Do credit rating agencies piggyback? Evidence from sovereign debt ratings*

Pedro Gomes†

Universidad Carlos III de Madrid

August 18, 2015

Abstract

When two or more credit rating agencies rate a product, they have an incentive to weigh competitors' ratings. Such piggybacking allows an agency to increase the precision of its own rating and engage in less monitoring. Using annual data on sovereign debt ratings, I demonstrate that the probability of a rating change depends on the rating differential towards its competitors, even when accounting for a common information set, which is consistent with the hypothesis.

JEL Classification: G15, G24

Keywords: sovereign debt ratings, credit rating agencies, rating transitions.

*I am grateful to the participants at the Universidad Carlos III de Madrid and the Bank of Spain seminars, particularly Marco Celentani, Ricardo Mora Villarrubia, Beatriz Mariano and Juanjo Dolado. I acknowledge financial support from the Ministerio de Economia y Competitividad.

†Universidad Carlos III de Madrid, C/ Madrid 126, 28903 Getafe, Spain. Tel:+34916245732, Email: pgomes@eco.uc3m.es.

1 Introduction

Credit rating agencies have been under close scrutiny. First, they were blamed for their role in the 2008 financial crisis, when they issued AAA ratings to mortgage-backed securities that turned out to be 'junk'. Subsequently, they were accused of having adapted too slowly to the deterioration of public finances in the Euro area and for exacerbating the area's sovereign debt crisis, following the severe downgrades of Greece, Ireland and Portugal.[1] These critiques have led to increasing discussions of credit rating agencies' business model and their regulatory framework.[2]

Economists have highlighted three characteristics of the credit rating game that contributed to the failure of the rating of structured credit products. First, a conflict of interest exists because issuers that pay for a rating may influence that rating (Bolton, Freixas, and Shapiro (2012)). The second problem is *rating shopping*. If a firm dislikes its rating, it can ask to be rated by another agency. *Rating shopping* becomes more perverse as products become more complex, thus increasing the benefits of shopping (Skreta and Veldkamp (2009)). Finally, reputation is crucial for agencies' future businesses and can be assessed by comparing the ratings with ex-post defaults.

However, the sovereign credit rating game is fundamentally different from that of the corporate sector. Most advanced countries have their sovereign bonds rated by the three main agencies: Moody's, Standard and Poor's (S&P) and Fitch. Therefore, no room exists for *rating shopping*. Furthermore, government bonds have not increased in complexity and most of the information used to evaluate their creditworthiness is publicly available. Second, conflict of interest is not as relevant as in the corporate sector. Although it is possible for countries to withdraw their ratings, they seldom do so.[3] Most advanced economies are rated

[1]See the review of credit rating agencies and the discussion of its critiques by de Haan and Amtenbrink (2011).

[2]See, for instance, European Commission (2010).

[3]In the history of the rating agencies, such a withdrawal only happened twice for Moody's (Moldova and Turkmenistan) and S&P (Madagascar and Mali) and nine times for Fitch (Benin, Gambia, Iran, Malawi, Moldova, Turkmenistan, Madagascar, Mali and Papua New Guinea).

by all agencies, and the threat of rating withdrawal is not credible because the credit rating agency could maintain the rating as unsolicited.[4] Finally, the default of a rated sovereign entity is a rare event. Greece is now the first country to have been rated higher than BBB- by any agency, and it defaulted within 10 years. Therefore, assessing ex-post the quality of an agency is difficult, particularly with respect to investment grade ratings.

My objective is to highlight one property of the credit rating game that is relevant to sovereign ratings: *piggybacking*. Rating agencies look at several elements when deciding on a rating, such as public debt or the unemployment rate. However, from public information, the agency knows the rating issued by its competitors. If a rating carries some information regarding the creditworthiness of a country, incorporating this information into its own rating – by weighing competitors' ratings – is optimal for an agency. This potential criticism of rating agencies was best described in an IMF working paper that analysed their role during the Asian currency crisis (Bhatia (2002)):

> The heavy workload at the ratings agencies may result in an element of piggybacking, with analysts relying to varying degrees on research produced by the IMF, academia, investment banks, and – conceivably – other rating agencies as they seek to stay abreast of developments. (...) The concept of piggybacking does not necessarily explain the upside bias in sovereign credit ratings, but may help to explain herd behaviour.

The concept of piggybacking is well established in the literature on the incentives of forecast analysts. For instance, Hong, Kubik, and Solomon (2000) and Jegadeesh and Kim (2010) argued that analysts are influenced by other analysts' forecasts, creating incentives to herd. Cohn and Juergens (2014) quantified this effect and found that, following the release of a new forecast one cent above (below) the current forecast, analysts revise the forecast upwards (downwards) by 0.21–0.36 cents. Using intraday returns around the release

[4]For instance, S&P has unsolicited ratings for Australia, Belgium, Cambodia, France, Germany, India, Italy, Japan, Netherlands, Singapore, Switzerland, Taiwan, the United Kingdom and the United States. See Byoun (2014) for a theory of unsolicited credit ratings.

of analysts' recommendations, Altinkilic and Hansen (2009) and Altinkilic, Balashoc, and Hansen (2013) found evidence consistent with the view that analysts' recommendations are uninformative and they tend to piggyback on the news. My contribution is to extend the discussion to the credit rating agencies by examining whether the evidence on sovereign ratings is consistent with piggybacking and discussing the possible consequences of such behaviour.

First, I construct a simple model to illustrate how piggybacking can naturally arise when two agencies rate the same country. The model does not account for rating shopping or conflicts of interest. A credit rating agency can obtain signals of the creditworthiness of a country at a certain cost. The agency can choose to get more signals to increase the precision of its rating. I assume that the payoff of an agency negatively depends on the variance of its rating. Agencies care about precision because it affects the performance of other business areas. Typically, the sovereign rating is the ceiling for domestic corporate issuers.[5] With only one agency, a trade-off exists between the precision of the rating and the costs of monitoring. When we introduce a second agency, it is optimal for both agencies to observe fewer signals and put some weight on the competitor's rating.

The first insight of the model is to show the natural incentive of credit rating agencies to utilise each other's information when updating beliefs. This prediction that agencies tend to be heard can be empirically tested. Several studies have indicated that changes in the ratings of an agency are unconditionally related to competitors' actions. Al-Sakka and ap Gwilym (2010b) showed that the rating difference relative to competitors is an important predictor of rating changes. Furthermore, Al-Sakka and ap Gwilym (2010a) used sovereign ratings and Guttler and Wahrenburg (2007) used corporate ratings near default and found that an agency is more likely to downgrade (upgrade) if their competitors have downgraded

[5]This rule seems to be implicit of rating agencies. In very few cases, corporate issuers have higher ratings than the sovereign. One justification of this rule is that sovereign risk is a key determinant of corporate defaults. For instance, Moody's (2009) found that country risk has been twice as important as firm risk in corporate defaults during sovereign crisis episodes and more than half as important as firm risk and as important as industry risk outside crisis periods.

(upgraded) within the past six months. However, because none of these studies included any controls in the regressions, we cannot distinguish whether agencies are piggybacking or responding to changes in the common information set.

I address this limitation in the empirical section. I use data on year-end sovereign ratings from the three main agencies for 117 countries between 1996 and 2006, as used in Afonso, Gomes, and Rother (2011). Whenever a country is rated by two agencies, the average absolute difference in the ratings is between 0.4 and 0.7 notches. First, I estimate a predictive model of the ratings for each agency on the basis of public information (macroeconomic, fiscal and external variables). In a second step, I estimate the probability that an agency changes its rating, including several control variables. Furthermore, I include the rating difference from the predicted rating of the other agencies in the previous year, and the difference from the prediction of the agency's own rating of the previous year. The horse race indicates that despite both being calculated from the same data, agencies are more influenced by the difference relative to competitors rather than their own ratings, which is consistent with piggybacking.

The model also provides a second insight that is relevant for policymakers. Under certain conditions, having more agencies can decrease the overall monitoring of a country because it might cause the country to rely too much on a competitor's rating. Although in a different setting, this result is also found in Faure-Grimaud, Peyrache, and Quesada (2009). This theoretical result cannot be easily tested but is consistent with empirical evidence provided by Becker and Milbourn (2011). They examined the effects of the entry of Fitch on the corporate sector ratings of the two incumbents and found that the increased competition from Fitch coincides with a lower correlation between ratings and market-implied yields and a lower ability of ratings to predict default. They interpreted these results as lower rating quality and suggested two possible explanations. Lower quality could be the outcome of a reputation mechanism. Agencies engage in more monitoring if they expect higher future returns from reputation. With higher competition, these returns are lower, thus reducing the incentive for quality ratings. In contrast, the lower quality returns could also be interpreted as evidence of *rating shopping*. This study provides a third explanation: lower quality may result from piggybacking.

2 Model

2.1 One Agency

First, I describe the benchmark with one agency. Let us assume that a country has a creditworthiness measure of c as defined in continuous support and that is unknown. The agency assessed the country's creditworthiness R on the basis of signals $x_i \sim N(c, \sigma^2)$. We interpret the number of independent signals t as the amount of information used, and the distribution as the statistical model used by the agency to compute the assessment. The agency can chose any number of signals, $t \in R^+$; however, each signal is costly. I assume that the total costs are given by ςt^α, with $\alpha > 0$. If α is larger than 1, the initial information is easy to obtain; however, obtaining more signals becomes increasingly costly. In contrast, α could be less than 1 if the initial costs of introducing a team to a country are not zero; however, once the team is established, more information becomes easier to obtain. The problem of the agency is as follows:

$$\begin{aligned} \max_{\{R,t\}} \quad & -[MSE(R)\delta + \varsigma t^\alpha] \\ s.t. \quad & \qquad t \geq \tau, \end{aligned}$$

where $MSE(R) = Var(R) + (E(R) - c)^2$ is the mean squared error of the estimator. Agencies care about the quality of their estimator because the sovereign rating affects other business areas. Sovereign risk is an important determinant of corporate defaults and, in the majority of the cases, the sovereign rating is the upper bound for domestic corporate issuers. The agencies have an incentive to be accurate, not because of the possibility that the country will default (which is a rare event for investment grade countries), but because being accurate affects the quality of ratings in other business areas. I assume that the payoff of the agency is negatively proportional to the mean square error of its rating, weighted by δ. We consider δ as the monetary cost associated with possible imprecise assessments — a reputation cost. For instance, if the rating issued to a country were higher than its creditworthiness, this mismatch would spill over to the assessments of companies within the country that would not properly incorporate the sovereign risk. Within an agency, this weight should vary from country to country depending on the country's share of the agency's revenue in other business areas.

