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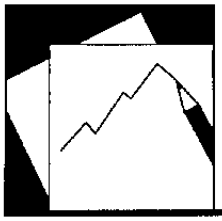

IMF Working Paper

On The Determinants of First-Time Sovereign Bond Issues

David A. Grigorian

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International Capital Markets Department

On The Determinants of First-Time Sovereign Bond Issues

Prepared by David A. Grigorian[1]

Authorized for distribution by Carlos Medeiros

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Abstract

In recent years, the number of countries which have borrowed in international capital markets by issuing sovereign bonds has increased substantially. For these countries, capital market access meant a de facto acknowledgement of their policy successes and improvements in their creditworthiness that enabled them to graduate from the group of official financing recipients into a more advanced group of emerging market economies. The paper looks at the determinants of sovereign bond issuances and derives the relationship between internal and external factors and market access using a simple macro model. The market access condition is then translated into a simple rule that requires an excess demand for the sovereign bonds in question. Regression results based on this model offer some insights into peculiarities of first-time sovereign bond issues that could be used in policy deliberations.

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Author's E-Mail Address: Dgrigorian@imf.org

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I. INTRODUCTION

In recent years, especially following the emergence of market-based economies in Eastern Europe and former Soviet Union, and the strong performance of some Latin American countries throughout the 1990s, the number of countries which have obtained access to international capital markets has increased substantially. For these countries, capital market access meant a de facto acknowledgement of their policy successes and improvements in their creditworthiness that enabled them to graduate from the group of official financing recipients into a more advanced group of emerging market economies. Yet, for a large number of developing countries obtaining international capital markets remains a much-desired outcome. This paper looks at the determinants of capital market access by developing countries and provides insights into successful first and subsequent sovereign bond issuances.

The primary objective pursued by sovereigns in accessing international capital markets is to smooth their consumption or investment, or to build up their foreign currency reserves. Other objectives in accessing the market include desire to diversify financing sources and establish a benchmark for the valuation of sovereign credit risk.

Recent literature provides some insights into the determinants of capital flows into developing countries. Reviewing the experience of developing countries since early 1990s, Calvo, Leiderman, and Reinhart (1996) note that "...the phenomenon (of capital inflows) was widespread, affecting countries with very diverse (internal) characteristics. This pattern suggests that global factors, like cyclical movements in interest rates, were especially important." Chuhan, Claessens, and Mamingi (1993) show that external factors explain half of the variation in bond and equity flows from the United States to a group of six Latin American countries. In a more recent paper, Mody, Taylor, and Kim (2001) find that both external and domestic factors are important in explaining capital flows to developing countries. External conditions proxied by interest rates and spreads on high-yield instruments in the United States have a strong effect on capital inflows. On the internal side, macro stability, sovereign credit ratings, stock prices, industrial production indicators, and debt-to-international-reserve ratios affect the magnitude of capital inflows.

With the exception of the 1970s, when syndicated bank lending played an important role, sovereign bonds have been the dominant means by which countries raised funds on international capital markets since the 1920s (Fernandez-Ansola and Laursen, 1995). The dominance of bonds over bank loans in recent years has a number of potential explanations that have to do with both creditor- and debtor-specific factors and preferences. First, the presence of a diverse investor group would arguably make the bond-related covenants less stringent and refinancing easier. Second, ever-tightening prudential requirements are likely to discourage banks from having large international exposures and, therefore, to effectively act as a cap on loan financing available on the international capital markets. Third, experience of money market banks in Latin America in 1980s had a profound impact on the popularity (that is, the supply) of loans on the emerging markets.

Recent emerging market sovereign bond issues share some common features. Despite the sophistication and availability of a wide range of financial instruments on corporate markets in general, sovereign bonds—particularly first-time issues—remain predominantly simple

(plain-vanilla-type) instruments.[2] Enhancements, such as put options and collateralization with either risk-free papers or physical assets used as the underlying collateral have been used, even though hedging considerations make them more difficult to deal with, potentially leading to borrowers getting less-than-full credit for including those enhancements. In light of potential importance of collective action clauses (CACs) in securing an orderly debt restructuring, they are likely to become the rule rather than the exception. Finally, most emerging market bonds are issued in foreign currency, with the choice of the currency appearing to depend on the investor base as well as the country's foreign exchange earnings.

Regardless of imperfections of the market and the variety of objectives behind their issuance, sovereign bonds remain an important channel for raising external financing for developing countries.[3] That is why studying the ways bond issuance is secured is important for policy considerations. From a developing country policymaker's point of view, this type of analysis may help assess the optimal set of fundamentals/market signals and external conditions needed to achieve a successful sovereign bond issuance.

This paper looks at sovereign bond issuance by emerging market countries, with a particular focus on first-time issues. The difference between the first and subsequent issues is made in the paper using the following logic. Because countries that made repeated issues have established a track record—by, among other things, having issued at least one outstanding bond—there is little uncertainty about the spread at which these countries will sell their subsequent issue bonds. To rephrase, there already exist benchmarks for repeated-access countries that would inform market participants about the spreads that each country's subsequent bond issues are likely to carry. This is not the case, however, for the first-time entrants. Without a benchmark, and in some cases with limited information available on which to judge the sovereign's creditworthiness, market participants can only estimate what the spread could be at the time of the sovereign's debut.[4] Even in cases where the first-time entrants attempt to secure sovereign credit ratings from rating agencies prior to accessing the market, any inferences will be only as good as the analysis of credit agencies, thus providing the basis for some uncertainty.

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[2] Fixed-coupon-paying bonds with bullet repayments turn out to be easier to price and hedge, as well as to build yield curves with. Additionally, any "enhanced" bonds will subordinate future "plain-vanilla" issues, making the latter less attractive for investors to hold. Proposals, however, have been made to allow for indexing of emerging market sovereign bonds to GDP or export performance (for example, commodity prices; see Borensztein and Mauro (2002) for a summary), but these have not gained wide acceptance so far.

