GDP and short term borrowings are the most important determining factors, especially during times of crisis.

Canuto, Santos and Porto (2004) investigated 66 countries rated by Moody's, Fitch, and S&P for the 1998-2002 period by cross section, fixed effect and first differences models; the study showed that high levels of per capita income, low levels of foreign debt/current account deficit, high levels of real growth rate, low inflation and low amount of debts of local administrations are determining factors for high credit ratings. Mellios and Paget-Blanc (2006) investigated 86 countries rated by Moody's, Fitch and S&P in 2003 by using ordered logit model and linear regression. The aforementioned study concludes that per capita income, domestic income, real exchange

rate fluctuations, inflation rate and default history are important in determining the credit ratings and that corruption in the country is also a key factor.

Halim, Nurazira and Ainulashikin (2008) indicated that the factors affecting credit ratings were debt solvency. Afonso, Gomes and Rother (2011) examined the EU countries rated by Moody's, Fitch and S&P for the 1995-2010 period by using linear and ordered reaction model; while GDP per capita, growth rate, public debt, and budget balance are shown to be the key factors in determining the credit rating in the short term, being a strong country, foreign debt, foreign exchange reserves and default history of the country are the key factors in the long term. Gültekin-Karakaş, Hisarcıklılar and Öztürk (2011) studied 106 countries with high and low income rated by Moody's for the 1999-2010 period by using ordered probit model. In this work, the countries are classified as low income and high income when the credit ratings are given; the results indicate that, while rating the countries with high income, macro-economic factors have the biggest explanatory power, and for countries with low income, political and social factors take precedence over other factors. Emara (2012) investigated 37 developed and developing countries rated by Moody's for the 1989-2006 period by means of two stage least squares method and argued that strengthening the financial structure and lowering inflation are essential factors in determining the credit ratings. Josip (2014) analyzed 46 European countries by using discriminant analyses and the paper implied that GDP per capita, inflation and international reserves are affecting credit ratings. Recent studies such as Kabaday and Çelik (2015) or Reusens and Croux (2017) applied probit models to find the determinants of credit ratings and these papers implied that macroeconomic variables are the most significant factors.

Recent studies added to the literature a new important variable, namely the way in which public policies are perceived by rating agencies. In this direction, Dimitrakopoulos and Kolossiatis (2016) examined 62 developed and developing countries between 2000 and 2011 using a dynamic panel ordered probit model (with auto-correlated disturbances and non-parametrically distributed random effects and an efficient Markov Chain Monte Carlo algorithm); as a result they found evidence of the stickiness of ratings. Boumparis, Milas and Panaigiotidis (2017) researched 19 Eurozone countries for the period of 2002-2015 applying panel data analyses, observing that economic policy uncertainty impacts negatively credit ratings across the conditional distribution; however, the impact is stronger for the lower rated countries. Duygun, Öztürk and Shaban (2016) investigated several aspects of the relationship between sovereign credit ratings and fiscal discipline for 93 countries during the 1999-2010 period using the GMM method; they found that a country's debt level is likely to increase with higher ratings, confirming the existence of pro-cyclicality and path dependence of ratings. Duygun, Öztürk and Shaban's (2016) findings further demonstrate that institutional quality is an important factor in the ratings – fiscal discipline nexus. Öztürk (2014) investigated sovereign credit ratings of 106 countries for the period of 1990-2010 by using ordered response models and observed that quality of institutions would greatly stimulate higher credit ratings. Table 1 provides a summary of the aforementioned academic studies.