Because the agency is paid independent of the rating it issues, no conflict of interest exists. Therefore, no reason exists to give a rating different from the mean of the signals: $R = \frac{\sum_{i=1}^{t} x_i}{t}$, which is an unbiased estimator of c.[6] The problem then collapses to

$$\begin{aligned} \max_{\{t\}} \quad & -[Var(R)\delta + \varsigma t^{\alpha}] \\ s.t. \quad & \qquad t \geq \tau, \end{aligned} \tag{1}$$

where $Var(R) = \frac{\sigma^2}{t}$. The agency chooses the number of signals, above a minimum level, τ.[7] The solution to this problem is $\bar{t}$, the optimal number of signals if the agency is alone in the market, given by $\bar{t} = (\frac{\sigma^2\delta}{\varsigma\alpha})^{\frac{1}{1+\alpha}}$. I assume that this number is larger than τ to have a non-trivial interior solution. An agency does more monitoring as the importance of the country for the rest of the business areas increases. Monitoring also increases on the basis of the variance of the signals and decreases as the costs of obtaining an extra signal increase.

[6] Certainly, the argument could be made that rating agencies' objectives are influenced by other objectives. For instance, Bhatia (2002) argued that rating agencies have an incentive to issue higher sovereign ratings than those issued by their competitors to attract more business to its corporate sector. Although this situation is plausible, it is not the aim of this study. I prefer to show the incentive to piggyback — even in the most innocuous setting — in which agencies attempt to perform their job the best they can.

[7] The second-order condition is satisfied, provided that the cost function is not too concave, in particular if $\alpha \geq \underline{\alpha} < 1$, which is guaranteed if τ is high enough.

2.2 Two Agencies

Given two agencies in the market, A and B, each receives signals independently from the same distribution $x_i, y_i \sim N(c, \sigma^2)$.[8] Despite looking at the same variables (i.e. GDP growth or government debt), the interpretation made by the rating agencies is based on a different statistical model; thus, it is not necessarily the same. The two agencies might also diverge because of the difference in the monetary costs associated with the variance of their ratings δ_A and δ_B.

In addition to their own signals, each agency can observe its competitors' ratings, which carries some information. Each agency chooses the number of signals to observe and the weight it places on the other firm's rating. For agency A

$$R_A = \tilde{\omega}_A \frac{\sum_{i=1}^{t_A} x_i}{t_A} + \hat{\omega}_A R_B. \tag{2}$$

The agencies play a static game of complete information through which they observe each other's monitoring, weight and ratings and decide simultaneously. Given the complete information, the rating agency can back out the average signals of its competitor, enabling the rating to be re-written as follows:

$$R_A = \omega_A \frac{\sum_{i=1}^{t_A} x_i}{t_A} + (1 - \omega_A) \frac{\sum_{i=1}^{t_B} y_i}{t_B}. \tag{3}$$

Once the two rating agencies determine ω_A and ω_B, the coefficients $\tilde{\omega}_A$, $\hat{\omega}_A$, $\tilde{\omega}_B$ and $\hat{\omega}_B$ can be easily backed out, as shown in the Appendix. Although the payoff function of the agency is the same as before, the expression of the variance of the rating now depends on the weights and the monitoring chosen by the two agencies. The problem (1) for agency A becomes

$$\begin{array}{cc} \max\limits_{\{t_A, \omega_A\}} & -[\omega_A^2 \frac{\sigma_\epsilon^2}{t_A} + (1 - \omega_A)^2 \frac{\sigma_\epsilon^2}{t_B}]\delta_A - \varsigma t_A^\alpha \\ s.t. & t_A \geq \tau. \end{array}$$

[8]The results also hold if the correlation is positive.

The optimal number of signals has an interior solution characterised by

$$t_A^* = \omega_A^{\frac{2}{1+\alpha}} \bar{t}_A. \tag{4}$$

The optimal number of signals collected, t_A^*, is increasing in ω_A. When $\omega_A = 1$, it is equivalent to the monopolist solution with $t_A^* = \bar{t}_A$. When the competitor performs a sufficiently high level of monitoring, $t_B > \bar{t}_A^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}} - \tau$, we have a corner solution in which the agency takes the minimum number of draws $t_A^* = \tau$. The first-order condition with respect to the weight is

$$\omega_A^* = \frac{t_A}{t_A + t_B}. \tag{5}$$

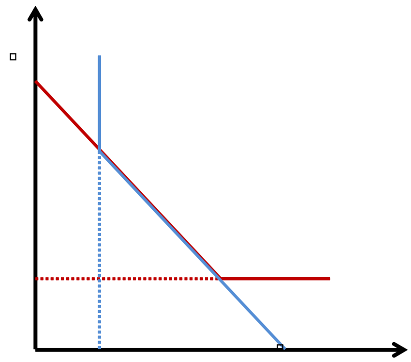
The optimal weight that the agency places on its own signals, ω_A^*, is increasing with the number of draws but is decreasing given competitors' monitoring. We use the conditions to write the reaction function t_A implicitly in terms of t_B:

$$\begin{cases} t_A = (\frac{t_A}{t_B + t_A})^{\frac{2}{1+\alpha}} \bar{t}_A & \text{if} \quad t_B \leq \bar{t}_A^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}} - \tau \\ t_A = \tau & \text{if} \quad t_B > \bar{t}_A^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}} - \tau. \end{cases} \tag{6}$$

2.2.1 Equilibria

The agencies play a static simultaneous game and I focus on the Nash equilibria. The equilibria are depicted in Figure 1 for the symmetric case in which $\bar{t}_A = \bar{t}_B$. Two types of equilibrium exist: one in which both agencies have an interior solution and another in which one agency engages in the minimum level of monitoring. The exact number of equilibria depends on the cost function. If agencies are identical and costs are linear, an infinite number of equilibria exist in which agencies simply share the burden of monitoring (panel a). If costs are convex, only one equilibrium satisfies the interior solution for both agencies (panel b). If costs are concave, three possible equilibria exist (panel c). In two equilibria, one agency free rides completely and places significant weight on the other. In the third

Figure 1: Symmetric equilibria



(a) Linear costs

(b) Convex costs

(c) Concave costs

equilibrium, an interior solution exists for which the two agencies perform equal monitoring. We can state four relevant propositions regarding this game.[9]

Proposition 1 *If $\tau > 0$, an agency always puts a positive weight on competitors' ratings.*

Proposition 2 *If δ_A is high enough relative to δ_B, only one equilibrium exists, with $t_B = \tau$.*

Proposition 3 *In all equilibria, the ratings of the two agencies are equal: $R_A = R_B$.*

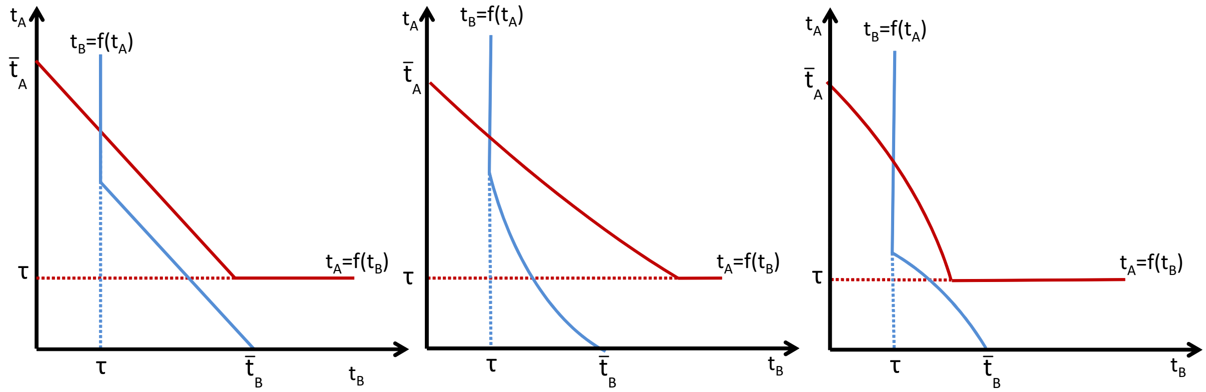
Proposition 4 *If $\delta_A = \delta_B$ and the cost function are concave, the overall level of monitoring with the two agencies is lower than when only one agency exists.*

As long as the minimum level of monitoring is not zero, agencies always put some weight on the other agency's rating. This phenomenon is independent of the cost function. The intuition is simple: as long as the competitor does some monitoring, its rating carries information about the country's creditworthiness. Therefore, for an agency to piggyback to reduce the variance of its own rating is optimal. Proposition 1 forms the basis for the empirical analysis.

Asymmetries in the importance of a country for agencies led to asymmetries in piggybacking. Proposition 2 states that if one agency strongly penalises the variance of its estimator

[9]All proofs are in the Appendix.

Figure 2: Asymmetric Equilibria



(a) Linear costs (b) Convex costs (c) Concave costs

relative to its competitor, only one equilibrium exists in which the competitor engages in minimum monitoring and free rides completely. This result is illustrated in Figure 2.

Proposition 3 follows trivially from the optimality condition for the weight and implies that the two ratings are equal. In the companion appendix, I extend the model to a dynamic setting with two periods and with one agency as the leader. When an agency is alone in the market, it performs all of the monitoring in the first period, sets its rating and keeps it for the two periods. With two agencies, the leader anticipates that the follower will engage in some monitoring and draws fewer signals. The second agency observes the leader's rating and incorporates it in its own assessment, thus saving monitoring effort. In the second period, the leader uses the new information from the follower to re-evaluate its rating. In this more realistic setting, the ratings differ in the first period but converge in the second.[10]

The last proposition states that, in some settings, having more agencies does not imply more monitoring. By putting some weight on competitors, agencies are free riding, i.e. they receive fewer signals than if they were alone in the market. The overall number of signals can be higher, lower or equal, depending on the cost function. If the costs are linear, all equilibria have the same level of monitoring. If the costs are concave, the overall monitoring

[10]Although the algebra in the dynamic model is more complicated, the numerical simulations are consistent with the four propositions. The dynamic setting does not change the nature of the incentives. An agency's re-evaluated rating brings new information to the market, which is used by competitors.

is lower than with one agency. If the costs are convex, more monitoring occurs. Although I do not explicitly test this result, it is consistent with the empirical evidence in Becker and Milbourn (2011).

3 Empirical Analysis

3.1 Overview

Sovereign credit ratings are a condensed assessment of a government's ability and willingness to repay its public debt on time, both for principal and interest payments. S&P evaluates the probability of default, whereas Moody's evaluates the expected loss, which is the product of the probability of default and the expected loss for investors in case of default. To conduct this evaluation, they analyse a wide range of elements, but not necessarily the same ones.[11] The three main rating agencies issue their ratings in the form of equivalent qualitative codes.