[3] Chile, Bulgaria, Dominican Republic, El Salvador, Egypt, Estonia, Grenada, Hungary, Latvia, Qatar, and Peru have issued internationally traded bonds for the first time since 1999 (see Table 1).

[4] An estimate can be made by using the spreads on the bonds of similarly rated sovereign countries.

This difference between the first-time and subsequent accesses has an important implication on the empirical methodology used to study market access. If indeed the markets perceive the first issues to be different from all subsequent ones—in that they carry more uncertainly (that is, higher variance) than subsequent issues—they would require a different econometric treatment. Unless accounted for in the estimation—either by treating them separately or controlling for them in the pooled regression of all market access cases—lumping first-time access cases with others will introduce a bias in the coefficient estimates. From the point of view of policy implications, this is likely to understate the challenges faced by the first-time issuers and overstate those faced by repeat issuers.

By focusing on the first-time bond issues, the analysis in this paper provides an extension of the current empirical literature on sovereign bond markets. Instead of using an ad hoc "access equation" to predict the probability of successful bond issuance, the paper shows that the implied relationship between internal and external conditions and (first-time) market access can be derived from simple macro models. It translates the (favorable) conditions under which a sovereign bond issue takes place into a simple condition that requires that there be excess demand for those bonds (that is, sovereign papers with certain risk characteristics determined by the borrower's macro fundamentals). Instead of estimating them separately (see Mody and Taylor, 2002), the model derives the *implicit/unobservable* demand and supply of external funds equations and uses *observable* data to estimate a combined market access function. This approach also eliminates the need of making restrictive assumptions to deal with issues related to sovereigns' voluntary abstention from borrowing, which credit-ceiling-based models necessarily introduce (see Gelos, Sahay, and Sandleris, 2003).

The paper is structured as follows. Section II builds a conceptual framework for looking at the (first-time) sovereign market access and its determinants.[5] In Subsection A, we conceptualize the decision process that a sovereign bond issuer goes through prior to announcing a bond issue. In Subsections B and C, we introduce the concepts of demand for and supply of external funds to define the *market access condition*. These explicit forms are then used in Section III to build and estimate an econometric model of market entry.

II. The Model

A. Basic Framework

In a simplified setting, the decision making process undergone by a sovereign issuer can be presented as follows (refer to Figure 1 below for notations):

Step 1: The sovereign determines its need to borrow, or the demand for external funds, $D(r)$, which, given its internal (macro) characteristics, is a decreasing function of the cost of borrowing.

[5] From here on, the term 'market access' would only mean issuance of internationally tradable sovereign bonds.

Step 2: It then estimates the supply of external funds, $S^e(r)$, which given the sovereign's risk profile and conditions on the international capital markets, is an increasing function of the rate of return on the sovereign bond.[6]

Step 3: Based on prevailing internal as well as external conditions (e.g., international interest rate, r^*, liquidity in international markets, growth in developed countries, spreads on similarly rated sovereign bonds, etc.), the sovereign estimates the spread, s^e, (such that the interest rate is $r^* + s^e$) at which it would sell its bonds.[7] This could be at or below the sovereign's cost-of-funds ceiling—determined perhaps by debt management considerations—or cost-of-funds of alternative (non-bond) financing options available to the sovereign.

Step 4: The decision to issue a bond is made if there is excess supply of external funds at $r^* + s^e$ (measured as distance AB). At this stage, an announcement is made to sell a fixed amount of bonds, effectively transforming the demand curve $D(r)$ into $D'(r)$ (i.e., the CAF curve).[8]

Step 5: An offering is made that determines the spread at which the issue is to be sold.[9] If the borrower sells only a preannounced amount of bonds, the equilibrium is achieved at point E, with bonds traded at r_0'.[10] If, on the contrary, the borrower reopens the issue

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[6] The last condition strictly speaking does not always hold. Owing to potential adverse selection problems, higher returns on bonds may not always translate into more funds supplied by creditors. This may—for sufficiently high values of interest rate—lead to backward bending supply curve, which would nevertheless have no bearing on our analysis.

[7] As indicated in Section I, having to estimate the spread (i.e., uncertainty on the side of creditors related to sovereign's creditworthiness) is what makes the first issue conceptually different from subsequent issues.

[8] Typically, the specification of the bonds (i.e., an initial spread and the volume of issue) are discussed during the road shows, where borrower country officials meet with potential creditors weeks/months before the action.

[9] Although the bonds will carry the coupon rate initially advertised, the price of the bond may reflect the excess demand, changing the overall yield on the bond.

[10] Point E may not be achievable during the first offering and may take some secondary trading to achieve (i.e., on the next day). The important implication of this is that because bonds in short supply are likely to trade up on the secondary market—an outcome treated very favorably by maker participants thereby influencing sovereign's subsequent market access—issue managers will be tempted to create excess demand for bonds by limiting the volume of issue (i.e., intentionally staying off of point O).

(to capture the excess supply of funds), the equilibrium is achieved at point O.[11] This will, however, render the overall issue (or at least the re-opened portion of it) more expensive since the bonds will now be traded at $r_0 > r_0'$.[12]

Even though by starting from $r^* + s^e \neq r_0$ (in Step 3) it is implicitly assumed less-than-perfect foresight or presence of information asymmetries (and/or validity of considerations described in footnote 10), this becomes relevant only in cases where there is an estimated excess demand for funds. To see this, note that—in cases where the issue amount is not pre-set—point O will also be the full-information equilibrium, regardless of a sovereign's initial estimates of the spread in Step 3, as long as the latter was estimated to suggest an excess supply of external funds.[13] In this case the relevant demand for external funds schedule will be the COF' curve (i.e., prior to the start of the auction, the sovereign announces its plans to issue exactly as many bonds as the market is ready to absorb).

Step 4 above is the most important insight used to build the rest of the paper. To reiterate its logic (in essence the *market access condition*), note that the sovereign bond issue takes place if the amount of funds the creditors are willing to invest in a particular sovereign bond (i.e., the supply of external funds) exceeds the financing needs of the borrower (i.e., the demand for external funds). No bonds will be issued if at $r^* + s^e$, or any other rate at or below the sovereign's cost-of-funds ceiling, there is an excess demand for funds (or a shortage of supply of funds). In other words, no market clearing solution exists, with a rate below the cost-of-funds ceiling or that of alternative financing, which would enable the sovereign to issue a bond.

