DETERMINANTS OF SUB-SOVEREIGN GOVERNMENT RATINGS IN EUROPE

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Abstract

The aim of this paper is to identify the determinants of the rating assigned to sub-sovereign entities in Germany, Austria, Belgium, France, Italy and Spain, using a total of 92 territorial entities for the 1989-2012 period. Multinomial ordered probit estimation models were estimated for each specification and agency.

We conclude that the country's rating is one of the most important determinants of regional government's ratings with a positive influence (as expected), and that the country debt/GDP ratio is a stronger determinant for regions than their own indebtedness with a negative sign. Other relevant variables are population growth rate, unemployment rate, elderly people weight, regional public expenditure weight and size. Additionally, economic variables, such as country's rating and population growth are more important to Fitch; whereas budget variables and size variables are more relevant to Moody's. Debt variables and elderly people ratio are more important to S&P.

Keywords: rating, sub-sovereign entities, multinomial ordered probit, international financial markets.

1. Introduction

The role played by ratings in the capital market is fundamental given that, in theory, in the savings-investment flow they minimize information costs when making decisions. Moreover, they solve agency problems as it incentivizes the provision of safe and reliable information to decrease uncertainty and thus reduce the risk premium demanded by investors. With decreasing information costs, in theory, rating agencies improve the efficiency of capital markets (Wakeman, 1984). Furthermore, Lane (1993) shows that the presence of rating agencies enhances issuers' markets discipline because of the precise and transparent information they provide, and according to Liu and Thakor (1984) and Kliger and Sarig (2000), they give additional information that would have not been provided in another manner. Of the more than 130 existing agencies, the three most well-known (Moody's, Standard and Poor's (S&P) and Fitch) have a market share of 94%, according to Lannoo (2010).

At least 77% of the sub-sovereign governments in the six countries of the study (Austria, Belgium, France, Germany, Italy and Spain) have had one rating among the three most well-known credit rating agencies. Firstly, this requirement is explained because many have been borrowing from capital markets; and secondly, in the access to derivative and loan contracts, rating is needed. In these contracts, some banks have included rating trigger clauses, being able to require the early termination or redemption of the contracts if the rating was below a certain minimum rating.

Due to these circumstances, downgrades from credit rating agencies may have a huge impact for sub-sovereign governments increasing interest payments, reducing or restricting the access to capital markets or large sums of money due to loan early redemptions. Therefore, actually it is important for these sub-sovereign governments to know the more sensitive and relevant variables, credit rating agency comparison, and the existence of country bias in the rating decision. Unlike other articles that include sub-sovereign governments, the present article, using a total of 92 territorial entities for the period 1989-2012, focuses only on European countries with the aim of identifying the determinants of the rating assigned to sub-sovereign entities in Germany, Austria, Belgium, France, Italy, and Spain.

Furthermore, we analyze the extent to which the models approach the real data. Within this context, the focus of this article is centered on the analysis of sub-sovereign governments' ratings for a group of European countries characterized by different institutional frameworks and stark differences in terms of fiscal decentralization. The fact that this decentralization process towards regions has been underway for some time guarantees an analysis of whether or not agency ratings have been correct. Simultaneously, in a situation of economic crisis, the role played by rating agencies has changed with respect to previous, more stable periods. The analysis of sub-sovereign governments' ratings allows us to identify how credit ratings have varied and whether the influence of a modification in a country's rating is decisive with respect to its corresponding sub-sovereign entities. Therefore, the identification of the explanatory variables of the rating and, closely related, the correspondence between

the estimated ratings and the ratings actually assigned by agencies constitute a key element for understanding the role of agencies in the capital markets of European sub-sovereign governments.

The paper is structured as follows. Section 2 reviews the existing financial literature about the determinants of ratings. In Section 3, we describe the ratings given to sub-sovereign entities in Europe. In Section 4, we describe the specifications of the rating based on a set of explanatory variables. In Section 5, the results of the rating estimates are explained. In Section 6, we compare the deviations between the actual ratings and the estimated ratings by country and agency. In Section 7, we explain marginal effects of the fourth specifications for each agency. In Section 8 we summarize the main conclusions.

2. Literature review

The literature about ratings has attempted to link the effect of ratings with the spread (Reisen and Maltzan, 1999), to verify the independence of the rating agencies' decisions (Gande and Parsley, 2004), to find spill-over effects (Rigobon, 2002), to analyze the existence of the pro-cyclicality (Gaillard, 2014), or to obtain the rating's determinants (Cheung, 1996; Afonso, 2003; Venneri, 2009). In the context of developing countries, Monfort and Mulder (2000), using a sample of 20 emerging countries in the period 1994-1999, show that credit ratings have a degree of inertia and follow a random walk in an error correction model, and the lagged variables of debt related to export and growth of exports contribute to current ratings. Mulder and Perrelli (2001), using panel data for 25 countries, including emerging markets, find that in the period 1991-1999, the investment level related to the GDP is the only significant factor.

