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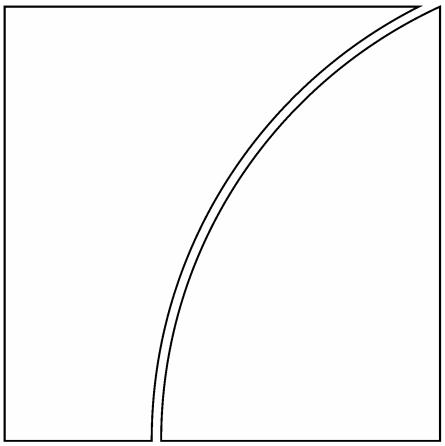

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Potentially endogenous borrowing and developing country sovereign credit ratings

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Foreword

It is a pleasure for me to introduce the fifth Occasional Paper published by the Financial Stability Institute. The purpose of these papers is to raise awareness of, and provide information on, topics of interest to financial sector supervisors. For this fifth paper in our series, the Financial Stability Institute is pleased to introduce an empirical study by one of its own staff on the determinants of developing country sovereign credit ratings.

Under Basel II's standardised approach for computing regulatory capital for credit risk, sovereign ratings can have a direct impact on a bank's minimum capital requirement. For this reason, it is important to understand the determinants of these credit assessments and the extent to which they are consistently generated. Many variables undoubtedly play a role, and their relative importance is likely to vary significantly across country groups. However, by focusing only on the foreign currency ratings assigned to a group of developing country national governments, the current paper is able to show that a surprisingly large share of the cross-country differences in these ratings can be explained with a very small number of variables.

The paper also takes the study of the determinants of sovereign credit ratings in a novel direction. It is conceivable that the extent of national indebtedness not only influences the ratings assigned to sovereigns by credit assessment institutions but also itself responds to these same ratings via the effect of ratings on borrowing costs. In this case the assumptions underlying well known and often employed methods for estimating the relation between credit ratings and their determinants are not satisfied, and alternative estimation techniques should be used. To the best of my knowledge, this paper is the first to recognise and address this issue.

We present this work in the hope that it will provide financial sector supervisors and others with greater insight into the determinants of developing country sovereign credit ratings, an important class of external credit assessments.

Josef Tošovský
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Contents

Abstract

This paper studies the determinants of the foreign currency credit ratings assigned to about 30 developing country national governments by the two leading rating agencies using two different econometric techniques. First, an equation relating the average of the two agencies' ratings assigned to a particular national government to a number of potential determinants, including measures of the country's external debt burden, is estimated by ordinary least squares (OLS) under the assumption that all of the explanatory variables are exogenous. It is shown that, under this assumption, a very large share of the cross-country dispersion of the ratings studied is explained by a small number of variables. The highly statistically significant variables include a corruption perceptions index, the time elapsed since the resolution of the government's most recent default on its foreign currency debt, debt service on public and publicly guaranteed external debt relative to exports and a measure of the maturity structure of international banking claims against both private and public sector entities in the country. Collectively, these four variables explain 87% of the dispersion in average foreign currency credit ratings. The highly statistically significant variables remain statistically significant under an alternative estimation strategy (instrumental variables estimation) that permits one measure of the country's external debt burden - the ratio of total external debt to gross national income - to respond to the values of these ratings as would be the case if the demand for external financing by developing country entities responded systematically to borrowing costs. No evidence for such feedback is found, suggesting that it may be appropriate to estimate the parameters of rating equations that include measures of the external debt burden by OLS.

Introduction

Under the Basel II capital adequacy framework, the credit ratings assigned to national governments by credit assessment institutions, so-called sovereign ratings, can play an important role in determining a bank's regulatory capital. The standardised approach for computing regulatory capital for credit risk, one of two approaches recognised by the Accord, requires that banks use a risk weighting schedule for calculating the minimum credit risk capital to be held against sovereign exposures and other extensions of credit. When a credit assessment institution's rating is available (whether for a sovereign, financial institution or corporation), it is used to determine the risk weight to be applied against the outstanding amount of the exposure. A bank's minimum regulatory capital for credit risk is obtained by taking the sum of the individual exposures multiplied by their respective risk weights. In this way external credit assessments in general, and sovereign ratings in particular, can have a direct impact on a bank's minimum capital requirement. For this reason, it is important to understand the determinants of these credit assessments and the extent to which they are consistently generated.