Table 1 provides statistics on agency ratings for the period between 1996 and 2006. Each agency rates approximately 100 countries, with one quarter being industrialised economies. Moody's is more concentrated in industrialised and Latin American and Caribbean countries. S&P and Fitch are more balanced, with a relative larger weight of African and Middle East countries. S&P is the most active agency with 137 upgrades and 63 downgrades. Moody's is known to be less active and has only 102 upgrades and 47 downgrades. Fitch is in between with 118 upgrades and 40 downgrades. The last two rows indicate the number of ratings in investment and speculative grades. On an average, 60 percent of the ratings are investment grade. Moody's has a larger weight of investment grade ratings than S&P.

[11] S&P looks at political risk, income and economic structure, economic growth prospects, fiscal flexibility, general government debt burden, offshore and contingent liabilities, monetary flexibility, external liquidity and external debt burden. Moody's rates a country on assessment of economic strength, institutional strength, government financial strength and susceptibility to event risk. Finally, Fitch has a long list of areas that determine its rating: demographic, educational and structural factors, labour market analysis, structure of output and trade, dynamism of the private sector, balance of supply and demand, balance of payments, analysis of medium-term growth constraints, macroeconomic policy, trade and foreign investment policy, banking and finance, external assets, external liabilities, politics and the state and international position.

Table 1: Ratings, upgrades, downgrades and geographic distribution by agencies (1996–2006)

	All countries		
	Moody's	S&P	Fitch
Countries$	93	102	95
Industrialized	24 (26%)	24 (24%)	24 (25%)
Africa and Middle East	13 (15%)	22 (22%)	21 (22%)
South and East Asia and Pacific	13 (15%)	15 (15%)	15 (16%)
European and Central Asia	18 (19%)	18 (18%)	19 (20%)
Latin America and Caribbean	23 (25%)	23 (23%)	16 (17%)
Ratings	927	941	791
Downgrades	47	63	40
Upgrades	102	137	118
Ratings by grade			
Investment (BBB- or above)	596 (64%)	577 (61%)	497 (63%)
Speculative (BB+ or below)	331 (36%)	364 (39%)	294 (37%)

Notes: $ Countries rated at the end of 2006

Table 2: Comparison of year-end ratings between agencies (1996–2006)

	All countries		
	Moody's-Fitch	Moody's-S&P	Fitch-S&P
Countries	76	88	84
Observations	689	822	736
Differences			
0 Notches	50.5%	50.1%	61.5%
$\leq$ 1 Notch	82.7%	85.8%	95.8%
$\leq$ 2 Notches	97.7%	97.8%	99.9%
Average abs.	0.69	0.67	0.43
Average	0.07	0.04	-0.02

Table 2 compares the year-end rating of countries rated by any two agencies. On an average, 80 countries have a common rating for nine years. Although the agencies look at different variables and use different statistical models, they make close assessments. Using a scale comprising 17 categories, the average absolute difference is between 0.4 and 0.7 notches. More than 50 percent of the ratings issued by any two agencies have the exact same code. Only 2 percent of the observations have a difference of more than two notches, and this difference is even more notorious between Fitch and S&P, which agree on 60 percent of the ratings and for which 96 percent are within one notch. The average difference is only 0.4 notches.[12]

[12]This conclusion is also valid for investment and speculative grades countries, even if we exclude the observations with AAA and below B- ratings. The results for these cases are shown in the companion appendix.

3.2 Methodology

The natural starting point of the empirical approach is the equation suggested by the model

$$R_i^j = \tilde{\omega}\bar{x}_i + \hat{\omega}R_i^{-j}, \tag{7}$$

where R_i^j is the rating of country i issued by agency $j \in \{M, SP, F\}$ and R_i^{-j} is the average rating of its two competitors. We explore the time series dimension of the data. For simplicity, the theoretical model considered a static setting in which all agencies played simultaneously. In reality, when agencies re-evaluate a rating, they can only observe the rating issued by their competitors in the previous period. Using the dynamic model in the companion appendix, I include time subscripts in equation (7)

$$R_{i,t}^j = \tilde{\omega}\bar{x}_{i,t} + \hat{\omega}R_{i,t-1}^{-j}, \tag{8}$$

and subtracting the previous period rating

$$R_{i,t}^j - R_{i,t-1}^j = \tilde{\omega}\bar{x}_{i,t} - \hat{\omega}(R_{i,t-1}^j - R_{i,t-1}^{-j}) - (1-\hat{\omega})R_{i,t-1}^j. \tag{9}$$

Equation (9) implies that past rating differences relative to competitors predict changes in ratings. Given that ratings change infrequently, the left-hand side has many zeros; therefore, discrete choice models are more appropriate. I define the variable $Change$ that takes the value of 1 if an upgrade occurred, the value -1 if the country has been downgraded and 0 if the rating has not changed. Further, I estimate an ordered probit model of the type:

$$L_{it}^* = \breve{\omega}(R_{it-1}^j - R_{it-1}^{-j}) + Controls_{it} + \mu_{it}, \tag{10A}$$

$$Change_{it}^{j} = \begin{cases} 1 & \text{if} \quad L_{it}^{*} > c_2 \\ 0 & \text{if} \quad c_2 > L_{it}^{*} > c_1 \\ -1 & \text{if} \quad c_1 > L_{it}^{*}. \end{cases} \tag{10}$$

I assume that no country-specific errors exist; therefore, we estimate the model using an ordered probit analysis.[13] If agencies piggyback, we expect that a higher rating than the competitors increases the probability of a downgrade and reduces the probability of an upgrade. Although we control for several observable variables, the past rating of competitors might still be driven by other unobservable variables that might cause a change in the current rating.

3.2.1 Controlling for a common set of unobservable variables

The strategy to control for a common set of unobservable variables driving the rating of all agencies has two steps. First, I estimate an ordered response model of ratings using the observable variables, following Afonso, Gomes, and Rother (2011).[14]

$$R_{it}^{*} = \beta X_{it} + \eta \bar{X}_i + \lambda Z_i + \epsilon_i + \mu_{it}, \tag{11}$$

$$R_{it} = \begin{cases} AAA(AAa) & \text{if} \quad R_{it}^{*} > c_{16} \\ AA+(Aa1) & \text{if} \quad c_{16} > R_{it}^{*} > c_{15} \\ \ldots & \\ < CCC+(Caa1) & \text{if} \quad c_1 > R_{it}^{*}, \end{cases}$$

where X_{it} is a vector of time-varying explanatory variables, $\bar{X}_i$ is the time average of these variables and Z_i is a vector's time invariant variables. I include macroeconomic variables

[13]This analysis would translate into a country always having a higher probability of downgrades, which leads to a divergence in the ratings for a long enough time series. If having a country effect on the average rating makes sense, having a country effect on the probability of rating changes does not seem plausible.

[14]A cardinal transformation of the ratings was done following a correspondence with the qualitative codes using a linear scale with numerical equivalents between 1 and 17. Therefore, the maximum sovereign rating takes the value of 17 (corresponding to AAA for S&P and Fitch, and Aaa for Moody's) and a lower limit of 1, encompassing all rating notations below B- (for S&P and Fitch) and below B3 (for Moody's).

(such as GDP per capita, real GDP growth, unemployment rate, inflation), government variables (such as government debt, fiscal balance, government effectiveness), external variables (such as external debt, foreign reserves, current account balance) and other variables (such as default history, European union and regional dummies), and estimate the model using an ordered probit analysis.[15] Next, I predict the year-end ratings of Moody's, S&P and Fitch: $\hat{R}^{M}_{it}$, $\hat{R}^{SP}_{it}$, $\hat{R}^{F}_{it}$.

In the second stage, I estimate the annual probability of rating changes, including controls (10A); however, instead of the difference vis-a-vis the other agencies (R^{j}_{t-1}-R^{-j}_{t-1}), I include the difference in the rating from the average predicted rating of the competitors: (R^{j}_{t-1}-$\hat{R}^{-j}_{t-1}$), and the difference in the rating from its own prediction (R^{j}_{t-1}-$\hat{R}^{j}_{t-1}$). We consider the last term as an error correction mechanism.

$$L^{*}_{it} = \breve{\omega}(R^{j}_{it-1} - \hat{R}^{-j}_{it-1}) + \gamma(R^{j}_{it-1} - \hat{R}^{j}_{it-1}) + Controls_{it} + \mu_{it}. \tag{10B}$$

I estimate the models (10A and 10B), including as control variables the lagged rating, the lagged rating squared and the following variables, which are all included in first differences: log of GDP per capita, real GDP growth, unemployment rate, inflation rate, government debt, fiscal balance, government effectiveness, external debt, foreign reserves and current account balance. For robustness, I also separately estimate two probit regressions for downgrades and upgrades.

3.3 Results

The results are presented in Table 3.[16] For each agency, the first column includes the difference in their ratings relative to competitors. The variable is significant for all three agencies and has a negative coefficient. If a rating is overvalued relative to that of the competitors,

[15] See Afonso, Gomes, and Rother (2011) for details on the methodology and the data.

[16] See the companion appendix for a description of the variables, the results of the first stage forecasting models and the estimations of the rating changes using only controls. Their pseudo R^2 are 0.11, 0.16 and 0.20. The changes in GDP per capita and in the government surplus are the most important determinants.

Table 3: Estimations of rating changes (1993–2006)

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
Rating changes						
$R^j_{it-1} - R^{-j}_{it-1}$	-0.35***		-0.38***		-0.59***	
	(-4.14)		(-3.80)		(-4.68)	
$R^j_{it-1} - \hat{R}^{-j}_{it-1}$		-0.24**		-0.25		-0.43***
		(-2.11)		(-1.64)		(-2.82)
$R^j_{it-1} - \hat{R}^{j}_{it-1}$		-0.24		-0.20		-0.11
		(-1.55)		(-1.20)		(-0.74)
Pseudo R^2	0.15	0.23	0.20	0.24	0.26	0.31
Downgrades						
$R^j_{it-1} - R^{-j}_{it-1}$	0.15		0.41***		0.69***	
	(0.15)		(3.84)		(4.47)	
$R^j_{it-1} - \hat{R}^{-j}_{it-1}$		0.22*		0.01		0.53***
		(1.71)		(0.07)		(2.80)
$R^j_{it-1} - \hat{R}^{j}_{it-1}$		0.33*		0.64**		0.17
		(1.74)		(2.42)		(0.92)
Pseudo R^2	0.28	0.38	0.27	0.36	0.35	0.42
Upgrades						
$R^j_{it-1} - R^{-j}_{it-1}$	-0.53***		-0.38***		-0.53***	
	(-4.21)		(-3.38)		(-3.99)	
$R^j_{it-1} - \hat{R}^{-j}_{it-1}$		-0.24		-0.31**		-0.40**
		(-1.39)		(-2.01)		(-2.42)
$R^j_{it-1} - \hat{R}^{j}_{it-1}$		-0.17		-0.06		-0.06
		(-0.94)		(-0.30)		(-0.35)
Pseudo R^2	0.22	0.23	0.29	0.31	0.31	0.35

*Notes: The sample is from 1993 to 2006 and includes 66 countries for Moody's (484 observations, 34 downgrades and 59 upgrades), 65 countries for S&P (497 observations, 41 downgrades and 79 upgrades) and 57 countries for Fitch (420 observations, 25 downgrades and 68 upgrades). Estimations of rating changes are calculated using an ordered probit, whereas a probit is used for downgrades and upgrades. In addition to the lagged rating and rating squared, all regressions include as control variables changes in the following: GDP per capita, real GDP growth, unemployment rate, inflation, government debt, fiscal balance, government effectiveness, external debt, foreign reserves and current account balance. The standard errors are clustered by country. T-statistics are reported in brackets. ***, **, * indicate significance at 1%, 5% and 10% level, respectively.*

the probability of downgrading increases and the probability of upgrading decreases. The conclusions are similar for the separate estimations of downgrades and upgrades.