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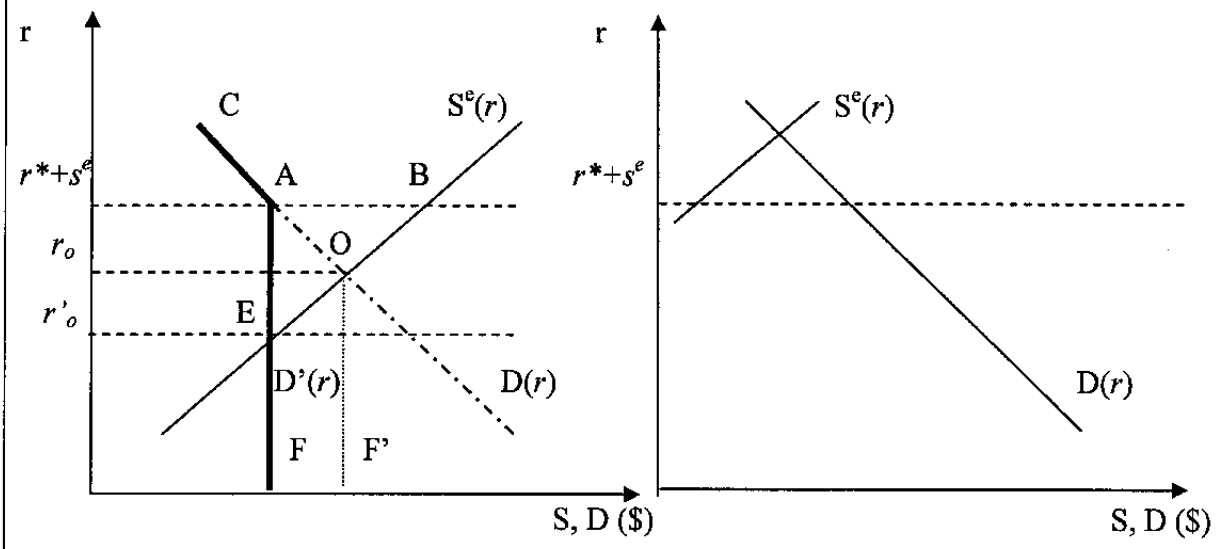
[11] The excess demand for bonds (or using the terms employed above, the supply of external funds) appears to have played an important role in determining the amount issued, leading to reopening of the initial issues during some recent first-time issuances (e.g., Egypt).

[12] This could be partially why—for debt management considerations—sovereigns may decide to limit the size of the issue, even though they can issue additional bonds to reach point O. However, as discussed in footnote 10, sovereigns and their emerging market advisors may limit the size of the issue also for the reason of securing a strong next-day trading of the bond.

[13] Of course, if the estimates suggested that there would instead be an excess demand for external funds at $r^* + s^e$, then no issue will take place (Panel B of Figure 1).

The rest of the paper builds on the framework described above to explain the determinants of successful first-time sovereign market issuances.

Figure 1. Supply of and Demand for External Funds



B. Demand for External Funds

The infinitely lived representative agent in debtor country maximizes the following lifetime utility function:

$$\sum_{t=0}^{\infty} \beta^t U(C_t)$$

subject to the following constraints:

$$Y_t = C_t + I_t + G_t - B_{t+1} + (1+r) \cdot B_t \quad (1)$$

$$K_{t+1} = I_t + (1-\delta) \cdot K_t \quad (2)$$

$$Y_t = F(K_t) = A_t \cdot K_t^{\alpha} \quad (3)$$

where, Y_t, C_t, I_t, G_t, K_t are the output, private consumption, gross domestic investment, government expenditures, and stock of physical capital respectively. In equation (1), the current account is presented as a change in total indebtedness to the rest of the world, $B_{t+1} - B_t$. In equation (2), next period's capital stock is determined as a sum of non-

depreciated capital stock from the previous period plus investment in the current period. Finally, in equation (3), output is a function of existing capital stock and a random productivity shock, A_t.[14] The difference $B_{t+1} - B_t$ is also thought of as the demand for foreign funds in this model. We will, for simplicity, assume that foreign funds are only raised through issues of sovereign bonds.[15]

Within this framework, maximizing with respect to K_{t+1} and B_{t+1} yields the following familiar first-order conditions (FOCs):

K_{t+1}: $U'(C_t) = \beta \cdot (F'(K_t) + 1 - \delta) \cdot U'(C_{t+1})$ *Euler equation*

B_{t+1}: $r = F'(K_t) - \delta$ *Marginal product of capital condition*

Assuming a utility function $U(C_t) = \ln C_t$ allows us to rewrite the Euler equation as:[16]

$$C_{t+1} = \beta \cdot (1 + r) \cdot C_t \tag{4}$$

From the second FOC, it could be shown that:

$$K_{t+1} = (\frac{A_t}{A_{t+1}})^{\frac{1}{\alpha-1}} K_t \tag{5}$$

with the path for investment determined from equation (2) as:

$$I_t = [(\frac{A_t}{A_{t+1}})^{\frac{1}{\alpha-1}} - (1 - \delta)] \cdot K_t \tag{6}$$

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[14] Making the interest rate a function of time slightly complicates the presentation but does not change the overall results. We will therefore switch to time-varying interest rates at the end of this section.

[15] This assumption is later lifted to allow private (FDI) flows.

[16] Assuming an isoelastic utility function of the form $U(C_t) = \frac{C_t^{1-\frac{1}{\sigma}}}{1 - \frac{1}{\sigma}}$ does not change the thrust of the results.