This paper studies for a group of developing countries the determinants of their foreign currency sovereign ratings. Because a foreign currency sovereign rating reflects the perceived likelihood that the particular government will default on its foreign currency bonds, variables that influence the capacity and willingness of the sovereign to honour its foreign currency bond obligations are potential determinants of these ratings. One variable likely to be related to the capacity of a sovereign to honour its foreign currency bond obligations is required debt service on public and publicly guaranteed external debt, because the external debt of developing countries tends to be denominated in the major reserve currencies and therefore represents a need for foreign exchange.[1] It might be best to measure debt service relative to export earnings, to form an indicator of the government's foreign currency needs relative to the supply of foreign exchange.[2] The size of the nation's international reserves is also likely to be related to the capacity of the national government to honour its foreign currency bond obligations and thus also to its foreign currency credit rating.

Measures of national indebtedness other than required debt service on public and publicly guaranteed external debt may also play a role in the determination of foreign currency sovereign ratings. In particular, the extent of private sector indebtedness may also be important. In the first systematic study of the determinants of foreign currency sovereign ratings, Cantor and Packer (1996) conjecture that, among other variables, a nation's recent current account balances may play a role. Yet the rating agencies probably pay greater attention to the accumulated sum of past borrowing by a country's public and private sectors. This suggests that measures of national indebtedness are potentially more relevant than measures of the flow demand for new borrowing from abroad. One measure of national indebtedness vis-à-vis foreigners is the total value of external debt. One might conjecture, therefore, that the stock of external debt, measured relative to national income, is another variable potentially related to a national government's credit rating.

However, estimating the relation between sovereign ratings and debt variables is not straightforward, because debt variables are not necessarily exogenous; they may depend in part on borrowing costs. All else equal, lower borrowing costs may lead the government and private sectors to take on greater levels of debt. And borrowing costs depend, at least in part, on the credit ratings assigned to national governments. Thus, sovereign ratings and measures of a nation's external debt burden are potentially simultaneously determined. As is well known, simultaneity has important implications for the estimation of the parameters of structural economic relations. In particular, ordinary least squares (OLS) estimation and associated inference strategies are generally inappropriate. Instead, instrumental variables (IV) methods or other suitable techniques need to be employed in order to obtain consistent estimates and conduct proper inference.

This paper studies the determinants of the foreign currency credit ratings assigned to about 30 developing country national governments by the two leading rating agencies, Moody's Investors Service and Standard & Poor's, using two different econometric techniques and is organised as

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[1] According to World Bank (2004b), in 2002, 62% of the long-term external debt of developing countries was denominated in US dollars, 15% was denominated in euros and a further 11% was yen-denominated debt.

[2] This assumes that the national government has the ability to seize the foreign currency export earnings of domestic firms in order to make payments on its foreign currency debt.

follows. Section 1 discusses theoretical considerations motivating a set of potential determinants of foreign currency sovereign ratings and then explains the data used in this study to capture these influences. In addition to measures of the external debt burden and international reserves, these variables include a corruption perceptions index, the time elapsed since the resolution of the government's most recent default on its foreign currency debt, an indicator for whether the country joined the European Union in May 2004 and a variable capturing the maturity structure of international banking claims against entities in the country. The section also presents OLS estimates of the parameters of an equation relating the average of the two ratings given each sovereign to these potential determinants under the assumption that all of the regressors are exogenous. Under this assumption, it is shown that debt service on public and publicly guaranteed external debt (measured relative to exports), the elapsed time since the resolution of the most recent default, the level of perceived corruption and the maturity structure of international banking claims against entities in the country are highly statistically significant determinants of the average foreign currency rating. Collectively, these four variables account for 87% of the variation in the average rating across the sovereigns studied.

Perhaps somewhat surprisingly, OLS estimates indicate that neither the prospect of being admitted to the European Union nor the size of the country's external debt when measured relative to national income - henceforth called the external debt/income ratio - is systematically related to the average foreign currency credit rating assigned to the country's national government, at least after other relevant variables are taken into account. To investigate whether simultaneous equations bias arising from endogeneity of the external debt/income ratio is driving these results, Section 2 formulates a structural simultaneous equations econometric model for the joint determination of the average rating variable and the external debt/income ratio and estimates the parameters of the model with IV methods. The variables that are highly statistically significant with OLS estimation remain statistically significant with IV estimation, at least for a subsample of countries for which the external debt/income ratio is systematically related to the size of recent foreign direct investment flows into the country, a key assumption of the model. In this specification, both the indicator for EU accession and the external debt/income ratio continue to fail to be systematically related to the average foreign currency sovereign rating.

The IV estimation results presented in Section 2 also suggest that the external debt/income ratio is not a function of the average foreign currency credit rating assigned to the national governments of the countries studied, suggesting that it may be appropriate to estimate rating equations that include measures of the external debt burden, such as the external debt/income ratio, by OLS.

