THE ADJUSTMENT OF BANK RATINGS IN THE FINANCIAL CRISIS: INTERNATIONAL EVIDENCE

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The adjustment of bank ratings in the financial crisis: International evidence

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Abstract

This paper analyses the adjustment occurring in the ratings of the banks of the United States and the European Union as a result of the financial crisis. It uses a methodology that permits decomposition of the observed change in the rating into an effect associated with the change in the agencies' rating policies and into another effect associated with the banks' asset situation. The results obtained show that with the crisis there was a generalised fall in the ratings. This fall is due both to a worsening of the banks' asset situation and to the hardening of rating policies. Specifically, we find that in Fitch 79.66% and in Standard and Poor's 63.93% of the fall in the rating is due to a hardening of the rating policies, while in Moody's the steep worsening of the banks' asset situation is offset by a slight improvement in the rating criteria. These changes suggest a procyclical behaviour in Standard and Poor's and Fitch, and conversely a through the cycle behaviour in Moody's.

Key words: Rating, financial crisis, asset situation, rating criteria.

JEL classification: G21, G33.

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1. Introduction

The outbreak of the subprime crisis in 2007 and the subsequent sovereign debt crisis in Europe has increased the doubts regarding the behaviour of the three principal rating agencies (Fitch, Standard and Poor's and Moody's) and the quality of the ratings issued. Specifically, the rating agencies (CRAs) have been accused of relaxing their rating criteria during the period of economic growth up to the outbreak of the subprime crisis (Securities and Exchange Commission, 2008). Furthermore of this accusation the agencies have been criticised because of the conflicts of interest deriving from their business model, lack of transparency and excessive credibility given by investors and regulators (Bank of England, 2011). This is not new, as in the past several episodes have questioned the agencies' operation. First, in the Mexican crisis of 1994-1995, in which the rating agencies were blamed for reacting to the events that were occurring rather than anticipating them (Reisen and Maltzan, 1999). A similar criticism was made following the Asian crisis of the late 1990s (Ferri et al., 1999). Later, with the bankruptcies of Enron and Parmalat, the agencies were again in the firing line for having awarded these firms an investment grade rating in the days before their failure (Hill, 2004; Danvers et al., 2004).

In response to the criticisms received, the CRAs have defended themselves by arguing that their ratings are drawn up with a medium and long term perspective (through the cycle), and consequently ignore the transitory changes occurring in the solvency of the products that they assess, i.e. they do not issue ratings with a "point in time" perspective. In this context, numerous studies in the literature test whether indeed the rating agencies follow a "through the cycle" strategy or on the contrary a "point in time" strategy. These studies show diverse results. On the one hand, Altman and Rijken (2004 and 2006) find evidence in favour of the "through the cycle" strategy, whereas Bangia et al. (2002) and Salvador et al. (2014) find that ratings have a markedly procyclic character [1]. Despite defending these arguments it is true that with the financial crisis the CRAs have adjusted their criteria (International Monetary Fund, 2010).

These criticisms have also touched the regulators, who have been accused of assigning an excessive role to ratings and of performing an ineffective

[1] Other studies that demonstrate the procyclic character of ratings are: Catarineu-Rabell et al. (2005), Amato and Furfine (2004) and Zicchino (2006).

supervision of the rating agencies. In this sense, the International Organization of Securities Commissions (IOSCO) revised its code of conduct with the aim of increasing transparency, independence and competition among the rating agencies and of reducing the conflicts of interest deriving from their business model. But this has not been the only reform: in 2009 the European Parliament passed a new regulation (Regulation (Ec) No 1060/2009) compelling CRAs to register with the European Securities and Markets Authority (ESMA). In 2009, the Securities and Exchange Commission (SEC) in the United States also carried out a series of reforms imposing restrictions to the agencies to prevent the conflicts of interest deriving from their business model, as well as demanding greater transparency through publication of the rating methodologies and of the ratings issued. Lastly, the Basel Committee carried out a review of the role of the ratings issued by the rating agencies in the calculation of regulatory capital requirements (Sundmacher and Ellis, 2011).

With the financial crisis, at the same time as the CRAs adjusted their rating criteria and regulators carried out different reforms to strengthen their supervision, banks experienced a significant worsening of their financial situation (Laeven and Valencia, 2013; BCE, 2008a and 2008b). A worsening that has been characterised by the substantial reduction of profitability, undermining the capacity to generate capital. The collapse of the financial markets has meant an increase in the need for liquidity. In turn, the financial crisis has generated a loss of quality of credits and an increase in uncertainty, occasioning an increased cost of financing. All these circumstances caused serious problems in the banks with greatest liquidity needs, with over-dependence on the wholesale markets or real estate assets, especially in the banks with major exposure to structured products and/or sovereign debt of the peripheral countries of Europe. In response to these problems, between late 2008 and early 2009, some countries took substantial measures to rescue and restructure their financial sectors, including recapitalisation packages and the nationalisation of some financial entities (Laeven and Valencia, 2013).

Therefore, with the outbreak of the subprime crisis and the subsequent sovereign debt crisis in the peripheral countries of the European Union (Portugal, Ireland, Italy, Greece and Spain), bank ratings underwent a downward adjustment due both to the hardening of rating policies and to the

worsening of their asset situation. In this context, this paper has a dual aim. First, we analyse the adjustment occurring in bank ratings, quantifying the contributions of the change in policy rating, on the one hand, and the worsening of the asset situation, on the other. For this, following the methodology proposed by Salvador et al. (2014) for the case of the Spanish Banking System (SBS), we calculate the probability of a bank obtaining a certain rating as a function of the factors that the rating agencies describe in their methodological reports. On the basis of these results and by means of a prediction exercise the Rating Change Index (RCI) is calculated, to quantify the adjustment in the ratings, as well as the percentage of the latter that is due to the change in the asset situation and that derived from the hardening of the rating policies. Secondly, we determine whether the adjustment in the ratings has occurred with the same intensity in all banking systems or, on the contrary, there exist differences between the banks of the United States (US) and the European Union, and within the latter, between the PIGS and the non-PIGS. This permits us to determine, by groups of countries, whether the asset situation and the hardening of the rating policy at a general level have had the same relative importance in the adjustment of the ratings. This analysis uses the issuer ratings of a significant sample of United States and European Union banks, between the years 2004 and 2011.

The results obtained show that with the financial crisis in 2008 there is a generalised fall in bank ratings, the intensity of which depends on the CRA considered. On average, a fall of ratings is estimated in Fitch, Standard and Poor's and Moody's of 5.35%, 4.19% and 7.70%, respectively. This fall in Fitch and Standard and Poor's is due both to the worsening of the asset situation and to the hardening of rating policies. Specifically, in Fitch 79.66% of the fall is due to the hardening of the rating policy and 20.34% to the worsening asset situation. In Standard and Poor's, 63.93% is due to the hardening of the rating policy and 36.07% to the worsening of the solvency level. In Moody's, on the contrary, the whole of the fall in ratings is explained by the worsening of the financial asset situation of the banks evaluated, partly offset by the application of a more flexible rating policy. If this analysis is performed on the basis of the geographical area analysed, we find that, on average, ratings have worsened with greater intensity in US and the European PIGS due to the hardening of the

rating policy with the onset of the financial crisis. Consequently, these results suggest that although the financial crisis has led to a general hardening of rating policy, its relative importance in the downward adjustment of ratings varies depending on the group of countries analysed.