Afonso (2003) concludes that significant variables include GDP per capita for developed countries, and that external debt plays an important role in developing countries. Subsequently, Afonso, Gomes and Rother (2009) use an ordered multinomial probit model with panel data from 66 countries in the period 1996-2005 to conclude that the significant variables are GDP per capita, GDP growth, debt, fiscal result, external debt, unemployment rate, inflation, current account balance, reserves, government efficacy and a default experience. Mellios and Paget-Blanc (2006) use an ordered multinomial logit model with data from 86 countries from Moody's, S&P and Fitch to conclude that the variations in ratings are due to GDP per capita, GDP growth, inflation, the exchange rate, history of defaults, the corruption index, and the quality of government management.

More recently, Afonso, Gomes and Rother (2011) studied the determinants of global sovereign debt ratings, and their results indicate a good performance of the estimated models across agencies and time. Furthermore, Afonso and Gomes (2011) have concluded that fiscal imbalances are reflected in the sovereign debt notations.

In the European context, Afonso, Furceri and Gomes (2012) use daily data on EU sovereign bond yields and CDS spreads to conduct an event study analysis on the reaction of government yield spreads before and after announcements from rating agen-

cies. Their results show significant responses of government bond yield spreads to changes in rating notations and outlook, particularly in the case of negative announcements. Gaillard (2014) provides an analysis of sovereign ratings, including the recent default of Greece and concludes that credit ratings are more stable than market-based indicators, which means that their pro-cyclical role could have been much sharper. In the same year, Afonso, Gomes and Taamouti (2014) examined EU countries from 1995 until 2011; they used sovereign ratings established by the rating agencies S&P, Moody's and Fitch concluding that rating upgrades do not have any significant effect on volatility, but sovereign downgrades increase bonds volatility after two lags.

In the area of sub-sovereign governments, there are a few published studies regarding the determination of ratings. Outside the US, Cheung (1996) uses an ordered multinomial probit model for nine Canadian provinces between 1969 and 1995 to conclude that the debt/GDP ratio, employment rate, provincial GDP, federal transfers, and provincial revenues can significantly explain the variations in ratings. Sabourin (1999) employs a logit model for the Canadian provinces and is able to predict 63% of the ratings by S&P for the period 1976-1995. Subsequently, García-Romo, Ibarra-Salazar and Sotres-Cervantes (2005) implement ordered multinomial logit and probit models with the Fitch rating as the dependent variable for Mexican states for the period 2000-2003; they conclude that debt/GDP, current expenditures, and primary expenditures negatively affect the rating and that budgetary savings, investment expenditures, and variables representing the social and welfare situation positively affect the rating.

Venneri (2009 and 2010) conducts a study of risk valuation for local Italian entities in the period 2004-2008 using an ordered multinomial probit model with data from Moody's, S&P and Fitch. This paper intends to continue this line of research by performing a study of sub-sovereign entities at European level.

3. The ratings of sub-sovereign governments in Europe

European sub-sovereign governments in the considered countries represent a total of 92 territorial entities. As a whole, 77% currently have or have had at least one rating assigned by one of the three largest credit rating agencies, and 35% have been assessed by more than one, a percentage considered high as far as sub-sovereign governments are concerned. Nevertheless, this global number hides certain asymmetries when delving into matters at the country level.

The use of ratings is common in regional European governments (Table 1), with the exception of France, where only 42.3% have had an assessment performed at least once, with 35% of regions currently having at least one rating.

More asymmetries are observed upon comparing the regions with more than one rating. Italy and Spain are clearly the countries where regions have more ratings by agencies (13 and 9 regions respectively) when compared to sub-sovereign governments from other countries. There are some explanations that may justify the extensive use of ratings.

Table 1: Regions with ratings by Moody's, S&P, and Fitch

Country	Number of regions	Regions with rating in 2012	Regions with rating in any time	Regions with more than one rating
Germany	16	10	12	6
Austria	9	7	8	2
Belgium	3	3	3	1
France	26	9	11	1
Spain	17	16	16	9
Italy	21	20	21	13
Total	92	65	71	32

Source: Own elaboration

Currently, the assessment of European sub-sovereign entities by rating agencies differs significantly depending on the country. Fitch assesses sub-sovereign entities with greater proximity to the reference country and regardless of the particular country. This agency, for example, considers AAA all German *Landers* as their own sovereign. Additionally, Fitch accounts for the fact that the Spanish Autonomous Communities have a minimum rating of BBB-, i.e., they have an investment grade rating just two notches below their national level[1]. However, in this case, Moody's and S&P differ from Fitch as the dispersion of the ratings, when compared to the sovereign, is much greater, even after the implementation of various instruments at the centralized levels by the Spanish government to avoid default and to strengthen the institutional framework[2] (Table 2).