Table 1: Brief literature on credit ratings determinants

Authors	Model/ Period/ Countries	Main factors affecting credit ratings
Cantor and Packer (1996)	Multiple regression method, 1987-1994, 49 countries	Growth, per capita income, inflation, foreign debt, economic development level and default history of the country;
Ferri, Liu and Stiglitz (1999)	Multiple regression, 1997-1998, Asian countries	Credit ratings affected by crisis periods;
Gür (2000)	Tobit model, 1990-1998, 34 countries	Rating agencies ignore political risks in assessing credit notes; due to this, ratings do not reflect true results;
Mulder and Perrelli (2001)	Panel Data, 1992-1997, 25 countries	Generally, macroeconomic variables determine ratings but, in crisis periods, investments and debts are more significant determinants;
Afonso (2002)	OLS, 2001, 81 developed and developing countries	GDP per capita, real growth rate, inflation, default rate and economic development level as main determinants;
Canuto, Santos and Porto (2004)	Panel data analysis, 66 countries, 1998-2002	GDP per capita, external debt, current account, real growth rate, inflation and local government's gross debts;
Bissondoyal-Bheenick, Brooks and Yip (2006)	Ordered probit model, 2002, 94 countries	GDP, technology and inflation;
Mellios and Paget-Blanc (2006)	Ordered logit model, 2003, 86 countries	GDP per capita, real exchange rates, inflation, credit defaults and corruption;
Halim, Nurazira and Ainulashikin (2008)	Bound test approach, 1991-2004, Malaysia	Debt solvency;
Iyengar (2010)	OLS, 2007, 93 countries	GDP per capita, debt and economic development level;
Gültekin-Karakaş, Hisarcıklılar and Öztürk (2011)	Ordered probit model, 1999-2010, 106 countries	Macroeconomic factors in the case of high income countries, political and social factors for low income countries;
Şahinöz and Gönenç (2011)	Panel data analysis, 1998-2008, 18 developing countries	Growth, political stabilization, debts, monetary policy and institutionalization;
Emara (2012)	2SLS, 1989-2006, 37 developing and developed countries	Strong financial structure and inflation;
Josip (2014)	Discriminant analysis, 46 European countries	GDP per capita, inflation and international reserves;
Öztürk (2014)	Ordered response models, 1999-2010, 106 countries	Quality of institutions would greatly stimulate higher credit ratings. 'Government effectiveness' and 'regulatory quality' were predominantly responsible for low sovereign credit ratings;
Kabaday and Çelik (2015)	Ordered probit and logit, 1993-2009, 19 emerging countries	Macroeconomic variables affect credit ratings;
Montes, De Oliveira and Mendonça (2016)	Panel data approach, 1994-2013, 40 countries	Openness, democracy, laws, inflation targeting and corruption;

Authors	Model/ Period/ Countries	Main factors affecting credit ratings
Duygun, Öztürk and Shaban (2016)	GMM models, 1999-2010, 93 countries	A country's debt level is likely to increase with higher ratings, confirming the existence of pro-cyclicality and path dependence of ratings;
Dimitrakopoulos and Kolossiatis (2016)	Panel ordered probit model, 2000-2011, 62 developed and developing countries	Stickiness of ratings and of the three sources of ratings persistence, with true state dependence being weak;
Reusens and Croux (2017)	Probit analyses, 2002-2015, 90 countries	Financial balance, economic development, debt, GDP growth;
Boumparis, Milas and Panagiotidis (2017)	Panel data analyses, 2002-2015, 19 Eurozone countries	Regulatory quality and competitiveness have a stronger impact for low rated countries whereas GDP per capita is a major driver of high rated countries.

Source: The authors

3. Data and methodology

In this study the probit model was utilized in order to establish a model regarding the criteria for changing the credit ratings given to countries by international credit rating agencies. In this respect, it has been questioned which economic and financial indicators are effective in the ratings given to countries by international credit rating agencies, and whether the previous rating assessments are consistent. The credit ratings given by international credit rating agencies S&P, Fitch, and Moody's to twelve countries (USA, Canada, Japan, England, Germany, France, Italy, Ireland, Spain, Portugal, Greece and Turkey), between 2001-2016, are taken into consideration; while selecting the countries, data availability and continuity were taken into account.