After this introduction, the structure of the paper is as follows. The second section briefly reviews the literature on modelling of bank ratings. The third section specifies the sample used and performs a descriptive analysis of the behaviour of ratings during the period analysed. The fourth section defines the methodology and the variables used on modelling bank ratings. The fifth section presents the empirical results, and finally, the last section presents the conclusions.

2. Literature on modelling of Bank Ratings

The literature on bank ratings has focussed on modelling and predicting ratings on the basis of various econometric techniques. In this sense, Poon et al. (1999) model the *Bank Financial Strength* Ratings of Moody's (*BFSRs*), which consider only the intrinsic solvency of the entities evaluated. For this, they use an ordered logit model and define a set of 100 factors that reflect the level of return, efficiency, risk, leverage and interest cover of the banks assessed. Using these models the authors achieve a percentage of correct predictions between 21% and 70%. Morgan (2002) also models bank ratings using ordered logit and probit models with the aim of determining the factors that explain the discrepancies between the different rating agencies when issuing ratings for financial entities. The results indicate that the discrepancies between the rating agencies are due to the opaqueness of the assets that define the bulk of the banks' balance sheets (loans and other financial assets). In this same line of research, Iannotta (2006) justifies that the discrepancies between the agencies in their evaluations of the banks are due to the opaqueness of the assets that define the bank's balance sheets. His results indicate that the opaqueness of financial entities increases with size and capital and on the other hand decreases with fixed assets.

Estrella (2000) studies the relationships among a set of financial ratios that measure the probability of default of the banks of the United States and the ratings of the debt issued by them, showing that the information available on

balance sheets predicts accurately enough the ratings of the banks' debt. Tabakis and Vinci (2002) model the bond ratings of 67 banks belonging to the European Union, USA and Japan, finding evidence that the ratings awarded by the three principal agencies (Standard and Poor's, Moody's and Fitch) depend on the information available in the balance sheets, the specialisation and the country to which the banks belong.

Other more recent studies in the literature have focussed on analysing the existence of heterogeneity among the ratings of the banks of different countries. Iannotta et al. (2008) assess the influence of the ownership structure of the banks in the EU on the issuer ratings of Standard and Poor's and on the individual and issuer ratings of Fitch using an ordered logit model. These authors find evidence that publicly owned banks receive a higher rating than other banks. Likewise, Peresetsky and Karminsky (2008) use an ordered logit model to identify the determinants of Moody's Foreign-currency long term Deposit Ratings (DR) and Bank Financial Strength Ratings (BFSRs). Their results indicate that Moody's does not consider only the internal factors of the banks associated with their financial structure, but also other external factors such as political risk. Consequently, this result shows the importance of considering the heterogeneity among the different countries when modelling bank ratings. In the same line, Bellotti et al. (2011), using an ordered logit model and the technique called Support Vector Machine (SVM), find evidence of the existence of differential effects associated with the country in which the bank ratings are issued. More recently, Caporale et al. (2011), using an ordered model and controlling for the specific effects of countries by introducing different intercepts, find evidence of significant differences between the ratings of banks belonging to the "new" countries and "old" countries of the European Union. Specifically, they find evidence that in general terms the latter banks receive a relatively higher rating than the former.

Shen et al. (2012) model the issuer ratings of Standard and Poor's, to determine the reason that the variation of ratings between countries even when the financial variables remain constant. The authors reach the conclusion that the significance of the explanatory factors on the modelling of bank ratings is influenced by the existence of different degrees of asymmetric information among the different banking systems. Thus, the banks of different countries

may have different ratings even though they present similar financial ratios. Öğüt et al. (2012) focus on modelling Moody's Bank Financial Strength Ratings in Turkey. For this, they use different econometric techniques; the Support Vector Machine (SVM), Artificial Neural Network (ANN), Multiple Discriminant Analysis (MDA) and logit techniques. These authors also find evidence of the importance of considering, on modelling bank ratings, the environmental variables that capture the heterogeneity between the banks of different countries.

Finally, other recent studies have focussed on analysing how the crisis has affected the behaviour of bank ratings. Packer and Tarashev (2011) perform a descriptive analysis of the effect of the crisis on the behaviour of the issuer and individual ratings awarded by the three principal CRAs (Standard and Poor's, Moody's and Fitch). Their results indicate that with the onset of the crisis the generalised fall in bank ratings occurs with greater intensity in the case of individual ratings. This shows the importance of considering external support when assessing the credit quality of the banks and consequently the issuer ratings. In this same line, Salvador et al. (2014) using an ordered probit model with random effects, model the issuer and individual bank ratings of the three principal rating agencies in the Spanish Banking System taking into account the possible effect of the crisis. These authors show that the principal factor explaining the adjustment in the ratings is the worsening of the asset situation, though the hardening of rating policies have a significant contribution. Specifically, they find that three quarters of the downward adjustment in the ratings is due to a worsening of the solvency level and one quarter to the hardening of the rating policy. It should be emphasised that considering a single banking system, as these authors do, has possibly two limitations. Firstly, they possibly do not consider some significant variables in the modelling of the bank ratings, as the CRAs indicate in their methodological reports, and which refer to the banking system in which the banks operate; for example, in the financial crisis, the changes in sovereign credit ratings, the level of public deficit and/or the rate of growth of the national GDP. Secondly, the consideration of a single banking system implies that all the banks are subject to the same shocks occurring in the economy. Consequently, this study analyses the impact of the financial crisis on the behaviour of bank ratings for a set of international banks.

3. Sample

The sample is formed by 337 international banks, corresponding to 21 countries (United States and 20 countries of the European Union) during the period from 2004 to 2011. The type of rating used is the issuer rating, which is considered a better indicator than the individual rating because it captures the total probability of default, taking into account both the banks' intrinsic solvency and the external support that they may receive in the event of insolvency. In order to capture the possible effect of the financial crisis, we consider only the banks for whom it has been possible to obtain ratings both in the period before and in the period of financial crisis. The first year chosen for the sample is 2004, with the aim of avoiding the possible structural change after 1997 Asian crisis and the subsequent bankruptcies of Enron and Parmalat. All those events called into question the role of the rating agencies and highlighted the need to implement stricter regulation. The total number of observations of rated banks with available accounting information is 2,322. Both the ratings information and the accounting information were extracted from the Bankscope database (Bureau van Dijk).

As in Poon et al. (1999), Morgan (2002) and Caporale et al. (2011) among others, the categorical scale of ratings has been transformed into a numerical scale, as specified in Table 1. The numerical scale awards higher values as credit quality improves. The lower categories have been grouped together because they each contain only a small number of observations[2]. In Table 1, two groups of ratings can be differentiated depending on the degree of risk of default that they represent. Those in the investment grade (from AAA/Aaa to BBB-/Baa3) indicate a relatively low risk of default while ratings of the speculative grade (from BB+/Ba1 to D) indicate either a high default risk or that the default has already occurred.

[2] The results presented in this paper are fairly similar for the case where the rating categories are not grouped. Specifically, the correlation with the predicted rating is 0.99 in each of the three rating agencies. These results are available on request from the authors.