Section 3 extends the OLS analysis conducted in Section 1 by examining, for the full sample of countries, whether there are important differences in the weights given the explanatory variables by the two largest rating agencies by regressing the ratings assigned individually by them on the same explanatory variables employed earlier. Important differences in the weights assigned by the two agencies are documented and discussed below. The final section offers some conclusions and makes a suggestion for future research.

I. The determinants of foreign currency sovereign ratings: theory, data and OLS estimates

A. Theory

A foreign currency sovereign credit rating reflects the perceived likelihood that the particular national government will default on its foreign currency bonds. Accordingly, variables that influence the capacity and willingness of the government to honour its foreign currency bond obligations are potential determinants of foreign currency sovereign ratings. As mentioned above, required debt service on public and publicly guaranteed external debt, measured relative to exports, is one variable likely to be related to these credit ratings, as is the size of the nation's international reserves. It is expected that greater debt service would be associated with a worse credit rating for the national government, all else equal, while greater international reserves would be associated with a better rating.

Measures of national indebtedness other than required debt service on public and publicly guaranteed external debt may also play a role in the determination of foreign currency sovereign ratings. In particular, the external debt/income ratio, which includes private sector debt and is an indicator of whether the country as a whole is solvent, is conceivably a determinant of the credit rating assigned to

the national government. In this case, it would be expected that a higher external debt/income ratio would be associated with a worse rating, all else equal.

Political variables are also likely to be important determinants of sovereign ratings. For instance, countries with institutions that generate predictable economic policies are likely to be viewed as less risky and their national governments are thus likely to receive better ratings. This suggests that governments of countries with less perceived corruption are likely to receive better ratings. Another reason why corruption perceptions might influence sovereign ratings is that countries with less corruption are also likely to be countries in which there is a greater protection of property rights. Another political variable that might influence sovereign ratings is prospective European Union membership. In addition to the greater predictability of economic policy associated with the prospect of EU membership, joining the Union has in the past led most countries to improved macroeconomic policymaking and greater political stability. This suggests that, all else equal, governments of EU accession countries might receive better ratings.

Because a sovereign credit rating reflects not only the capacity of the particular government to honour its bond obligations but also its willingness to do so, default history is also likely to be an important determinant of these ratings. In particular, sovereigns that have tended to honour their debt obligations in the past might be assumed to be better credits going forward. This suggests that governments that have recently been in default on their debt obligations are likely to receive worse ratings.

Although the above-mentioned variables are likely to collectively explain a large part of cross-country differences in foreign currency sovereign ratings, many other variables undoubtedly play a role. As a proxy for these omitted variables, this paper considers data on the maturity structure of international banking claims. The conjecture is that a relatively high amount of short-term international banking claims against both public and private sector entities of a particular country suggests that entities in the country are having difficulty obtaining long-term financing at reasonable rates. This could reflect the existence of current economic or financial difficulties or the perception that such difficulties have a greater than average likelihood of arising in the future. These considerations suggest that a relatively high amount of short-term international banking claims against the entities of a particular country would be associated with a worse credit rating for the national government, all else equal.

B. Data and OLS estimates of a rating equation

This subsection explains in greater detail the data studied and reports OLS estimates of the parameters of an equation relating the average foreign currency credit rating assigned to a particular national government across the two largest rating agencies, Moody's Investors Service and Standard & Poor's, to the above-mentioned explanatory variables. As noted in the Introduction, OLS estimation may be inappropriate if debt variables influence rating decisions and the extent of indebtedness also responds to ratings, perhaps via borrowing costs. Nevertheless, it is helpful to begin the analysis by estimating a rating equation by OLS under the assumption that the debt variables employed as explanatory variables are exogenous.

The credit ratings studied are the long-term foreign currency debt ratings assigned to a total of 32 developing country national governments as of January 2004.[3] Each rating of B– (B3) and above was assigned a numeric value, with B– (B3) equal to one, B (B2) equal to 2, up through AAA (Aaa), which was given a value of 16. The complete correspondence between the two agencies' ratings and their numeric equivalents is given in Table 1. An average credit rating for each sovereign was obtained by taking the arithmetic average of the numeric equivalents of the two agencies' ratings.

[3] For a country to be included in the sample, a long-term foreign currency rating of at least B– (B3) needed to be assigned from both agencies. The sovereign ratings studied were those assigned to the national governments of Bolivia, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Egypt, Estonia, Guatemala, Hungary, Indonesia, Jamaica, Kazakhstan, Latvia, Lithuania, Malaysia, Mexico, Morocco, Pakistan, Panama, Peru, the Philippines, Romania, Russia, Slovakia, South Africa, Thailand, Trinidad and Tobago, Turkey, Ukraine and Uruguay.