Now, note that substituting forward, and imposing the transversality condition (i.e., $\frac{B_\infty}{(1+r)^\infty} = 0$), equation (1) can be presented as:

$$(1+r)\cdot B_0 + \sum_{t=0}^{\infty} C_t \cdot R^t = \sum_{t=0}^{\infty} (Y_t - I_t - G_t)\cdot R^t \quad \text{where } R \equiv \frac{1}{1+r} \tag{7}$$

Substituting equation (4) into equation (7) and solving for C_0 yields:

$$C_0 = \frac{\lambda + r}{1+r}\cdot\left[W_0 - (1+r)\cdot B_0\right] \tag{8}$$

where $W_0 = \sum_{t=0}^{\infty}(Y_t - I_t - G_t)\cdot R^t$ is the discounted value of the stream of net future income, or a measure of debtor's capacity to service its debt, and $\lambda \equiv 1 - \beta\cdot(1+r)$. Re-writing equation (1) and substituting equation (8) yields the following outcome for the demand for external funds in the first period:

$$B_1 - B_0 = \frac{\lambda + r}{1+r}\cdot\left[W_0 - (1+r)\cdot B_0\right] + I_0 + G_0 - Y_0 + r\cdot B_0 \tag{9}$$

Finally, substituting equation (6) into equation (9) results in the following function for demand for external funds:

$$D_1 = B_1 - B_0 = (1-\beta)\cdot W_0 + \left[\left(\frac{A_1}{A_0}\right)^{\frac{1}{1-\alpha}} - (1-\delta)\right]\cdot K_0 + G_0 - Y_0 - \lambda\cdot B_0 \tag{10}$$

Before we close this section, note that allowing for time-varying interest rates would only alter the term in the squared brackets in equation (10) (i.e., because of the change to the second FOC and, subsequently, to equation (5) that the time-variance of interest rates would introduce). Without going into the details of the derivation, and noting that r_1 (or, in general, r_{t+1}) is the relevant interest rate to be paid on the newly contracted portion of B_1 (or, in general, B_{t+1}), note that

$$\frac{\partial D_1}{\partial r_1} = -(1-\beta)\cdot\frac{Y_1 - I_1 - G_1}{(1+r_1)^2} - \frac{1}{1-\alpha}\cdot\frac{(\alpha A_1)^{\frac{1}{1-\alpha}}}{(r_1+\delta)^{\frac{2-\alpha}{1-\alpha}}} < 0$$

as long as $Y_1 - I_1 - G_1 > 0$ and the economy is facing a non-negative productivity shock A_1.[17] This basically says that (in the absence of negative productive shocks) higher interest rates would lead to lower appetite for borrowing.

Finally, noting that K_0 is predetermined, and making use of the above-described relation between new borrowing and interest rates, a linearized version of equation (10) with time-varying interest rates could be written as:

$$D_{t+1} = \gamma_0 + \gamma_1 \cdot W_t + \gamma_2 \cdot G_t + \gamma_3 \cdot Y_t + \gamma_4 \cdot B_t + \gamma_5 \cdot r_{t+1} + \varepsilon_{t+1} \tag{11}$$

where ε_{t+1} contains elements of (stochastic) productivity shocks, $\gamma_1 > 0, \gamma_2 > 0, \gamma_3 < 0$ and the signs of γ_4 and γ_5 depend on preferences (i.e., whether $\beta >< \frac{1}{1+r}$) and productivity shocks.

C. Supply of External Funds

The infinitely lived representative agent in creditor country earns an exogenous labor income Y_t^* and invests in two types of assets: a (domestic) risk-free bond with a yield of r^*, and an international (sovereign) bond that yields a rate of r_t, with a probability distribution function of $f_r(\cdot)$. In doing so the agent maximizes her expected lifetime utility function:

$$E\sum_{t=0}^{\infty} \beta^t U(C_t^*)$$

subject to the following asset evolution condition:

$$A_{t+1}^* = (A_t^* + Y_t^* - C_t^*) \cdot [(1+r^*) \cdot \omega_t + (1+r_{t+1}) \cdot (1-\omega_t)] \tag{12}$$

where ω_t is the share of assets invested in risk-free securities.[18] Again, assuming a utility function $U(C_t^*) = \ln C_t^*$, and maximizing with respect to C_t^* and ω_t the following first order conditions are obtained (see Blanchard and Fisher (1994), p. 284 for derivations):

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[17] The sign of the partial derivative may change if these conditions do not hold. However, these conditions will be sufficient to reduce the demand for new foreign funds as interest rate goes up. The logic behind this is simple: higher r_1 will reduce the discounted value of next period's income (i.e., reduces ones overall W_0), and also lead to less investment in the current period, as the latter will have to equalize (now higher) r_1 with the net marginal product of capital in period one (see the second FOC).

[18] The notation in equation (12) assumes that the interest rate paid on both types of bonds is the one that prevails at the beginning of the next period.

$$C_t^*: \qquad C_t^* = (1-\beta)\cdot(A_t^* + Y_t^*)$$

$$\omega_t: \qquad E\left(\frac{r^* - r_t}{(1+r^*)\cdot\omega_t + (1+r_{t+1})\cdot(1-\omega_t)}\right) = 0 \text{ or simply } E\Phi\left(\omega_t \middle| r^*, r_{t+1}\right) = 0$$

The first condition provides the path for consumption, suggesting that it would be equal to a constant share of assets and income. Solving the second condition would provide an optimal value of ω_t, and the allocation of assets between risky and risk-free bonds. To get an explicit solution for ω_t, note that the first order Taylor approximation of the function $\Phi(\cdot)$ taken at $\omega_t = 1$ could be presented as follows:

$$\Phi(\cdot) \approx \Phi_{\omega=1}(\cdot) - \left(\frac{\partial\Phi}{\partial\omega_t}\right)_{\omega=1}\cdot(\omega_t - 1) \tag{13}$$

Calculating the partial derivative of $\Phi(\cdot)$ with respect to ω_t at $\omega_t = 1$, and making the expected value of equation (13) equal to zero (to satisfy the second first order condition), one could arrive at the optimal share of assets invested in foreign bonds as:

$$1-\omega_t = \frac{1+r^*}{r^* - Er_{t+1}} \qquad \text{where} \quad \frac{\partial(1-\omega_t)}{\partial r^*} < 0 \quad \text{and} \quad \frac{\partial(1-\omega_t)}{\partial(Er_{t+1})} > 0 \tag{14}$$