In the second column of each agency, I include the difference in the rating relative to the predicted rating of the competitors ($R^j_{it-1} - \hat{R}^{-j}_{it-1}$) and relative to its own rating prediction, ($R^j_{it-1} - \hat{R}^{j}_{it-1}$). The latter variable is never statistically significant in the estimation of rating changes, whereas the coefficient of piggybacking remains significant for Moody's and Fitch. In the separate regressions of upgrades and downgrades, the coefficient is statistically

Table 4: Predicted upgrading and downgrading probabilities (Moody's and S&P)

	Moody's						S&P					
	Downgrades			Upgrades			Downgrades			Upgrades		
$R^j_{it-1} - \hat{R}^{-j}_{it-1}$	1	0	-1	1	0	-1	1	0	-1	1	0	-1
AAA	9.4	3.9					15.7	7.6				
AA	6.3	2.4	0.8	3.4	8.5	17.7	13.4	6.3	2.5	2.3	5.9	12.7
A	4.7	1.7	0.5	4.7	10.9	21.6	11.3	5.1	2.0	2.9	7.2	14.9
BBB	5.5	2.0	0.6	4.0	9.6	19.5	10.6	4.7	1.8	3.2	7.7	15.8
BB	9.6	4.0	1.4	2.0	5.5	12.4	11.1	5.0	1.9	3.0	7.3	15.1
B	21.5	10.8	4.6	0.5	1.7	4.8	13.0	6.1	2.4	2.4	6.1	13.0

Notes: Based on regression of rating changes in column (1), (3) and (5) from Table 3. All other controls are set to 0.

significant in four cases (at least one per agency), whereas the error correction term is only statistically significant in two. That both variables are calculated using the same data shows an interdependence of ratings beyond the fundamentals.

Table 4 indicates the probabilities of upgrades or downgrades by Moody's and S&P depending on the rating difference from the other agencies and based on specification 10A. I set all control variables (which are included in differences) to zero. The rating difference has a sizeable effect on the probabilities of upgrades and downgrades. If the rating is one notch higher than that of its competitors, the probability of a downgrade increases twofold for Moody's and S&P. In contrast, if the rating is below that of its competitors, the probability of upgrade increases twofold for all three agencies. For instance, a country with an AA rating from Moody's has an 8.5 percent probability of being upgraded when the other agencies have the same rating; this probability increases to 17.7 percent if the other agencies issue an AA+ rating.

3.4 Robustness

I perform two robustness exercises.[17] First, I re-do the regressions to enable interaction between the piggybacking effect with dummies for geographic area and for grade. Agencies seem to piggyback less in areas with the highest relative share of business. Moody's does

[17] All of the results are in the companion appendix.

not rely on other agencies for industrialised countries and relies on them to a lesser extent in Latin America and Caribbean. S&P and Fitch do not seem to rely on other agencies for African countries. However, when we formally test the equality of the coefficients, we only reject the null for Moody's. The breakdown by grade indicates that Moody's relies more on other agencies related to speculative grades and less for investment grades. The differences are statistically significant. S&P indicates the opposite, yet not statistically significant, behaviour.

As a second robustness exercise, I use data at a daily frequency. I use the same dataset as used in Afonso, Furceri, and Gomes (2012) to analyse the effects of rating announcements on yield spreads. This exercise has two advantages. First, because we focus on the Euro area debt crisis, we have a sample that captures more downgrades. Furthermore, we examine further elements of the interaction between the agencies by including data on outlooks or dummies for past downgrades or upgrades. The second advantage is that we can include high frequency control variables, such as government bond yields or stock market returns, which reflect the information available in the market on the economic and fiscal conditions of the country. If two agencies respond to the same information, that information is likely already incorporated in the market variables. Including the market variables should minimise the problem of the common unobservable information set.

In all estimations, if the rating is higher than that of the competitors, the probability of downgrading increases and of upgrading decreases. The coefficient is statistically significant for Moody's and Fitch. However, all agencies respond to the outlook of the competitors. Negative outlooks increase the probability of a downgrade. Finally, if a competitor has downgraded a country over the past six months, the country is more likely to be downgraded by S&P and Fitch, but not Moody's.

4 Conclusion

This study highlights one characteristic of the credit rating game that is particularly relevant for sovereign ratings. Rating agencies can put a weight on competitors' ratings to improve the precision of their own rating and save on monitoring costs. Evidence from sovereign debt ratings indicates that rating changes can be predicted by the difference in the past rating relative to that of competitors, even when controlling for a common information set, which is consistent with the hypothesis. This piggybacking does not introduce a systematic bias in the reported rating but has two implications. First, if agencies are themselves averaging their ratings, they are closer than predicted by their individual assessments. If investors or policymakers are not aware, they might develop the wrong perception about the true dispersion of opinions. Second, and perhaps more importantly, policymakers should be alert that promoting competition might not be enough to obtain more monitoring if new agencies simply foster piggybacking.

The empirical estimation finds an interdependence between ratings that go beyond the fundamentals. This evidence is consistent with piggybacking but is also consistent with other hypotheses. For instance, one can argue that when an agency observes that its rating differs from that of the competitors, it might question the validity of its own rating. This questioning might lead to more monitoring and a re-evaluation of its rating. Alternatively, one can consider that agencies might not want to be too different from their competitors. If an agency systematically assigns lower sovereign ratings, it might lose customers from the corporate sector. The lack of transparency within the industry limits our ability to study the issue empirically, making it difficult to distinguish between alternative hypotheses.

Although the empirical exercise allows for alternative interpretations, the theoretical model demonstrates that even in the most basic setting, the incentive to piggyback is present. We could extend the model to include other dimensions of the rating game. We could allow for different signal precision, different biases in the signals or even different objective functions of the rating agencies. We could introduce rating shopping or conflicts of interest. However, as long as agencies care about the precision of their ratings and that the ratings themselves carry some information, an incentive exists to piggyback.

References

Afonso, A., D. Furceri, and P. Gomes (2012): "Sovereign credit ratings and financial markets linkages: application to European data," *Journal of International Money and Finance*, 31(3), 606–638.

Afonso, A., P. Gomes, and P. Rother (2011): "Short- and long-run determinants of sovereign debt credit ratings," *International Journal of Finance & Economics*, 11(1), 1–15.

Al-Sakka, R., and O. ap Gwilym (2010a): "Leads and lags in sovereign credit ratings," *Journal of Banking & Finance*, 34(11), 2614–2626.

——— (2010b): "Split sovereign ratings and rating migrations in emerging economies," *Emerging Markets Review*, 11(2), 79–97.

Altinkilic, O., V. Balashoc, and R. S. Hansen (2013): "Are analysts' forcasts informative to the general public?," *Management Science*, 59(11), 2550–2565.

Altinkilic, O., and R. S. Hansen (2009): "On the information role of stock recommendation revisions," *Journal of Accounting and Economics*, 48(1), 17–36.

Becker, B., and T. Milbourn (2011): "How did increased competition affect credit ratings?," *Journal of Financial Economics*, 101(3), 493–514.

Bhatia, A. V. (2002): "Sovereign Credit Ratings Methodology: An Evaluation," IMF Working Papers 02/170, International Monetary Fund.

Bolton, P., X. Freixas, and J. Shapiro (2012): "The Credit Ratings Game," *Journal of Finance*, 67(1), 85–112.

Byoun, S. (2014): "Information content of unsolicited credit ratings and incentives of rating agencies: A theory," *International Review of Economics & Finance*, 33(C), 338–349.

Cohn, J., and J. Juergens (2014): "How Much Do Analysts Influence Each Others Forecasts?," Working papers, University of Texas.

Commission, E. (2010): "Public Consultation on Credit Rating Agencies," Discussion paper, Directorate General Internal Market and Services.

de Haan, J., and F. Amtenbrink (2011): "Credit Rating Agencies," DNB Working Papers 278, Netherlands Central Bank, Research Department.

Faure-Grimaud, A., E. Peyrache, and L. Quesada (2009): "The ownership of ratings," *RAND Journal of Economics*, 40(2), 234–257.

Guttler, A., and M. Wahrenburg (2007): "The adjustment of credit ratings in advance of defaults," *Journal of Banking & Finance*, 31(3), 751–767.

Hong, H., J. D. Kubik, and A. Solomon (2000): "Security Analysts' Career Concerns and Herding of Earnings Forecasts," *RAND Journal of Economics*, 31(1), 121–144.

Jegadeesh, N., and W. Kim (2010): "Do Analysts Herd? An Analysis of Recommendations and Market Reactions," *Review of Financial Studies*, 23(2), 901–937.

Moody's (2009): "Emerging Market Corporate and Sub-Sovereign Defaults and Sovereign Crises: Perspectives on Country Risk," Discussion paper.

Skreta, V., and L. Veldkamp (2009): "Ratings shopping and asset complexity: A theory of ratings inflation," *Journal of Monetary Economics*, 56(5), 678–695.

Appendix - Proofs

Backing the coefficients in the piggybacking equation

Given a rule for setting the rating

$$R_A = \tilde{\omega}_A \frac{\sum_{i=1}^{t_A} x_i}{t_A} + \hat{\omega}_A R_B, \tag{11}$$

and under complete information, we can re-write the rating as

$$R_A = \omega_A \frac{\sum_{i=1}^{t_A} x_i}{t_A} + (1-\omega_A) \frac{\sum_{i=1}^{t_B} y_i}{t_B}. \tag{12}$$

Once the rating agencies determine ω_A and ω_B, which are observable, the rating agencies can set the weight on the competitor's rating as $\tilde{\omega}_A = \omega_A - \frac{(1-\omega_B)(1-\omega_A)}{\omega_B}$ and $\hat{\omega}_A = \frac{(1-\omega_A)}{\omega_B}$.

