Interest Rates in the North and Capital Flows to the South:

Is There a Missing Link?

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Revised, June 1998

Forthcoming: Journal of International Finance

Abstract

Past analyses have found a puzzling decline in spreads on primary issues of emerging market bonds when U.S. interest rates rise. Part of the puzzle is resolved by accounting for the selectivity bias: poor credits drop out of the market when interest rates rise. In addition, some, especially East Asian fixed-rate, bond issuers have been able to time their debt issuance to take advantage of favorable market conditions. However, the magnitude of the change in spreads following the movement of U.S. interest rates is small. U.S. interest rates do have a large impact in determining the volume of bond issuance.

I. Introduction

Each surge of lending to emerging markets rekindles the debate over the importance of push and pull factors in international capital flows. In one camp are those who stress macroeconomic stabilization, economic liberalization, and enterprise privatization during periods of rising lending, and disappointing progress in the borrowing countries when capital imports decline.[1] In the other are those who emphasize the influence of interest rates in the creditor countries over international capital flows.[2] Falling world interest rates, in their view, encourage investors to search for yield in emerging markets and enhance the ability to borrow of indebted countries by reducing the cost of servicing already-existing loans.[3] Similarly, rising interest rates in the major money centers curtail lending to emerging markets for reasons largely beyond the

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[1]See for example Chuhan, Claessens and Mamingi (1993), Edwards (1995), Montiel (1995), and Fernandez-Arias and Montiel (1995).

[2]See e.g. Diaz-Alejandro (1983), Calvo, Leiderman, and Reinhart (1992, 1993), Dooley, Fernandez-Arias and Kletzer (1996), Calvo and Reinhart (1996), and World Bank (1997).

[3]Both mechanisms are clearly described by Fernandez-Arias (1996) and Dooley and Stone (1993). As Kamin and van Kleist (p.19) put it, "An increase in industrial country interest rates increases the debt service burden borne by the borrower countries, thereby reducing their ability to repay their debts and hence lowering their creditworthiness. This, in turn, can lead to increases in spreads paid by borrower countries." They go on to explain that in addition there is the effect of industrial country interest rates on "appetite for risk." That is, "international investors attempt to enhance portfolio returns in a low interest rate environment by increasing their risk exposure. On this reasoning, spreads on risky assessets in general, and emerging market debt instruments in particular, are positively related to levels of short-term interest rate in the industrial countries. Therefore, declines in industrial country interest rates can lead to declines in spreads on emerging market debt instruments." A separate literature asks whether the capital flows are driven by fads (in other words, whether the structural relationship determining such flows shifts unpredictably over time). This question is the subject of a companion paper (Eichengreen and Mody, 1998) and is not addressed here.

latter's control.

It is important to understand what is at stake in this debate. If the price and availability of foreign finance depend largely on conditions in the capital-importing countries, as argued by proponents of the first view, then the borrowers should be able to regulate inflows by adopting the appropriate policies. If, on the other hand, the price and availability of funds depends heavily on external financial conditions, as argued by members of the second camp, then emerging markets may find themselves alternatively swamped by and starved of foreign capital. They may be vulnerable to inflow-induced consumption booms, asset-price bubbles, and real overvaluation when industrial-country interest rates are low and to sudden reversals in the direction of flows sufficient to precipitate a crisis when industrial-country interest rates rise. A number of observers have noted that capital-flow reversals and emerging-market financial crises appear to coincide in time with increases in industrial-country interest rates (see e.g. Eichengreen and Rose, 1998; International Monetary Fund, 1998). Some of those who adopt this view therefore question the advisability for developing countries of capital-account convertibility and suggest the adoption of capital-inflow taxes like those used by countries like Chile, Colombia, and Israel.[4] Clearly, this the debate has profound implications for advisability of widespread capital account liberalization versus the retention of controls on capital inflows in the context of current discussions of whether to amend the IMF's Articles of Agreement to give

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[4]An early recognition of this implication is Calvo, Leiderman and Reinhart (1993).

the Fund jurisdiction over the capital account.[5]

Although the view attaching importance to the external determinants of capital flows

has a long and distinguished lineage (see e.g. footnote 2 above), the recent literature analyzing

spreads on emerging-market debt lends it surprisingly little support. Regression analyses by