Table 1. Ratings and numerical score

	Fitch				Standard and Poor's				Moody's			
	Rating	Scale 22	Scale 11	Number of ratings	Rating	Scale 22	Scale 11	Number of ratings	Rating	Scale 22	Scale 11	Number of ratings
Investment	AAA	22	11		AAA	22	11	13	Aaa	22	11	30
	AA+	21	11	8	AA+	21	11	20	Aa1	21	11	61
	AA	20	10	72	AA	20	10	88	Aa2	20	10	105
	AA-	19	9	271	AA-	19	9	194	Aa3	19	9	116
	A+	18	8	629	A+	18	8	254	A1	18	8	173
	A	17	7	227	A	17	7	455	A2	17	7	149
	A-	16	6	295	A-	16	6	130	A3	16	6	103
	BBB+	15	4	114	BBB+	15	5	95	Baa1	15	4	15
	BBB	14	4	118	BBB	14	4	72	Baa2	14	4	26
	BBB-	13	3	78	BBB-	13	3	19	Baa3	13	3	9
							Speculative					
	BB+	12	2	35	BB+	12	2	9	Ba1	12	2	4
	BB	11	2	13	BB	11	2	22	Ba2	11	2	5
	BB-	10	2	12	BB-	10	2	7	Ba3	10	2	5
	B+	9	1	5	B+	9	1	4	B1	9	1	8
	B	8	1	13	B	8	1	3	B2	8	1	
Speculative	B-	7	1	3	B-	7	1		B3	7	1	
	CCC+	6	1		CCC+	6	1		Caa1	6	1	
	CCC	5	1	2	CCC	5	1		Caa2	5	1	
	CCC-	4	1		CCC-	4	1		Caa3	4	1	1
	CC	3	1	1	CC	3	1		Ca	3	1	
	C	2	1	2	C	2	1		C	2	1	
	D	1	1		D	1	1		D	1	1	
	WR		-		WR		-		WR		-	

Table 1. Transformation of the categorical rating assigned by Fitch, Standard and Poor's and Moody's into the numerical scale defined in this study (Scale 11). As the score decreases, so does the credit quality, and consequently the probability of default increases. The top and bottom categories are grouped, due to the small number of observations they present.

Source: Own elaboration.

As reflected in Table 2, the sample consists of 4,093 ratings awarded by the three principal international rating agencies (Fitch, Standard and Poor's and Moody's). Of these three, as also shown in Table 2, the one presenting the highest market share by percentage of ratings issued is Fitch, with 46.37%, followed by Standard and Poor's with 33.84%. Moody's presents the lowest market share, its ratings representing only 19.79% of the total number of ratings issued. Of these 4,093 ratings observations, as can be deduced from Table 3, most are concentrated in the cases of Fitch and Standard and Poor's in the countries of the European Union (63.1% and 68.6%, respectively). Specifically, the majority of the banks evaluated by these two agencies are located in Germany, Spain, France and Italy. Conversely, in the case of Moody's most of the ratings are issued for banks located in USA (65.3%).

Table 2. Market share of rating agencies

	Number of Observations				Market Share		
Year	Fitch	SP	Moodys	Total	Fitch	SP	Moodys
2004	161	122	92	375	42.93%	32.53%	24.53%
2005	215	125	99	439	48.97%	28.47%	22.55%
2006	234	173	98	505	46.34%	34.26%	19.41%
2007	254	190	104	548	46.35%	34.67%	18.98%
2008	264	198	105	567	46.56%	34.92%	18.52%
2009	264	203	106	573	46.07%	35.43%	18.50%
2010	262	197	107	566	46.29%	34.81%	18.90%
2011	244	177	99	520	46.92%	34.04%	19.04%
Total	1898	1385	810	4093	46.37%	33.84%	19.79%

Table 2. This table shows for the period 2004-2011, the number of rating issued by each rating agency and the share market per year.

Source: BankScope (Bureau Van Dijk) and own elaboration.

Table 3. Distribution of banks rated in the sample by countries.

	Number of Observations			Number of Banks			Weight in the sample		
Country	Fitch	SP	Moodys	Fitch	SP	Moodys	Fitch	SP	Moodys
Austria	30	9	0	6	2	0	1.6%	0.6%	0.0%
Belgium	15	23	8	2	3	1	0.8%	1.7%	1.0%
Bulgaria	20	24	0	3	3	0	1.1%	1.7%	0.0%
Germany	440	340	31	68	60	4	23.2%	24.5%	3.8%
Denmark	16	21	16	2	3	2	0.8%	1.5%	2.0%
Spain	197	74	93	26	10	12	10.4%	5.3%	11.5%
Estonia	8	0	0	1	0	0	0.4%	0.0%	0.0%
Finland	16	23	23	2	3	3	0.8%	1.7%	2.8%
France	106	144	30	15	21	4	5.6%	10.4%	3.7%
United Kingdom	17	5	5	3	1	1	0.9%	0.4%	0.6%
Greece	40	21	0	6	3	0	2.1%	1.5%	0.0%
Hungary	7	15	0	1	2	0	0.4%	1.1%	0.0%
Italy	90	99	28	14	16	4	4.7%	7.1%	3.5%
Lithuania	15	4	0	2	1	0	0.8%	0.3%	0.0%
Luxembourg	12	42	7	2	7	1	0.6%	3.0%	0.9%
Norway	48	21	16	6	3	2	2.5%	1.5%	2.0%
Poland	31	24	0	4	3	0	1.6%	1.7%	0.0%
Portugal	32	21	0	5	3	0	1.7%	1.5%	0.0%
Slovenia	33	8	0	5	1	0	1.7%	0.6%	0.0%
Sweden	24	32	24	3	4	3	1.3%	2.3%	3.0%
United States	701	435	529	96	59	71	36.9%	31.4%	65.3%
Total	1898	1385	810	272	208	108	100.0%	100.0%	100.0%

Table 3. Distribution of the number of banks and observations by each rating agency (Fitch, Standard and Poor's and Moody's) during the period analysed (from year 2004 to 2011). The last three columns show the weight of each country above the total number of rating issued by each rating agency during the period analysed.

With regard to the evolution of the rating issued by each of the rating agencies, it can be seen in Table 4 that from 2009 onwards with the financial crisis occurs a significant fall on ratings. In this table it can also be observed how the return on assets of the banks analysed worsens significantly between the years 2008 and 2009. In this context, Laeven and Valencia (2013) date the start of the financial crisis in the United States and the United Kingdom in 2007, and for the rest of the cases in 2008. During 2008 important events occurred that led to an increase in uncertainty regarding banks, outstanding among them the collapses of Bear Stearns and Lehman Brothers in the USA and the nationalisation of the Royal Bank of Scotland in the UK. Therefore, with the aim of responding to the question posed as to whether the reduction in ratings is due to a hardening of rating policies or to the asset situation of the banks, the sample is divided into two sub-periods: the period before (2004-2008) and the period of financial crisis (2009-2011).