Moreover, the inclusion of countries in the two groups below was designed in order to increase representation; one group of countries was picked due to stable high payment guarantee rates (AAA) before the 2008 crisis (like USA and Germany) and a second group was chosen with dramatically revised credit rating scores (Greece, Spain, Portugal).

In establishing these ratings for the countries, multiple factors determined quantitatively such as domestic savings, growth, unemployment, inflation, current deficit, public revenue, public expenditures, budget deficit, primary deficit and ratio of public debt to GDP are taken into account. Each credit rating agency is considered separately in the empirical analysis. Data has been compiled from IMF World Economic Outlook Database and IMF Article IV country reports for the relevant period.

The probit model is a model explaining the ratio of probability of an event happening to the probability of it not happening, with explanatory variables (Allison, 2000, p. 15). The reason why this model is widely used is that the normality assumption is not applicable in cases where the dependent variable is comprised of discrete variables containing dual/dummy levels such as 0, 1 or levels more than two; as such, it offers much more ease of use and the obtained model is flexible and easy to interpret mathematically (Bhattacharrya and Dunson, 2011). In order to estimate the probit model, repeating and non-repeating observations should be distinguished from each other; for this purpose, the likelihood method is the method that is most widely used. This method generally indicates the error in the model when an independent variable is added to the analysis. Log likelihood value ranges between 0 and 1, showing the probability of dependent variables' estimation by independent variables. Therefore, the significance of undetermined variance in the dependent variable is indicated with -2LogL; this statistics in probit analysis resembles sum of error squares in regression analysis. Hence, if the likelihood ratio is 1, the -2 LogL statistics is equal to zero. As a result, a smaller -2LogL statistics always indicates a better model (Almendros, Benitez-Parejo and Gonzalez-Ramirez, 2011).

In this study the probit model was used since our dependent variables are qualitative variables and the probabilities are comprised of dual variables in the 0-1 interval (probability of whether S&P, Fitch and Moody's make changes in the credit rating).

The equation of the model:

$$Y_{S\&P,M,F} = \alpha + \beta 0 X0_{1,2,3} + \beta 1 X1_{1,2,3} + \beta 2 X2_{1,2,3} + \beta 3 X3_{1,2,3} + ... + \beta 9 X9_{1,2,3} \qquad (1)$$

The dependent and independent variables are included in Table 2.

Table 2: Variables

Variables	Definitions	
	Dependent Variables	
$Y_{S\&P}$	S&P credit rating, there is no revised = 0, there is revised = 1	
Y_F	Fitch credit rating, there is no revised = 0, there is revised = 1	
Y_M	Moody's credit rating, there is no revised = 0, there is revised = 1	
	Independent Variables*	
	Variables	**Scale**
$X0_{1,2,3,4}$	Domestic Savings/GDP	Percentage of GDP
$X1_{1,2,3,4}$	Growth (Constant Prices)	Percent Change
$X2_{1,2,3,4}$	Unemployment	Percent of Total Labor Force
$X3_{1,2,3,4}$	Inflation (end of Consumer Prices)	Percent Change
$X4_{1,2,3,4}$	Current Account Deficit/GDP	Percentage of GDP
$X5_{1,2,3,4}$	Public Revenue/GDP	Percentage of GDP
$X6_{1,2,3,4}$	Public Expenditure/GDP	Percentage of GDP
$X7_{1,2,3,4}$	Primary Deficit/GDP	Percentage of GDP
$X8_{1,2,3,4}$	Budget Deficit/GDP	Percentage of GDP
$X9_{1,2,3,4}$	Public Gross Debt/GDP**	Percentage of GDP

Note: * independent variables are analyzed under three subjects ($_1$: annual performance, $_2$: near estimates for the same year, $_3$: far estimates for the same year).

** Total Public Debt/GDP data is used for USA, Japan, Canada, Turkey and England, and Net Public Debt/GDP data is used for Ireland, France, Greece, Italy, Spain, Portugal and Germany.

