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Short and Long-run Determinants of Sovereign Debt Credit Ratings*

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Abstract

We study the determinants of sovereign debt ratings from the three main rating agencies, for the period 1995-2005. Using linear and ordered response models we employ a specification that allows us to distinguish between short and long-run effects, on a country's rating, of macroeconomic and fiscal variables. Changes in GDP per capita, GDP growth, government debt, and government balance have a short-run impact on a country's credit rating, while government effectiveness, external debt, foreign reserves and default history are important long-run determinants.

JEL: C23; C25; E44; F30; G15

Keywords: credit ratings; sovereign debt; rating agencies; random effects ordered probit.

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1. Introduction

Sovereign credit ratings are a condensed assessment of a government's ability and willingness to repay its public debt on time. Such measures of the probability of default are particularly relevant for international financial markets, economic agents and governments. First, sovereign ratings are a key determinant of the interest rates a country faces in the international financial market and therefore of its borrowing costs. Second, sovereign ratings may have a constraining impact on the ratings assigned to domestic banks or companies. Third, some institutional investors have lower bounds for the risk they can assume in their investments. Consequently, they choose their bond portfolio composition taking into account the credit risk perceived by the rating notations. Therefore, it is important, both for governments and for financial markets, to understand what factors rating agencies put more emphasis on, when attributing a rating score.

We perform an empirical analysis of foreign currency sovereign debt ratings, using data from the three main rating agencies: Fitch Ratings, Moody's, and Standard & Poor's (S&P). We have compiled a panel data set on sovereign debt ratings, macroeconomic data, and qualitative variables for a wide range of countries starting in 1995. The use of panel data is appealing because it allows examining not only how the agencies attribute a rating, but also how they decide on upgrades and downgrades.

Our main contribution to the existing literature is methodological. The fact that a country's rating does not vary much across time raises some econometric problems. On the one hand, fixed effects estimation only informs us on how the agency decides on upgrades and downgrades, because the country dummy captures the average rating. On the other hand, random effects estimation is inadequate because of the correlation between the country specific error and the regressors. We salvage the random effects approach by modelling the country specific error, which in practical terms implies adding time-averages of the explanatory variables as additional time-invariant regressors. This setting allows us to make a distinction between short and long-run determinants of sovereign ratings.

Regarding the empirical modelling strategy, we follow the two main strands in the literature. We use linear regression methods on a linear transformation of the ratings and we also estimate our specification using both ordered probit and random effects ordered probit methods. The latter is the best procedure for panel data as it considers the existence of an additional normally distributed cross-section error. This approach allows us to determine the cut-off points throughout the rating scale, as well as to test whether a linear quantitative transformation of the ratings is a good approximation.

The results show that four core variables have a consistent short-run impact on sovereign ratings: the level of GDP per capita, real GDP growth, the public debt level and the government balance. Government effectiveness, as well as the level of external debt and external reserves are important long-run determinants. A dummy reflecting past sovereign defaults is also found significant. Fiscal variables seem more important determinants than previously found in the literature.

The paper is organised as follows. Section Two gives an overview of the rating systems and related literature. Section Three explains our methodology. Section Four reports the estimation and prediction results. Section Five concludes.

2. Rating systems and literature

Sovereign ratings are assessments of the relative likelihood of default. The rating agencies look at a wide range of elements, from solvency factors affecting the capacity to repay the debt, to socio-political factors that might influence the willingness to pay of the borrower.

An earlier study on the determinants of sovereign ratings by Cantor and Packer (1996) concluded that the ratings can be largely explained by a small set of variables: per capita income, GDP growth, inflation, external debt, level of economic development, and default history. Further studies incorporated, for instance, macroeconomic variables like the unemployment rate or the investment-to-GDP ratio (Bissoondoyal-Bheenick, 2005). In papers focussing on currency crises, several external indicators such as foreign reserves, current account balance, exports or terms of trade seem to play an important role (Monfort and Mulder, 2000). Indicators of how the government conducts its fiscal policy, in particular budget balance and government debt, can also be relevant, as well as variables that assess political risk, like corruption or social indexes (Depken et al., 2007).

Regarding the econometric approach, there are two strands in the literature. The first uses linear regression methods on a numerical representation of the ratings. The study by Cantor and Packer, applies OLS regressions to a linear representation of the ratings, on a cross section of 45 countries. This methodology was also pursued by Afonso (2003) and Butler and Fauver (2006). Using OLS on a numerical representation of the ratings is quite simple and allows for a straightforward generalization to panel data by doing fixed or random effects estimation (Mora, 2006; Monfort and Mulder, 2000).

Although estimating the determinants of ratings using these approaches has, in general, a good predictive power, it faces some critiques. As ratings are a qualitative ordinal measure, traditional estimation techniques on a linear representation of the ratings are not adequate. First, they implicitly assume that the difference between any two adjacent categories is always equal. Besides, even if this is true, in the presence of elements in the top and bottom category, the coefficient estimates are still biased, even in large samples.

To overcome this critique, another strand of the literature uses ordered response models, for instance, Hu et al. (2002), Bissoondoyal-Bheenick (2005) and Depken et al. (2007). Although ordered probit should be considered the preferred estimation procedure, it is not entirely satisfying. The ordered probit asymptotic properties do not generalise for small samples, so it is problematic to estimate it using only a cross-section of countries. It is, therefore, imperative to maximize the number of observation by having a panel data, but when doing so, one has to be careful. Indeed, the generalization of ordered probit to panel data is not simple, because of the country specific effect. Furthermore, within this framework, the need to have many observations makes it harder to perform robustness analysis by, for instance, partitioning the sample.

3. Methodology

3.1. Linear regression framework

Our starting point is the straightforward generalization of the a cross-section specification to panel data,

$$R_{it} = \beta X_{it} + \lambda Z_i + a_i + \mu_{it}\,, \qquad (1)$$

where we have: R_{it} – quantitative variable, obtained by a linear transformation; X_{it} is a vector containing time varying variables and Z_i is a vector of time invariant variables. The index i (i=1,…,N) denotes the country, the index t (t=1,…,T) indicates the period and a_i stands for the individual effects for each country i. Additionally, we assume that the disturbances μ_{it} are independent across countries and across time.