Before we wrap up this section, note that the amount of money spent by the creditor country agent on risky assets (i.e., emerging market sovereign bonds) in period t could be presented as $(A_t^* + Y_t^* - C_t^*)\cdot(1-\omega_t)$ which could be treated as the supply of external funds. Bearing in mind the first FOC above, and substituting equation (14), one could present the supply for external funds function as:

$$S_t = \beta\cdot(A_t^* + Y_t^*)\cdot\frac{1+r^*}{r^* - Er_{t+1}} \tag{15}$$

or in its estimable form:

$$S_t = \gamma_0^* + \gamma_1^*\cdot Y_t^* + \gamma_2^*\cdot r^* + \gamma_3^*\cdot Er_{t+1} + \varepsilon_t^* \tag{16}$$

where $\gamma_1^* > 0, \gamma_2^* < 0$ and $\gamma_3^* > 0$. Finally, to the extent that borrower's current macro fundamentals describe its capacity to repay in the future, and, therefore, the default rate and subsequently the variance of the return, the creditor's choice to purchase the bond as well as the spread ($s_{t+1} = r_{t+1} - r^*$) she is willing to hold the bonds for, will be influenced by those fundamentals. With this in mind we re-write equation (16) as follows:

$$S_t = \gamma_0^* + \gamma_1^* \cdot Y_t^* + (\gamma_2^* + \gamma_3^*) \cdot r^* + \Lambda^* \cdot Macro_t + \varepsilon_t^* \tag{17}$$

where $Macro_t$ stands for (a vector of) macro indicators describing conditions in and creditworthiness of the borrower's economy.

III. Regression Results

A. Basic Setup and Data

As discussed in Section II, an emerging market bond issuance takes place if the amount of money that creditors are willing to invest in bonds in emerging economy *i* is greater than or equal to the demand for external funds in that emerging market economy. In other words, using the terms defined above,

if $S_{it} \geq D_{it}$ a sovereign bond is issued by country *i* at period *t*

if $S_{it} < D_{it}$ no issuance takes place.

where neither supply nor demand for external funds are observable. To address this, we define an observable variable $Access_{it}$ to take value of 1 if an emerging market sovereign bond issuance takes place, and 0 otherwise. The above model can thus be re-written to be:

$Access_{it} = 1$ if $S_{it} - D_{it} \geq 0$

$Access_{it} = 0$ if $S_{it} - D_{it} < 0$

Note that although unobservable, the excess supply of external funds, $S_{it} - D_{it}$, could be presented (after incorporating equations (11) and (18)) as a linear combination of factors determining the demand the supply for external funds, that is:

$$S_{it} - D_{it} = \Gamma' \cdot X \tag{18}$$

where $X = [1, W, G, Y, B, Y^*, r^*, Macro]$ contains all indicators included in equations (11) and (17), and Γ is the vector of coefficients on those indicators. Note that for indicators that enter both the supply and demand for funds equations, the elements of Γ would be indicative of their *net* or *overall effect*. Incorporating equation (18) into the model and noting that

$$\Pr ob(Access_{it} = 1) = \Pr ob(\Gamma' \cdot X \geq 0)$$

will allow us to use a (standard textbook) logit transformation of the right-hand side of the above equation to arrive at:

$$\Pr ob(Access_{it} = 1) = \frac{e^{\Gamma' \cdot X}}{1 + e^{\Gamma' \cdot X}} \tag{19}$$

or, in a more user-friendly form:

$$Access_{it} = f(External_{it}, Internal_{it}) + \varepsilon_{it} \quad \text{with } \varepsilon_{it} \sim i.i.d.(0, \sigma_{\varepsilon}^2) \tag{20}$$

which could be estimated by standard maximum likelihood-based procedures.[19] The dependent variable in equation (20), the probability of access, is a dummy variable that takes value of 1 if the country *i* issued a sovereign bond at time *t*, and 0 otherwise. In the sub-sample used to make inferences about the first time issuance, the sovereigns that issued a bond at time *t*, are dropped from the sample starting from the subsequent periods (i.e., from *t+1*).[20] The vectors *External* and *Internal* combine external and internal factors contained in vector X.

All indicators used in the analyses are available from the IMF's World Economic Outlook, International Financial Statistics, and World Bank's World Development Indicators database. The dependent variable in equation (20) is constructed based on the data available from the Bondware: the sample used in paper (which includes 38 countries that have issued emerging market bonds during the period of 1980-2002) is presented in Table 1.[21]

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[19] Note that this approach is similar to that commonly used in the literature on early warning indicators and determinants of currency and banking crises (e.g., Frankel and Rose, 1996). The difference is that instead of attempting to explain negative shocks, such as currency or banking crises, this set up intends to explain a positive shock, such as the emerging market access by a sovereign borrower.

[20] To demonstrate this, below I have shown the structure of the dependent variable for Chile and Egypt, which issued their first emerging market bonds in 1999 and 2001, respectively:

	1980	–	1998	1999	2000	2001	2002
Egypt	0	0	0	0	0	1	...
Chile	0	0	0	1	...	...	...

The three dots indicate that countries are excluded from the sample after their first bond issue took place. It should be noted that the countries of the former Soviet Union appear in the sample starting from 1992 (as opposed to 1980, which is the case for the rest of the sample), that is, following the breakup of the Soviet Union in 1991.

[21] The sample is not much different from the population of countries which issued emerging market bonds for the same period, and excludes eight countries for which the terms of the bond issue or certain macroeconomic statistics were not readily available.

B. Results from the Baseline Regression

The results of the estimation are presented in Table 2. Maximum likelihood logit estimation is used in the estimation with individual country effects controlled by dummy variables (not shown). The first set of results—columns 1–4—is based on the restricted sample (i.e., first-time bond issues), while the second set—columns 5–6—is based on the complete sample (i.e., all emerging market bond issues). In addition to the baseline regressions (columns 1 and 5), we estimated specifications including indicators for trade openness, IMF program, and the terms-of-trade changes. All regression produce remarkable fits and reject the hypothesis of joint insignificance of regressors.