Cline and Barnes (1997) for the period 1992-96 and Kamin and van Kleist (1997) from 1991

through mid-1997, for example, find no evidence of a positive relationship between U.S.

treasury rates and emerging-market launch spreads (spreads on newly issued securities) of

the sort one would expect if changes in industrial-country interest rates were in fact driving

the demand for developing-country bonds. Indeed, in some cases they report a negative

correlation, which they see as casting doubt on the importance of external factors in the

market for emerging-market debt. As Kamin and van Kleist put it, this result suggests, "on

the face of it... that variations in industrial country interest rates have made no contribution

to emerging market bond spreads."[6]

In this paper we show that previous studies using regression analysis to link primary

spreads to U.S. treasury yields suffer from limitations that disguise the underlying

relationship. This is because the volume and composition of international lending, and not

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[5]See the contributors to Kenen (1998) for a sampling of this debate.

[6]Kamin and van Kleist (1997), p.22. An earlier econometric literature using aggregated data on flows and secondary-market prices does provide some support for the view that industrial-country interest rates have an impact on prices and quantities. See for example Calvo, Leiderman and Reinhart (1993), Fernandez-Arias (1996), and Dooley, Fernandez-Arias and Kletzer (1996). Our paper can be seen as an attempt to reconcile the findings of these macro- and micro-level studies.

just the price of new issues, are affected by U.S. interest rates. As a result, ordinary-least-squares estimates of the relationship between emerging-market spreads and U.S. interest rates can be highly misleading.

Considering these additional effects, we find that a rise in U.S. treasury yields consistently reduces the quantity of bonds brought to the market. The impact on yields and spreads is less consistent, but for reasons that are intuitive. An increase in U.S. treasury yields will raise spreads when it mainly affects the demand by investors for developing-country bonds, but reduce them when its main effect is to stimulate the supply. Different effects dominate in different regions and for fixed- and floating-rate issues. Higher U.S. rates increase spreads on Latin American issues and, less dramatically, on floating-rate East Asian bonds. For East Asian fixed-rate bonds, in contrast, higher U.S. rates which make borrowing more expensive mainly discourage new placements. It would appear that less-heavily-indebted East Asian borrowers have been better able, historically, to time their placements to capitalize on favorable market conditions.[7] That this last effect is more clearly evident for fixed- than floating-rate issues reflects the fact that changes in borrowing costs get locked in for longer periods on fixed-rate bonds, encouraging their issuers to make a special effort to time their placement to coincide with favorable market conditions.

In contrast to other recent studies, then, we find more evidence of an effect of U.S. interest rates on emerging-market spreads.

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[7]Whether this will remain true following the Asian crisis is not clear. Our data do not permit us to address this question because they extend only through 1996.

II. The Debate over the Role of Industrial-Country Interest Rates

The debate over the role of industrial-country interest rates has come to the fore each time reversals in the direction and sharp changes in the level of emerging-market capital flows have occurred. We illustrate the point with reference to experience in the 1920s, 1970s and 1990s.

Much of the literature on capital flows to emerging markets in the 1990s emphasizes structural reform -- that is, the stimulus to lending provided by the advent of a new, improved policy regime in the borrowing countries.[8] Starting in 1989, Brady Plan restructurings cleared away the worst problems of nonperforming debt. Inflation was brought under control, and fiscal positions were strengthened. The fiscal balance of Latin America as a whole swung from a deficit of three per cent of GDP in 1989 to a surplus of one per cent in

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[8]A forceful statement of this view is Edwards (1998). His paper begins, "During the late 1980s and early 1990s the vast majority of the Latin American countries embarked on ambitious reforms aimed at modernizing their economies. Country after country turned away from decades of protectionism and government controls, and began to experiment with market oriented policies. Colombia provides a vivid illustration of this regional trend.....a set of policies aimed at drastically changing the nature of Colombia's economic structure were put into effect: exchange controls were abolished; imports were liberalized; labor legislation was reformed; controls over direct foreign investment were relaxed; the financial sector was deregulated; legislation governing ports and operations was modified; the insurance industry was liberalized; and the tax system was modernized. This phenomenon was not unique to Colombia, however. Close to Colombia, the administrations of presidents Fujimori in Peru, Perez in Venezuela and Sanchez de Losada in Bolivia also embarked in major reform efforts. In other countries a similar trend was followed: Presidents Menem in Argentina, Cardoso in Brazil, and Arzu in Guatemala, among others, also launched important modernization programs during the 1990s."