Table 2: Comparison of regional ratings and regional country ratings between agencies

Countries	Germany	Austria	Belgium	France	Spain	Italy
Max reg Moody's	Aaa	Aaa	Aa1	A1	Baa2	A3
Min reg Moody's	Aa1	A1	A1	A1	B1	Baa3
Country Rating Moody's	Aaa	Aaa	Aa3	Aa1	Baa3	Baa2
Max reg S&P	AAA	AA+	AA	AA+	BBB+	BBB+
Min reg S&P	AA-	AA+	AA-	AA-	BB-	BBB-
Country Rating S&P	AAA	AA+	AA	AA+	BBB-	BBB+
Max reg Fitch	AAA	-	AA	AAA	BBB+	A
Min reg Fitch	AAA	-	AA	AA-	BBB-	BBB
Country Rating Fitch	AAA	AAA	AA	AAA	BBB	BBB+

Source: Own elaboration

Regarding the variability of ratings, we observe that with the financial and sovereign crises, these downward rating variations have become more common and have

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1 Catalonia is an exemption to the investment grade floor by Fitch because of the independence process.

2 Specifically, these instruments refer to the Instituto de Crédito Oficial (ICO) ad-hoc lines in 2012, the fund for financing repayment to suppliers, the Autonomous Liquidity Fund, and the new Organic Law of Budgetary Stability and Financial Sustainability (Law no. 2/2012). In this context, the rating of B1 by Moody's or BB- by S&P for the Generalitat Valenciana is surprising.

intensified both in the number of downgrades and the notches, affecting almost exclusively Italy and Spain. In some cases, the downgrades are caused by sovereign downgrades, which would demonstrate a certain positive correlation between both entities, and in other cases, the downgrades are due to the repayment capacity problems of the sub-sovereign entity itself.

In general, the ratings have been very stable over time in sub-sovereign governments in Europe as the average duration of ratings for the three agencies is 6 years; nevertheless, durations vary greatly among countries. In Spain and Italy, on average, the ratings are maintained for 2 or 3 years. This length of time is influenced by continued ratings downgrades in these countries' regions during the last economic crisis and due to the effects of the ratings downgrades of the corresponding sovereign.

4. Rating assignment model specifications

The probit model explains the probability that a credit rating is assigned to a sub-sovereign government as a function of explanatory variables. It is constructed on the basis of the existence of a non-observable continuous variable (Y), which is a linear function of explanatory variables (X) with a vector β and an error ε. It is calculated according to the following expression:

$_{jt}$, where the variable Y_{jt} is the non-observable dependent variable of a sub-sovereign entity j at moment t, which depends on the values of the explanatory variables x_{jt}, thus establishing the observed ratings of the sub-sovereign entity corresponding to values from 1 to 21.

The use of a discrete dependent variable in this specification leads to the use of models with an ordered multinomial logistic function (logit) or with a normal distribution (probit)[3]. Taking into account the fact that ratings are assessments ordered by the repayment capacity of financial obligations on the respective expiry dates, and that they are expressed by a combination of letters, numbers, and signs, this naming is transformed into a numerical order, with the best assessment (Aaa/AAA) being 21 and the lowest, i.e., D or C, being 1.

The independent variables that are included are those that are potentially considered for the ratings assessments by agencies. These variables are grouped into:
  – Demographic variables: given that they could affect the rating on the expenditure side or for the existence of economies of scale;
  – Economic variables: these reflect the core variables which allow the sustainability of the public finances and the level of solvency;
  – Debt and Deficit variables: these are related with the capability to repay the debt. The greater the debt and the deficit, the lower capability to redeem the debt, and therefore weaker level of solvency;
  – Rating variables: the variable representing the rating assigned by the same agency to the country in question which reflect the country's influence on the regions.

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3 The estimations have been performed using the STATA 12 program.

Table 3: Independent variables

Variables	Name (sign)	Description
Demographic variables	POPGROWTH (-)	Annual population growth rate.
	POP64A(-)	Population over 64 years of age compared to the total population.
	DENSCOMP (?)	Population density of each region in relation to that of the country.
	SIZEPOP (-)	The relative size of a region within a given country is the weight of the region's population in relation to total country population.
Economic variables	GDPGROWTH (+)	Annual GDP growth rate.
	UNEMP (-)	The unemployment rate.
	PPPREGION (+)	GDP per capita of each region in terms of PPP (Purchasing Power Parity) compared to the European Union mean.
	GAPCOUNTRY (+)	The difference between the GDP growth of the country and its potential growth estimated by the European Commission.
	GAPBIN (+)	A binary variable of 1 if GAP is positive and 0 otherwise.
	GAPCOUNTRYBIN (+)	A binary variable of 1 if GAPCOUNTRY is positive and 0 otherwise.
Debt and deficit variables	DEBTIC (-)	The ratio of the direct debt stock of a region to operative revenues.
	VARDEBTIC (-)	The variation in the direct debt of a region compared to operative revenues.
	DEBTSTATEGDP (-)	The country's debt/GDP ratio.
Rating variables	RATINGCOUNTRYN (+)	The rating assigned by the same agency to the country in question.
Budgetary variables	CAPITALINC (-)	The ratio of total capital expenditures not financed by capital revenues divided by the operative revenues of the region.
	NFCETE (-)	The ratio of operative expenditures, excluding interest payments, and the total expenditures of each region.
	SAVEBEFINT (+)	The ratio of primary operative balance to operative revenues.
	SAVEINT (+)	The ratio of primary operative balance to interest payments, i.e., interest coverage.
	EXPENDGDP (-)	The ratio of the total expenditure of a region to regional GDP.
Politics and countries dummies	MAJOR (+)	Variable equal to 1 in the presence of absolute majority in a region and 0 in the absence of absolute majority.
	RIGHT (+)	Variable equal to 1 for conservative governments and 0 for non-conservative governments.
	IDENT (+)	Variable equal to 1 in cases where the government of the region coincides with the political affiliation of the central government and 0 where it does not.
	GER (?)	Dummy variables for German *Landers.*
	AUS (?)	Dummy variables for Austrian *Landers.*
	BEL (?)	Dummy variables for Belgian regions.
	FRA (?)	Dummy variables for French regions.
	ITA (?)	Dummy variables for Italian regions.