The difference between first-time and subsequent bond issues becomes evident when one compares the magnitudes and the patterns of significance of coefficients in columns 1 and 5. Noting that columns 5 and 6 are based on all market access cases—first and subsequent—the observed difference between the results reported in columns 1 and 6 would have been even more pronounced if one compared the first-time with subsequent (as opposed to all) issues. To formalize this finding, an F-test of the equality of the coefficients in columns 1 and 5 (i.e., first and subsequent issues) was rejected, therefore supporting the earlier conjecture about the need for a differentiated treatment of the first-time issues in studies of market access.[22]

The coefficient on international interest rate suggests that higher international rates are associated with lower probability of market access, first as well as subsequent, reflecting perhaps both the unwillingness of sovereigns to pay high interest as well as availability of investment opportunities in developed countries, and therefore, less funds available for investment into emerging economies. As expected, the U.S. GDP growth, a proxy for availability of liquidity in international markets, is positively correlated with market access.

The impact of the size of sovereign's economy on probability of access is less clear. When the dollar value of sovereign's GDP is used, although different in magnitude for the first and subsequent issues, the impact of size is positive and statistically significant. This is consistent with results reported by Gelos, Sahay, and Sandleris (2003) who argue that there are fixed costs of borrowing through mechanisms such as bonds and syndicated loans. However, when the sovereign's PPP-adjusted GDP share in the world is included in the regressions to proxy for the size, the results suggest that smaller countries have better chances of placing their *first bonds* than their larger counterparts (results not reported but could be obtained upon request). This tendency reverses itself once all emerging market bond issues are being studied, with larger size making it likelier for an emerging economy to issue a bond.

Among variables which describe both the need for external financing (from the borrower's point of view) and macroeconomic discipline (from the creditor's point of view), the regression results vary. While the coefficient on the current account balance indicates that the supply-for-funds considerations dominate the first time access (with tighter external balance implying higher probability of access), the importance of external account discipline fades

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[22] Performing a Chow test here was not feasible because the samples are not independence.

away for the subsequent bond issues. Conversely, the coefficient on fiscal balance suggests that, irrespective of sovereign's market experience (i.e., first time or subsequent issuer), the demand for external budgetary financing outweighs the requirement of fiscal discipline, typically put forth by the creditors. Finally, the GDP growth produces no net impact on the probability of access, either first or subsequent.

There appears to be an asymmetry in the treatment of first and subsequent market access when it comes to the assessment of foreign assets and liabilities of sovereign borrowers. While the gross foreign reserves (measured in months of imports) seem to be an important indicator explaining the first-time access, the stock of foreign debt (measured as a ratio to exports) is the variable that markets seem to pay attention to when it comes to subsequent bond issues. This perhaps reflects some asymmetry in the debt profiles, with repeat entrants more likely to have higher debt burden than the first time issuers. Coefficients on GDP per capita (a proxy for wealth and of sovereign's capacity to repay) have positive and significant impacts on the probability of market access. As expected, high consumer price inflation seems to decrease the probability of market access. This is likely to be indicative of creditors' unwillingness to lend into a high inflationary environment (as high inflation could be indicative of poor overall quality of sovereigns' policies), and sovereigns' unwillingness to borrow when domestic prices are rising, possibly signaling high future costs of debt service (if exchange rate is allowed to adjust).

The results showed no links between trade openness (measures as sum of exports and important over GDP) and probability of market access (column 2). Similarly, there is no evidence that Fund programs make the market access more likely.[23] (These two indicators were also tried in the specification with all issues but the results are reported for first-time issues only). In contrast, changes in terms-of-trade appear to be significant in determining market access, with favorable movements in terms-of-trade leading to higher probability of successful bond issuances.

C. Robustness Tests and Goodness of Fit

The first-time access regression results reported in Table 2 were tested for robustness. The test results are summarized in Table 3. They appear to be robust with respect to: (1) sample truncation with only post-1985 data used, (2) inclusion of FDI as an alternative channel of financing, and (3) use of alternative estimation method, panel logit approach. (Baseline regression is reported in Table 3 for convenience of presentation).

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[23] The dummy variable for IMF program takes value of 1 if the country has a Stand-by or EFF arrangement with the Fund in a given year, and 0 otherwise. From 38 countries present in the sample, only Pakistan and Sri Lanka have had ESAF/SAF-type arrangements with the Fund (Pakistan in 1997-2000 and 2001-current, and Sri Lanka in 1988–1991 and 1991–1995). These countries/cases, however, were given 0's, given the restrictions that the ESAF arrangements typically carried in terms of external borrowing.

The first robustness test was done by reducing the sample by a quarter, with the cutoff point happening at 1986.[24] Despite a significant reduction in the sample size, the results reported in the column marked "post-1985" shows remarkable resemblance to those in the baseline regression. In the second robustness test, we included foreign direct investment (FDI) to capture the impact of private flows on the probability of first-time access. Despite the strong showing of the coefficient on FDI, the overall results remain qualitatively similar: the change in magnitude and statistical significance of the coefficients on the real GDP growth and fiscal balance are not inconsistent with relationships that typically exist between private flows on one hand and the growth and fiscal performance on the other hand. In line with the findings of Gelos, Sahay, and Sandleris (2003), the results are also indicative of the complementarity between official and private flows.[25] Finally, the third robustness test employed a slightly different estimation technique to make a fuller use of the panel character of the data. The last column in Table 3 used panel (fixed effects) logit estimates to arrive at the first-time access equation. (Simple logit estimates with controls used in the baseline estimation are somewhat more attractive to use because they allow for estimation of marginal effects and elasticities of regressors.) Again, the results are similar to those reported under the baseline specification.