Table 1

Credit ratings

Standard & Poor's rating	Moody's rating	Numeric equivalent
AAA	Aaa	16
AA+	Aa1	15
AA	Aa2	14
AA–	Aa3	13
A+	A1	12
A	A2	11
A–	A3	10
BBB+	Baa1	9
BBB	Baa2	8
BBB–	Baa3	7
BB+	Ba1	6
BB	Ba2	5
BB–	Ba3	4
B+	B1	3
B	B2	2
B–	B3	1

The average rating of each sovereign in the sample was then regressed on a number of potential determinants. They are a dummy variable that takes the value of unity if the country was admitted to the European Union in May 2004 and zero otherwise (*EU*); the natural logarithm of Transparency International's Corruption Perceptions Index for the country for 2003 (*CP*); the natural logarithm of the number of years elapsed since the resolution of the most recent default by the government on either its foreign currency bonds or bank loans (*TLD*);[4] the natural logarithm of the nation's international reserves in 2003 (*IR*);[5] the natural logarithm of the ratio of short-term international banking claims against the country to the total of all international banking claims against the country (*STC*);[6] the natural logarithm of the country's public and publicly guaranteed external debt service expressed as a percentage of exports (*PEDS*);[7] and the natural logarithm of total external debt measured relative to national income (*EDR*).[8]

Formally, the rating equation under consideration is:

$$\overline{R}_i = \alpha_1 + \alpha_2 EU_i + \alpha_3 CP_i + \alpha_4 TLD_i + \alpha_5 IR_i + \alpha_6 PEDS_i + \alpha_7 STC_i + \alpha_8 EDR_i \quad (1)$$

where $\overline{R}_i$ is the average rating assigned to government i and the alphas are parameters to be estimated by OLS.[9]

[4] Default history is taken from Beers (2004).

[5] As reported in IMF (2004).

[6] As of end-June 2003, as reported in BIS (2003).

[7] In 2002, as reported in World Bank (2004a).

[8] In 2002, as reported in World Bank (2004a).

[9] The error term associated with the equation has been suppressed.

Table 2 reports OLS estimates of the parameters of equation (1) for the full sample of 32 countries and also for a subsample of 27 countries discussed in the next section. Concerning the full-sample estimates, the theory discussed above would seem to receive substantial support from the data. The corruption perceptions, time since last default, debt service and banking claims variables are highly statistically significant and the reserves variable is significant at the 8% level.[10] In addition, all of these variables have the expected signs.[11] Furthermore, the explanatory power of the regression is high; the R-squared statistic is 0.89.

Table 2

OLS estimates of equation (1)

Constant	*EU*	*CP*	*TLD*	*IR*	*PEDS*	*STC*	*EDR*
Full sample: 32 countries							
–1.61	0.37	3.29	0.65	0.29	–1.60	–2.67	–0.40
(0.94)	(0.50)	(5.26)	(4.37)	(1.88)	(5.25)	(3.34)	(0.86)
Subsample: 27 countries							
–2.94	1.12	3.43	0.51	0.35	–1.47	–3.15	–0.70
(1.32)	(1.30)	(4.50)	(2.79)	(1.98)	(4.43)	(3.52)	(1.25)

Note: Absolute values of t-statistics are reported in parentheses.

As expected, by far the largest part of the explanatory power of the regression comes from the highly statistically significant variables *CP*, *TLD*, *PEDS* and *STC*. Yet the degree of explanatory power is surprising: these four variables alone explain 87% of the cross-country variation in the sovereign ratings studied (regression results not shown but are available from the author upon request). This is surprising, because the rating agencies indicate that a number of different aspects of a wide array of political and economic indicators are taken into account when sovereign ratings are assigned and, furthermore, that this is done within the context of a committee process that also takes into consideration more qualitative factors.[12]

The indicator for EU accession is not statistically significant at traditional levels of confidence, although the estimate of its coefficient is positive, as predicted by theory. The lack of statistical significance is surprising, given the generally positive views the agencies have concerning the impact of greater integration with the European Union for the credit ratings of the national governments of accession countries.[13] Indeed, Moody's upgraded the foreign currency sovereign ratings of eight of the 10 accession countries in November 2002, in the belief that the integration process would significantly reduce the risk of a foreign currency crisis leading to a systemic interruption in the timely servicing of these countries' foreign currency debt. The countries studied in this paper that were affected by this rating action are Estonia, Hungary, Latvia, Lithuania and Slovakia.