Source: Own elaboration

– Budgetary variables: we have considered variables which generate additional pressure on the expenditure side and then a weaker solvency as the ratio of total capital expenditure not financed by capital income divided by the operative revenues of the region or the ratio of the total expenditure of a region to regional GDP. We have also considered the variables which reflect a greater or smaller margin of maneuver and therefore a stronger or weaker credit risk as the ratio of operative expenditures, excluding financial costs and the total expenditures of each region;

– Politics dummies: according to the economic literature, there is a potential influence on the budget performance depending on the government stability and the color of the government; and

– Country dummies: these variables try to identify both the different strength of the national institutional frameworks and the biases generated by rating agencies which cannot be explained through the other variables considered.

Furthermore, there is no potential endogeneity between regional rating and country variables (including country's rating). The state variables influence the assignment of the regional rating but not vice versa. The main reasons are two: first, in every country the sovereign rating is a limit, in general, for the regional rating; and, second, the credit rating agencies take into account the country's rating for the regional rating decisions.

5. Results of the ratings estimates

We estimate the best 4 models for each agency. In model 1, we include the dummy variables COUNTRY and the country's rating (RATINGCOUNTRYN); in model 2, the country's rating is included (RATINGCOUNTRYN) without the COUNTRY dummy variables; in model 3, the COUNTRY variables are present. Furthermore, we estimate a fourth specification, using the same variables for each agency in order to be more comparable among them. The results are in Table 4.

First of all, we found the variable of country rating (RATINGCOUNTRYN) significant for each agency in the 3 estimates and positive, as expected. Thus, a better country rating has a positive effect on the regional rating. Moreover, country variables (GER, FRA, AUS, ITA, BEL) are significant for each agency as there is a positive or negative effect in the rating as a function of the country to which the region belongs, regardless of the credit rating of the country. It shows the positive bias in the assessments by rating agencies for German and Austrian Landers and French Regions unexplained by other variables.

Regarding the demographic variables, the coefficient of annual growth rate of the population (POPGROWTH) is significant and negative in the majority of estimates, as expected, because demographic pressure can weaken the solvency of a region due to rigidities or the lack of revenue adjustments. In the case of S&P and Fitch, the density compared to country density (DENSCOMP) is significant in some specifications and has a positive sign. The expected sign is undetermined, and the positive sign means