1993 (Eichengreen and Fishlow 1996). Tariffs and quotas were reduced, encouraging a shift

of resources into the traded goods sector and with it a surge in exports. Privatization extended

to airlines, telecommunications, steel and other enterprises. These reforms, it is said, attracted

capital back to emerging markets.

The problem with this view, it has been observed, is that capital flooded back to

different emerging markets at more or less the same rate irrespective of the pace of domestic

reform.[9] This suggests that external factors, namely, declining interest rates in the major

money centers, played an independent role in triggering the recovery of lending. U.S. interest

rates fell by 50 per cent between 1989 and 1991.[10] By 1992 short-term rates in the United

States were at their lowest level since the early 1960s. Chuhan, Claessens and Mamigni

(1993) and Fernández-Arias (1994) concluded that lower international interest rates explained

about half the variation in capital inflows to emerging markets. Such observations led some

authors (viz. Calvo, Leiderman and Reinhart, 1992) to question whether flows to emerging

markets could be sustained in the face of a rise in industrial-country interest rates. Indeed,

when that rise came in 1994 it was associated with a curtailment of capital flows and the

sharp shock to confidence now known as the Tequila crisis.[11]

Similarly, in accounting for the rise and retreat of capital flows to emerging markets in

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[9]As emphasized early on by Calvo, Leiderman and Reinhart (1992). See also Edwards (1998).

[10]Calvo, Leiderman and Reinhart (1992), p.16.

[11]As Calvo, Leiderman and Reinhart (1996, p.126) put it, "Surely enough, the tightening of monetary policy in the United States and the resulting rise in interest rates in early 1994

the period centered on the summer of 1997, some observers cited changing economic

conditions in the borrowing countries, specifically Asia's remarkably successful economic

performance. Between 1992 and 1995 the developing countries of Asia grew in excess of 9

per cent per annum without significant inflation or serious fiscal imbalances. The countries of

Latin America and East Asia, for their part, rededicated themselves to economic liberalization

following the disruption associated with the Tequila crisis. Capital flows to emerging

markets thus recovered to earlier levels within quarters of Mexico's devaluation.

Other analyses, however, stressed the role of low interest rates in the industrial

countries in encouraging the resurgence of capital flows to emerging markets.[12] Low rates

fueled the "carry trade" in which investors borrowed in Japan to purchase high-yielding fixed-

income securities in emerging Asia.[13] Then in the early months of 1997, in response to a

strong domestic expansion, the U.S. Federal Reserve raised short-term interest rates. In

Japan, bond yields rose from 2 to 2 _ per cent when the outlook for the economy appeared to

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made investment in Asia and Latin America relatively less attractive."

[12] "A development that contributed to the surge in capital inflows to emerging markets in the early to mid-1990s was the decline in asset yields in the industrial economies. Weak economic performance in many industrial countries in this period led to accommodative monetary policies, abundant liquidity, and low interest rates, and these in turn contributed to rises in stock markets — most notably in the United State up to 1995 but more generally thereafter — that reduced dividend yields and ratios of corporate earnings to equity values." International Monetary Fund (1997), pp.4-5.

[13] One of the present authors (Eichengreen et al. 1998) has argued in another context that the exchange rate pegs maintained by the principal Asian borrowers are a key element of this story, insofar as they reassured investors that the relatively high interest rates they enjoyed on investments in Asia would not be wiped out by currency depreciation.

brighten, and short rates firmed with talk that the Bank of Japan might raise rates. Evidence that European growth was gaining momentum similarly nurtured expectations of a rise in yields. These events put a damper on capital flows to emerging markets and, in the view of those who emphasize external factors, helped to precipitate the Asian crisis.