Table 4. Evolution of average ratings

	Average of ratings			Growth rate		
Year	Fitch	SP	Moodys	Fitch	SP	Moodys
2004	6.76	7.04	7.82			
2005	7.00	7.16	7.95	0.04	0.02	0.02
2006	7.11	7.17	7.96	0.02	0.00	0.00
2007	7.19	7.45	8.60	0.01	0.04	0.08
2008	7.13	7.50	8.49	-0.01	0.01	-0.01
2009	6.92	7.31	8.21	-0.03	-0.03	-0.03
2010	6.64	6.84	7.21	-0.04	-0.06	-0.12
2011	6.27	6.58	6.77	-0.06	-0.04	-0.06
Total	6.88	7.14	7.88			

Table 4. This table shows for the period 2004-2011, the mean rating issued by each rating agency per year. The mean rating was calculated from the numerical scale defined from 1 to 11. Furthermore this table shows the ROA and ROE ratios of all the banks considered in the sample and the banks of the banking system analysed.
Source: BankScope (Bureau Van Dijk) and own elaboration.

The downward adjustment of ratings occurring with the financial crisis can be appreciated more clearly in Table 5, which shows the transition matrices for each of the two sub-periods defined. Specifically, on comparing the matrices of the pre-crisis and crisis periods, the downward adjustment in the ratings can again be observed. We also observe that with the financial crisis ratings are less stable, implying that the rating agencies review their ratings more frequently. These descriptive statistics therefore seem to point out that the ratings presents a certain procyclical behaviour.

Table 5. Issuer ratings transition matrices

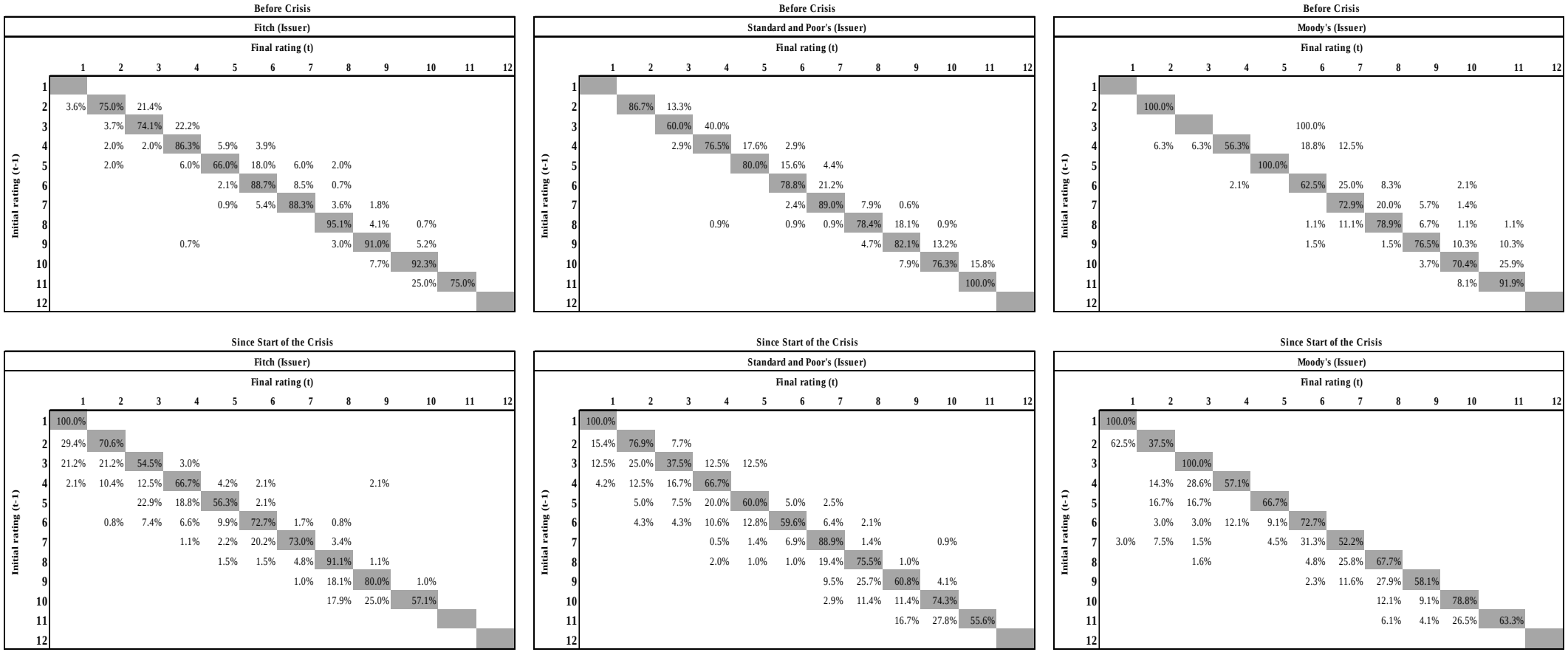

Table 5. Transition matrices for the period before and since start of the financial crisis for issuer ratings of each rating agency (Fitch, Standard and Poor's and Moody's). These matrices have been calculated as the total number of transitions between year t-1 and year t of the sample defined in each matrix. The ratings are ordered from lower to higher credit quality. **Source:** BankScope (Bureau Van Dijk) and own elaboration.

4. Methodology and variables used

The aim of this paper is to decompose the observed variation of ratings into two components: one associated with the worsening of the banks' asset situation and another derived from a possible hardening of rating policies. To perform this decomposition a two-stage procedure is proposed. The first stage models bank ratings during the period analysed, taking into account the possible structural change occurring as a consequence of the financial crisis. In a second stage, by means of different prediction exercises, the adjustment that has occurred in ratings is quantified as well as the contribution of each factor. Once this decomposition has been performed, the differences among the banks of different groups of countries are compared in order to analyse the possible existence of heterogeneity in the factors explaining the adjustment of ratings among the different geographical areas.

In the modelling of the ratings, as in other studies in the literature, an ordered probit model is used[3]. With this model we calculate the probability of obtaining a certain rating according to the factors defining the asset situation of the banks evaluated. Consequently, the specification of equation (1) is as follows[4]:

$$Y_{it}^{*} = \beta' x_{it-1} + u_{it} \qquad (1)$$

Where Y^{*}_{it} is a linear function of the explanatory variables, x_{it-1}, that define the rating of the banks analysed. Like Altman and Rijken (2004) and Caporale et al. (2011), we introduce the values of the factors determining the ratings with a lag period, *t-1*. This is because accounting information is issued annually and is unknown when the rating is drawn up. For example, the rating of a bank in the first quarter of 2008, *t*, refers to the bank's asset situation in the last year, 2007, *t-1*, since at that time the value of the factors referring to 2008 is unknown. The error term, u_{it}, is a stochastic error term.

[3] As referred to by Greene (2003) the results of the estimations with logit and probit models are practically the same. The difference between the two specifications lies essentially in the form of the accumulative distribution function. In this sense the probit model assumes a normal accumulative distribution function, while the logit model assumes a logistical accumulative distribution. The precision of this specification is demonstrated in previous studies of the modelling of bank ratings. Outstanding among them are Öğüt et al (2012), Shen et al. (2012), Salvador et al (2014), Caporale et al. (2011).