Interestingly, Moody's foreign currency ratings for these five sovereigns were, as of January 2004, higher than those assigned by Standard & Poor's, mostly by two notches. This suggests that there may be important differences in these agencies' views concerning the appropriate quantitative impact of prospective EU membership on the sovereign ratings of accession countries. To investigate this

[10] Based on Student's t distribution with 24 degrees of freedom. This distribution theory is appropriate if the error terms in the regression are independent and identically distributed Gaussian random variables that are also distributed independently of the explanatory variables.

[11] A higher level of the corruption perceptions index is associated with less perceived corruption.

[12] For a description of some of the indicators that the agencies take into consideration when assigning sovereign ratings, see Moody's Investors Service (2004a) and Standard & Poor's (2004).

[13] For one view on this matter, see Moody's Investors Service (2004b).

possibility, Section 3 below reports OLS estimates of equation (1) with the dependent variable $\overline{R}$ replaced with, alternately, Moody's and Standard & Poor's rating.

The external debt/income ratio also fails to be statistically significant in equation (1), suggesting that countries with high external debt, measured relative to national income, are not penalised with worse credit ratings, holding the *PEDS* variable constant. However, as mentioned in the Introduction, endogeneity of the debt variables could render all of the parameter estimates inconsistent. It could also invalidate the inference procedures associated with OLS estimation.

One solution to the simultaneity problem would be to formulate a structural simultaneous equations model that would endogenise ratings and both debt variables; however, this paper takes a more modest approach. In the next section, a simultaneous equations model for the joint determination of the ratings and *EDR* variables is formulated and estimated with IV methods under the assumption that the *PEDS* variable is exogenous. Treating the *PEDS* variable as exogenous is justifiable in the present context under the assumption that there is substantial variation in exports across countries and that the value of exports does not respond to ratings. Interestingly, the *PEDS* and *EDR* variables are essentially uncorrelated, indicating that they are capturing different dimensions of these countries' external debt burden.[14]

II. A structural model for the joint determination of the average rating and external debt/income ratio

It is conceivable that the external debt/income ratio not only influences the ratings the particular government receives from the rating agencies but also is itself determined in part by the cost of borrowing. The cost of borrowing, in turn, depends in part upon the ratings the sovereign receives from the agencies. As noted above, this potential simultaneity has important implications for the proper estimation of the parameters of rating equations and associated inference procedures.

This potential simultaneity is perhaps best addressed within the context of a small-scale structural econometric model. A simple two-equation structural econometric model for the joint determination of the average rating variable $\overline{R}_i$ and the external debt/income ratio is given by the following two equations:

$$\overline{R}_i = \beta_{12} EDR_i + \gamma_{11} + \gamma_{12} EU_i + \gamma_{13} CP_i + \gamma_{14} TLD_i + \gamma_{15} IR_i + \gamma_{16} PEDS_i + \gamma_{17} STC_i \quad (2)$$

$$EDR_i = \beta_{21} \overline{R}_i + \gamma_{21} + \gamma_{22} EU_i + \gamma_{23} CP_i + \gamma_{24} TLD_i + \gamma_{27} STC_i + \gamma_{28} FDI_i \quad (3)$$

where FDI_i is the average ratio of foreign direct investment to gross domestic product over the 2000-02 period in country *i*.[15] Like equation (1), equation (2) is a rating equation meant to capture the average behaviour of the two leading rating agencies. The explanatory variables in equation (2) are assumed to enter the relation in the manner discussed above. In particular, it is assumed that greater indebtedness as measured by the *EDR* variable will, all else equal, lead to a worse (lower) average rating ($\beta_{12} < 0$).

Equation (3) is a relation describing the aggregate demand for external debt by entities in country *i*. The demand for external debt (measured relative to national income) is assumed to be positively related to the perceived marginal product of capital in the country and negatively related to borrowing costs. This latter assumption suggests a positive relation between the external debt/income ratio and the rating variable ($\beta_{21} > 0$). Concerning the perceived marginal product of capital, it is assumed that the variables *EU* and *CP* have a positive influence and are therefore positively related to the demand for external debt ($\gamma_{22} > 0$ and $\gamma_{23} > 0$) while the proxy variable *STC* is assumed to be negatively associated with the marginal product of capital ($\gamma_{27} < 0$). The turmoil associated with a sovereign default is also assumed to have a negative impact on the marginal product of capital with an effect that diminishes over time ($\gamma_{24} > 0$). The foreign direct investment variable is included in equation (3) as an

[14] The correlation between the *EDR* and *PEDS* variables is 0.05 in the full sample and 0.03 in the subsample.

[15] As reported in World Bank (2002, 2003, 2004a).

additional indicator of the perceived marginal product of capital in the country, and it is assumed that $\gamma_{28} > 0$.