The same themes again feature in the literature on lending in the 1970s and the debt crisis of the 1980s. The boom in lending followed a decade in which Asian countries had implemented structural reforms, boosted domestic saving and investment, and moved strongly in the direction of export-promoting policies (World Bank, 1993). Reform was less comprehensive in Latin America, but even there tariffs were slowly reduced, several countries allowed their exchange rates to adjust downward, and nontraditional exports were promoted (Cardoso and Fishlow, 1992; Baer and Samuelson, 1977). It is important to recall that GDP-weighted growth rates for Latin America a whole averaged nearly six per cent in the 1960s, and real export earnings expanded healthily.[14] These conditions provided the backdrop to the resumption of portfolio capital flows to emerging markets following several decades during which lending to developing countries had been limited to direct foreign investment and official aid. And when lending suddenly fell off in 1982, this reflected the deterioration of economic, specifically fiscal, performance, notably in Mexico and Brazil, and mounting real

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[14]Eichengreen and Fishlow (1996), pp.18-21. Thus, ratios of debt to exports remained stable over the period 1972-81 despite heavy external borrowing (Calvo, Leiderman and Reinhart 1992, p.16).

exchange rate overvaluation throughout the region.[15]

Accounts of LDC lending in the 1970s emphasize not just these domestic factors, however, but also external financial circumstances, specifically the ample liquidity in the hands of the money-center banks following the first OPEC oil-price hike and the industrial countries' policy response to oil shock. Nominal interest rates in the United States declined by a third between 1972-74 and 1975-77, coincident with the surge in U.S. lending.[16] For much of this period real interest rates were negative, heightening the attractions of borrowing abroad for developing countries. U.S. and European banks, for their part, were attracted to developing-country debt by the low real returns on investment at home. Then, of course, came the Volcker disinflation and the rise in real interest rates which made foreign lending less attractive.

The same debate can be found in the literature on lending in the 1920s and the debt crisis of the 1930s. After World War I financial capital was attracted from the United States to the economies of Central Europe and Latin America by reconstruction and reform -- that is, by inflation stabilization, the restoration of gold convertibility, and the recovery of trade. This was not the entire story, however: the fact that the Federal Reserve kept interest rates low encouraged American investors to seek more remunerative investments abroad.[17] After

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[15]On this, see Fishlow (1988) and Edwards (1998).

[16]Calvo, Liederman and Reinhart (1992), p.16.

[17]A point emphasized by Diaz-Alejandro (1983) and Eichengreen and Portes (1989).

1925, the yield on domestic medium-grade securities was consistently less than on Lary's (1943) sample of foreign bonds. Starting in 1928, however, the Fed raised the discount rate to damp down the "excessive" stock market speculation that it feared was diverting resources from productive uses. Over the first half of the year it raised the discount rate in half-point steps from 3 1/2 to 5 per cent. In addition, it sold government securities to drain liquidity from the market.[18] The consequence was a sharp fall in U.S. foreign lending.[19] Net portfolio lending by the United States declined from more than $1,000 million in 1927 and about $700 million in the first half of 1928 to virtually zero in the second half of the latter year.[20] Capital outflows recovered modestly at the end of 1929, following the Wall Street crash and the fall in the demand for borrowed funds in the United States, but then declined again with the onset of the worldwide depression and the spread of financial instability.

In sum, the literature on each of the 20th-century episodes characterized by sudden shifts in the volume of international lending attributes an important role to interest rates in the United States and the other money centers. No consensus exists, however, on the weight that should be attached to this factor relatively to economic conditions in the borrowing countries. For that, a more detailed statistical analysis is required.

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[18]Hall and Ferguson (1998), pp.63-64.

[19]As emphasized recently by Hamilton (1988). Much the same emphasis appears in the contemporary literature; see for example Madden and Nadler (1935).

[20]Eichengreen (1992), p.226.

III. Previous Studies Using Bond Market Data

An increasing number of studies have sought to address these questions using panel

data on emerging-market bond spreads. Typically, they relate the pricing of international

bonds (more precisely, the spreads between their yields and the yield on a benchmark fixed-

income asset) to a vector of country and period characteristics. Cantor and Packer (1995), for

example, analyze spreads on sovereign bonds for 49 developing and developed countries,

relating them to per capita income, GDP growth, inflation, the fiscal balance, the external

balance, the level of external debt, the country's default history, and the average of Moody's

and Standard & Poor's country credit ratings. Cline (1995) analyzes the effect of many of the

same variables on corporate as well as government issues but considers only highly-indebted

countries. Cline and Barnes (1997) use more recent data for 11 emerging market and 6

European industrial countries and essentially the same list of explanatory variables. Using

information on 304 new international bond issues, Kamin and van Kleist (1997) relate

primary spreads to Moody's and Standard & Poor's country credit ratings and to various

issue characteristics.