There are three ways to estimate this equation: pooled OLS, fixed effects or random effects estimation. Under *standard conditions* all estimators are consistent and the ranking of the three methods in terms of efficiency is clear: random effects is preferable to fixed effects, which is preferable to pooled OLS. What we mean by *standard conditions* is whether the country specific error is uncorrelated with the regressors $E(a_i| X_{it}, Z_i)=0$. If this is the case one should opt for the random effects estimation, while if this condition does not hold, both the pooled OLS and the random effects estimation give inconsistent estimates and fixed effects estimation is preferable.

In our case, it seems natural that the country specific effect is correlated with the regressors, so one may be tempted to say that the "fixed effects estimation" is the best strategy.[1] This conclusion is flawed. As there is not much variation of a country's rating over time, the dummies included in the regression capture the country's average rating, while the other variables only capture movements in the ratings across time. Although statistically correct, a fixed effects regression is partially stripped of meaning.

There are two ways of rescuing a random effects approach when there is correlation between the country specific error and the regressors. One is to do the Hausman-Taylor IV estimation, but we would need instruments that are uncorrelated with a_i, which are not easy to find. We opt for a different approach that consists on modelling the error term a_i. This approach, introduced by Mundlak (1978) and described in Wooldridge (2002), is usually applied when estimating non-linear models, as IV estimation proves to be a Herculean task.[2] As we shall see, the application to our case is quite successful. The idea is to give an explicit expression for the correlation between the error and the regressors, stating that the expected value of the country specific error is a linear combination of time-averages of the regressors $\overline{X}_i$.

$$E(a_i \mid X_{it}, Z_i) = \eta \overline{X}_i . \quad (2)$$

If we modify our initial equation (1), with $a_i = \eta \overline{X}_t + \varepsilon_i$ we get

$$R_{it} = \beta X_{it} + \lambda Z_i + \eta \overline{\mathrm{X}}_{\mathrm{i}} + \varepsilon_i + \mu_{it} , \quad (3)$$

where ε_i is an error term by definition uncorrelated with the regressors. In practical terms, we eliminate the problem by including a time-average of the explanatory variables as additional time-invariant regressors. We can rewrite (3) as:

$$R_{it} = \beta(X_{it} - \overline{\mathrm{X}}_i) + (\eta + \beta)\overline{\mathrm{X}}_i + \lambda Z_i + \varepsilon_i + \mu_{it} . \quad (4)$$

This expression is quite intuitive. $\delta = \eta + \beta$ can be interpreted as a long-term effect (e. g. if a country has a permanent high unemployment what is the effect on the rating),

[1] In several studies (Depken et al., 2007, and Mora, 2006) the random effects estimator is rejected by the Hausman test. We confirm this by estimating equation (1) using random effects and performing the Hausman test: the null hypothesis of no correlation is rejected with a p-value of 0.000.

[2] See, for instance, Hajivassiliou and Ioannides (2007).

while β is a short-term effect (e. g. if a country manages to reduce unemployment this year what is the impact on the rating). This intuitive distinction is useful for policy purposes as it can tell what a country can do to improve its rating in the short to medium-term. Alternatively, we can interpret δ as the coefficient of the cross-country determinants of the credit rating. We estimate equation (4) by random effects. The way we modelled the error term can be considered successful if the coefficients η are significant and if the Hausman test indicates no correlation between the regressors and the new error term.[3]

3.2. Ordered response framework

We also estimate the determinants of sovereign debt ratings under a limited dependent variable framework. The ordered probit is a natural approach for this type of problem, because the rating is a discrete variable and reflects an order in terms of probability of default. Each rating agency makes a continuous evaluation of a country's credit-worthiness, embodied in an unobserved latent variable R_{it}^*. The latent variable has a linear form and depends on the same set of variables as before,

$$R_{it}^* = \beta(X_{it} - \overline{X}_i) + \delta\overline{X}_i + \lambda Z_i + \varepsilon_i + \mu_{it} . \tag{5}$$

The rating agencies have several cut-off points to draw up the boundaries of each rating category. The final rating is given by

$$R_{it} = \begin{cases} AAA\ (Aaa) & if \quad R_{it}^* > c_{16} \\ AA+\ (Aa1) & if \quad c_{16} > R_{it}^* > c_{15} \\ AA\ (Aa2) & if \quad c_{15} > R_{it}^* > c_{14} \\ \vdots & \\ < B-(B3) & if \quad c_1 > R_{it}^* \end{cases} . \tag{6}$$

The parameters of equation (5) and (6), notably β, δ, λ and the cut-off points c_1 to c_{16} are estimated using maximum likelihood. As we have panel data, the generalization of

[3] An alternative way would be to estimate β using fixed effects and regress the country dummies on the time averages of the regressors to estimate η. We do not follow such method because it cannot be generalized to ordered response models.

ordered probit is not straightforward, because instead of one error term, we now have two. Wooldridge (2002) describes two approaches to estimate the parameters. One "quick and dirty" possibility is to assume only one error term that is serially correlated within countries. We can then do the standard ordered probit estimation and use a robust variance-covariance matrix to account for the serial correlation. The second possibility is a random effects ordered probit estimation, which considers both errors ε_i and μ_{it} to be normally distributed, and maximizes the log-likelihood accordingly. The second approach should be considered the best one, but it has as a drawback the quite cumbersome calculations involved.[4]

3.3. Explanatory variables

Building on the evidence from the existing literature, we identify a set of variables that may determine sovereign ratings, aggregated in four main areas.

Macroeconomic variables

GDP per capita (+): richer economies are expected to have more stable institutions to prevent government over-borrowing and to be less vulnerable to exogenous shocks.

Real GDP growth (+): higher real growth strengthens the government's ability to repay outstanding obligations.

Unemployment (–): a country with lower unemployment tends to have more flexible labour markets. In addition, lower unemployment reduces the fiscal burden of unemployment and social benefits while broadening the base for labour taxation.

Inflation (+/–): on the one hand, it reduces the real stock of outstanding government debt in domestic currency, leaving more resources to cover foreign debt obligations. On the other hand, it is symptomatic of problems at the macroeconomic level.

[4] The STATA procedure was created by Rabe-Hesketh et al. (2000) and substantially improved by Frechette (2001).

Government variables

Government debt (–): a higher stock of outstanding government debt implies a higher interest burden and should correspond to a higher risk of default.

Fiscal balance (+): large fiscal deficits absorb domestic savings and also suggest macroeconomic disequilibria. Persistent deficits may signal problems with the institutional environment for policy makers.