Equilibrium with interior solution

Putting the reaction functions of agency A and B together, and focusing on the interior solution we get

$$t_A = \frac{(\bar{t}_A)^{\frac{1+\alpha}{\alpha-1}}}{[(\bar{t}_B)^{\frac{1+\alpha}{\alpha-1}} + (\bar{t}_A)^{\frac{1+\alpha}{\alpha-1}}]^{\frac{2}{1+\alpha}}}. \tag{13}$$

Proof of Proposition 1

The coefficient on the opponents rating is $\hat{\omega_A}$ given by

$$\hat{\omega}_A = \frac{(1-\omega_A)}{\omega_B}, \tag{14}$$

where the optimal $1-\omega_A$ is given by

$$1-\omega_A^* = \frac{t_B}{t_A + t_B}. \tag{15}$$

The weight put on the competitors rating will be positive if $t_B > 0$ which is guaranteed by the minimum monitoring τ.

Proof of Proposition 2

If $\frac{\delta_A}{\delta_B} > x$, there will only be one equilibrium with $t_B = \tau$. We have to show that for a high enough x, no interior equilibrium exists nor an equilibrium with $t_A = \tau$. If an interior equilibrium exists, then

$$t_A = \frac{(\bar{t}_A)^{\frac{1+\alpha}{\alpha-1}}}{[(\bar{t}_B)^{\frac{1+\alpha}{\alpha-1}} + (\bar{t}_A)^{\frac{1+\alpha}{\alpha-1}}]^{\frac{2}{1+\alpha}}}. \tag{16}$$

This equation can be re-written knowing that $\bar{t}_i = (\frac{\sigma^2 \delta_i}{\epsilon})^{\frac{1}{1+\alpha}}$, as

$$t_A = \frac{(\bar{t}_A)^{\frac{1}{1+\alpha}}}{(1 + x^{\frac{1}{1-\alpha}})^{\frac{2}{1+\alpha}}}. \tag{17}$$

If the interior solution is bellow τ, the equilibrium does not exist.

$$\frac{(\bar{t}_A)^{\frac{1}{1+\alpha}}}{(1 + x^{\frac{1}{1-\alpha}})^{\frac{2}{1+\alpha}}} < \tau \tag{18}$$

Solving for x

$$x > [\bar{t}_A^{\frac{1}{2}} \tau^{\frac{1+\alpha}{-2}} - 1]^{\frac{1}{1-\alpha}} \tag{19}$$

The second step is to show that, for a high enough x there is no equilibrium with $t_A = \tau$. It is not an equilibrium, provided that $t_B + \tau < \bar{t}_A^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}}$. Using the reaction function the second agency and assuming an interior solution for their problem

$$t_B + \tau = (\frac{\bar{t}_B}{t_b})^{\frac{1+\alpha}{2}} t_B. \tag{20}$$

Combining the equations

$$\bar{t}_B^{\frac{1+\alpha}{2}} t_B^{\frac{1-\alpha}{2}} < \bar{t}_A^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}}, \tag{21}$$

and rearranging, we get

$$(\frac{t_B}{\tau})^{1-\alpha} < x. \tag{22}$$

Proof of Proposition 4

As we have seen, with concave costs there are three equilibria. In the symmetric equilibrium, adding the equilibrium monitoring of the two agencies $T = t_A + t_B$ we get the expression $T = 2^{\frac{\alpha-1}{\alpha+1}} \bar{t}_A$. This is smaller the t_A if $\alpha < 1$.

If we are in the equilibrium with one corner solution, $t_B = \tau$, then

$$t_A = (\frac{t_A}{\tau + t_A})^{\frac{2}{1+\alpha}} \bar{t}_A, \tag{23}$$

rearranging we get

$$\tau + t_A = t_A^{\frac{1-\alpha}{2}} \bar{t}_A^{\frac{1+\alpha}{2}}. \tag{24}$$

As $t_A > 1$, if $\alpha < 1$ then

$$\tau + t_A = t_A^{\frac{1-\alpha}{2}} \bar{t}_A^{\frac{1+\alpha}{2}} < \bar{t}_A^{\frac{1+\alpha}{2}} < \bar{t}_A. \tag{25}$$

COMPANION APPENDIX

<u>FOR ONLINE PUBLICATION</u>

Do credit rating agencies piggyback? Evidence from sovereign debt ratings

Pedro Gomes

I - Dynamic model

The game consists of two periods. All the monitoring is done in the first period. With only one agency in the market, the objective function is

$$\begin{array}{ll} \max\limits_{\{t\}} & -[Var(R_1)\delta + \varsigma t^{\alpha}] - \beta[Var(R_2)\delta] \\ s.t. & t \geq \tau. \end{array}$$

The solution of this problem is $\bar{t} = (\frac{\sigma^2\delta(1+\beta)}{\varsigma\alpha})^{\frac{1}{1+\alpha}}$.

With two agencies, I assume that agency A plays first in both periods. In the first period, agency A chooses how much monitoring to do (t^A) and sets its rating. Then agency B decides how much monitoring to do (t^B) and how much weight should it put in its signals (ω^B). In the second period, agency A might update its rating based on the new information from the competitors, so it decides on (ω^A). The utility function is the same as before. We can solve the model by backward induction. In the second period, agency A's problem is

$$\begin{array}{ll} \max\limits_{\{\omega_A\}} & -[Var(R_2^A)\delta_A] \\ s.t. & t \geq \tau, \end{array}$$

with $R_2^A = \omega_A \frac{\sum_{i=1}^{t_A} x_i}{t_A} + (1-\omega_A)R_1^B$. Where t_A, t_B and ω_B are taken as given. The solution is given by

$$\omega_A^* = \frac{\omega_B t_A}{\omega_B t_A + t_B}. \tag{26}$$

In period 1, agency B's problem is the following:

$$\begin{array}{ll} \max\limits_{\{\omega_B, t_B\}} & -[Var(R_1^B)\delta_B + \varsigma t_B^{\alpha}] - \beta[Var(R_2^B)\delta_B] \\ s.t. & t \geq \tau, \end{array}$$

with $R_1^B = \omega_B \frac{\sum_{i=1}^{t_B} y_i}{t_B} + (1-\omega_B)R_1^A$ and t_A taken as given. The solution for the weight is given by $\omega_B^* = \frac{t_B}{t_A+t_B}$ and for the monitoring is

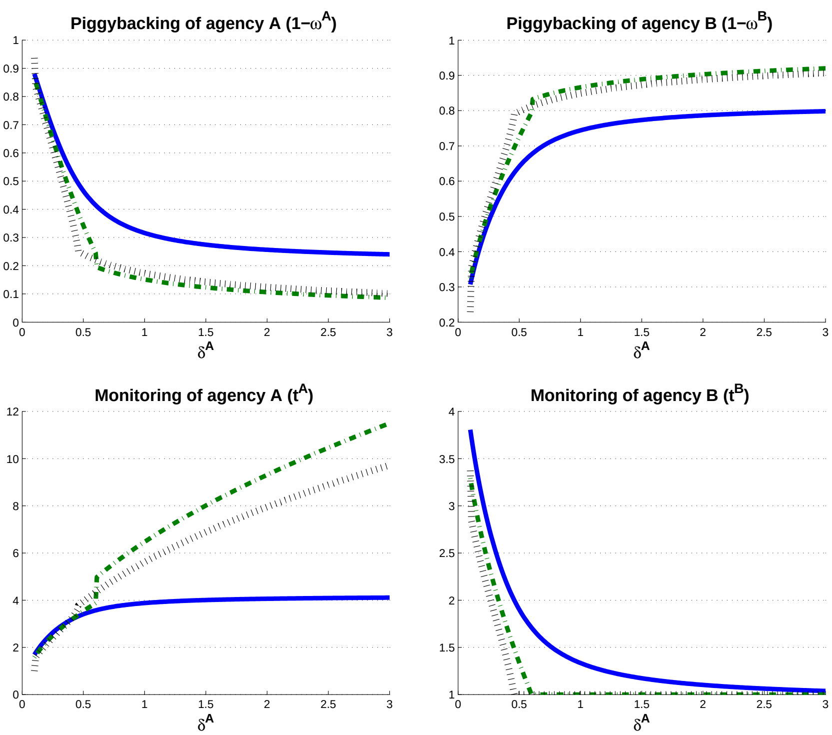
$$\begin{cases} \bar{t}_B^{\frac{1+\alpha}{1-\alpha}} = t_B(t_A+t_B)^{\frac{2}{\alpha-1}} & \text{if} \quad t_A < \bar{t}_B^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}} - \tau \\ t_B = \tau & \text{if} \quad t_A \geq \bar{t}_B^{\frac{1+\alpha}{2}} \tau^{\frac{1-\alpha}{2}} - \tau. \end{cases} \tag{27}$$

Finally, in period 1, agency A's problem is to maximize the payoff function knowing how agency 2 will behave after observing the rating and how itself is going to update the rating in period 2.

$$\begin{aligned} \max_{\{t_A\}} \quad & -[Var(R_1^A)\delta_A + \varsigma t_A^\alpha] - \beta[Var(R_2^A)\delta_A] \\ s.t. \quad & t \geq \tau \\ & Eq.(27) \\ & Eq.(26). \end{aligned}$$

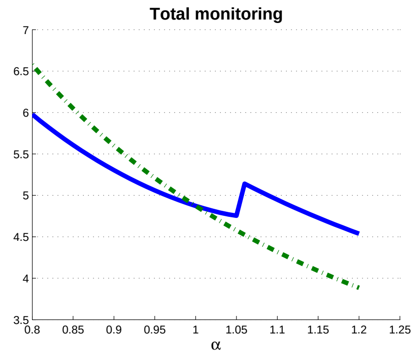
We cannot find an explicit solution to this problem but we can analyse its properties numerically. The following graphs use: $\delta_A = \delta_B = 0.6$, $\beta = 0.9$, $\sigma^2 = 5$, $\varsigma = 0.1$ and $\tau = 1$. Figure A.1 shows the equilibrium piggybacking and monitoring of the two agencies as a function of δ_A for different levels of α. As the importance of the country for agency A increases, it will do more monitoring. This makes the agency B do less monitoring and piggyback more. At some point, it will simply do the minimum level of monitoring. As a consequence, it is always optimal for agency A to revaluate their rating in period 2, by incorporating the new information provided by agency B. We can see that even for high importance of the country, there is always a weight put on the competitor's rating. Finally, Figure A.2 shows the total level of monitoring in the symmetric case for different levels of concavity of the cost function. We can see that if the cost function is concave, the level of monitoring with two agencies is lower than with only one agency. The jump we observe is when agency B sets the minimum level of monitoring. This jump can occur with α lower

Figure A.1: Equilibrium monitoring and piggybacking



Notes: solid line ($\alpha = 0.9$), dashed line ($\alpha = 1$) and dotted line ($\alpha = 1.1$).