Source: The authors

The dependent variables (according to Table 2) are whether credit rating agencies (S&P, Moody's and Fitch) made changes in the ratings they have given, and independent variables are growth, unemployment, inflation, domestic savings, current deficit, public revenue, public expenditures, budget deficit, primary deficit and public debt as a share of GDP.

Realizations, near estimates, far estimates and deviation of realization of near estimate of the economic indicator of countries between 2001 and 2016 are used in the model. In this respect, realizations are the calculated values of each economic indicator at any given year 't', for the previous year (t-1). Near estimates are the calculated values by estimating the end year value for the year (t) of each economic indicator given at any year 't' and far estimates are projected estimated values of each economic indicator at any given year 't', for the year (t+1).

The credit rating of any given year 't' refers to the credit rating announced at the end of the related year 't'. The ratings change affecting the credit rating at year 't' emerges as a result of the calculated economic indicators (EG_i). In this respect, four

scenarios stated below are used:

- Scenario 1 (Xi_1) – realization. For this analysis, the previous year (t-1) realizations are used ($Xi_1 = EG_{i[t-1]}$). In this scenario the effect of previous year performance of parameters called realizations on the credit grades revealed by credit rating agencies are examined.
- Scenario 2 (Xi_2) – near estimate for the same year. Near estimate for each economic indicator is used. Near estimates are the calculated values by estimating the end year value for year (t) of each economic indicator given at any year 't' ($Xi_2 = EG_{i[t]}$). The estimation of current years' end is taken as the nearest estimation in the second scenario in order to investigate the effect of current years' realization estimation on the credit notes. Apart from the first scenario, this scenario takes current years' realization estimations into consideration (not previous years).
- Scenario 3 (Xi_3) – far estimate. Far estimate for each economic indicator is used in the model. Far estimates are projected estimated values of each economic indicator at any given year 't', for the next year (t+1) ($Xi_3 = EG_{i[t+1]}$). In this case, the following year projections are taken into account and the effect of the following years' projections on the credit notes are analyzed. Differing from the previous two scenarios, upcoming periods' expectations are taken into account in this approach.

Based on the year 2015, the following table summarizes the calculation methodology for the three scenarios.

Table 3: Summary table of calculation methodology

Parameters	Scenario 1 (2015) Realization	Scenario 2 (2015) Near estimation	Scenario 3 (2015) Far estimation
Unemployment	2014 (final)	2015 (in year estimation)	2016 (projection)

Source: The authors

- Scenario 4 (Xi_4) – deviation of realization for near estimate. Deviations from the target for each economic indicator are used in the model; deviation rate means the departure from the realization rate according to the target ($Xi_4 = (EG_{i.[t]} / EG_{i.[t+1]})-1$). The deviation between parameters realization value and the nearest estimation are calculated and the effects of deviations on credit rates are analyzed. Here, the deviation (t+1) is calculated based on the difference between near estimates (t) and realization, then it is examined whether it has an effect on credit ratings.

The probit model reveals the degree of probability between the dependent variable and independent variables. The marginal effect was also taken into consideration in order to assess the relative effect of this interaction. The marginal effects regarding each independent variable are obtained by making use of sample averages of dependent variables, as presented in the following equation:

(MeanP)*(1-MeanP)*(β) = Marginal effect   (2)

4. Findings

The independent variables, growth, unemployment, inflation, current account deficit, domestic savings, public revenue, public expenditure, budget deficit, primary deficit and total public debt were examined in order to study the effects of these indicators to the credit ratings in three scenarios. As mentioned in the previous section, the first scenario refers to the annual performance (t-1) of these variables, the second scenario is near estimation (t) and the third scenario is far estimation (t+1) for each credit agency. Table 4 shows S&P realizations, near and far estimations and, according to these, the marginal effects (probability of changes in the S&P credit ratings).