Government effectiveness (+): high quality of public service delivery, competence of bureaucracy and lower corruption should improve the ability to service debt obligations.

External variables

External debt (–): the higher the external indebtedness, the higher the risk for additional fiscal burden, either directly due to a sell-off of foreign government debt or indirectly because of the need to support over-indebted domestic borrowers.

Foreign reserves (+): higher (official) foreign reserves should shield the government from having to default on its foreign currency obligations.

Current account balance (+/–): a higher current account deficit could signal an economy's tendency to over-consume, undermining long-term sustainability. Alternatively, it could reflect rapid accumulation of investment, which should lead to higher growth and improved sustainability over the medium term.

Other variables

Default history (–): past sovereign defaults may indicate a great acceptance of reducing the outstanding debt burden via a default.

European Union (+): countries that join the European Union (EU) improve their credibility as their economic policy is restricted and monitored by other member states.

Regional dummies (+/–): some groups of countries of the same geographical location may have common characteristics that affect their rating.

4. Empirical analysis

4.1. Data

We build a ratings database with sovereign foreign currency rating, attributed by the three main rating agencies, S&P, Moody's and Fitch Ratings. We cover a period 1970-2005. The rating of a particular year is the rating attributed at 31st of December.[5] We group the ratings in 17 categories by putting together the few observations below B-, which are given the value one, while AAA observations receive the value 17. In 2005, there are 130 countries with a rating, though only 78 have a rating attributed by all three agencies.

Given data availability for the explanatory variables, our estimations only cover the period 1995-2005. Fiscal balance, current account and government debt are in percentage of GDP, foreign reserves enter as percentage of imports and external debt as percentage of exports. The variables inflation, unemployment, GDP growth, fiscal balance and current account enter as a 3-year average, reflecting the agencies' approach to take out the effect of the business cycle when deciding on a sovereign rating. The external debt variable is taken from the World Bank and is only available for non-industrial countries, so for industrial countries we attribute the value zero, which is equivalent to having a multiplicative dummy. We include a dummy variable indicating a past default and a variable measuring the number of years since it last occurrence. This variable captures the recovery of credibility after a default. As for the dummy variable for EU, we consider that the rating agencies anticipated the EU accession. Thus we test the contemporaneous variable, as well as up to three leads. We find that for Moody's and S&P the variable enters with two leads, while for Fitch we find no anticipation of EU accession. Regarding the regional dummies, only the dummies for Industrialised countries and for Latin America and Caribbean countries were significant. Overall, we have an unbalanced panel with 66 countries for

[5] The compiled full historical rating dataset, including foreign and local currency ratings as well as credit rating outlooks, is available from the authors on request.

Moody's, 65 for S&P and 58 for Fitch, with an average of 8 yearly observations per country. Each country experienced, on average, either one or two changes in its rating.[6]

4.2. Linear panel results

In light of the analytical considerations above, we focus the discussion on the random effects estimations (Table 1).[7]

[Table 1]

We report the results for each rating agency of a restricted and an unrestricted model. While the unrestricted model incorporates all variables, the restricted model contains only the variables which have a statistically significant impact. The restricted models are quite robust to alternative exclusion procedures. The explanatory power of the models is very high with R-square values around 0.95 in both restricted and unrestricted versions. We can also assess how successful our specification is. First, in most of the cases, the short and long–run coefficients of the explanatory variables are quite different, which implies that, if we did not include the additional regressors, we would be mispecifying the model.[8] Second, the models pass the Hausman test, which suggests that the country specific error is now uncorrelated with the regressors.

The restricted models (columns 2, 4, and 6 in Table 1) reveal a homogenous set of explanatory variables across agencies. On the real side, the short-run coefficients of GDP per capita and GDP growth rates are significant for all three companies, but do not seem to have a long-run effect. An increase of 2 percentage points of GDP growth improves the

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[6] See Afonso et al. (2007) for a full list of variables, specifications and sources, notably IMF World Economic Outlook, World Bank Aggregate Governance Indicator and Jaimovich, Panizza (2006).

[7] We performed additional analysis, estimating the model using OLS and fixed effects and we have differentiated across sub-periods, ratings levels and exchange rate regimes. Results are not reported to conserve space, but can be found in Afonso et al. (2007).

[8] We perform the formal significance test by estimating equation (3) and testing directly the coefficients of the time averages of the explanatory variables. Average per capita GDP and government effectiveness are always significant at 5% for all agencies. In addition, average unemployment is significant for Moody´s, average government debt is significant for S&P and the average reserves-to-imports is significant for S&P and Fitch. None of the models without the additional variables pass the Hausman test.

rating by around 0.17 notches for Moody's and S&P, while an increase of 6 percent of GDP per capita improves the rating by 0.1 notches.

Regarding the fiscal variables, the coefficient of the government debt-to-GDP ratio as a difference from the average is significant for all three agencies. S&P and Fitch put more emphasis on this variable: a 10 percentage point decline improves the rating by 0.3 notches (0.15 notches for Moody's). On the other hand, Moody's puts more emphasis on the the government balance: a 3 percentage point decrease in the deficit raises Moody's rating by 0.2, compared to 0.1 in the other two agencies. Given their interdependence, one should not see these effects in isolation but rather together, which implies a high overall effect of fiscal policies on the ratings. Finally, the government effectiveness indicator is an important determinant of the rating in the long-run. An improvement of 1 point in the World Bank indicator translates into an improvement of 2 notches. The cross-country difference between the 10^{th} and 90^{th} percentile of the average government effectiveness indicator between countries is 2.5 points. Thus, it captures elements that account for 5 notches difference between ratings.

The external debt-to-exports ratio and the reserves–to-imports ratio are also significant. Increases in external debt drive the rating down in the short and long-run. The difference between the 10^{th} and 90^{th} percentile of the cross-country average external debt ratio is around 300, which corresponds to a cross-country difference of 3 notches for Fitch, 2 notches for S&P, and 1.2 notches for Moody's. External reserves are significantly positive, in the long-run for S&P and Fitch and in the short-run for Moody's. The difference between the 10^{th} and 90^{th} percentile of the average reserves-to-import ratio is 0.4, so they account for a 1.2 notch cross-country difference for Fitch and a 0.8 notches for S&P. The current account balance has a negative impact in the short-run. A current account deficit seems to be an indicator for the willingness of foreigners to cover the current account gap through loans and foreign investment. In this situation, a higher current account deficit is associated with either higher credit-worthiness or good economic prospects of the economy and consequently a higher sovereign rating.