The Cline-Barnes and Kamin-van Kleist papers include among the determinants of

spreads interest rates in the advanced industrial countries. This produces little evidence that

higher U.S. interest rates increase emerging market spreads, as one would expect if higher

industrial-country rates moderate the demand for developing-country bonds by raising the

opportunity cost of foreign investment and at the same time reduce the credit worthiness of

developing countries by raising the cost of servicing their pre-existing debts (Fernandez-

Arias, 1996; Kamin and van Kleist, 1997). Cline and Barnes report a positive coefficient on the U.S. treasury rate but a t-statistic of only 0.23. Kamin and van Kleist find that the coefficient on industrial-country interest rates is significantly negative or insignificantly different from zero but never significantly positive. They obtain the same result using interest rates in the U.S., Germany and Japan.

Thus, recent econometric studies are curiously at odds with qualitative accounts attributing importance to industrial-country interest rates.

IV. New Evidence

The typical model employed in these studies is a linear relationship of the form:

$$\log (\text{spread}) = fX + u_1 \tag{1}$$

where the dependent variable is the logarithm of the spread, X is a vector of issue, issuer and period characteristics, and u_1 is a random error. Unfortunately, the conditions under which equation (1) provides an unbiased estimate of the relationship between characteristics and spreads are unlikely to be met in practice, for not all potential issuers will be in the sample at all points in time. The spread (and its relationship to issue and issuer characteristics) will be observed only when positive decisions to borrow and lend are made. Assume for example that spreads are observed when a latent variable B crosses a threshold B' defined by:

$$B' = gX' + u_2 \qquad\qquad (2)$$

where X' is the vector of variables that determines the desire of borrowers to borrow and the willingness of lenders to lend, and u_2 is a second error term. Ordinary-least squares estimates of (1) will then be biased. If the error terms are bivariate normal with standard deviations s_1 and s_2 and covariance $s_{12}^2/s_1 s_2$, then this is a standard sample selection model, a la Heckman (1979), and equations (1) and (2) can be estimated simultaneously. They can be identified by the nonlinearity of the fitted probabilities in the selection equation or by the inclusion of elements in X' that are not also in X.

A. Data

We estimated this model using data for primary market (launch) spreads for all developing-country bonds—public and private—issued in the period 1991-96, drawn from Capital Data Bondware.[21] Between 1991 and 1996, 1328 fixed-rate bonds and 540 floating-rate bonds were issued. Latin America dominated the fixed-rate market with 804 bonds, followed by East Asia with 320 and Eastern Europe with 134. East Asia issued 425 floating-rate bonds, Latin America 76, with other regions accounting for the remainder

That these are launch spreads is important, since spreads at the time of issue behave

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[21] The data were processed by the Emerging Markets Division of the International Monetary Fund. Launch spreads were not reported for about 20 percent of the bonds issued in this period. In addition, absence of complementary country characteristics reduced the number of usable observations. The number of observations used in each regression is listed in the next-to-last line of Tables 1-4.

differently than spreads on the secondary market. In particular, in poor market conditions when secondary spreads rise, launch spreads generally fall. This reflects the tendency for the number of issues to decline and for only the most creditworthy borrowers to come to the market when global financial conditions tighten. This response turns out to be at the heart of our empirical analysis.[22]

We supplemented these data on spreads with information on country, issue, and period characteristics. From Bondware we gathered data on the maturity of each issue, whether it was privately placed, whether the issuer was a private or governmental entity, whether the issue was denominated in dollars, yen or deutschmarks, and whether the interest rate was fixed or floating. Following the studies described in Section III, as measures of creditworthiness we used external debt relative to GNP, international reserves relative to GDP, debt service relative to exports, a dummy variable for whether the country had concluded a debt restructuring agreement with private or official creditors in the preceding year, the growth of real GDP, and the variance of the export growth rate.[23] We also included

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[22]An asymmetric information framework (e.g. Stiglitz and Weiss, 1981) would suggest that, due to the operation of adverse selection, average credit quality could decline when interest rates rise. As we document below, this does not appear to be the case in the market for developing-country debt.