[4] This model is estimated following a Data Pool model. Previously, we tested for the possible existence of unobservable characteristics associated with the *i* banks, i.e. whether it is more appropriate to estimate these models considering fixed effects or random effects. To determine if the individual effects associated with each bank are significant, we run a test of joint significance of the coefficients that refer to those effects. The results show in all cases that the individual effects are not significant. In addition, the Hauman test shows that the random effect estimators are not efficient. Consequently, these results point to the use of a data pool model.

To test the possible change in the rating policy arising as a consequence of the financial crisis, equation (2) is defined. In this equation (2) we introduce a dummy variable that takes a value equal to unity for the years of the financial crisis, and zero otherwise. This variable further interacts with the variables determining the rating of equation (1).

$$Y_{it}^{*} = \beta' x_{it-1} + FC + FC \cdot \beta' x_{it-1} + u_{it} \qquad (2)$$

The variable FC and its interaction with the rest of the explanatory variables permits us to test whether with the start of the financial crisis there was a change in the agencies' rating policy. Thus, if the coefficient accompanying the interaction of this dummy with any explanatory variable is statistically non-zero, it means that the effect of this factor has changed and consequently the rating agencies have adjusted their criteria.

At this point it is fundamental to select those explanatory variables that best represent the behaviour of ratings. For this we follow a dual criterion. On the one hand, we follow the methodological reports of the different rating agencies analysed, Fitch (2009, 2011), Moody's (2007a, b), Standard and Poor's (2010, 2011). According to these reports the agencies pay special attention to variables that measure profitability, own resources, liquidity, efficiency, size, credit risk management, the diversification of the banking business and the economic environment in which the banks mainly carry out their activity. But we also consider those variables that in other previous studies have shown greater capacity predicting ratings. These variables, which are included in equations (1) and (2), are listed below.

In this sense, one of the most important factors in the measurement of the banks' asset situation, as pointed out in the methodological reports of the rating agencies, is profitability. This factor has commonly been used in different studies on modelling bank ratings (Caporale et al., 2011; Hammer et al., 2012 and Salvador et al., 2014). Its importance, according to Moody's (2007a), is that this factor measures a bank capacity to generate economic value and absorb the losses deriving from the risks assumed both by the bank and by the economic environment in which it operates. This factor is measured by means

of the ratio between pre-tax profits and total assets (ROA). Consequently, a positive sign is expected.

Another key factor in the evaluation of banks' asset situation is the capital ratio maintained. Capital acts as a cushion to absorb losses, preventing a bank from experiencing a default situation when it meets difficulties. This factor despite its importance, does not by itself determine a bank's rating (Fitch, 2011), since a bank may maintain a solid level of capital but may be exposed to deterioration due to other factors. The capital level maintained by a bank is measured by the ratio between equity level and total assets (Capital). This factor is therefore expected to present a positive sign.

Banks' liquidity ratio is also included, since the lack of liquidity can lead to a bank's failure (Fitch 2011; Moody's 2007a). This factor is captured by means of the ratio between liquid assets and total assets (Liquidity). In this factor also, a positive coefficient is expected.

The credit risk is another of the key factors in the evaluation of banks' asset situation. As Fitch (2011) specifies, a key factor in measuring credit risk is the structure of the balance sheet. The banks that present a high ratio of credits to total assets (Credits) will have a higher credit risk and greater opaqueness (Morgan, 2002; Iannotta, 2006 and Iannotta et al., 2008). Conversely, as Iannotta et al (2008) also point out, loans can make a positive contribution to ratings by offering more stable profits than other types of assets such as shares. Therefore, the effect of credits on banks' economic financial situation is a priori indeterminate. In this sense, to capture the credit risk, it is also important to consider the quality of the credit portfolio. As no information is available on doubtful assets, we use as proxy the ratio of the provisions for doubtful credits to total assets (Loanloss). Therefore, the sign expected for this last factor is negative.

The increase in banking competition and the standardisation of banking products have led to banks reducing their operating margin, and with it their profit margin. For this reason, banks attempt to optimise costs, and be more efficient, with the aim of achieving an increase in profits without adopting risky strategies. Thus, these two variables, competition and efficiency, are important for determination of the rating. Efficiency is captured through the operational efficiency ratio (Shen et al., 2012) defined as the quotient between operating

expenses and the ordinary margin (Efficiency). According to this ratio a higher value means a higher level of inefficiency, because a higher percentage of the ordinary margin will be used to cover operating expenses. Consequently, this factor is expected to present a negative coefficient.

As has been demonstrated in earlier studies of the modelling of bank ratings (Caporale et al., 2011; Shen et al. 2012 and Salvador et al., 2014), size is an important factor for the rating agencies. This is because greater size is assumed to imply greater external support from the economic authorities in the event of the bank getting into difficulties (Too-big-to-Fail hypothesis*)*. This hypothesis is based on the argument that the economic authorities will try to avoid the failure of the big banks due to the possible systemic effect on the economy as a whole. Size is measured by means of the logarithm of total assets (Size). Therefore, the expected sign of this factor is positive.

As pointed out by Fitch (2011), analysis of the economic environment is the starting point for the analysis of the banks' asset situation. In this context, as it is emphasised by Moody's (2007a) the banks can be victims of the environments where there is a weak legal and/or political environment. In turn, this factor allows us to capture the heterogeneity in the behaviour of ratings between the different banking systems[5]. For this reason, to capture the conditions of the economic environment in which banks operate, two variables are introduced. The first is the indicator of government effectiveness (Government) drawn up by the World Bank. This indicator measures the level of quality of public services and of the public administration, as well as the level of political stability. Therefore, the higher the level of government effectiveness, the greater the probability of obtaining a higher rating, since the banks that operate in that country will enjoy a more stable environment. The sign expected for this factor is positive.

The second variable capturing the conditions of the economic environment is the economic cycle of the country in which the bank mainly operates. A contractive economic cycle has negative effects on the bank's asset situation because it implies a worsening of the quality of the assets and the reduction of its profits. Consequently, the inclusion of the economic cycle, as shown by

[5] Other studies highlighting the importance of considering the heterogeneity among countries when modelling ratings are: Rojas-Suarez (2001), Ferri et al. (2001), Ferri and Liu (2003), Purda (2003), Poon (2003), Poon and Firth (2005), Poon et al. (2009), Caporale et al. (2011), Bellotti et al. (2011) and Shen et al. (2012).

Salvador et al. (2014), enables testing the hypothesis as to whether the ratings are immune to the economic cycle and therefore adopt a “through the cycle” philosophy. The economic cycle is measured by the GDP growth rate (Cycle).

Finally, to control for the time effects associated with each financial year, a continuous time variable (Time) is introduced, corresponding to the year in which the rating is issued. Its square (Time2) is also introduced with the aim of considering a non-linear effect in the ratings associated with the maximum reached just before the start of the crisis.

The mean values of each of these factors between the periods before (2004-2008) and during (2009-2011) the financial crisis are reflected in Table 6. We can observe that as a result of the crisis the banks rated experienced, on average, a worsening of the economic and financial situation. Specifically, profitability, liquidity levels (except in Moody’s) and the conditions of the economic environment, i.e. economic growth and government effectiveness, all worsened. It has also to be emphasised that there was a reduction in the quality of the assets on the balance sheet, as shown by the increased level of provisions for doubtful debts. Despite the worsening of these indicators, there has been an increase in the banks’ capital level, size and efficiency. Justification for the increase in capital levels can be found both in the requirement by some banking systems to increase the level of own resources and in the injections of capital received by many banks from the economic authorities. The increase in the size and efficiency of banks may be justified by the fact that with the start of the crisis there was a set of bank mergers with the aim of preventing a possible failure. It must be taken into account, as referred by the rating agencies in their methodological reports, that although each of the factors defined is important when determining the asset situation of banks, by themselves they are not sufficient. In this sense, for example, a bank may not maintain a high rating even though it presents a high capital level, since the quality of its assets is low (Fitch, 2011).