EU and industrial country dummies are also significant for all agencies. If a country has previously defaulted on its debt, it is permanently penalized by 1 to 2 nothes.

Beyond the set of core variables, the agencies appear to employ a limited number of additional variables. Fitch relies on the smallest set of additional variables, comprising government effectiveness and foreign currency reserves as deviation from the average. By contrast, Moody's and S&P look at more factors, with a large degree of homogeneity between these two agencies. In particular, inflation is found to have a significantly negative impact, although with a relative small magnitude.

Finally, the impact of the unemployment on the rating ilustrates the importance of distinguishing between short and long-run impacts. While the average (stuctural) level of unemployment has a significant negative impact on the rating by Moody's, the short-run deviation from the average enters positively and significantly in the S&P model. Unemployment in the short run can be driven by re-adjustments of economic activity that might improve economic performance in the future. Also, structural reforms that raise unemployment in the short run but improve fiscal sustainability or economic prospects in the long run could explain this finding.

4.4. Ordered probit results

Ordered probit models should give additional insight into the determinants of sovereign ratings. As discussed, they generate estimates of the threshold values between rating notches allowing an assessment of the shape of the ratings curve.

The results from the ordered probit estimations validate the findings highlighted above (see Table 2 for the random effects ordered probit). The core variables identified in the linear regressions also show up with the same sign. In addition, the ordered probit models suggest the significance of more explanatory variables, particularly for Fitch. Finally, for the current account variable, the restricted specification for Moody's shows a negative sign for deviations from the average, but a positive sign for the average. Similar sign switches also come out for S&P. This result confirms our priors. In the short run, a higher current account deficit is associated with either higher credit-worthiness or good economic prospects of the economy, but if the countries run permanent current account deficits, it negatively affects their ratings.

[Table 2]

The estimated threshold coefficients reported in the second part of Table 2 suggest that the linear specification, assumed for the panel regression, is broadly acceptable. Nevertheless, the econometric tests at the bottom of the tables reveal additional insights. For the restricted model of Moody's, the test does not reject the null hypothesis of equal distances between thresholds, but the significance level is close to 10%. Indeed the estimated thresholds point to a relatively large jump between the ratings for BBB– and BBB. Countries close to the non-investment grade rating are given a wider range before they actually cross that threshold. For Fitch, the hypothesis of equal distances is rejected, as the thresholds for higher ratings are further apart than those of the lower ratings. In this case the kink lies at the A rating. For S&P, above investment grade, the distances between thresholds first decline and then increase, making the transition to the highest grades more difficult.

4.5. Prediction analysis

Our prediction analysis focuses on two elements: the prediction for the rating of each individual observation in the sample, as well as the prediction of movements in the ratings through time. For the random effects estimations we can have two predictions, with or without the country specific effect, ε_i:

$$\hat{R}_{it} = \hat{\beta}(X_{it} - \overline{X}_i) + \hat{\delta}\overline{X}_i + \hat{\lambda}Z_i + \hat{\varepsilon}_i, \quad (7a)$$

$$\tilde{R}_{it} = \hat{\beta}(X_{it} - \overline{X}_i) + \hat{\delta}\overline{X}_i + \hat{\lambda}Z_i. \quad (7b)$$

We can estimate each country specific effect by taking the time average of the estimated residual for each country. As a result we can include or exclude this additional information that comes out of the estimation. We compute the fitted value and then round it to the closest integer between 1 and 17. For both ordered probit and the random effects ordered probit we fit the value of the latent variable, by setting the error term to zero, and match it up to the cut-off points to determine the predicted rating. Table 3 presents an overall summary of the prediction errors, using the restricted specifications.

[Table 3]

The random effects model including the estimated country effect is the method with the best fit. On average for the three agencies, it correctly predicts 70% of all observations and more than 95% of the predicted ratings lie within one notch (99% within two notches). This is expected, as the estimated country errors capture factors like political risk, geopolitical uncertainty and social tensions that are likely to systematically affect the ratings, therefore, they act as a correction for these factors.

This additional information from the random effects estimation with the country specific effect is not useful if we want to make out-of-sample predictions. In that case, only the random effects estimation excluding the country error is comparable to the other specifications. We can see that, in general, both ordered probit and random effects ordered probit have a better fit. Overall, the simple ordered probit seems the best method as far as prediction in levels is concerned as it predicts correctly around 45% of all observations and more then 80% within one notch.

Let's now turn to how the models perform in predicting changes in ratings. Table 4 presents the total number of sample upgrades (downgrades), the predicted number of upgrades (downgrades) and the ones that where correctly predicted. Over the sample period, on average, there was a change of rating every six years for Moody's and every five years for S&P and Fitch. A country was twice more likely to be upgraded than downgraded.[9]

[Table 4]

The models correctly predict between one third and one half of both upgrades and downgrades. The most noticeable difference between the models is not the number of correctly predicted changes, but the total number of predicted changes. In fact, the ordered probit and random effects ordered probit predict substantially more changes than the random effects estimation. For instance, for S&P, while random effects predict around 79 upgrades and 50 downgrades, the ordered probit model predicts 102 upgrades and 64 downgrades. This strengthens the idea that rating agencies smooth the ratings, along the lines discussed in Altman and Rijken (2004). It also suggests that linear methods might be better in capturing the inertia of rating agencies than ordered response models.

4.6. Examples of specific country analysis

In Table 5 we show the rating for some European and emerging countries in 1998 and 2005. Then, we use the estimated short-run coefficients of the random effects ordered probit, together with the values for the relevant variables to disaggregate the overall prediction change in the rating of each agency into the contributions of the different blocks of explanatory variables: macroeconomic performance, government performance, external elements and the EU. The upper and lower bounds are computed by adding and subtracting one standard deviation to the point estimate of the coefficients.

[Table 5]

[9] This analysis is, in a way, limited as it does not capture upgrades/downgrades across multiple grades or multiple upgrades/downgrades within a year. Although this could be important to analyse particular cases, such as, currency crises, the cases of multiple upgades/downgrades are relatively few compared to the full sample.