Table 4: S&P probit results

Variables	Scenario 1		Scenario 2		Scenario 3	
	Dependent variable: S&P credit ratings					
	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx
Growth	0.0636* (1.68)	0.0163	-0.0122 (-0.22)	-0.0026	-0.0874 (-0.89)	-0.0220
Unemployment	0.0826*** (3.26)	0.0211	0.1368*** (4.26)	0.0302	0.1428*** (4.35)	0.0360
Inflation	0.0159 (0.47)	0.0040	-0.0388 (-1.09)	-0.0085	-0.0004 (-0.01)	-0.0001
Current acc.	0.0278 (0.89)	0.0071	0.0113 (0.34)	0.0024	-0.0064 (-0.18)	-0.0016
Savings	-0.760*** (-2.94)	-0.0194	-0.0535** (-2.15)	-0.0118	-0.0440** (-1.68)	-0.0111
Revenue	-0.0997 (-0.64)	-0.0025	0.7041 (1.69)	0.1554	-0.0741 (-0.82)	-0.0187
Expenditure	0.0763 (0.50)	0.0195	-0.7560* (-1.81)	-0.1669	0.0214 (0.24)	0.0054
Budget def.	0.0289 (0.21)	0.0074	-0.8175* (-1.90)	-0.1804	0.0442 (0.43)	0.0111
Primary def.	-0.0438 (-0.54)	-0.0112	0.1064 (1.62)	0.0235	0.0916 (1.40)	0.0231
Debt	0.0032 (1.06)	0.0008	0.0094*** (2.96)	0.0020	0.0109 (3.5)	0.0027
Wald test	73.95		71.32		71.91	
Log likelihood	-77.36		-68.1133		-69.95	
N	192		185		183	

Note: Parentheses shows z statistics, *** $p<0.01$, ** $p<0.05$, *$p<0.1$

Source: The authors

When the results for S&P are taken into consideration, unemployment and domestic savings levels are observed to be significant in the three scenarios. Both parameters have an explanatory effect on the three scenarios. As shown in Table 4 (in scenario 1, showing realizations), when the significance level of the independent

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variables are evaluated with Wald test statistics it has been found that the variables significantly affecting the changes in credit ratings of countries are growth, unemployment and domestic savings for S&P. The third column indicates the probability of S&P changing the credit ratings according to the marginal effects of variables assumed statistically significant; based on the model, the probability of changing credit ratings increases by growth, unemployment and decreases in the ratio of domestic savings as a share of GDP.

In scenario 2 of Table 4 (for near estimations) unemployment, savings, public expenditures, budget deficits and public debts are determinants of credit ratings for S&P. At that point, fiscal indicators were found statistically significant. Column 5 shows the probability of S&P changing the credit ratings according to the marginal effects of variables assumed statistically significant for near estimations. Following the model, one unit fall in the ratio of public expenditures to GDP decreases the probability of S&P changing the credit rating by 0.9980 units and also has a negative probability of domestic savings; budget deficits, on the other hand, positively affect unemployment and debts.

In scenario 3 of Table 4 (for far estimations) unemployment and domestic savings affect the credit ratings of S&P. For near estimations fiscal variables are effective determinants of the credit rating procedure for S&P; according to the analysis, one unit fall of domestic savings to GDP decreases the probability of S&P changing the credit rating by 0.0111 units; in public debts 0.0027 units and have a positive effect for unemployment in column 7.

Table 5 shows Fitch probit estimation results. According to the results, unemployment is meaningful in three scenarios and the near estimation scenario is more effective in Fitch when compared with the others.

In scenario 1 of Table 5 unemployment, inflation and domestic savings significantly affect the changes in credit ratings of countries; in column 3, the marginal effect (the probability of changing the ratings) is shown. One unit decrease in the ratio of domestic savings to GDP decreases the probability of changing the credit rating by 0.0149 units, and one unit increase in the rate of unemployment increases the probability of changing the credit rating by 0.0163 units; however, there is a positive probability for inflation rate.

In scenario 2 of Table 5 (for near estimations) unemployment, savings, primary deficits and public debts are determinants of credit ratings for Fitch. As in the case of S&P (see Table 4) fiscal indicators are again determinants of the credit score. In scenario 3 of Table 5 (for far estimations) unemployment and public debt are the main determinants of Fitch credit ratings.