Table 6. Average values of bank solvency's factors.

	Fitch			Standard and Poor's			Moody's		
	2004-2008	2009-2011	2004-2011	2004-2008	2009-2011	2004-2011	2004-2008	2009-2011	2004-2011
ROA (%)	1.34%	0.34%	0.93%	1.36%	0.55%	1.02%	1.78%	0.41%	1.25%
Capital (%)	8.06%	8.20%	8.12%	7.64%	7.79%	7.70%	8.99%	9.64%	9.24%
Size	15.99	16.06	16.02	16.51	16.49	16.50	17.04	17.27	17.13
Liquidity (%)	16.38%	15.76%	16.13%	20.22%	18.71%	19.59%	14.47%	14.69%	14.55%
Credits (%)	57.78%	57.66%	57.73%	54.46%	54.64%	54.54%	60.04%	59.34%	59.77%
Loanloss (%)	0.40%	0.96%	0.63%	0.37%	0.84%	0.57%	0.39%	1.34%	0.76%
Eficiency (%)	63.62%	62.28%	63.08%	65.46%	60.63%	63.45%	67.32%	65.68%	66.69%
Goverment	1.48	1.35	1.43	1.49	1.38	1.44	1.60	1.43	1.53
Cycle (%)	2.88%	-0.33%	1.57%	2.72%	-0.31%	1.46%	2.75%	-0.28%	1.59%

Table 6. The table shows the mean of the factors that define the financial situation of the banks evaluated for each rating agency.

Source: BankScope (Bureau Van Dijk), World Development Indicators (WDI), Worldwide Governance Indicators (WGI) and own elaboration

5. Empirical results

Table 7 shows the results of the estimation of equation (1) that models the so-called issuer bank ratings. In this table it can be appreciated that in general terms the coefficients of the factors defining the financial situation of the banks are significant, and furthermore present the expected signs. Specifically, an increase in profitability, size, liquidity, and/or an improvement of the economic environment, measured by the quality of the government under which the banks operate, means an increased probability of obtaining a higher rating. It should be emphasised that the level of capital has a significant and positive effect only in the case of Moody's. On the other hand, though the total effect is not significant, in Standard and Poor's and in Moody's, we observe that a lower credit quality implies a reduction in the probability of being placed in the higher rating category. It should also be highlighted that the sign of the relative importance of credits in the total balance depends on the rating agency analysed. As commented in the previous section the sign of this variable is not defined a priori because it may be considered a factor that contributes more stable profits than another type of assets, such as shares, or, conversely, credits may also be seen as a factor that increases the credit risk. The only discrepancy with regard to the expected sign in the factors that consider the agencies is found in Fitch and Standard and Poor's, in the negative sign of the GDP growth rate that measures the economic cycle.

Finally, we highlight the positive sign of the trend (Time) and the negative sign of the square of this variable (Time2). This result implies, as already described, that ratings grow until they reach a maximum just before the start of the crisis, decreasing from then onwards.

Table 7. Ordered probit model. Eq(1)-(2)

	2004-2011											
	Fitch				Standard and Poor's				Moody's			
	Eq(1)		Eq(2)		Eq(1)		Eq(2)		Eq(1)		Eq(2)	
ROA	8.305	***	1.01		14.72	***	7.546	**	22.17	***	24.164	***
Capital	-0.865		-0.50		-1.058		-0.462		2.45	***	2.5	**
Size	0.2	***	0.25	***	0.193	***	0.24	***	0.45	***	0.517	***
Liquidity	0.733	***	0.61	*	1.227	***	1.327	***	1.36	***	2.39	***
Credits	-0.661	***	-0.82	***	0.313		0.122		-0.16		1.106	**
Loanloss	0.648		30.03	***	-7.64		21.506	***	-5.33		-16.672	*
Eficiency	0.009		0.01		0.015		0.004		0.00		0	
Cycle	-2.126	**	-6.51	***	-2.425	*	-8.692	***	-0.66		8.571	*
Goverment	0.746	***	0.62	***	0.959	***	0.931	***	0.66	***	0.733	***
TIME	0.333	***	0.34	***	0.448	***	0.502	***	0.65	***	0.671	***
TIME^2	-0.031	***	-0.03	***	-0.038	***	-0.043	***	-0.06	***	-0.066	***
FC			0.38				0.818				4.98	***
FC_ROA			10.71	**			11.53	*			1.567	
FC_Capital			0.54				-0.357				-0.152	
FC_Size			-0.07	***			-0.072	***			-0.128	**
FC_Liquidity			0.37				-0.325				-2.077	**
FC_Credits			0.39				0.34				-2.79	***
FC_Loanloss			-36.68	***			-37.368	***			14.844	
FC_Eficiency			-0.08				0.089				0.052	
FC_Cycle			5.92	***			7.924	**			-8.727	
FC_Goverment			0.26	**			0.068				-0.251	
Cut1	2.205	***	2.53	***	2.923	***	3.475	***	7.59	***	9.939	***
Cut2	2.782	***	3.12	***	3.877	***	4.475	***	8.16	***	10.513	***
Cut3	3.152	***	3.50	***	4.095	***	4.705	***	8.39	***	10.736	***
Cut4	3.516	***	3.87	***	4.599	***	5.233	***	8.79	***	11.147	***
Cut5	3.778	***	4.14	***	4.997	***	5.646	***	8.95	***	11.31	***
Cut6	4.309	***	4.69	***	5.371	***	6.031	***	9.69	***	12.061	***
Cut7	4.659	***	5.05	***	6.382	***	7.051	***	10.41	***	12.796	***
Cut8	5.784	***	6.20	***	7.026	***	7.699	***	11.17	***	13.56	***
Cut9	6.787	***	7.21	***	7.739	***	8.419	***	11.73	***	14.128	***
Cut10	7.746	***	8.18	***	8.42	***	9.107	***	12.39	***	14.804	***
N	1,898		1,898		1,385		1,385		810		810	
Log Lik	-3472.59		-3433.21		-2484.52		-2462.71		-1424.97		-1413.32	
chi2	709.3		710.1		449.9		460.7		363.3		437.9	
RV			78.76				43.63				23.29	
P-val			0.000				0.000				0.010	

Table 7. Results of the estimation of the models (Eq.1) and (Eq.2) for the issuer rating issued by each rating agency. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. RV likelihood ratio test between the model (Eq.1) (the restricted model) and model (Eq.2) (the general model), i.e, $H_0 : \beta_{FC}\beta_k = 0$.