Let's compare, for instance, Portugal and Spain. In 1998 they both had an AA (Aa2) rating but in 2005 while Spain had been upgraded to AAA (Aaa) by all agencies, Portugal had been downgraded by S&P. For Portugal, the positive contribution of the macroeconomic performance was overshadowed by the negative government developments: the worsening of the budget deficit since 2000, the upward trend in government debt and the decline in the World Bank government effectiveness indicator. As for Spain, the good macroeconomic performance was the main cause of the upgrade, especially the reduction of structural unemployment since the mid nineties and the increase of GDP per capita due to the persistent high growth.

As a final example we report the results for five emerging economies that have also been upgraded: Brazil, Mexico, Malaysia, Thailand and South Africa. For Brazil, Malaysia and Thailand the main positive contribution came from the external area specially the reduction of external debt and the increase in foreign reserves. This effect is stronger for Fitch. For Mexico and South Africa the contributions are balanced.

5. Conclusion

In this paper we have studied the determinants of global sovereign debt ratings using ratings from the three main international rating agencies for the period 1995-2005. Overall, our results point to a good performance of the estimated models across agencies and across time.

Regarding the methodological approach, we have used linear regression methods and limited dependent variable models, by means of an ordered probit and random effects ordered probit estimations. The latter is the best estimation procedure using panel data, as it considers the existence of an additional cross-country error term. We have also employed a new specification that consists of including time averages of the explanatory variables as additional time-invariant regressors. On the one hand, it allows us to correct the problem of correlation between the country specific error and the regressors. On the other hand, it allows us to distinguish between short-run and long-run effects of a variable on the sovereign rating level, which improves the economic interpretation of the results.

Our results show that a set of core variables have a short-run impact on a country's credit rating: per capita GDP; real GDP growth; government debt and government deficit. Government effectiveness, external debt, foreign reserves and sovereign default dummies are important determinants of the cross-country dimension of the ratings, and therefore, only have a long-run impact. Moreover, the importance of fiscal variables appears stronger than in the previous literature.

The models correctly predict the rating of 40% of the sample and more than 75% of the predicted ratings lie within one notch of the observed value. They also correctly predict between one third and one half of upgrades and downgrades. In our opinion this is quite satisfactory given that the empirical approach used here necessarily neglects two sources of information that are known to enter the decision of the rating agencies. On the one hand, rating agencies generally state that they cover several qualitative variables in addition to quantitative data in the rating process. On the other hand, rating agencies base their decision, to some extent, on projected economic developments. Thus, a more comprehensive model could also incorporate the agencies' expectations regarding the relevant explanatory variables.

Although incorporating forward-looking behaviour of agencies into an econometric model seems important to study particular episodes of sudden and repeated changes in ratings, we think it is not essential for our purposes. First, because most of the countries do not have frequent changes in their ratings, timing is not a fundamental issue. Second, even if the behaviour of agencies were strictly forward-looking, they still base their projections on current information, which should be captured in our modelling. All in all, we believe that such attempt to incorporate expectations would remain tentative.

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Table 1 – Random effects estimation

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.431	8.291	4.347	7.421***	4.409	7.179***
	(0.95)	*(12.49)*	*(1.25)*	*(15.11)*	*(1.19)*	*(13.16)*
GDP per capita	1.779***	1.789***	1.411***	1.403***	1.697***	1.667***
	(7.61)	*(8.03)*	*(7.12)*	*(7.67)*	*(8.83)*	*(9.51)*
GDP per capita Avg.	0.650		0.450		0.375	
	(1.46)		*(1.05)*		*(0.87)*	
GDP growth	8.643***	8.768***	8.125***	8.256***	3.385	4.110*
	(3.07)	*(3.26)*	*(3.50)*	*(3.72)*	*(1.39)*	*(1.74)*
GDP growth Avg.	5.237		-1.907		3.220	
	(0.46)		*(-0.20)*		*(0.26)*	
Unemployment	0.014		0.055**	0.056***	0.017	
	(0.52)		*(2.53)*	*(2.73)*	*(0.61)*	
Unemployment Avg.	-0.072*	-0.073*	-0.018		0.027	
	(-1.78)	*(-1.70)*	*(-0.45)*		*(0.50)*	
Inflation	-0.124*	-0.145**	-0.235***	-0.229***	-0.107	
	(-1.79)	*(-2.11)*	*(-6.17)*	*(-6.13)*	*(-1.24)*	
Inflation Avg.	-0.360*	-0.347**	-0.427***	-0.353**	-0.150	
	(-1.84)	*(-2.00)*	*(-2.65)*	*(-2.44)*	*(-0.66)*	
Gov Debt	-0.014**	-0.014**	-0.033***	-0.033***	-0.022***	-0.027***
	(-2.38)	*(-2.53)*	*(-6.61)*	*(-7.22)*	*(-3.82)*	*(-7.30)*
Gov Debt Avg.	-0.011	-0.014**	-0.010	-0.012**	-0.007	
	(-1.49)	*(-2.24)*	*(-1.34)*	*(-1.97)*	*(-0.69)*	
Gov Balance	7.740***	6.991***	4.387**	4.411**	4.371	
	(2.77)	*(2.54)*	*(1.97)*	*(2.01)*	*(1.37)*	
Gov Balance Avg.	7.893		5.144		5.220	
	(0.80)		*(0.59)*		*(0.69)*	
Gov Effectiveness	0.242		0.370**	0.362**	0.787***	0.887***
	(1.18)		*(2.36)*	*(2.47)*	*(4.54)*	*(5.34)*
Gov Effectiveness Avg.	1.906***	2.470***	2.370***	2.758***	2.155***	2.741***
	(4.06)	*(6.80)*	*(4.91)*	*(7.75)*	*(4.23)*	*(7.47)*
External Debt	-0.004*	-0.004*	-0.003*	-0.003	-0.005***	-0.005***
	(-1.79)	*(-1.95)*	*(-1.68)*	*(-1.51)*	*(-2.97)*	*(-2.76)*
External Debt Avg.	-0.004**	-0.004**	-0.006*	-0.007**	-0.010**	-0.011***
	(-2.20)	*(-2.47)*	*(-1.81)*	*(-2.18)*	*(-2.53)*	*(-3.34)*
Current Account	-7.246***	-8.760***	-3.700**	-3.586**	-3.137	
	(-3.67)	*(-4.84)*	*(-2.18)*	*(-2.18)*	*(-1.16)*	
Current Account Avg.	-3.321		0.123		2.955	
	(-0.78)		*(0.03)*		*(0.63)*	
Reserves	1.423**	1.710***	0.064		-0.100	
	(3.63)	*(4.61)*	*(0.19)*		*(-0.23)*	
Reserves Avg.	1.475	1.254	1.909**	1.988**	3.090***	2.987***
	(1.60)	*(1.43)*	*(2.06)*	*(2.28)*	*(3.59)*	*(3.78)*
Def 1	-1.998***	-2.075***	-1.307***	-1.337***	-1.523***	-1.331***
	(-6.87)	*(-8.11)*	*(-5.23)*	*(-6.74)*	*(-4.13)*	*(-4.60)*
Def 2	-0.015		-0.018		0.075	
	(-0.32)		*(-0.33)*		*(1.15)*	
EU (2)	1.598***	1.650***	0.415**	0.418**	0.507**	0.554**
	(6.63)	*(6.69)*	*(2.41)*	*(2.48)*	*(2.03)*	*(2.40)*
IND	2.289***	3.157***	2.831***	3.438***	2.781***	2.634***
	(2.89)	*(4.61)*	*(3.03)*	*(4.69)*	*(2.61)*	*(3.55)*
LAC	-0.903*		-0.459		-0.718	
	(-1.93)		*(-0.94)*		*(-1.29)*	
R^2	0.945	0.940	0.948	0.946	0.947	0.944
Countries	66	66	65	65	58	58
Observations	551	557	564	565	480	481
Hausman Test [$]	21.93 (0.06)	14.30 (0.160)	16.77 (0.210)	10.73 (0.467)	12.68(0.473)	3.68 (0.816)