Several conditions need to be met in order for both equations (2) and (3) to be identified.[16] The exclusion of the variables *IR* and *PEDS* from equation (3), on the grounds that these variables are unlikely to influence the marginal product of capital, form part of the sufficient conditions for identification. The assumption that the *FDI* variable does not enter the rating equation, on the grounds that the amount of foreign direct investment into a particular country is unlikely to directly influence the ratings assigned the sovereign by the agencies, is also part of the sufficient conditions for the identification of the model.[17]

The following two conditions also form part of the sufficient conditions for identification:

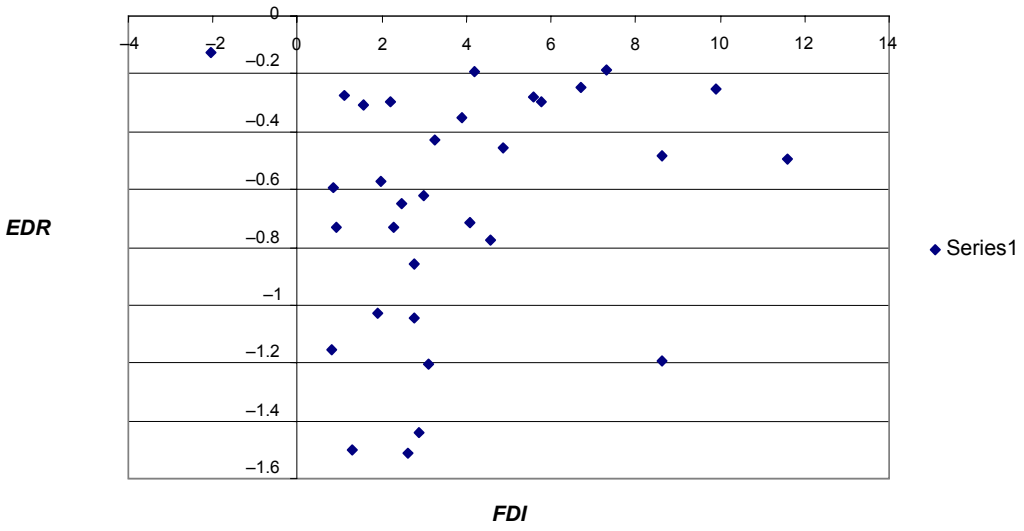
$\gamma_{28} \neq 0$ (C1)

Either $\gamma_{15} \neq 0$ or $\gamma_{16} \neq 0$ (C2)

Condition (C1) is probably more contentious than condition (C2). For this reason, the reasonableness of the former condition was investigated in a preliminary IV estimation of the parameters of equation (3).[18] For the full sample of 32 countries, the null hypothesis $\gamma_{28} = 0$ could not be rejected at the 10% level of confidence. The implication is that the structural model given by equations (2) and (3) may in fact not be identified.

However, a scatter diagram of the joint values of the *FDI* and *EDR* variables (Figure 1) suggests that a small number of countries with extreme rates of foreign direct investment are obscuring the existence of a positive relation between the variables for the rest of the countries. The one country with negative average foreign direct investment over the 2000-02 period is Indonesia. The four countries with foreign direct investment averaging more than 8% of GDP over this same period are Bolivia, Kazakhstan, Slovakia and Trinidad and Tobago. It is shown below that the null hypothesis $\gamma_{28} = 0$ can be rejected at traditional levels of confidence when equation (3) is estimated by IV methods on the group of 27 countries obtained by deleting these five countries from the sample.

Figure 1



[16] See Johnston and DiNardo (1997) for a discussion of identification in the context of simultaneous structural econometric models.

[17] In most cases, the amount of foreign direct investment into a particular country is not an important consideration in the rating decision. However, it can be a factor when foreign direct investment flows are responsible for large current account deficits, in which case the agencies consider the deficits to be less cause for concern.

[18] See Johnston and DiNardo (1997) for a discussion of IV estimation. In the case of all IV estimation results reported in the present study, the instrument set is all seven exogenous variables plus a constant term.

OLS estimates of the parameters of equation (1) for this same subsample of 27 countries are reported in the lower part of Table 2. All of the variables that are highly statistically significant in the case of the full sample remain highly statistically significant, and the reserves variable remains significant at the 8% level of confidence.[19]

Table 3 reports IV estimates of the parameters of equation (2) for the subsample of 27 countries. All of the slope coefficients have the expected signs. Furthermore, the corruption perceptions, time since last default, debt service and banking claims variables are statistically significant at the 5% level of confidence or better, and the reserves variable is statistically significant at the 10% level.[20] On the other hand, the hypothesis that the coefficient on the external debt/income ratio variable is zero cannot be rejected at the 10% level; however, this might reflect primarily a high degree of sampling uncertainty concerning the value of this coefficient. With IV estimation, the point estimate of the coefficient doubles in size (in absolute value) relative to that associated with OLS estimation reported in the lower part of Table 2.