Figure A.2: Total monitoring with one and two agencies



Notes: solid line (one agency), dashed line (two agencies).

than one, so it is possible to have higher monitoring with concave costs, but there is always a low level of α implying less overall monitoring with more agencies. The three properties of the game still hold in the dynamic setting.

II - Data

Table A.1: Data sources

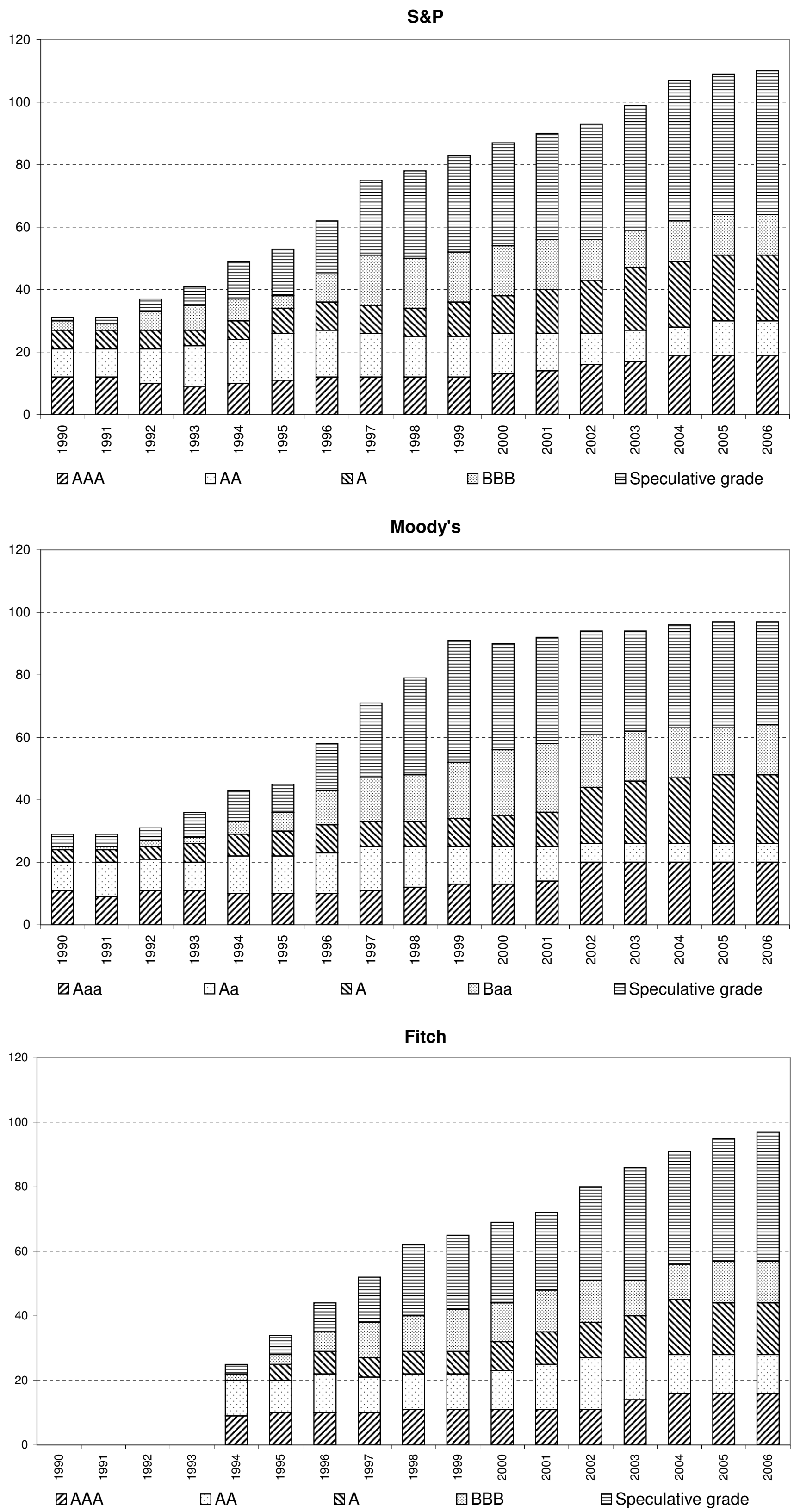
Variable	Description	Source
Per Capita GDP	Per capita nominal GDP in US dollars (logs)	IMF (WEO)
GDP Growth	Annual growth rate of real GDP	IMF (WEO)
Unemployment Rate	Unemployment Rate	IMF (WEO)
Inflation	Annual growth rate of Consumer Price Index	IMF (WEO)
Government Debt	Central Government Debt over GDP	JP (2006)
Government balance	General government balance as percentage of GDP	IMF (WEO)
Government Effectiveness	Aggregate Governance Indicators 1996-2006	WB(AGI)
External Debt	Total debt as share of exports of goods and services	WB (GDF)
Current Account	Current account balance as percentage of GDP	IMF (WEO)
Reserves	Reserves to Imports ratio	IMF (WEO, IFS)
DEF 1	Dummy: 1 if country has defaulted since 1980	S&P
EU	Dummy: 1 If country belongs to European Union	
IND	Dummy: 1 if Industrial Countries	WB
LAC	Dummy: 1 if Latin America and Caribbean	WB
ASI	Dummy: 1 if South Asia or East Asia and Pacific	WB
ECA	Dummy: 1 if Europe and Central Asia	WB
AFR	Dummy: 1 if Sub-Saharan Africa or Middle East and North Africa	WB

Notes: WEO -World Economic Outlook; AGI - Aggregate Governance Indicators; GDF - Global Development Finance; IFS - International Financial Statistics; WB - World Bank; IMF - International Monetary Fund; JP - Jaimovich and Panizza (2006); TI - Transparent International.

Table A.2: Comparison of end-of-year ratings between agencies (1996-2006)

	All countries			**Countries between B- and AA+**		
	Moody's-Fitch	Moody's-S&P	Fitch-S&P	Moody's-Fitch	Moody's-S&P	S&P-Fitch
Countries	76	88	84	58	68	66
Observations	689	822	736	489	607	560
Differences						
0 Notches	50.5%	50.1%	61.5%	41.7%	43.0%	56.1%
$\leq$ 1 Notch	82.7%	85.8%	95.8%	80.2%	83.4%	95.5%
$\leq$ 2 Notches	97.7%	97.8%	99.9%	97.8%	98.7%	99.8%
Average abs.	0.69	0.67	0.43	0.81	0.75	0.48
	Investment grade			**Speculative grade**		
	Moody's-Fitch	Moody's-S&P	Fitch-S&P	Moody's-Fitch	Moody's-S&P	S&P-Fitch
Countries						
Observations	526	454	488	247	188	236
Differences						
0 Notches	54.5%	57.3%	64.3%	51.4%	44.4%	57.4%
$\leq$ 1 Notch	85.3%	84.0%	96.3%	93.5%	86.4%	93.5%
$\leq$ 2 Notches	97.9%	96.9%	99.8%	99.6%	99.4%	100%
Average abs.	0.65	0.62	0.40	0.55	0.70	0.49

Figure A.3: Number of countries rated and rating categories



III - Auxiliary estimations

Table A.3: Forecasting models of rating levels (ordered probit, eq. 11)

	Moody's		S&P		Fitch	
	(1)		(2)		(3)	
GDP per capita	1.83***	(3.87)	1.36***	(3.16)	1.59***	(4.16)
GDP per capita Avg.	0.51*	(1.78)	0.59*	(1.76)	0.51*	(1.67)
GDP growth	2.71	(0.53)	2.48	(0.65)	1.65	(0.40)
GDP growth Avg.	-1.53	(-0.20)	-7.60	(-0.99)	-0.29	(-0.03)
Unemployment	-0.06	(-1.29)	-0.03	(-0.83)	-0.05	(-0.87)
Unemployment Avg.	-0.05**	(-1.99)	-0.04	(-1.59)	0.00	(-0.11)
Inflation	-1.61*	(-1.91)	-4.62***	(-2.76)	-4.22***	(-3.98)
Inflation Avg.	-1.74**	(-1.98)	-4.88***	(-2.82)	-4.37***	(-3.92)
Gov Debt	-0.01	(-0.98)	-0.03***	(-3.15)	-0.03***	(-2.90)
Gov Debt Avg.	-0.02***	(-3.50)	-0.02***	(-3.51)	-0.02**	(-2.38)
Gov Balance	6.17	(1.23)	5.18	(1.24)	2.70	(0.58)
Gov Balance Avg.	1.40	(0.21)	-2.42	(-0.36)	-0.49	(-0.07)
Gov Effectiveness	0.53*	(1.84)	0.47*	(1.78)	0.82**	(2.42)
Gov Effectiveness Avg.	1.65***	(5.03)	1.88***	(4.82)	1.68***	(4.22)
External Debt	-0.01***	(-3.99)	-0.01*	(-1.85)	-0.01**	(-2.12)
External Debt Avg.	-0.01***	(-2.66)	-0.01***	(-2.46)	-0.01***	(-3.52)
Current Account	-7.74**	(-2.38)	-5.88**	(-2.00)	-5.41	(-1.45)
Current Account Avg.	4.19	(1.19)	6.78*	(1.75)	7.30	(1.53)
Reserves	1.61***	(3.01)	0.42	(0.76)	0.60	(0.86)
Reserves Avg.	0.71	(0.79)	1.51	(1.56)	2.61***	(2.48)
Def 1	-1.09***	(-3.18)	-1.07***	(-2.96)	-1.29**	(-3.61)
EU	0.99***	(2.63)	1.03**	(2.21)	1.11***	(2.44)
IND	1.32*	(1.83)	1.65***	(2.59)	1.71*	(1.75)
LAC	-0.89***	(-2.49)	-0.78**	(-2.32)	-0.79**	(-2.19)
Cut1	-2.52	(2.22)	-2.62	(2.46)	-3.09	(2.31)
Cut2	-1.73	(2.24)	-1.79	(2.45)	-1.90	(2.35)
Cut3	-0.85	(2.26)	-0.74	(2.52)	-1.13	(2.37)
Cut4	-0.02	(2.23)	-0.07	(2.52)	-0.24	(2.42)
Cut5	0.47	(2.23)	0.74	(2.51)	0.38	(2.44)
Cut6	1.08	(2.19)	1.82	(2.54)	1.48	(2.39)
Cut7	1.95	(2.21)	2.72	(2.57)	2.65	(2.45)
Cut8	3.25	(2.22)	3.94	(2.63)	3.88	(2.51)
Cut9	3.92	(2.25)	4.81	(2.63)	4.70	(2.49)
Cut10	4.63	(2.25)	5.32	(2.63)	5.40	(2.49)
Cut11	5.29	(2.24)	6.63	(2.67)	6.86	(2.48)
Cut12	5.83	(2.19)	7.65	(2.71)	7.76	(2.58)
Cut13	6.40	(2.15)	8.26	(2.63)	7.81	(2.56)
Cut14	6.96	(2.12)	8.55	(2.67)	8.61	(2.54)
Cut15	7.74	(2.13)	9.31	(2.73)	9.61	(2.56)
Cut16	8.32	(2.16)	10.45	(2.75)	10.21	(2.57)
Observations	551		564		480	
Countries	66		65		58	
LogLik	-711.8		-715.1		-587.45	
Pseudo R^2	0.50		0.51		0.52	