The model does a remarkable job in fitting the actual data, that is, predicting the probabilities of first time market access. Table 4 contains the (in-sample) estimated probabilities of access during the years when countries issued their emerging market bonds (i.e., the issue year).[26] With at least 95 percent accuracy, the model predicts that 29 out of 38 first-time issues will take place during the actual launch year. The (cross-country) average estimated probability of the issue happening in the same year is approximately 90 percent.

D. Possible Extensions

Since this paper has established a difference between the first and subsequent bond issues, this type of analysis could be extended to study the spreads—and, as a result, the premiums —that creditors require to hold the first-time issue bonds. This could be done in the context of conditional probability models, in which observations on spreads are conditioned upon market access, and use the probability of access estimated by equation (21). This type of approach also provides a good testing ground for the relevance of *debt intolerance*-related considerations in market access decisions (see Reinhart, Rogoff, and Savastano, 2003). These could be tested, among other ways, by simply replacing the debt-to-exports ratio used in this paper by one of the debt-intolerance indicators proposed by these authors.

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[24] Number of zeros and ones is reported in Table 3.

[25] The causality here could, however, go both ways: although larger private flows are likely to improve sovereign's capacity to repay (as they are likely to stimulate growth) and, therefore, increase the probability of access, the official flows (i.e., market access) may play a catalytic role for private investments.

[26] For example, as indicated in Table 4, the predicted probability that Chile would have issued its first emerging market bond in 1999 (that is, when it actually issued its first bond) is 65.1 percent. The model predicts that the probability that Egypt would issue its first emerging market bond in 2001 to be 98.8 percent.

List of Variables Used

Dependent Variable

Dummy variable for sovereign bond issuance

External Variables

International interest rates (3 month US Treasury Bill yield)

U.S. real GDP growth

Internal Variables

U.S. dollar value of sovereign's GDP

Purchasing Power Parity (PPP)-adjusted world share of sovereign's GDP

Gross foreign reserves (in months of imports)

Current account balance (percent of GDP)

Total external debt (percent of exports)

Fiscal balance (percent of GDP)

PPP-adjusted GDP per capita

Real growth rate of GDP

Consumer price inflation

Terms-of-trade index (annual percent change of)

Trade openness = (Exports + Imports)/GDP

Foreign direct investment (share of GDP)

IMF program dummy

Table 1. Terms of the First Emerging Market Bond Issues by Country

Country	Launch Date	Currency	Amount, USD equiv.	Coupon	Issue Price	Yield	Spread	Maturity
Argentina	09/10/91	US$	300.0	11.00	99.5	11.29	508	2.0
Bulgaria	11/12/01	EUR	223.4	7.25	98.9	7.51	378	5.3
Chile	04/20/99	US$	500.0	6.88	99.9	7.01	185	10.0
Colombia	07/29/86	YEN	38.4	6.90	100.0	6.90	...	8.0
Costa Rica	04/23/98	US$	200.0	8.00	100.0	8.16	250	5.0
Croatia	12/24/96	HRK	54.2	12.50	98.5	13.85	804	1.9
Dominican Rep.	09/20/01	US$	500.0	9.50	100.0	9.73	576	5.0
Ecuador	04/18/97	US$	500.0	11.25	99.4	11.74	501	5.0
Egypt	06/29/01	US$	1500.0	8.38	99.8	8.60	333	10.0
El Salvador	08/04/99	US$	150.0	9.50	92.2	11.47	534	7.0
Estonia	06/17/02	EUR	94.8	5.00	99.2	5.19	156	5.0
Grenada	06/20/02	US$	100.0	9.75	99.2	10.12	527	10.0
Guatemala	07/28/97	US$	150.0	8.50	99.6	8.74	258	10.0
Hungary	01/26/99	EUR	579.1	4.38	100.5	4.31	67	10.0
Israel	12/07/95	US$	250.0	6.38	99.2	6.60	88	10.0
Jamaica	06/26/97	US$	200.0	9.63	99.8	9.92	356	5.0
Kazakhstan	12/09/96	US$	200.0	9.25	99.9	9.30	349	3.0
Latvia	05/04/99	EUR	158.7	6.25	98.8	6.55	343	2.0
Lebanon	09/28/94	US$	400.0	10.13	99.5	10.31	348	3.0
Lithuania	12/11/95	US$	60.0	10.00	99.9	10.06	468	2.0
Mauritius	09/05/95	US$	150.0	...	100.0	...	120	5.0
Moldova	12/10/96	US$	30.0	9.88	99.8	9.93	713	3.0
Oman	03/03/97	US$	225.0	7.13	99.8	7.29	88	5.0
Pakistan	12/14/94	US$	150.0	11.50	99.7	11.92	418	5.0
Papua New Guinea	07/01/84	YEN	20.4	8.00	99.9	8.02	...	7.0
Peru	02/06/02	US$	500.0	9.13	97.7	9.71	479	10.0
Philippines	02/10/93	US$	150.0	7.88	99.9	7.92	313	3.0
Poland	06/27/95	US$	250.0	7.75	100.0	7.76	182	5.0
Qatar	05/12/99	US$	1000.0	9.50	99.9	9.74	423	10.0
Romania	06/03/97	DM	351.8	7.75	101.5	7.38	267	5.0
Russia	11/21/96	US$	1000.0	9.25	99.6	9.58	364	5.0
Saudi Arabia	08/15/94	US$	280.0	...	100.0	...	52	5.0
Slovak Republic	01/28/98	US$	200.0	0.00	96.8	6.50	84	0.5
Slovenia	07/22/96	US$	325.0	7.00	99.3	7.31	69	5.0
Sri Lanka	03/13/97	US$	50.0	...	100.0	...	172	3.0
Turkey	04/25/88	DM	301.9	6.50	100.0	6.50	...	7.0
Ukraine	08/11/97	US$	450.0	0.00	91.8	8.91	328	1.0
Uruguay	05/22/92	US$	100.0	8.25	99.1	8.61	280	3.0