Table 3

IV estimates of equation (2)

Subsample of 27 countries

EDR	***Constant***	***EU***	***CP***	***TLD***	***IR***	***PEDS***	***STC***
–1.42	–3.99	1.45	3.64	0.47	0.32	–1.36	–3.48
(0.64)	(1.03)	(1.10)	(3.66)	(2.19)	(1.66)	(2.74)	(2.59)

Note: Absolute values of t-statistics are reported in parentheses.

The estimated value of the coefficient on the external debt/income ratio reported in Table 3 is large enough in absolute value to be important economically, even if it is not statistically significant. If a country like Latvia, with the second highest external debt/income ratio, were to cut its external debt/income ratio to that of, say Guatemala, the country with the second lowest external debt/income ratio, the estimates reported in Table 3 indicate that Latvia's average foreign currency sovereign credit rating could be expected to increase by about 1.9 notches. For purposes of comparison, if Colombia, the country with the second highest debt service/exports ratio, were able to reduce its debt service/exports ratio to be equal to that of Ukraine, the country with the second lowest debt service/exports ratio, Colombia's average foreign currency sovereign credit rating could be expected to increase by 2.6 notches.

Table 4 reports IV estimates of the parameters of equation (3) for the subsample of 27 countries. The results reported in the table show that foreign direct investment is a statistically significant (at the 5% level) determinant of the external debt/income ratio, once insignificant coefficients are set equal to zero. Interestingly, it is the only statistically significant explanator of the external debt/income ratio, at traditional levels of confidence, aside from the constant term. In particular, even at the 10% level, one cannot reject the null hypothesis that the external debt/income ratio does not respond to the rating variable. The absence of such a response suggests that it may be appropriate to estimate the parameters of rating equations like (1) and (2) that include measures of the external debt burden by OLS.

[19] Based on Student's t distribution with 19 degrees of freedom.

[20] All t-statistics associated with IV estimation are assumed to be distributed as standard normal random variables.

Table 4

IV estimates of equation (3)

Subsample of 27 countries

$\overline{R}$	Constant	*EU*	*CP*	*TLD*	*STC*	*FDI*
–0.09	–1.48	0.46	0.45	0.01	–0.60	0.05
(1.46)	(3.11)	(1.77)	(1.25)	(0.10)	(1.57)	(1.05)
–0.05	–1.02	0.38	–	–	–0.38	0.08
(1.31)	(3.96)	(1.47)			(1.11)	(1.96)
–0.03	–0.85	0.33	–	–	–	0.10
(0.84)	(3.94)	(1.26)				(2.28)

Note: Absolute values of t-statistics are reported in parentheses.

III. Differences in rating behaviour across agencies

With the aim of identifying differences in rating behaviour across the two main rating agencies, this section reports OLS estimates of the following equation:

$$R_i^A = \phi_1 + \phi_2 EU_i + \phi_3 CP_i + \phi_4 TLD_i + \phi_5 IR_i + \phi_6 PEDS_i + \phi_7 STC_i + \phi_8 EDR_i \quad (4)$$

The explanatory variables in equation (4) are the same as those in equation (1), but the dependent variable is different. In the present case, the dependent variable is R_i^A, the rating assigned to government i by agency A.

Table 5 reports OLS estimates of the parameters of equation (4) for $A = M$ in the case of Moody's ratings and $A = SP$ for Standard and Poor's ratings for the full sample of 32 countries. For purposes of comparison, the top row of the table again reports OLS estimates of equation (1), which has the average rating variable $\overline{R}$ as the dependent variable. The results reported in Table 5 do suggest important differences in the weights the two agencies assign to some of the explanatory variables in the regression. In the case of the estimates for Moody's ratings, for instance, a one-sided test of the null hypothesis that the coefficient on the dummy for EU accession is zero, against the alternative that it is greater than zero, rejects the null at about the 6% level of confidence.[21] The estimates suggest, therefore, that Moody's has notched up the ratings of EU accession countries by about 1.4 notches (on average) over and above any effect that preparing for EU membership might have had on the national government's rating via the other explanatory variables in the regression.[22] The estimates reported in the table also indicate important differences across the two agencies in the weights assigned to the corruption perceptions index and to international reserves, with Standard & Poor's placing a greater weight on both explanatory variables, relative to Moody's.

[21] Based on Student's *t* distribution with 24 degrees of freedom.