*Notes: The coefficient of the variable with Avg. corresponds to the country time average of the variables. The t statistics are in parentheses, expect for the cut-off points for which we present in parentheses the standard errors. *, **, *** - statistically significant at the 10, 5, and 1 per cent. The correspondence between the ratings and the cut-off points is specified in (11).*

Table A.4: Prediction errors of forecasting models

Rating Agency	Obs.	Prediction error (notches) ≤ -3	-3	-2	**-1**	**0**	**1**	2	3	≥ 3	% Correctly predicted	% Within 1 notch*	% Within 2 notches**	Average error Abs.	
Moody's	551	4	13	42	**94**	**258**	**90**	38	11	1	46.8%	80.2%	94.7%	0.79	-0.06
S&P	564	4	12	20	**113**	**262**	**127**	21	5	0	46.5%	89.0%	96.3%	0.69	-0.04
Fitch	480	1	12	27	**86**	**229**	**100**	25	0	0	47.7%	86.5%	97.3%	0.69	-0.06

*Note: * prediction error within +/- 1 notch. ** prediction error within +/- 2 notches.*

Table A.5: Estimations of rating changes (ordered probit, eq. 10A, only control variables)

	Rating changes (Moody's)	(S&P)	(Fitch)	**Downgrades** (Moody's)	(S&P)	(Fitch)	**Upgrades** (Moody's)	(S&P)	(Fitch)
(R_{t-1}^j)	0.16**	-0.01	-0.05	-0.06	0.05	0.05	0.19**	0.10	0.13
	(2.49)	(-0.17)	(-0.65)	(-0.74)	(0.62)	(0.62)	(2.36)	(1.10)	(1.44)
$(R_{t-1}^j)^2$	-0.01***	0.00	0.00	0.00	-0.01	-0.01	-0.01***	-0.01**	-0.01**
	(-2.57)	(-0.18)	(0.01)	(-0.39)	(-1.42)	(-1.42)	(-3.15)	(-2.07)	(-2.42)
GDP per capita	2.25***	2.74***	3.93***	-3.17**	-2.19*	-2.19*	1.58**	3.32***	4.39***
	(3.45)	(4.41)	(5.04)	(-2.39)	(-1.79)	(-1.79)	(2.33)	(4.30)	(4.74)
GDP growth	4.17	4.04	-1.84	-7.88	-6.89	-6.89	-5.15	-7.11	-8.89
	(0.59)	(0.64)	(-0.29)	(-0.83)	(-0.71)	(-0.71)	(-0.78)	(-1.29)	(-1.12)
Unemployment	-0.11	-0.08	-0.14	-0.04	0.20*	0.20*	-0.18**	0.04	-0.03
	(-1.28)	(-1.04)	(-1.36)	(-0.35)	(1.89)	(1.89)	(-2.01)	(0.45)	(-0.29)
Inflation	-0.04	-0.38***	0.10	0.34	0.07	0.07	0.33	-0.45***	0.26
	(-0.67)	(-3.39)	(1.07)	(0.78)	(0.55)	(0.55)	(1.06)	(-5.11)	(0.98)
Gov Debt	0.01	0.00	0.01	-0.03	-0.01	-0.01	-0.02	-0.06***	-0.06**
	(0.50)	(0.03)	(0.35)	(-1.24)	(-0.65)	(-0.65)	(-1.33)	(-3.19)	(-2.42)
Gov Balance	17.21***	24.03***	22.35***	-8.11	-14.56	-14.56	22.46***	28.44***	24.76***
	(2.72)	(3.67)	(3.17)	(-0.74)	(-1.50)	(-1.50)	(2.89)	(3.60)	(2.60)
Gov Effectiveness	0.58	0.93***	1.02**	-0.37	-1.49***	-1.49***	0.97**	0.93*	1.25**
	(1.39)	(2.59)	(2.17)	(-0.52)	(-2.67)	(-2.67)	(2.25)	(1.84)	(2.42)
External Debt	-0.01	-0.01	0.00	0.01***	0.00	0.00	0.00	-0.01	0.00
	(-1.97)	(-1.42)	(-0.72)	(3.49)	(0.80)	(0.80)	(0.21)	(-1.00)	(-0.60)
Current Account	1.33	-2.49	0.16	2.88	2.45	2.45	4.37	-3.33	1.21
	(0.32)	(-0.65)	(0.02)	(0.54)	(0.39)	(0.39)	(0.86)	(-0.72)	(0.18)
Reserves	1.16	1.31	-0.96	-1.37	-1.36	-1.36	0.47	0.94	-0.89
	(1.45)	(1.51)	(-0.86)	(-1.24)	(-1.05)	(-1.05)	(0.44)	(0.78)	(-0.49)
Cut1	-0.87	-1.70	-2.22						
	(0.31)	(0.36)	(0.40)						
Cut2	2.09	1.09	0.86						
	(0.33)	(0.34)	(0.34)						
Constant				-0.74	-1.36	-1.36	-1.79	-1.33	-1.45
				(-2.27)	(-3.86)	(-3.86)	(-4.68)	(-3.21)	(-3.32)
Observations	484	497	420	484	497	420	484	497	420
Countries	66	65	57	66	65	57	66	65	57
Upgrades	59	79	68				59	79	68
Downgrades	34	41	25	34	41	25			
Pseudo R^2	0.117	0.164	0.199	0.264	0.229	0.284	0.142	0.254	0.268

*Notes: The sample is from 1993 to 2006 . The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively.*

IV - Additional estimations: rating changes by area and grade

Table A.6: Estimations of rating changes by area and grade (multiplicative dummies)

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
Rating changes						
$R^j_{it-1} - R^{-j}_{it-1}$						
$\times Ind$	-0.16		-0.41***		-0.58***	
	(-1.61)		(-3.20)		(-2.69)	
$\times Lac$	-0.22*		-0.41**		-0.93***	
	(-1.74)		(-2.26)		(-3.57)	
$\times Afr$	-0.48***		-0.02		-0.24	
	(-2.80)		(-0.08)		(-1.02)	
$\times Asi$	-0.49*		-0.35*		-0.55	
	(-1.87)		(-1.70)		(-1.48)	
$\times Eca$	-0.67***		-0.37*		-0.46**	
	(-5.60)		(-1.68)		(-2.16)	
$\times Investment$		-0.25***		-0.42***		-0.51***
		(-2.79)		(-3.94)		(-3.01)
$\times Speculative$		-0.61***		-0.30*		-0.71***
		(-3.71)		(-1.80)		(-4.36)
Pseudo R^2	0.15	0.16	0.20	0.20	0.26	0.261
Equality test	0.006	0.049	0.779	0.532	0.450	0.365

*Notes: The sample is from 1993 to 2006 . It includes 66 countries for Moody's (464 observations, 29 downgrades and 59 upgrades), 65 countries for S&P (484 observations, 41 downgrades and 79 upgrades) and 57 countries for Fitch (419 observations, 25 downgrades and 68 upgrades). Estimation of rating changes is with ordered probit. All regressions include as controls the change of: GDP per capita, real GDP growth, unemployment rate, inflation, government debt, fiscal balance, government effectiveness, external debt, foreign reserves and current account balance. The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively.*

Table A.7: Estimations of upgrades and downgrades by area and grade

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
Downgrades						
$R^j_{it-1} - R^{-j}_{it-1}$						
$\times Ind$	-0.37*		0.39**		0.22	
	(-1.94)		(2.12)		(1.16)	
$\times Lac$	0.03		0.59***		0.87***	
	(0.13)		(3.98)		(3.93)	
$\times Afr$	-0.46		0.20		-	
	(-0.99)		(0.39)			
$\times Asi$	0.33		0.27		-0.19	
	(0.66)		(0.89)		(-0.70)	
$\times ECA$	0.50***		0.27		0.73**	
	(3.23)		(1.29)		(2.03)	
$\times IG$		0.06		0.36**		0.37**
		(0.31)		(2.33)		(1.96)
$\times SG$		0.31		0.48**		0.96
		(1.43)		(3.49)		(3.51)
Pseudo R^2	0.32	0.28	0.27	0.27	0.35	0.37
Equality test	0.001	0.471	0.713	0.546	0.033	0.083
Upgrades						
$R^j_{it-1} - R^{-j}_{it-1}$						
$\times Ind$	-0.27		-0.60***		-0.67**	
	(-1.23)		(-2.57)		(-2.55)	
$\times Lac$	-0.42**		-0.12		-0.47	
	(-2.35)		(-0.59)		(-1.44)	
$\times Afr$	-1.79***		0.18		0.12	
	(-4.67)		(0.31)		(0.38)	
$\times Asi$	-0.65*		-0.30*		-0.91**	
	(-1.86)		(-1.87)		(-2.48)	
$\times ECA$	-0.96***		-0.46**		-0.41**	
	(-4.22)		(-2.09)		(-2.00)	
$\times IG$		-0.38***		-0.52***		-0.54***
		(-2.99)		(-3.41)		(-2.98)
$\times SG$		-0.87***		-0.17		-0.50***
		(-3.90)		(-0.98)		(-2.97)
Pseudo R^2	0.25	0.24	0.30	0.30	0.32	0.31
Equality test	0.002	0.040	0.439	0.107	0.272	0.877

*Notes: The sample is from 1993 to 2006 . It includes 66 countries for Moody's (464 observations, 29 downgrades and 59 upgrades), 65 countries for S&P (484 observations, 41 downgrades and 79 upgrades) and 57 countries for Fitch (419 observations, 25 downgrades and 68 upgrades). Estimation of downgrades and upgrades are done using probit. All regressions include as controls the change of: GDP per capita, real GDP growth, unemployment rate, inflation, government debt, fiscal balance, government effectiveness, external debt, foreign reserves and current account balance. The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively.*

V - Additional estimations: rating changes during the Euro Area crisis

The equation we are going to estimate is:

$$L^*_{it} = \alpha_1(R^j_{it-1} - R^{-j}_{it-1}) + \alpha_2(Out^{-j}_{it-1}) + \alpha_3(Down^{-j}_{it}) + \alpha_4(Up^{-j}_{it}) + Controls_{it} + \mu_{it}, \quad \text{(A.1)}$$

where Out^j_{it-1} is a variable that takes the value 1 if the country has a positive outlook and -1 if it has a negative outlook from agency j. Out^{-j}_{it-1} is the average of the outlook variable of its competitors. I also include two dummy variables, whether one of the competitors has downgraded or upgraded the country over the past 6 months: $Down^{-j}_{it}$ and Up^{-j}_{it}. As controls I include the change in yields spreads over the past: 1 week, 1 month, 3 months, 6 months; stock market returns over the past: 1 week, 1 month, 3 months, 6 months; yield spreads volatility (6 months) and stock market returns volatility (6 months). Additionally, I also add in the regressions the lagged rating outlook of the agency, the lagged rating and its square, and two dummy variables $Down^j_{it}$ and Up^j_{it} .