Variables	Senario 1		Scenario 2		Scenario 3	
	Dependent variable: Fitch credit ratings					
	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx
Growth	0.0592 (1.59)	0.0145	0.0590 (1.07)	0.0143	-0.1211 (-1.25)	-0.0299
Unemployment	0.0664*** (2.68)	0.0163	0.0906*** (3.42)	0.0220	0.0976*** (3.59)	0.0241
Inflation	0.0085*** (0.25)	0.0020	-0.0191 (-0.59)	-0.0046	0.0981 (1.57)	0.0242
Current acc.	0.0370 (1.21)	0.0090	0.0362 (1.12)	0.0088	0.0184 (0.53)	0.0045
Savings	-0.061*** (-2.46)	-0.0149	-0.0538** (-2.19)	-0.0130	-0.0224 (-0.88)	-0.0055
Revenue	-0.125 (-0.81)	-0.0308	-0.0240 (-0.22)	-0.0058	0.0170 (0.18)	0.0042
Expenditure	0.1031 (0.68)	0.0253	-0.0099 (-0.09)	-0.0024	-0.0591 (-0.61)	-0.0146
Budget def.	0.0284 (0.21)	0.0069	-0.0653 (-0.65)	-0.0158	0.0191 (0.18)	0.0047
Primary def.	0.0304 (0.38)	0.0074	0.1283** (2.12)	0.0311	0.0544 (0.85)	0.0134
Debt	0.0008 (0.27)	0.0002	0.0050* (1.58)	0.0012	0.0064 (2.18)	0.0016
Wald test	78.03		74.91		74.80	
Log likelihood	-79.23		-75.57		-75.71	
N	192		185		183	

Note: Parentheses shows z statistics, *** p<0.01, ** p<0.05, *p<0.1

According to the model results calculated for Moody's (see Table 6), unemployment is also significant in the three scenarios. Among credit note determinants, the near estimation scenario is more effective than the others in Moody's.

In Table 6 (scenario 1), unemployment, current account and domestic savings are the main determinants of Moody's credit ratings. The probability of changing the credit rating increases with unemployment and current account and the probability of changing the credit rating decreases with domestic savings to GDP.

In scenario 2 of Table 6, growth, unemployment, current account, domestic savings and public debts have significant and also rising effects. One unit fall in domestic savings makes the probability of changing Moody's rating 0.0490. In scenario 3 of Table 6 (for far estimations), unemployment and public debts are effective determinants. Besides macroeconomic variables, public debt is an important factor to explain credit ratings. Following these results, column 7 implies the probability of Moody's changing the credit ratings according to the marginal effects of the variables assumed statistically significant.

Table 6: Moody's probit results

Variables	Scenario 1		Scenario 2		Scenario 3	
	Dependent variable: Moody's credit ratings					
	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx
Growth	0.0526 (1.41)	0.0127	0.0035** (0.07)	0.0008	-0.0589 (-0.62)	-0.0141
Unemployment	0.0648*** (2.55)	0.0157	0.0765*** (2.92)	0.0183	0.0898*** (3.25)	0.0216
Inflation	0.0328 (0.96)	0.0079	-0.0238 (-0.73)	-0.0057	0.0380 (0.62)	0.0091
Current acc.	0.0805** (2.47)	0.0195	0.0799** (2.35)	0.0191	0.0791 (2.18)	00190
Savings	-0.0755*** (-2.98)	-0.0183	-0.0490** (-2.03)	-0.0117	-0.0363 (-1.42)	-0.0087
Revenue	0.0054 (-0.03)	0.0013	-0.0334 (-0.31)	-0.0079	-0.0228 (-0.23)	-0.0055
Expenditure	-0.0207 (-0.13)	-0.0050	-0.0002 (-0.05)	-0.0000	-0.0164 (-0.17)	-0.0039
Budget def.	-0.0044 (-0.03)	-0.0010	-0.0692 (-0.72)	-0.0150	-0.0629 (-0.65)	-0.0050
Primary def.	-0.0923 (-1.10)	-0.0224	0.0733 (1.21)	0.0178	0.0747 (1.23)	0.0036
Debt	0.0041 (1.41)	0.0010	0.0069** (2.36)	0.0015	0.0064*** (2.21)	0.0020
Wald test	77.51		75.40		75.58	
Log likelihood	-77.82		-73.64		-73.71	
N	192		185		183	