[22] Likewise, being an EU accession country might have led Standard & Poor's to assign the national government a higher credit rating, even though in this case the null hypothesis that the coefficient on the dummy for EU accession is zero cannot be rejected. It is possible that the efforts associated with preparing for EU membership positively influenced some of the other explanatory variables in the regression.

Table 5

OLS estimates of equations (1) and (4)

Full sample of 32 countries

Dep var	Constant	*EU*	*CP*	*TLD*	*IR*	*PEDS*	*STC*	*EDR*	R^2
$\overline{R}$	–1.61	0.37	3.29	0.65	0.29	–1.60	–2.67	–0.40	0.89
	(0.94)	(0.50)	(5.26)	(4.37)	(1.88)	(5.25)	(3.34)	(0.86)	
R^M	–0.50	1.37	2.48	0.65	0.24	–1.56	–2.94	–0.53	0.86
	(0.25)	(1.62)	(3.42)	(3.73)	(1.35)	(4.42)	(3.17)	(0.98)	
R^{SP}	–2.72	–0.64	4.10	0.66	0.33	–1.63	–2.39	–0.27	0.89
	(1.67)	(0.92)	(6.85)	(4.61)	(2.30)	(5.61)	(3.13)	(0.61)	

Note: Absolute values of t-statistics are reported in parentheses.

Conclusions

This paper examines for a group of about 30 developing countries the determinants of their foreign currency sovereign credit ratings using two different econometric techniques. First, an equation relating the average rating given the national government by the two main rating agencies to a number of potential determinants is estimated by OLS under the assumption that all of the explanatory variables are exogenous. It is shown that, under this assumption, a very large percentage of the cross-sectional dispersion of the ratings studied is explained by a small number of variables. Indeed, seven explanatory variables explain 89% of the dispersion. The highly statistically significant variables include a corruption perceptions index, the time elapsed since the resolution of the most recent default by the government on its foreign currency debt and debt service on public and publicly guaranteed external debt measured relative to exports.

Another highly statistically significant variable in the OLS analysis is a measure of the maturity structure of international banking claims against both private and public sector entities in the country. This variable, the ratio of short-term international banking claims against entities in the country to total international banking claims against those same entities, is included as a proxy for various omitted variables related to sovereign credit ratings. The conjecture is that a relatively high value of this variable suggests that entities in the country are having difficulty obtaining long-term financing at reasonable rates. This could reflect the existence of current economic or financial difficulties or the perception that such difficulties have a greater than average likelihood of arising in the future. Consistent with this conjecture, a relatively high value of this short-term banking claims variable is shown to be associated with a worse average foreign currency credit rating for the national government, all else equal.

A high amount of short-term international banking claims against both public and private sector entities of a particular country might also directly influence the credit ratings assigned to the national government. A high amount of such claims can magnify a country's vulnerability to changes in investor sentiment and thus increase the perceived credit risk of the national government. It should be noted, however, that the ratio of short-term international banking claims to the total of such claims, the banking claims variable employed in the present study, can be large even if the amount of short-term banking claims against entities in the country is small, if the total of all such claims is also small.

Of course, the highly statistically significant variables account for most of the ability of the estimated regression equation to explain the cross-country dispersion in sovereign ratings. Yet the fraction of dispersion explained is surprisingly large: the four highly statistically significant variables discussed above explain 87% of the cross-country variation in average ratings. This is surprising, because the agencies indicate that a number of different aspects of a wide array of political and economic variables are taken into account when sovereign ratings are assigned and, furthermore, that this is done within the context of a committee process that also takes into consideration more qualitative factors.

The OLS estimates indicate that the ratio of total external debt to gross national income - the external debt/income ratio - is not a statistically significant explanator of the sovereign ratings studied, at least after other relevant variables are taken into account. This finding is robust to an alternative estimation strategy (IV estimation) that permits the external debt/income ratio to respond to sovereign ratings as would be the case if the demand for external financing by developing country entities responded systematically to borrowing costs. No evidence for such feedback is found, suggesting that it may be appropriate to estimate the parameters of rating equations that include measures of the external debt burden by OLS.

Although perhaps contrary to first thoughts, it might in fact not be too surprising that the external debt/income ratio is dominated by the debt service variable when explaining foreign currency sovereign ratings. For these ratings, the perceived ability of the national government to meet its foreign currency debt service requirement over the near and medium term may be viewed as more important by the rating agencies than longer-term solvency considerations. Another possibility is that the external debt/income ratio is too broad a measure of solvency. It reflects the external debt of both the public and private sectors, and it is not obvious that the debt burden of the private sector is relevant for the credit rating assigned to a country's national government. Future research may wish to investigate whether a narrower solvency measure, such as the ratio of total government debt to national income, is a superior explanator of sovereign ratings.

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