Table 4: Estimation results for the rating agencies

	Moody's 1	Moody's 2	Moody's 3	Moody's 4	S&P 1	S&P 2	S&P 3	S&P 4	Fitch 1	Fitch 2	Fitch 3	Fitch 4
RATINGCOUNTRYN	0.686***	0.707***	-	0.735***	0.678***	0.768***	-	0.774***	0.503***	0.783***	-	0.769***
GER	2.349***	-	2.935***	-	1.736***	-	2.401***	-	-	-	-	-
AUS	-	-	1.337***	-0.865***	-	-	0.579***	-0.825***	-	-	-	-
BEL	-1.049***	-	-	-1.706***	-0.798**	-	-	-1.093***	-	-	-	1.528*
FRA	2.257***	-	2.671***	0.687**	1.917***	-	2.230***	1.259***	-2.029***	-	-4.436***	-0.137
ITA	-0.416**	-	1.391***	-0.911***	-1.557***	-	-1.081***	-1.574***	-1.679***	-	-4.817***	-1.211***
ESP	-	-	-	-	-	-	-	-	-4.230***	-	-7.612***	-
POP64A	0.078***	0.049**	0.033*	0.055***	0.096**	0.0750***	-	0.082***	-	-	-	-0.036
POPGROWTH	-0.146**	-0.358***	-	-0.392***	-	-0.271***	-0.112	-0.252***	-0.590***	-0.908***	-0.338***	-0.975***
SIZEPOP	0.063***	-	0.071***	0.058***	0.042***	0.040***	0.034***	0.038***	-	-	-0.069***	-0.036***
DENSCOMP	-	-	-	-	0.0003***	-	0.0004***	-	-	-	0.001***	-
GDPGROWTH	-	-0.061**	-	-	-	-0.096***	0.076***	-	-0.066**	-0.191***	-	-
PPPREGION	0.023***	-	0.016***	0.024***	0.021***	0.022***	0.015***	0.023***	0.030***	0.024***	0.028***	0.026***
UNEMP	-0.126***	-0.113***	-0.133***	-0.126***	-0.082***	-0.061***	-0.115***	-0.083***	-0.102***	-0.119***	-0.114***	-0.137***
DEBTIC	-0.007***	-0.002***	-0.005***	-0.002***	-0.018***	-0.012***	-0.018***	-0.013***	-0.004***	0.006***	-0.012***	0.006***
VARDEBTIC	-	-0.009*	-0.008	-	0.016***	0.010**	0.014***	-	-	-	-	-
DEBTSTATEGDP	-	-0.017***	-0.036***	-	-	-0.024***	-0.022***	-	-0.057***	-0.015***	-0.073***	-
GAPCOUNTRY	-	-	-	-	-	0.097***	-	-	-	0.192***	-	-
GAPCOUNTRYBIN	-	-	-	-	-	-	-	-	-	-	-	-
GAPBIN	-	0.230***	-	-	-	-	-0.349***	-	-	-	-0.339***	-
SAVEBEFINT	0.013**	0.027***	0.012*	0.014**	-	0.007*	0.025***	-0.019***	0.018***	0.021***	0.013*	0.013**
SAVEINT	-	-0.020**	0.035***	-0.009	0.027***	0.020***	-	0.027***	-	-	-	-0.023**
CAPITALINC	-0.012***	-0.006	-0.017***	-	-0.013***	-	-0.018***	-	-	-	-	-
NFCETE	-	-	-0.024***	-	-	-	-0.014	-	-	-	-	-
EXPENDGDP	0.077***	0.050***	0.056***	0.068***	0.054***	0.016**	0.039***	0.048***	0.098***	0.082***	0.086***	0.087***
MAJOR	0.445***	-	0.294**	-	-0.656***	-0.586***	-0.661***	-	-	-	-	-
IDENT	-0.149	-0.209**	-0.240***	-	-0.217**	-0.339***	-0.222	-	-0.370***	-0.105	-0.365***	-
RIGHT	-	-	-	-	-	0.147	-	-	-	-	-	-
LR chi2 (16)	1192.47	1080.28	970.11	1067.34	1039	968.22	873.55	974.68	973.24	860.03	956.43	861.1
Prob>chi2	0	0	0	0	0	0	0	0	0	0	0	0
loglikelihood	-768.148	-824.24	-879.32	-822.32	-665.903	-701.311	-748.645	-698.08	-387.48	-444.09	-395.885	-443.55
PseudoR²	0.437	0.395	0.355	0.387	0.438	0.408	0.368	0.411	0.556	0.491	0.547	0.492
Num obs	676	676	676	676	611	611	611	611	528	528	528	528

Note: *** significant 99%; ** significant 95%; * significant 90%

Source: Own elaboration

that higher density leads to lower expenditure pressure and is therefore a positive influence on the rating. The population over 64 years (POP64A) is significant and has a positive sign, which is contrary to what was expected, given that an aged population generates more healthcare and social services expenditures, therefore increasing total expenditure and net borrowing. This phenomenon may be explained because the most aged European countries, such as Germany, have better ratings.

Furthermore, for Moody's and S&P, the region's size, defined in terms of population (SIZEPOP), is significant and positive, meaning that the size of a region implies more diversification and economies of scale in expenditure, which is a positive factor for obtaining a better rating. Meanwhile, this variable for Fitch has a negative sign.

Economic variables are also significant in the models. Income per capita in terms of PPP (PPPREGION) is very significant and positive, as was expected (higher levels of a region's population income imply better ratings from agencies). The unemployment rate (UNEMP) is also significant and negative, as expected; this means that higher levels of unemployment imply worse credit ratings. However, GDP growth (GDPGROWTH) is significant in some estimates but has a negative sign, contrary to what was expected, which may reflect the fact that countries with lower GDP growth have a lower potential growth rate due to lower labor participation rates. However, in other estimates, the sign is positive, as expected.

In the case of the ratio of debt stock to current revenues (DEBTIC), the relationship is significant with a negative sign; in the case of the ratio of debt variation to current revenues (VARDETIC) is significant in only 1 estimation, at 90% with a negative sign by Moody's and significant with a positive sign in the 3 S&P specifications. This result indicates that higher levels of debt lead to lower solvency and negatively affect the rating awarded by the 3 rating agencies considered.

Regarding the potential external influence of the country's debt level on the ratings of its regions (DEBTSTATEGDP), we confirm this influence to be significant and with a negative sign, as was forecasted. In other words, a higher level of country's debt/GDP generates a negative effect on the ratings of the country's regions, regardless of their indebtedness and deficit.