The second block of Table 7 presents the results of the estimation of equation (2), which analyses whether the rating agencies changed their criteria as a result of the financial crisis. In these estimations we observe that with the crisis there occurs a change in rating policies: the importance of each factor in the probability of obtaining a higher rating is modified. The coefficient of each variable without interacting with the dummy variable (FC) indicates the influence of each variable in the rating. However, the coefficient of the interaction indicates how much greater or smaller this effect is in the crisis years than in the previous sub-period. In this sense, it should be emphasised that the change in rating criteria is not homogeneous among the agencies, since the coefficient of the interaction of the dummy variable (FC) with each of the explanatory variables depends on the rating agency analysed. For example, we observe that with the financial crisis, in the case of Fitch the profitability (ROA) comes to have a significant positive effect. In Standard and Poor's this factor increases its positive effect on the probability of obtaining a certain rating. On the other hand, in Moody's the profitability has the same relative importance throughout the period analysed, i.e. the financial crisis has not affected the effect of this factor on the probability of obtaining a certain rating. On the contrary, in all three rating agencies we observe that with the crisis the effect of size on the probability of obtaining a certain rating is reduced. This shows that with the crisis the agencies assign less relative importance to the Size factor when they determine their asset situation. Although it should be noted that the change in the effect of this factor is not the same in all agencies.

In the same line regarding the impact of the crisis on the relative importance of the explanatory variables on modelling bank ratings, Table 7 shows that the coefficient of the dummy variable (FC) is significant only in the case of Moody's, and furthermore it is positive. This suggest that with the start of the financial crisis, this agency implemented a more flexible rating policy, since the banks evaluated increased the probability of obtaining a higher rating given the level of the rest of the variables. This policy, as will be referred to below, may be because in some countries Moody's may have offset the steep fall in the asset situation of some banks with perhaps somewhat more lax criteria, with the aim of avoiding a steep fall in the ratings.

In order to confirm the change in the rating policy in each of the agencies we propose the likelihood ratio test between equation (1) and equation (2) which considers the possible structural change occurring with the financial crisis. The results of these tests permit us to reject, for all the rating agencies, the null hypothesis of joint non-significance of the interaction between the dummy variable Crisis (FC) and the rest of the variables. Therefore, these results suggest that with the financial crisis the agencies readjusted their criteria. The change of rating is not due solely to the worsening of the banks' asset situation, but also to the change in rating policies, i.e., to the relative importance of each variable in the probability of obtaining a certain rating.

It has therefore been shown that in general terms the different importance of each factor that determine the banks ratings from the start of the financial crisis in comparison with the pre-crisis period cannot be rejected.

Next we perform various prediction exercises starting from the estimation of equation (2), that permit us to disaggregate the observed adjustment in the ratings into two factors: the change in the rating policy, associated with the change in the value of the coefficients, and the change in the asset situation of the banks evaluated, derived from the value of the explanatory variables before and during the financial crisis. Therefore, unlike other papers that study only the effects of the rating agencies' change of behaviour during the periods of crisis (Ferri et al. 1999; Gärther et al. 2011) we capture these two factors defining the Rating Change Index (RCI). This index measures the change in the ratings that is due both to the changes in the value of the explanatory variables (x_t), i.e. what is called the banks' asset situation, and to the change in the rating policies (I_t), according to expression (3) below.

$$RCI = \frac{I^{t}(x_t)}{I^{t-1}(x_{t-1})} \qquad (3)$$

Where, I^{t-1} and I^{t}, make reference to the rating policy (i.e the value of the coefficients in the equation (2) of the CRAs before and during the financial crisis, respectively). The rating policy before the financial crisis, I^{t-1}, refers to the value of the rating predicted by equation (2) when the dummy variable FC takes the value 0. On the other hand, the rating policy after the start of the financial crisis, I^{t}, refers to the value of the rating predicted by equation (2) when the

dummy variable FC takes the value 1. Likewise, x_{t-1} and $x_{t,}$ refer to the asset situation (mean values of each determinant), before and during the financial crisis, respectively. Therefore, the numerator of the above expression (3) indicates the rating predicted according to equation (2) with the rating policy, I^t, and the asset situation, x_t, existing in the crisis years. Likewise, the denominator, $I^{t-1}(x_{t-1})$, indicates the rating obtained with the rating policy, I^{t-1}, and the asset situation, x_{t-1}, before the start of the crisis. If the value of this index is less than unity it means that with the financial crisis there has been a generalised fall in ratings; if it is equal to one it means that the rating has remained constant. If, on the contrary, the value of this index is greater than unity, it means that there has been an increase in the ratings.

This index, as demonstrated in expression (4) can be decomposed multiplicatively into two factors. The first factor of this index, $\frac{I^t(x_t)}{I^{t-1}(x_t)}$, refers to the effect that the change of rating policy would have had on the adjustment in the ratings if the determinants of the rating had not changed, i.e. if the banks' asset situations had remained constant. To calculate this effect the asset situation in the crisis period is fixed, x_t, and we calculate the quotient between the rating predicted in equation (2) with the rating policy applied during the crisis, $I^t(x_t)$, and the rating predicted with the rating policy before the crisis, $I^{t-1}(x_t)$. If this quotient is less than unity, it means that with the crisis there was a fall in the rating due to the hardening of the rating policy, and if it is equal to unity, that there has been no change. If, on the contrary, it is greater than unity, it implies that with the outbreak of the crisis, the agencies have adopted a more flexible rating policy.

$$RCI = \frac{I^{t}(x_t)}{I^{t-1}(x_{t-1})} = \left(\frac{I^{t}(x_t)}{I^{t-1}(x_t)} \times \frac{I^{t-1}(x_t)}{I^{t-1}(x_{t-1})} \right) \qquad (4)$$

The second factor of this index, $\frac{I^{t-1}(x_t)}{I^{t-1}(x_{t-1})}$, measures the effect that the change in the banks' asset situation has had on the adjustment in the ratings, assuming that the rating agencies had maintained their rating policy as in the period before the crisis. To calculate this effect, the rating policy is set in the pre-crisis

period, I^{t-1}, i.e. in equation (2) only the coefficients before the crisis are considered, and we calculate the quotient between the rating predicted with the asset situation during the crisis period, $I^{t-1}(x_t)$, and the rating predicted with the asset situation of the period before the crisis, $I^{t-1}(x_{t-1})$. If this quotient is less than unity, it means that with the start of the crisis there was a worsening of the banks' financial situation that translated into a reduction of the rating, if it is equal to unity it means that there was no adjustment in the rating due to change in the financial situation.