Note: Parentheses shows z statistics, *** $p<0.01$, ** $p<0.05$, *$p<0.1$

Source: The authors

In the study, credit ratings are also evaluated by focusing on the deviation rates according to the target to understand whether deviations affect the agencies' credit rates based on the scenario 4 (see Table 7); here we tried to understand the impact of forecast errors on credit notes, which shows the performance of the economy management as a part of the country's public administration system.

Table 7 clearly shows that unemployment and government expenditures are the main parameters for the three agencies, which means that deviation in government expenditures and unemployment rates are directly taken into account in their models. Growth, inflation, budget deficit and public revenues were not found to have a significant effect on credit ratings and this can been seen as a problematic area in terms of the consistency of the models used by these institutions.

Table 7: Probit results of deviation of near estimation (scenario 4)

Variables	S&P		Fitch		Moody's	
	Dep. var.: S&P rating		Dep. var.: Fitch rating		Dep. var.: Moody's rating	
	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx	Coef.	Marg. eff. Dy/dx
Growth	0.0000 (0.01)	8.94	-0.0173 (-0.90)	-0.0069	-0.0167 (-0.91)	-0.0066
Unemployment	1.278** (2.00)	0.4406	1.1701* (1.82)	0.4655	1.3941** (2.14)	0.5515
Inflation	-0.0862 (-1.26)	-0.0297	-0.0060 (-0.11)	-0.0024	-0.0850 (-1.25)	-0.0336
Current acc.	0.0002 (0.43)	0.0000	0.0001 (0.27)	0.0000	0.0001 (0.28)	0.0000
Savings	1.1802 (1.46)	0.4067	0.8540 (1.13)	0.3397	-0.6822 (0.91)	0.2698
Revenue	3.0349 (1.50)	1.0460	2.5188 (1.49)	1.0021	2.7732 (1.48)	1.0970
Expenditure	-5.0244*** (-2.48)	-1.7317	-3.9328** (-2.34)	-1.5647	-4.4937*** (-2.41)	-1.7776
Budget def.	0.1081 (1.63)	0.0372	-0.0029 (-1.01)	-0.0011	0.0138 (0.84)	0.0054
Primary def.	-0.0054 (-0.15)	-0.0018	0.0122 (0.34)	0.0048	0.0320 (0.87)	0.0126
Debt	0.4260 (-0.76)	0.1468	-0.5630 (-1.01)	-0.2239	-0.2633 (-0.48)	-0.1041
Wald test	14.26		10.93		12.32	
Log likelihood	-112.82		-117.28		-115.18	
N	180		180		180	

Note: Parentheses shows z statistics, *** p<0.01, ** p<0.05, *p<0.1

Source: The authors

From the public management point of view, it must also be noted that the afore-mentioned results should be interpreted in the context of how well the governments' economic policy making mechanism (in other words, their governance structures) handles economic problems. This is especially important as the quality of a country's management structure is one of the main variables by which the government responds to economic and fiscal challenges and market shocks (Nye, 2014). This issue (whether governments can effectively manage their options and constraints) is also taken into account as an indicator by credit rating agencies.

Overall, the macro-economic parameters used in this study appear to be the main elements which determine the ratings of countries in the short term. As a result of the analysis, Table 8 shows a summary of the indicators which proved to be significant determinants of the credit ratings given by the three agencies.