Table 2. First-Time and Subsequent Sovereign Bond Issues: Regression Results

	First Time Issues				All Issues	
	Dependent Variable: Dummy for Sovereign Bond Issue					
	1	2	3	4	5	6
External Factors						
International interest rate	-3.68**	-4.34**	-3.73**	-4.33**	-0.41**	-0.41**
	(1.07)	(1.34)	(1.09)	(1.31)	(0.13)	(0.13)
U.S. GDP growth	1.52**	1.54**	1.60**	1.82**	0.36**	0.37**
	(0.73)	(0.74)	(0.75)	(0.80)	(017)	(017)
Internal Factors						
GDP	0.97**	1.17**	1.04**	1.03**	0.06**	0.06**
	(0.36)	(0.42)	(0.40)	(0.37)	(0.02)	(0.02)
Current account balance (-1)	0.52**	0.70**	0.59**	0.67**	-0.06	-0.05
	(0.21)	(0.27)	(0.25)	(0.26)	(0.26)	(0.04)
Fiscal balance (-1)	-0.82**	-1.08**	-0.96**	-0.84**	-0.11*	-0.11*
	(0.32)	(0.41)	(0.38)	(0.33)	(0.33)	(0.06)
Real GDP growth	-0.16	-0.36	-0.18	-0.19	-0.04	-0.06
	(0.14)	(0.21)	(0.16)	(0.17)	(0.05)	(0.05)
External debt/exports	0.47	0.48	0.52	0.53	-0.46*	-0.43*
	(0.52)	(0.75)	(0.57)	(0.51)	(0.25)	(0.25)
Foreign reserves/imports	2.77**	3.02**	2.72**	2.93**	-0.05	-0.06
	(1.17)	(1.33)	(1.18)	(1.24)	(0.16)	(0.16)
PPP-adjusted GDP per capita	0.01**	0.01**	0.01**	0.01**	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Consumer price inflation	-0.04**	-0.06**	-0.05**	-0.05**	-0.03**	-0.03**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.00)	(0.01)
Openness		-0.13				
		(0.09)				
IMF program			1.70			
			(2.36)			
Terms-of-trade changes				0.25*		2.91*
				(0.14)		(1.60)
Pseudo-R^2	0.82	0.83	0.82	0.83	0.60	0.60
No. of observations	458	458	458	458	604	604
Likelihood ratio test	214.0**	216.5**	214.5**	217.1**	373.0**	375.7**

Note: * and ** indicate significance at 10 and 5 percent confidence levels respectively. Standard deviations are in parenthesis. Maximum likelihood logit estimation is used with group effects controlled by dummy variables (not reported).

APPENDIX

Table 3. First-Time Sovereign Bond Issues: Robustness Tests

	Baseline	Robustness Tests		
	1980-2002	1986-2002	w/ FDI	Panel logit
External Factors				
International interest rate	-3.68**	-3.84**	-6.07**	-2.12**
	(1.07)	(1.16)	(2.56)	(0.83)
US GDP Growth	1.52**	0.92	1.67	0.89
	(0.73)	(0.85)	(1.14)	(0.56)
Internal Factors				
GDP	0.97**	1.05**	3.39**	0.58**
	(0.36)	(0.39)	(1.28)	(0.29)
Current account bal. (-1)	0.52**	0.50**	1.24**	0.30*
	(0.21)	(0.26)	(0.50)	(0.16)
Fiscal balance (-1)	-0.82**	-0.86**	-1.32	-0.48**
	(0.32)	(0.34)	(0.87)	(0.24)
Real GDP growth	-0.16	-016	-0.83**	-0.09
	(0.14)	(0.15)	(0.38)	(0.12)
External debt/exports	0.47	0.49	0.74	0.23
	(0.52)	(0.54)	(1.79)	(0.45)
Foreign reserves/imports	2.77**	3.22**	8.89**	1.61*
	(1.17)	(1.35)	(3.75)	(0.92)
PPP-adjusted GDP per capita	0.01**	0.01**	0.02**	0.01**
	(0.00)	(0.00)	(0.01)	(0.00)
Consumer price inflation	-0.04**	-0.04**	-0.18**	-0.03**
	(0.01)	(0.01)	(0.08)	(0.01)
FDI			3.05**	
			(1.29)	
Number of zeros	420	310	420	420
Number of ones	38	37	38	38
Pseudo-R^2	0.82	0.80	0.90	N/A
No. of observations	458	347	458	458
Likelihood ratio test	214.0**	186.0**	236.5**	143.0**

Note: * and ** indicate significance at 10 and 5 percent confidence levels respectively. Standard deviations are in parenthesis. Maximum likelihood logit estimation is used with group effects controlled by dummy variables (not reported).

Table 4. In-Sample Predicted Probability of First-Time Bond Issues by Country

Country	Issue Year	Predicted Probability of Issue During the Issue Year 1/
Argentina	1991	100.0
Bulgaria	2001	99.15
Chile	1999	65.11
Colombia	1986	100.0
Costa Rica	1998	97.11
Croatia	1996	99.99
Dominican Rep.	2001	99.99
Ecuador	1997	98.44
Egypt	2001	98.77
El Salvador	1999	87.50
Estonia	2002	100.0
Grenada	2002	49.74
Guatemala	1997	99.34
Hungary	1999	99.99
Israel	1995	100.0
Jamaica	1997	99.43
Kazakhstan	1996	100.0
Latvia	1999	64.56
Lebanon	1994	99.98
Lithuania	1995	6.28
Mauritius	1995	83.40
Moldova	1996	69.48
Oman	1997	99.58
Pakistan	1994	99.99
Papua New Guinea	1984	43.61
Peru	2002	99.99
Philippines	1993	98.85
Poland	1995	100.0
Qatar	1999	100.0
Romania	1997	61.55
Russia	1996	100.0
Saudi Arabia	1994	98.38
Slovak Republic	1998	99.98
Slovenia	1996	99.99
Sri Lanka	1997	99.50
Turkey	1988	98.32
Ukraine	1997	99.99
Uruguay	1992	97.95
Average predicted probability		**89.89**

1/ The actual (ex post) values are equal to 100 for all countries.

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