Notes: The coefficient of the variable with *Avg*. corresponds to the long-run coefficient ($\beta+\eta_i$) while the one without corresponds to the short-run coefficient β. White diagonal standard errors & covariance (d.f. corrected). The t-statistics are in parentheses. *, **, *** - statistically significant at 10%, 5%, and 1%. [$] The null is that RE estimation is consistent and therefore preferable to fixed effects. The test statistic is to be compared to a Chi-Square with 13 and 11 degrees of freedom respectively (the number of time-varying regressors). The p-value is in brackets.

Table 2 – Random effects ordered probit

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	3.422***	3.349***	3.246***	2.686***	4.087***	4.160***
	(9.40)	*(9.14)*	*(9.02)*	*(8.12)*	*(12.15)*	*(13.12)*
GDP per capita Avg.	0.478***	0.562***	1.117***	0.614***	1.132***	0.913***
	(2.75)	*(3.84)*	*(6.03)*	*(3.94)*	*(7.81)*	*(5.45)*
GDP growth	6.464**	7.852**	5.979*	7.729***	-5.119*	
	(2.06)	*(2.30)*	*(1.93)*	*(2.60)*	*(-1.73)*	
GDP growth Avg.	-9.387**		-8.43*		-6.083	
	(-2.04)		*(-1.79)*		*(-1.31)*	
Unemployment	0.016		0.152***	0.135***	0.012	
	(0.50)		*(4.57)*	*(3.01)*	*(0.36)*	
Unemployment Avg.	-0.078***	-0.085***	0.002		-0.073***	-0.033**
	(-4.40)	*(-5.18)*	*(0.10)*		*(-4.40)*	*(-2.09)*
Inflation	-0.199	-0.214	-0.353**	-0.418***	-0.273**	-0.245*
	(-1.41)	*(-1.51)*	*(-2.53)*	*(-2.93)*	*(-1.96)*	*(-1.79)*
Inflation Avg.	-0.623***	-0.939***	-0.532***	-0.949***	-0.713***	-0.272*
	(-4.01)	*(-6.11)*	*(-3.41)*	*(-6.08)*	*(-4.62)*	*(-1.84)*
Gov Debt	-0.03***	-0.032***	-0.085***	-0.088***	-0.043***	-0.051***
	(-4.61)	*(-4.94)*	*(-11.90)*	*(-12.41)*	*(-7.24)*	*(-9.07)*
Gov Debt Avg.	-0.026***	-0.028***	-0.027***	-0.031***	0.001	
	(-6.99)	*(-8.80)*	*(-8.77)*	*(-10.47)*	*(0.26)*	
Gov Balance	13.898***	10.937***	10.187***	11.559***	9.487***	
	(3.74)	*(2.77)*	*(3.07)*	*(3.32)*	*(3.00)*	
Gov Balance Avg.	6.757*		8.873**		22.304***	21.812***
	(1.84)		*(2.40)*		*(6.18)*	*(5.83)*
Gov Effectiveness	0.223		0.707**	0.794**	1.761***	1.838***
	(0.64)		*(2.08)*	*(2.42)*	*(4.86)*	*(5.17)*
Gov Effectiveness Avg.	3.679***	3.547***	4.606***	3.752***	2.722***	3.104***
	(13.46)	*(15.44)*	*(16.30)*	*(15.62)*	*(11.37)*	*(12.28)*
External Debt	-0.004**	-0.002**	-0.002			
	(-2.29)	*(-2.21)*	*(-0.79)*			
External Debt Avg.	-0.004***		-0.008***	-0.014***		
	(-3.11)		*(-6.40)*	*(-10.39)*		
Current Account	-8.57***	-12.863***	-4.899**		2.772	
	(-3.62)	*(-5.94)*	*(-2.04)*		*(1.23)*	
Current Account Avg.	5.24**	3.723*	18.39***	5.769**	18.993***	26.980***
	(2.21)	*(1.73)*	*(7.21)*	*(2.54)*	*(7.89)*	*(11.27)*
Reserves	2.246***	2.952***	0.205		-0.549	
	(4.37)	*(5.82)*	*(0.42)*		*(-1.14)*	
Reserves Avg.	0.416		3.365***	2.520***	0.876*	
	(0.88)		*(6.94)*	*(5.57)*	*(1.83)*	
Def 1	-3.101***	-2.936***	-1.789***	-2.077***	-2.176***	-1.266***
	(-12.18)	*(-11.95)*	*(-8.05)*	*(-9.25)*	*(-9.33)*	*(-6.03)*
EU	2.197***	2.237***	0.324		0.336	
	(9.04)	*(8.90)*	*(1.55)*		*(1.57)*	
IND	3.554***	3.626***	3.923***	5.848***	4.982***	6.163***
	(7.71)	*(9.08)*	*(8.18)*	*(11.38)*	*(13.24)*	*(15.54)*
LAC	-1.766***	-1.711***	-1.485***	-0.901***	-2.570***	-3.165***
	(-7.08)	*(-8.86)*	*(-6.38)*	*(-4.34)*	*(-11.08)*	*(-13.78)*