Credit rating agencies (significant results)	Scenario 1	Scenario 2	Scenario 3	Scenario 4
S&P	Unemployment	Unemployment	Unemployment	Unemployment
	Savings	Savings	Savings	Expenditure
	Growth	Expenditure		
		Debt		
Fitch	Unemployment	Unemployment	Unemployment	Unemployment
	Savings	Savings		Expenditure
	Inflation	Primary deficit		
		Debt		
Moody's	Unemployment	Unemployment	Unemployment	Unemployment
	Current acc.	Growth	Debt	Expenditure
		Inflation		

According to the results of the analysis:

– The number of significant variables was the highest in scenario 2. This means that the estimates of the current year (in terms of the evaluation system of the credit rating agencies) are more prominent than those of the other scenarios.

– Unemployment is found significant as a primary determinant in all scenarios. Findings show that credit rating agencies take up unemployment as a significant parameter among the determinants of the economy.

– In the first scenario, while growth, unemployment and savings are significant for S&P and Fitch, unemployment and current account deficit are significant for Moody's. In this model, the amount of savings and balance of current accounts also come out (in terms of the previous year's performance) as determinants, besides unemployment.

– In the second scenario (in which current year's estimations are taken into consideration), unemployment is found significant in terms of all agencies; besides unemployment, saving, growth, debt, public expenditure, primary public balance, and inflation are also found to be significant determinants. Compared with the previous scenario, it is observed that more parameters are taken into account in terms of evaluating the current year's performance.

– Based on the third scenario's results, looking at the projections of the following year, while unemployment is found to be significant in all agencies ratings, savings and debts are also added to that parameter by S&P and Moody's.

– In the fourth scenario, unemployment and public expenditure are the parameters found significant by all three agencies.

Overall, the results support some of the findings of previous studies mentioned in the literature review such as Cantor and Packer (1996), Canuto, Santos and Porto (2004) and Reusens and Croux (2017).

5. Conclusion

According to the results of the four scenarios, unemployment is found as the primary factor influencing credit scores. Growth, unemployment, savings, current account deficit and public debt have come to the forefront in the realizations and far estimates, while the budget deficit, primary balance and public debt are more dominant determinants in the case of near estimates. These findings indicate that the factors that are differentiating in the case of the credit rating evaluation period are mainly driven by the public fiscal policy (which can be considered to be a sign for the political decisiveness of governments). It seems that the models used by credit institutions based on the near estimates results are more likely to focus on short-term outcomes (mainly fiscal policy parameters) without showing concern to a sound relation with economic fundamentals in a medium term perspective.

Our results also indicate that sound economic and fiscal policies are the key factors for sustainable growth and macroeconomic stability which are integral elements for a credible public administration. Since the credit rating shows both macroeconomic stability and effectiveness of existing programs, these indicators can be regarded as measures of the success of public administration as well as indicators of political stability.

The most important contribution of a country's government to increase savings and ensure growth is to ensure macroeconomic stability. Economic growth is particularly important in terms of employment rate increases and improving public spending, income and deficit. Furthermore, when we look at the findings of our study, mainly unemployment, savings and growth are shown to be statistically significant determinants in most of the scenarios.

The fiscal policy is the main policy area addressed by credit rating agencies. As Nye (2014) pointed out, fiscal policy provides a better gauge of future credit developments separated from other macro parameters. Fiscal policy indicators, namely budget expenditures and debt, are also statistically significant in this study, particularly in the near and far estimates, thus reflecting future credits of the counties and deviation scenarios. As said before, governance issues have a direct impact on sovereign ratings because their presence or absence affects the ability and willingness of a government to pay its debts (Nye, 2014). Governance related issues like transparency, quality of institutions, the fight against corruption and democratization processes play an important role in the medium and long term assessments of credit rating agencies, but this can only be observed in the medium and long term. However, in this study we looked at the framework of the macro parameters that we thought would be more effective in the short-term. Furthermore, good governance issues should be addressed in subsequent studies as a separate research topic.

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