Another analysis focused on whether each of the rating agencies performs assessments taking into account the cyclical position, as they state repeatedly (through the cycle). Of the three estimates from Moody's, in only one estimation there is evidence of significance that the economic cycle can impact the determination of the rating. The dummy GAPBIN has a positive sign. For S&P and Fitch, a variable such as GAP-COUNTRY (the difference between the GDP growth of the country and potential growth) is significant and positive.

Of the theoretical budgetary variables, 5 are significant for Moody's, 4 are significant for S&P, and 2 are significant for Fitch. The ratio of primary balance to current revenues (SAVEBEFINT) is significant in 10 specifications with a positive sign (with the exception of one S&P specification), as was expected given that a better current result leads to a better rating. The ratio of the volume of capital expenditures not

financed with capital revenues to current revenues (CAPITALINC) is significant in 4 estimates, and has a negative sign, as was forecasted, because more pressure to conduct investment weakens solvency and, consequently, the rating. Regarding the weight of current non-financial expenditures on total expenditures (NFCETE), the variable is significant in a specification, and has a negative sign, as was assumed, as the greater weight of current expenditures implies a smaller margin for maneuvering and therefore more weakness and a lower rating. However, the budgetary variable relating primary balance[4] with financial expenditures (the so-called interest coverage – SAVEINT) is significant and positive in almost all specifications. The expected sign is positive because more interest coverage is positive for solvency, and therefore should always positively influence the rating.

Regarding the weight of public expenditure in the region (EXPENDGDP), this variable is relevant and has a positive sign in the 12 estimates. The explanation to this fact is that if the scope of the study corresponded to one country only, with a sole institutional framework, then the sign should be negative; however, given that we are studying different economies that have heterogeneous expenditure structures, obtaining a positive sign is not unusual given that the greater the expenditure over GDP is the better the rating can be, provided that the earning structure covers the exerted competencies. In short, the region would be better considered.

Finally, for political variables, having an absolute majority (MAJOR) is a significant variable in the specifications, with a positive sign for Moody's and a negative sign for S&P. Absolute majority implies greater government stability and therefore should positively influence the rating.

6. Comparison of estimated ratings to actual ratings

Once the estimations of the ratings have been performed, it is interesting to analyze the extent to which the models have approached the real data. Hence, a comparison is made between the actual ratings, which have been given by the 3 main agencies, and the implicit rating obtained by the estimate. With that aim, our study focuses on calculating the degree of undervaluation or overvaluation reached, the proportion of issuances in which the external and the implicit ratings do not match, and among this latter category, those that are justified because their variation does not exceed 10% (Table 5).

Overvaluation exists when the implicit rating is less than the rating given by rating agencies; undervaluation exits when it is otherwise. The results are grouped by countries, which are composed of different sub-sovereign debt issuers. The analysis within each country is divided by agencies to facilitate comparison.

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4   Primary operating balance is defined as net operating balance plus net interest expense.

Table 5: Deviations between the actual rating and the implicit rating by country and agency

Country – agency	% undervalued	% overvalued	% Difference	% probability
Germany – Fitch	0	0.50	0.50	-
– Moody's	22.80	14.79	37.48	19.00
– S&P	16.80	17.10	33.90	16.80
Austria – Moody's	33.33	52.99	61.54	5.60
– S&P	21.60	5.10	26.70	37.00
Belgium – Fitch	36.10	19.40	55.60	20.00
– Moody's	38.50	26.90	65.40	21.60
– S&P	26.90	15.40	42.30	21.21
Spain – Fitch	21.00	18.70	39.60	17.80
– Moody's	31.70	26.81	58.51	22.30
– S&P	21.79	18.97	40.77	21.38
France – Fitch	21.80	25.00	46.80	12.87
– Moody's	41.03	26.15	67.18	29.00
– S&P	34.10	30.40	64.50	17.61
Italy – Fitch	33.30	20.00	53.30	28.65
– Moody's	28.35	27.21	55.56	26.15
– S&P	34.19	23.08	57.26	23.13

Source: Own elaboration

When we differentiate the results by country, we observe that the ratings given to the German regions are those in which the actual and the implicit ratings are closer, with only 0.5% mismatched in the case of Fitch and increasing to a difference of 37.48% and 33.9% for Moody's and S&P, respectively. The result means that the ratings belonging to the German Landers' issuances are more reliable because they adjust to their theoretical level. By contrast, we can find the French sub-sovereign issuers because, in the case of Moody's and S&P, more than 60% of the actual ratings of their issuances do not match the implicit credit rating, and in the case of Fitch, the percentage decreases to 46.8%. The other countries are closer to the French case than to the German one because, in more than 50% of the observations, they exhibit differences between the actual rating and the implicit rating. In sum, this implies that the model does not reflect the reality for most countries very well, finding more undervalued issuances rather than overvalued, overall.

7. Marginal effects of the estimates

The marginal effects allow us to know the elasticities of the variation of the probability of a specific rating related with the variation of each independent variable, for each given rating. Furthermore, through the marginal effects it is possible to determine which variables are more influential on changes in ratings for each rating agency.