Table 2 (Cont.) – Random effects ordered probit

	Moody's		S&P		Fitch	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	8.13	7.00	3.22	7.63	2.46	3.71
Cut1	1.00	1.00	1.00	1.00	1.00	1.00
Cut2	2.00	2.06	2.19	2.16	2.35	2.38
Cut3	3.40	3.36	4.12	4.07	3.33	3.43
Cut4	4.94	5.01	5.34	5.34	4.64	4.82
Cut5	5.94	6.14	7.11	7.19	5.77	5.93
Cut6	7.09	7.35	9.15	9.32	7.51	7.54
Cut7	8.65	8.92	10.75	10.80	9.13	9.02
Cut8	10.72	10.75	13.11	12.92	10.80	10.81
Cut9	11.76	11.82	14.59	14.30	11.82	12.02
Cut10	12.97	13.13	15.46	14.99	12.92	13.10
Cut11	14.25	14.49	17.49	16.59	15.30	15.42
Cut12	15.50	15.72	18.96	18.00	16.99	17.52
Cut13	17.62	17.50	21.51	19.99	17.63	18.42
Cut14	19.11	18.86	22.72	21.07	19.85	20.87
Cut15	20.60	20.26	24.54	23.00	22.11	23.07
Cut16	21.64	21.26	27.07	25.69	24.06	25.04
LogLik	-566.33	-578.24	-514.45	-531.22	-537.09	-533.09
Observations	551	557	564	565	553	564
Equal differences $	29.26 (0.009)	19.91 (0.133)	52.21 (0.000)	59.68 (0.000)	68.57 (0.000)	70.23 (0.000)
Jump&	[7-8]	[7-8]		[9-10]	[12-13]	
Different Slopes#			[2-3 ,5-6, 7-8, 10-11,12-13, 14-15, 15-16]	[2-3, 5-6, 7-8, 12-13, 14-15, 15-16]	[10-11, 13-14, 14-15,15-16]	[10-11, 11- 12, 13-14,14-15, 15-16]
Test*	18.22 (0.149)	12.22 (0.510)	19.23 (0.116)	14.02 (0.300)	22.03 (0.037)	16.69 (0.214)

Notes: The coefficient of the variable with *Avg.* corresponds to the long-run coefficient (β+η), while the one without corresponds to the short-run coefficient β. The t-statistics are in parentheses. *, **, *** - statistically significant at 10%, 5%, and 1%. $ The null is that the differences between categories is equal for all categories. The test statistic is to be compared to a Chi-Square with 14 degrees of freedom. & Identifies two cut points that have a irregular difference. # Identifies a cluster of categories that seem to have a higher slope (increase difficulty in transition between adjacent notches). * The null is that, excluding the jump point, within the two identified clusters the slopes are equal. The test statistic is to be compared to a Chi-Square with either 13 degrees of freedom (if only a jump or different slopes was identified) or 12 degrees of freedom (if both where identified). The p-value is in brackets. The correspondence between the ratings and the cut-off points is specified in (6).

Table 3 – Summary of prediction errors

	Estimation Procedure	Obs.	Prediction error (notches)							% Correctly predicted	% Within 1 notch *	% Within 2 notches **
			>3	2	**1**	**0**	**-1**	-2	<-3			
Moody's	RE with ε_i	557	1	17	**78**	**361**	**91**	8	1	64.8%	95.2%	99.6%
	RE without ε_i	557	21	49	**92**	**188**	**141**	53	13	33.8%	75.6%	93.9%
	Ordered Probit	557	22	35	**99**	**259**	**86**	46	10	46.5%	79.7%	94.3%
	RE Ordered Probit	557	31	59	**106**	**244**	**71**	34	12	43.8%	75.6%	92.3%
S&P	RE with ε_i	565	1	6	**80**	**392**	**83**	2	1	69.4%	98.2%	99.6%
	RE without ε_i	565	17	39	**98**	**216**	**133**	52	10	38.2%	79.1%	95.2%
	Ordered Probit	565	24	28	**99**	**262**	**118**	23	11	46.4%	84.8%	93.8%
	RE Ordered Probit	565	25	41	**115**	**218**	**130**	29	6	38.6%	81.9%	94.3%
Fitch	RE with ε_i	481	3	4	**63**	**339**	**71**	1	0	70.5%	98.3%	99.4%
	RE without ε_i	481	11	39	**93**	**174**	**106**	57	1	36.2%	77.5%	97.5%
	Ordered Probit	481	17	32	**91**	**209**	**95**	31	6	43.5%	82.1%	95.2%
	RE Ordered Probit	553	29	53	**115**	**191**	**121**	36	8	34.5%	77.2%	93.3%

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

Table 4 – Upgrades and downgrades prediction

		Sample Upgrades	Predicted Upgrades	Upgrades correctly predicted at time		Sample Downgrades	Predicted Downgrades	Downgrades correctly predicted at time	
				t	t+1			t	t+1
Moody's	RE with ε_i	60	87	28	17	34	51	16	12
	RE without ε_i	60	89	23	16	34	51	17	8
	Ordered Probit	60	127	31	25	34	72	20	8
	RE Ordered Probit	60	101	23	23	34	65	18	8
S&P	RE with ε_i	79	79	31	14	41	52	18	12
	RE without ε_i	79	90	34	15	41	61	19	14
	Ordered Probit	79	102	38	14	41	64	20	13
	RE Ordered Probit	79	90	31	15	41	68	20	12
Fitch	RE with ε_i	68	67	25	19	25	34	15	7
	RE without ε_i	68	89	24	20	25	53	15	5
	Ordered Probit	69	115	30	24	25	71	15	5
	RE Ordered Probit	89	154	43	29	26	77	13	7

Note: εi - estimated country specific effect.