Table A.8: Estimations of rating changes, Euro Area crisis (ordered probit, eq. A.1)

	Moody's			S&P			Fitch		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rating changes									
$R^j_{it-1} - R^{-j}_{it-1}$	-1.14***	-1.06***	-1.24***	-0.12	-0.23	-0.23	-0.50***	-0.61***	-0.56***
	(-6.00)	(-4.97)	(-5.24)	(-0.83)	(-1.59)	(-1.61)	(-3.81)	(-3.48)	(-3.72)
Out^{-j}		0.98**	1.11***		0.67***	0.64***		0.94***	0.92***
		(2.28)	(2.70)		(5.28)	(4.63)		(3.63)	(3.74)
$Down^{-j}$			0.83**			-0.22**			-0.38*
			(2.41)			(-2.19)			(-1.74)
Up^{-j}			0.17			0.33			0.47
			(0.41)			(0.94)			(1.37)
Pseudo R^2	0.39	0.42	0.44	0.29	0.31	0.32	0.22	0.26	0.27

*Notes: The 24 countries included are Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. The sample is daily from June 2002 to October 2010 with a total of 39778 observations and it includes 12, 23 and 18 downgrades and 6, 8 and 18 upgrades for Moody's, S&P and Fitch. All regressions include as controls: the week, month, 3 months and six months change in the yield spread over Germany and the week, month, 3 months and six months cumulative stock market returns until the previous trading day, the 6 months standard deviation of yield spread over Germany and the stock market returns, lagged rating outlook of the agency, the lagged rating and its square, plus two dummy variables $Down^j_{it}$ and Up^j_{it}. The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively.*

Table A.9: Estimations of downgrades and upgrades, Euro Area crisis (probit, eq. A.1)

	Moody's			S&P			Fitch		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Downgrades									
$R^{j}_{it-1} - R^{-j}_{it-1}$	1.17***	1.13***	1.53***	0.14	0.23	0.23	0.22**	0.28***	0.27***
	(3.58)	(4.20)	(3.52)	(0.93)	(1.54)	(1.56)	(2.48)	(2.73)	(2.91)
Out^{-j}		-0.27	-0.38		-0.63***	-0.59***		-0.82***	-0.76***
		(-0.68)	(-1.04)		(-3.57)	(-3.29)		(-3.19)	(-2.74)
$Down^{-j}$			-1.06*			0.19			0.48**
			(-1.95)			(1.53)			(2.04)
Up^{-j}			$			$			$
Pseudo R^2	0.49	0.50	0.52	0.13	0.15	0.15	0.31	0.34	0.35
Upgrades									
$R^{j}_{it-1} - R^{-j}_{it-1}$	-3.15**			-0.20	-0.49	-0.65	-1.46*	-2.29***	-2.26***
	(-2.38)			(-0.50)	(-0.74)	(-0.79)	(-1.95)	(-2.83)	(-2.97)
Out^{-j}					1.27	1.51		2.13***	2.22***
					(1.17)	(1.41)		(3.17)	(2.99)
$Down^{-j}$						$$			$$
Up^{-j}						0.36			0.43
						(0.84)			(0.87)
Pseudo R^2	0.51	-	-	0.24	0.26	0.28	0.26	0.33	0.34

Notes: The 24 countries included are Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. The sample is daily from June 2002 to October 2010 with a total of 39778 observations and it includes 12, 23 and 18 downgrades and 6, 8 and 18 upgrades for Moody's, S&P and Fitch. All regressions include as controls: the week, month, 3 months and six months change in the yield spread over Germany and the week, month, 3 months and six months cumulative stock market returns until the previous trading day, the 6 months standard deviation of yield spread over Germany and the stock market returns, lagged rating outlook of the agency, the lagged rating and its square, plus two dummy variables $Down^{j}_{it}$ *and* Up^{j}_{it}*. The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively.*
[$] There was never a downgrade when one of the competitors upgraded the country within 6 months so the variable is drop and some observations not used. [$$] There was never an upgrade when one of the competitors downgraded the country within 6 months so the variable is drop and some observations not used.

Table A.10: Estimations of rating changes, Euro Area crisis (ordered probit, eq. A.1, only control variables)

	Rating changes			**Downgrades**			**Upgrades**		
	(Moody's)	(S&P)	(Fitch)	(Moody's)	(S&P)	(Fitch)	(Moody's)	(S&P)	(Fitch)
(R^j_{t-1})	0.04	-0.33	0.07	-0.24	0.50	0.30	0.36	-0.24	1.09***
	(0.16)	(-1.27)	(0.32)	(-0.46)	(1.04)	(0.99)	(1.37)	(-0.49)	(2.78)
$(R^j_{t-1})^2$	0.00	0.01	0.00	0.00	-0.02	-0.01	-0.02**	0.01	-0.04 ***
	(-0.06)	(1.45)	(-0.15)	(0.22)	(-1.15)	(-1.01)	(-2.14)	(0.49)	(-2.94)
Out^j_{t-1}	1.01***	1.55***	0.99***	-1.52**	-	-1.52***	0.50	1.19***	0.66**
	(6.62)	(5.83)	(6.24)	(-2.46)		(-3.98)	(1.60)	(3.32)	(2.23)
$Down^j_{t-1}$	-0.02	0.61***	0.20	-0.50***	-0.76***	-0.36*			
	(-0.14)	(2.80)	(1.08)	(-2.75)	(-2.76)	(-1.71)			
Up^j_{t-1}	-0.21	-0.58***	-0.27*						
	(-1.00)	(-3.09)	(-1.83)						
sdequi	-13.60	-26.12***	-14.55	41.37***	43.63***	26.88	42.01*	7.41	-20.50**
	(-1.23)	(-2.65)	(-1.47)	(2.58)	(4.27)	(1.56)	(1.78)	(0.35)	(-2.33)
sdyield	0.25***	0.24	0.19	-0.79	-0.58	-0.62*	-3.98***	-0.59	-1.15
	(2.86)	(1.51)	(1.52)	(-1.62)	(-1.63)	(-1.93)	(-5.15)	(-1.36)	(-1.09)
yield0	0.00	0.02	-0.06	0.02	-0.05	0.08	0.39**	0.15	0.05
	(0.06)	(0.67)	(-1.55)	(0.51)	(-0.91)	(1.46)	(2.45)	(0.78)	(0.11)
yield1	0.03	-0.02	-0.03	-0.11	-0.03	0.00	-0.46***	-0.34**	0.07
	(0.40)	(-0.39)	(-0.55)	(-1.15)	(-0.48)	(0.04)	(-4.30)	(-2.06)	(0.13)
yield3	0.01	0.08	0.04	-0.10	-0.09	-0.10*	-0.85***	0.37*	0.68
	(0.15)	(1.04)	(1.02)	(-1.37)	(-0.95)	(-1.85)	(-5.83)	(1.78)	(1.17)
yield6	-0.17***	-0.13**	-0.11***	0.33*	0.26*	0.28**	-0.30	0.35	-0.47***
	(-3.32)	(-2.33)	(-4.19)	(1.76)	(1.89)	(2.29)	(-1.10)	(1.21)	(-2.95)
equi0	0.69	3.44***	1.26	-1.00	-3.64***	-5.03**	0.51	2.09	-6.99**
	(0.56)	(3.05)	(0.62)	(-0.77)	(-2.83)	(-2.50)	(0.23)	(0.51)	(-2.14)
equi1	-0.27	-0.67	-0.27	1.59	1.22**	1.61	3.18	1.35	2.03 **
	(-0.17)	(-1.18)	(-0.38)	(1.12)	(2.43)	(1.55)	(1.31)	(0.82)	(2.35)
equi3	1.07**	0.16	0.66	-1.60***	-0.29	-1.42***	-1.47	0.59	-1.14
	(2.03)	(0.42)	(1.14)	(-3.19)	(-0.71)	(-2.65)	(-0.98)	(0.36)	(-0.77)
equi6	-0.43	0.44	0.01	0.79	-0.22	0.38	0.27	0.74	1.39
	(-0.73)	(1.32)	(0.05)	(1.28)	(-0.54)	(1.39)	(0.18)	(0.73)	(1.58)
Cut1	-3.60	-6.26	-3.28						
	(1.46)	(1.77)	(1.43)						
Cut2	4.25	2.23	4.21						
	(1.42)	(1.67)	(1.31)						
Constant				-2.21	-5.75	-6.17	-4.63	-2.58	-10.34
				(-0.71)	(-1.93)	(-2.90)	(-2.65)	(-0.83)	(-3.53)
Observations	39778	39778	39778	38990	4622	38067	37953	36586	36402
Countries	24	24	24	24	12	24	24	24	24
Upgrades	6	8	12				6	8	12
Downgrade	12	23	18	12	23	18			
Pseudo R^2	0.22	0.29	0.18	0.37	0.12	0.30	0.26	0.24	0.12

*Notes: The sample is daily from 1993 to 2006 . The standard errors are clustered by country. T-statistics reported in brackets. ***,**,* means significance at 1%, 5%, 10%, respectively. There was never a downgrade of a country upgraded within 6 months, so the variable "Upgrade" is dropped and 788 observations are dropped by Moody's and 1711 for Fitch. S&P only downgrades with a negative outlook, so the outlook is dropped and 35156 obs. not used. There was no upgrade in the sample with less than 6 months of a downgrade so the dummy is dropped and 1037 observations not used for Moody's, 2276 for S&P and 1665 for Fitch. There was no upgrade in the sample with less than 6 months of a downgrade so the dummy is dropped and 788 observations not used for Moody's, 916 for S&P and 1711 for Fitch.*