Analyzing the marginal effects of the fourth specification for each rating agency (Tables 6, 7 and 8) we can see that the improvement in 1 notch of the country's rating increases by 11.01% the probability of maintenance in Aa2 for the regions rated Aa2 by Moody's; or the increase by 10% of the PPPREGION, reduces by 6.1% the probability of maintenance in AA for the regions rated AA by S&P, and therefore increases the probability of an improvement of the rating; or the increase by 10% of the DEBTIC rises the probability by 3% to remain in the same rating (AA).

Table 6: Marginal effects for Standard & Poor's

	AAA/Aaa	AA+/Aa1	AA/Aa2	AA-/Aa3	A+/A1	A/A2	A-/A3
RATINGCOUNTRYN	26.20%	-2.07%	-20.11%	-3.96%	-0.06%	-0.001%	0.000%
BEL	-23.97%	-11.15%	23.78%	10.93%	0.39%	0.008%	0.001%
FRA	45.67%	-18.24%	-24.11%	-3.28%	-0.04%	0.000%	0.000%
ITA	-37.34%	-11.07%	33.12%	14.70%	0.57%	0.012%	0.001%
POPGROWTH	-5.52%	0.44%	4.24%	0.83%	0.01%	0.000%	0.000%
POP64A	3.72%	-0.29%	-2.85%	-0.56%	-0.01%	0.000%	0.000%
SIZEPOP	1.38%	-0.11%	-1.06%	-0.21%	0.00%	0.000%	0.000%
PPPREGION	0.80%	-0.06%	-0.61%	-0.12%	0.00%	0.000%	0.000%
UNEMP	-2.34%	0.19%	1.80%	0.35%	0.01%	0.000%	0.000%
DEBTIC	-0.38%	0.03%	0.30%	0.06%	0.00%	0.000%	0.000%
SAVEBEFINT	-0.44%	0.03%	0.34%	0.07%	0.00%	0.000%	0.000%
EXPENDGDP	1.55%	-0.12%	-1.19%	-0.23%	0.00%	0.000%	0.000%
SAVEINT	0.78%	-0.06%	-0.60%	-0.12%	0.00%	0.000%	0.000%

Source: Own elaboration

Table 7: Marginal effects for Moody's

	AAA/Aaa	AA+/Aa1	AA/Aa2	AA-/Aa3	A+/A1	A/A2	A-/A3
RATINGCOUNTRYN	1.66%	15.91%	11.01%	-18.26%	-8.26%	-1.94%	-0.116%
BEL	-0.98%	-15.61%	-26.36%	2.89%	23.68%	13.93%	2.300%
FRA	2.91%	16.99%	4.96%	-18.42%	-5.35%	-1.04%	-0.052%
ITA	-1.44%	-14.64%	-12.36%	15.89%	9.60%	2.74%	0.207%
POPGROWTH	-0.76%	-7.26%	-5.02%	8.33%	3.77%	0.89%	0.053%
POP64A	0.16%	1.54%	1.07%	-1.77%	-0.80%	-0.19%	-0.011%
SIZEPOP	0.13%	1.21%	0.84%	-1.39%	-0.63%	-0.15%	-0.009%
PPPREGION	0.06%	0.54%	0.37%	-0.61%	-0.28%	-0.07%	-0.004%
UNEMP	-0.26%	-2.49%	-1.73%	2.86%	1.29%	0.30%	0.018%
DEBTIC	0.00%	-0.03%	-0.02%	0.04%	0.02%	0.00%	0.000%
SAVEBEFINT	0.04%	0.40%	0.28%	-0.46%	-0.21%	-0.05%	-0.003%
EXPENDGDP	0.15%	1.42%	0.98%	-1.63%	-0.74%	-0.17%	-0.010%
SAVEINT	-0.02%	-0.18%	-0.12%	0.20%	0.09%	0.02%	0.001%

Source: Own elaboration

Table 8: Marginal effects for Fitch

	AAA/Aaa	AA+/Aa1	AA/Aa2	AA-/Aa3	A+/A1	A/A2	A-/A3
RATINGCOUNTRYN	23.68%	6.82%	-22.71%	-7.41%	0.17%	-0.02%	-0.001%
BEL	55.52%	-8.14%	-42.20%	-5.00%	0.08%	-0.01%	0.000%
FRA	-4.07%	-1.33%	3.89%	1.43%	0.22%	0.00%	0.000%
ITA	-27.94%	-13.87%	20.89%	18.82%	0.98%	0.17%	0.015%
POPGROWTH	-30.03%	-8.65%	28.80%	9.40%	0.21%	0.02%	0.001%
POP64A	-1.12%	-0.32%	1.07%	0.35%	0.02%	0.00%	0.000%
SIZEPOP	-1.11%	-0.32%	1.06%	0.35%	0.01%	0.00%	0.000%
PPPREGION	0.80%	0.23%	-0.77%	-0.25%	0.01%	0.00%	0.000%
UNEMP	-4.22%	-1.22%	4.04%	1.32%	0.03%	0.00%	0.000%
DEBTIC	0.17%	0.05%	-0.16%	-0.05%	0.00%	0.00%	0.000%
SAVEBEFINT	0.41%	0.12%	-0.39%	-0.13%	0.00%	0.00%	0.000%
EXPENDGDP	2.69%	0.78%	-2.58%	-0.84%	0.02%	0.00%	0.000%
SAVEINT	-0.70%	-0.20%	0.68%	0.22%	0.01%	0.00%	0.000%