Table 5 – Example of country analysis: variables' contribution to expected rating changes

European countries

		Portugal			Spain			Greece			Italy			Ireland		
		1998		2005	1998		2005	1998		2005	1998		2005	1998		2005
Rating$	Moody's	Aa2 (15)		Aa2 (15)	Aa2 (15)		Aaa (17)	Baa1 (10)		A1 (13)	Aa3 (14)		Aa2 (15)	Aaa (17)		Aaa (17)
	S&P	AA (15)		AA- (14)	AA (15)		AAA (17)	BBB (9)		A (12)	AA (15)		AA- (14)	AA+ (16)		AAA (17)
	Fitch	AA (15)		AA (15)	AA (15)		AAA (17)	BBB (9)		A (12)	AA- (14)		AA (15)	AAA (17)		AAA (17)
Moody's	Macro	0.53	0.73	0.93	1.69	1.98	2.28	1.33	1.52	1.70	0.91	1.08	1.26	1.46	1.83	2.20
	Government	-0.69	-0.46	-0.23	0.27	0.65	1.03	-0.05	-0.01	0.02	-0.03	0.14	0.31	0.20	0.39	0.58
	External	0.09	0.12	0.15	0.22	0.31	0.39	0.18	0.24	0.31	0.17	0.24	0.30	0.15	0.21	0.26
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Overall change	**-0.07**	**0.39**	**0.86**	**2.19**	**2.95**	**3.70**	**1.46**	**1.75**	**2.03**	**1.05**	**1.46**	**1.87**	**1.81**	**2.43**	**3.05**
S&P	Macro	0.42	0.57	0.73	0.94	1.07	1.20	0.99	1.13	1.27	0.56	0.67	0.77	0.91	1.15	1.38
	Government	-1.06	-0.88	-0.70	0.48	0.77	1.06	-0.13	-0.10	-0.08	0.07	0.21	0.34	0.83	0.98	1.14
	External	0.03	0.05	0.08	0.07	0.14	0.21	0.06	0.11	0.16	0.05	0.11	0.16	0.05	0.09	0.14
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Overall change	**-0.61**	**-0.25**	**0.11**	**1.49**	**1.98**	**2.47**	**0.91**	**1.14**	**1.36**	**0.69**	**0.98**	**1.26**	**1.78**	**2.22**	**2.66**
Fitch	Macro	0.90	0.99	1.08	1.78	2.01	2.25	1.43	1.56	1.69	1.06	1.18	1.30	1.92	2.14	2.35
	Government	-1.26	-1.05	-0.85	-0.46	-0.13	0.19	-0.11	-0.08	-0.06	-0.45	-0.29	-0.14	0.15	0.31	0.47
	External	-0.06	-0.03	-0.01	-0.16	-0.09	-0.02	-0.13	-0.07	-0.01	-0.12	-0.07	-0.01	-0.11	-0.06	-0.01
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Overall change	**-0.42**	**-0.10**	**0.23**	**1.16**	**1.79**	**2.42**	**1.19**	**1.40**	**1.62**	**0.49**	**0.81**	**1.14**	**1.97**	**2.39**	**2.81**

Emerging economies

		Brazil			Malaysia			Mexico			South Africa			Thailand		
		1998		2005	1998		2005	1998		2005	1998		2005	1998		2005
Rating$	Moody's	B2(3)		Ba3 (5)	Baa3 (8)		A3 (11)	Ba2 (7)		Baa1 (10)	Ba1 (7)		Baa1 (10)	Baa3 (8)		Baa1 (10)
	S&P	BB- (5)		BB- (5)	BBB- (8)		A- (11)	BB (6)		BBB (9)	BBB- (8)		BBB+ (10)	BB+ (7)		BBB+ (10)
	Fitch	B+ (4)		BB- (5)	BB (6)		A- (11)	BB (6)		BBB (9)	BB+ (7)		BBB+ (10)	BB (6)		BBB+ (10)
Moody's	Macro	-0.59	-0.49	-0.39	1.00	1.19	1.37	0.95	1.17	1.39	0.79	1.03	1.27	0.91	1.19	1.47
	Government	-0.37	-0.16	0.06	-1.06	-0.79	-0.53	0.26	0.45	0.64	0.34	0.61	0.88	-0.31	-0.14	0.04
	External	-0.15	0.18	0.50	-0.70	-0.35	-0.01	0.13	0.26	0.38	0.28	0.38	0.48	-0.36	-0.12	0.12
	Overall change	**-1.11**	**-0.47**	**0.17**	**-0.76**	**0.04**	**0.83**	**1.34**	**1.88**	**2.42**	**1.41**	**2.02**	**2.64**	**0.24**	**0.94**	**1.64**
S&P	Macro	-0.19	-0.16	-0.13	0.77	0.91	1.05	0.71	0.88	1.05	0.86	0.99	1.13	0.70	0.92	1.13
	Government	-1.01	-0.84	-0.67	-0.93	-0.73	-0.53	0.25	0.40	0.54	0.75	0.96	1.17	-0.68	-0.54	-0.40
	External	-0.22	0.06	0.34	-0.56	-0.28	0.00	-0.06	0.04	0.15	0.00	0.08	0.17	-0.15	0.06	0.26
	Overall change	**-1.42**	**-0.94**	**-0.45**	**-0.71**	**-0.10**	**0.52**	**0.90**	**1.32**	**1.73**	**1.61**	**2.04**	**2.46**	**-0.13**	**0.43**	**0.99**
Fitch	Macro	-0.56	-0.49	-0.41	1.04	1.14	1.25	1.26	1.39	1.52	0.92	1.09	1.25	0.80	0.89	0.97
	Government	-0.46	-0.28	-0.11	-0.61	-0.40	-0.18	-0.08	0.08	0.24	0.91	1.14	1.37	-0.18	-0.03	0.12
	External	0.72	1.36	2.01	0.12	0.52	0.91	0.13	0.35	0.56	-0.06	0.07	0.20	0.43	0.86	1.28
	Overall change	**-0.30**	**0.60**	**1.49**	**0.55**	**1.26**	**1.97**	**1.31**	**1.82**	**2.32**	**1.76**	**2.30**	**2.83**	**1.06**	**1.72**	**2.38**

Notes: The block contributions were calculated using the changes in the variables multiplied by the short-run coefficients estimated by random effects ordered probit, and then aggregated. The only exception was unemployment, for which we used the long-run coefficient. The upper and lower bounds where calculated using plus and minus one standard deviation. $ The quantitative rating scale is in brackets.