[23] These are the same variables employed by Cline-Barnes and Kamin-van Kleist. We also followed them in trying the fiscal balance and per capita GNP but found that neither of these variables yielded consistent or intuitive results. This led us to drop these variables from our final specification. We interpret high export variability as a proxy for the perceived likelihood of interruptions to external debt servicing due to adverse balance-of-payments shocks. We used export variability rather than balance-of-payments variability because relatively reliable monthly data are available for this component of the balance of payments. The addition of

a measure of country credit worthiness derived from data provided by *Institutional Investor*.[24] Since the raw country credit rating is highly correlated with (and constructed by the rating agencies largely as a function of) other issuer characteristics, its inclusion creates potential problems of multicolinearity and complicates interpretation. We therefore employed the residual from a first-stage regression in which the credit rating was regressed on the ratio of reserves to GNP, the ratio of debt to GNP, the debt rescheduling dummy, the rate of GDP growth, and the variance of export growth.[25] Since this is a residual from a regression

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export variability to our credit-rating equation, described below, raises the R^2 from 0.48 to 0.60, supporting the notion that market participants regard this, or the variables for which it proxies, as relevant to their investment decisions. The IMF's *World Economic Outlook* was the source for annual data on debt, debt service, GNP, GDP and exports. Its *International Financial Statistics* provided quarterly figures on reserves and monthly data on exports (used to construct our measure of export variability). Dates for debt rescheduling agreements were obtained from the World Bank's *World Debt Tables* and *Global Development Finance.*

[24]The rating data are biannual. The advantage of the *Institutional Investor* data over the Moody's/S&P ratings used by most previous authors is more comprehensive country coverage and more regular publication. *Institutional Investor* asked leading international bankers to grade countries on a scale of zero to 100, with 100 representing the least chance of default. The individual responses are weighted by *Institutional Investor* using a formula that gives more importance to respones from banks with greater worldwide exposure and more sophisticated country-analysis systems.

[25] In addition to entering these variables in levels, we included interaction terms for each, interacting them with a dummy variable for Latin America. The coefficients on 9 of the 10 independent variables entered with coefficients that differed from zero at the 95 per cent confidence level. (The one exception was the interaction term between the debt/GNP ratio and the Latin America dummy.) The signs of the coefficients are intuitively plausible. Larger reserves, less debt, faster growth and more stable export growth all improve the credit rating, while a recent history of debt rescheduling worsens it. High reserves and stable exports matter more for credit worthiness in Latin America, while fast growth and a recent history of rescheduling matter less.

of credit ratings on observable economic characteristics, we interpret it as capturing elements
of political risk.[26]

To proxy for industrial-country credit conditions, we used the yield on ten-year U.S.
treasury bonds. Given our focus on interest-rate effects, the choice of rate is potentially
important. Ten-year rates are appropriate insofar as the term to maturity of the underlying
asset roughly coincides with that on the international bonds in our sample.[27]

Estimating equation (2) requires information on those who did not issue bonds. For
each country we considered for three types of issuers: sovereign, public, and private. For
each quarter and country where one of these issuers did not come to the market, we recorded
a zero, and where they did we recorded a one. We estimated equation (2) using limited-
dependent variable methods (and equation (1) by ordinary-least squares, as well as estimating
the system using maximum likelihood).

B. Exploratory Regressions

Tables 1 and 2 report ordinary-least-squares estimates of equation (1) analogous to
those in earlier studies. Table 1 focuses on bond characteristics, while Table 2 adds country

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[26]We are not aware of previous studies which have tested for the significance of political risk
by utilizing the credit rating residual as opposed to the raw credit rating.

[27]The average term to maturity was 6 to 8 years, depending on which of the samples used
below was considered. The ten year note was also used by previous authors such as Cline
and Barnes, which therefore enhances comparability. As a form of sensitivity analysis we re-
ran the regressions in Tables 1 and 2 using the one-year Treasury note rather than the ten-
year note. All of the results were qualitatively similar, not surprisingly given that the
correlation between the one-year and ten-year treasury rates for the dates on which the bonds
in our sample were issued is 0.55.

characteristics and highlights differences across regions.[28] The results are generally intuitive.