Equation (4) takes as reference the values of the explanatory variables during the financial crisis and the rating policy (coefficients of the variables) previous of the crisis. However, changing the references would imply reaching different results in the value of the index. To avoid this and to achieve a measurement that is invariant to the moment of time selected, we calculate an indicator that is invariant to the point of reference used. For this, following the proposal by Färe et al. (1994), that analyse the change in productivity according to the Malmquist index (Malmquist, 1953), we calculate the geometric mean of the points of reference. That means that the RCI of expression (3) is decomposed using a geometric mean between the two references possible according to the following expression (5):

$$RCI = \frac{I^{t}(x_t)}{I^{t-1}(x_{t-1})} = \left(\frac{I^{t}(x_t)}{I^{t-1}(x_t)} \times \frac{I^{t-1}(x_t)}{I^{t-1}(x_{t-1})} \right)^{0.5} \cdot \left(\frac{I^{t}(x_{t-1})}{I^{t-1}(x_{t-1})} \times \frac{I^{t}(x_t)}{I^{t}(x_{t-1})} \right)^{0.5}$$
$$= \underbrace{\left(\frac{I^{t}(x_t)}{I^{t-1}(x_t)} \times \frac{I^{t}(x_{t-1})}{I^{t-1}(x_{t-1})} \right)^{0.5}}_{effect\ rating\ policy} \cdot \underbrace{\left(\frac{I^{t-1}(x_t)}{I^{t-1}(x_{t-1})} \times \frac{I^{t}(x_t)}{I^{t}(x_{t-1})} \right)^{0.5}}_{effect\ bank\ solvency} \qquad (5)$$

Table 8 gives the results of the RCI for each of the CRAs analysed. In this table we observe that with the financial crisis in all three CRAs there is a generalised fall in ratings, as already mentioned in previous sections. Specifically, we observe that in Fitch there is an average fall of 5.35% in ratings, in Standard and Poor's 4.19% and in Moody's 7.70%. In the case of Fitch and Standard and Poor's this fall is explained both by the hardening of the rating policy (79.66% and 63.93%, respectively), and by the worsening of the asset situation of the banks evaluated, (20.34% and 36.07%, respectively). On the

other hand, in the case of Moody's all the fall in ratings is due to a worsening of the asset situation of the banks evaluated, given that on average the rating policy applied by this agency underwent a slight improvement, as reflected in the negative sign of this factor in the RCI. This last result may be explained due to most of the banks evaluated by Moody's, specifically 65.3% of them (Table 3) are located in the United States, where the financial crisis was more intense, and consequently it was attempted to offset the steep worsening of the asset situation of the banks evaluated with a slight flexibilisation of the rating policy applied.

Table 8. Rating Change Index (RCI)

	Real Adjustment	RCI	RCI Adjustment	% Policy	% Solvency
	Fitch				
All	5.94%	94.65%	5.35%	79.66%	20.34%
USA	12.69%	92.36%	7.64%	73.62%	26.38%
EU	2.77%	95.92%	4.08%	85.78%	14.22%
No PIGS	0.73%	98.10%	1.90%	63.98%	36.02%
PIGS	8.89%	90.84%	9.16%	87.69%	12.31%
	Standard and Poor's				
All	4.33%	95.81%	4.19%	63.93%	36.07%
USA	11.37%	91.09%	8.91%	53.84%	46.16%
EU	1.51%	97.80%	2.20%	81.81%	18.19%
No PIGS	1.27%	98.06%	1.94%	52.99%	47.01%
PIGS	4.07%	94.29%	5.71%	94.76%	5.24%
	Moody's				
All	8.82%	92.30%	7.70%	-136.67%	236.67%
USA	10.26%	90.45%	9.55%	-133.78%	233.78%
EU	6.27%	95.67%	4.33%	-153.18%	253.18%
No PIGS	0.26%	98.32%	1.68%	-323.00%	423.00%
PIGS	11.98%	92.40%	7.60%	-118.13%	218.13%

Table 8. This table shows the Real Adjustment in ratings, RCI and of its explanatory factors for the issuer rating issued by each rating agency (Fitch, Standard and Poor's and Moody's). Real Adjustment and RCI Adjustment indicate the downward of ratings between the period before and during the crisis according to the real change in ratings and RCI, respectively. The columns, % Policy and % Solvency, indicate the weight that represents both factors above the RCI. In these sense, negative values of % Policy factor indicates that the rating agency has not toughened its rating policy following the crisis. The values above 100% indicates that the change in ratings is due only to the change in solvency.

In the same Table 8 the analysis is repeated, distinguishing by geographical areas. Specifically, the index is replicated for the United States, the European Union, and within the latter, the PIGS. The results show that the adjustment in

ratings and the contribution of each component to the RCI was not the same in all the groups of countries. In this context, it should be emphasised that in all three agencies the greatest adjustment of ratings occurred among the banks of the US and the PIGS, where the Subprime crisis and the Sovereign debt crisis were originated, respectively. On analysing the factors explaining the adjustment in ratings, i.e. each of the components that define the RCI, we find that the relative importance of the adjustment in rating policy varies with the geographical area analysed. In this sense, we observe that in Fitch and Standard and Poor's the greatest importance of the adjustment in rating policy occurred among the PIGS, where it was 87.69% and 94.76 %, respectively. In the United States the adjustment of the rating policy was also relatively important as it represents 73.62% of total rating variation in Fitch and 53.84% in Standard and Poor's. On the other hand, the relative importance of the hardening of rating policy was less important in the countries of the European Union that do not belong to the PIGS, where the adjustment in Fitch and Standard and Poor's was 63.98% and 52.99%. The hardening of the rating policies provides evidence of the procyclical character of the ratings issued by Fitch and Standard and Poor's.

Moody's, unlike the other two rating agencies, eased their rating policies, offsetting the steep worsening of the banks' economic and financial situation. This implies that if Moody's had adjusted their rating policy like Fitch and Standard and Poor's, the banks rated would have suffered a greater fall in their ratings. Furthermore, the flexibilisation of the rating policies provides evidence that Moody's took a "through the cycle" perspective.

6. Conclusions

This paper analyses the impact of the financial crisis on the behaviour of the issuer ratings of the banks of the United States and of the European Union, during the period 2004-2011. This period includes years of economic growth from 2004 to 2008 and a sub-period of financial crisis from 2009 to 2011. The fact that it embraces a complete cycle permit us to test the hypothesis traditionally defended by the CRAs, namely that ratings are drawn up according to a medium and long term perspective (through the cycle) and consequently

ignore the transitory changes that take place in the financial situation (point in time) of the banks evaluated.

The analysis of the impact that the financial crisis has had on the ratings of banks proceeds in two stages. In the first stage we model the bank ratings and tests the existence of a possible structural change as a result of the financial crisis. In the second stage we uses various prediction exercises to quantify the adjustment occurring in the ratings and disaggregates this observed change into two multiplicative factors: the effect of the change in rating policy and the effect of the change in the asset situation. Overall, the results obtained show that with the financial crisis there is a generalised fall in ratings. Specifically, we find that the average adjustment in Fitch, Standard and Poor's and Moody's was 5.35%, 4.19% and 7.70%, respectively. This adjustment in Fitch and Standard and Poor's is respectively 79.66% and 63.93% justified by the change in rating policy. On the other hand, the adjustment in Moody's is justified almost totally by the worsening of the financial situation of the banks rated, which in part has been offset by a more flexible rating policy. The significant hardening of the rating policy carried out by Fitch and Standard and Poor's suggest a procyclical behaviour of these agencies. Conversely, the flexibilization of Moody's rating policy suggest a "through the cycle" behaviour.

If the results are disaggregated by geographical areas (United States, European Union, and within these, the PIGS), we find that the factors explaining the adjustment in ratings do not have the same relative importance in all groups of countries. Specifically, we find that in Fitch and in Standard and Poor's, the fall in ratings is greatest among the banks of the United States and the PIGS, due to a greater importance of the hardening of the rating policy. On the other hand in Moody's the fall in ratings is wholly due to the worsening of the asset situation, which in part has been offset by a more flexible rating policy.

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