Source: Own elaboration

Calculating the standard deviation of the marginal effects for each variable and rating agency for all the outcomes of the specifications (Table 9), the most relevant variables are RATINGCOUNTRY (Country rating) and country variables. The other relevant variables are POPGROWTH, UNEMP, POP64A, EXPENDGDP and SIZEPOP.

Table 9: Standard deviations of marginal effects

	MOODYS	S&P	FITCH
RATINGCOUNTRYN	11.42%	13.61%	14.01%
BEL	16.87%	15.19%	28.74%
FRA	10.73%	22.40%	2.44%
ITA	10.96%	21.72%	17.15%
POPGROWTH	5.21%	2.87%	17.77%
POP64A	1.11%	1.93%	0.66%
SIZEPOP	0.87%	0.72%	0.66%
PPPREGION	0.38%	0.41%	0.48%
UNEMP	1.79%	1.21%	2.49%
DEBTIC	0.02%	0.20%	0.10%
SAVEBEFINT	0.29%	0.23%	0.24%
EXPENDGDP	1.02%	0.80%	1.59%
SAVEINT	0.13%	0.41%	0.42%

Source: Own elaboration

Finally, we analyze for each rating agency which variable or group of variables are more important for the rating. For Fitch the economic variables (UNEMP and PPPREGION), the country rating (RATINGCOUNTRY) and POPGROWTH are more important whereas the budget variables – SAVEBEFINT, EXPENDGDP and size variable (SIZEPOP) are more important for Moody's. The debt variable (DEBTIC and POP64A) is more relevant for S&P than for the other agencies.

8. Conclusions

The role played by ratings has been fundamental for European regions seeking financing, especially on capital markets. The significant power of rating agencies is underpinned not only because investors find their opinions useful, but also because they are included in the regulations of various countries, in private contracts and in the investment policies of institutional and banking investors. The credit rating agency downgrades may have a huge negative impact for European sub-sovereign governments due to their relative high level of indebtedness and their use of the financial products.

To estimate the significant variables that affect agency ratings, data from Moody's and S&P from 2000-2012 and data from Fitch from 2001-2012 were used. Multinomial ordered probit estimation models were produced for each specification and agency, and the signs of the significant variables for the three agencies were considered. The dependent variable considered is the agency rating transformed into a numerical order variable, in which the best assessment (AAA/Aaa) is 21 and the lowest D or C is 1.

The first conclusion is that European sub-sovereign governments have to take into account the most determinant variables for the ratings, namely country ratings (RATINGCOUNTRY) and country variables, even if these are not under their direct control. It shows the strong influence that solvency and the national institutional framework has in their rating.

The second is that country variables have bias and therefore German and Austrian Landers and French Regions have better ratings, unexplained by other variables.

Third, budget, economic and debt variables are significant for the rating's decision, but more important variables are population growth rate, unemployment rate, elderly people weight, regional public expenditure weight and the size.

Fourth, the variables that explain the ratings of European sub-sovereign entities differ from one another, and depending on the credit rating agency chosen by European sub-sovereign governments these should focus more on some specific variables to prevent any downgrade. According to the estimates, Moody's is greatly influenced by political factors in determining ratings, giving higher ratings to regions that have governments with absolute majorities; however S&P penalizes this type of factor. This finding shows that the discrepancies in determining ratings transmit instability to market investors. Additionally, economic variables are more relevant to Fitch whereas budget variables or debt variables are more important to Moody's or S&P respectively.

The ratings of European regions have an average stability of 6 years, although in the case of Spain or Italy, the average stability is between 2 and 3 years due to the systematic downgrades of recent years, owing to the effects of the financial crisis. Political variables, such as absolute majority or a right-wing government, are also significant in the specifications, which leads to an improvement in ratings, while the fact that a region is ruled by the same party as the central government worsens the rating, perhaps due to more laxity in compliance with fiscal targets.

Fifth, regarding the difference between the specifications' explicit and implicit ratings, in general, they have a bias to be undervalued. That is, the implicit rating is superior to the explicit rating, and we can also find differences between the three agencies. On average, the Austrian *Landers* are very overvalued by Moody's and undervalued by S&P; by contrast, on average, Moody's undervalues the German *Landers* and S&P overvalues them.

Finally, despite the advances made, the role of agencies in rating assignments to European regions presents differences among them that are very significant. This circumstance has generated confusion in the market and has made difficult the consolidation of agencies, precisely at a time of strong market appeal.

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