Consider first Table 1. The coefficient on issue amount indicates that larger issues bear

smaller spreads (consistent with the existence of economies of marketing and distribution and

the greater liquidity of larger issues on the secondary market). Private placements command

larger spreads, consistent with the fact that these bonds are issued in markets with less

stringent disclosure requirements.[29] Private issuers pay higher spreads than public issuers,

presumably reflecting the greater security associated with the ability to tax. Fixed-rate issues

require larger spreads than floating-rate bonds, reflecting their greater price sensitivity to

global interest rates. The dummy variable for Latin America suggests that, other things equal,

Latin American borrowers have been required to pay higher spreads.

The coefficient on the U.S. treasury rate is negative, consistent with the findings of

other recent studies. Latin American spreads are relatively insensitive to this effect, however.

 (Note the coefficient on the interaction term between U.S. treasury rates and the dummy for

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[28]Prior to the onset of the Asian crisis, the literature laid considerable stress on structural
differences affecting behavior toward international capital markets between Latin America and
East Asia. See Sachs (1985) for an early statement and Edwards (1998) for a retrospective
view. This provided the rationale for testing for different slope coefficients for Latin
American borrowers. Including these interaction terms confirmed the existence of different
structural relationships for Latin America and considerably improved the fit of the estimated
equations.

[29]Because trading in those bonds is restricted to qualified investors assumed to be capable of
managing the risk, SEC disclosure requirements are relatively relaxed. Limited disclosure
implies that information on issuer characteristics may be somewhat less complete, leading
investors to demand a higher spread.

Latin America.) The absolute value of the coefficient is smaller for floating- than fixed-rate

bonds. (Note the coefficient on the term interacting the U.S. treasury rate and the dummy for

floating-rate bonds.)

Table 2 adds country characteristics and reports separate regressions for fixed- and

floating-rate issues and for Latin America and East Asia.[30] A larger credit rating residual

reduces the spread—that is, a better credit rating residual leads investors to bid up the issue

price. A high debt service ratio increases spreads, especially within East Asia. Rapidly

growing countries pay lower spreads, reflecting prospective improvements in their debt-

servicing capacity, while countries whose export growth is variable pay higher ones.[31] East

Asian issuers are able to take advantage of lower spreads in yen- and deutchmark-

denominated markets, especially for floating rate issues. Spreads on Latin American fixed-rate

issues are significantly higher following a rescheduling, but reschedulings have only a modest

effect on East Asian fixed-rate issues.[32] The coefficient on the dummy variable for Israel is

negative, reflecting the U.S. government guarantee of its issues. Issues floated by the

Corporacion de Fomento, a Latin American development banks operating in more than one

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[30]For Latin America, here as below, only results for fixed-rate bonds are reported, since very
few floating-rate bond were issued by borrowers in the region.

[31]Fixed-rate issues suffer a greater penalty for variable export growth, as if investors
especially value steady performance in cases where interest rates are locked in.

[32]No floating rate bond was issued within a year of rescheduling.

country,) pay lower spreads than issues by sovereigns.[33] Latin American issuers pay higher

spreads, reflecting the greater volatility and more troubled borrowing history of the region.[34]

The specification in Table 2 explains about 60 per cent of the variation in spreads in the full

sample.

The regressions in Table 2 are suggestive of differences across regions and types of

bonds in the response to U.S. treasury rates. While the negative sign and large coefficient on

U.S. rates is prominent for East Asian fixed rate issues, for Latin America and East Asian

floating-rate issues it is small and statistically indistinguishable from zero. The puzzle

remains, however, in as much as a positive and significant sign on the U.S. treasury rate is not

found even after disaggregation.

C. Determinants of the Issue Decision

The results in Tables 1-2 do not correct for selectivity. That this is a potentially

important problem is evident from our single-equation estimates of the probability of an issue

(Table 3).[35] These results indicate, in other words, that bond issuance is far from random.[36]

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[33]For these issues, we followed standard practice by using country characteristics for
Venezuela, the country in which the *Corporacion* is headquartered.

[34]On this relationship, see Kaminsky and Reinhart (1998).

[35]The probit coefficients in Table 3 are normalized to the partial derivative of the probability
distribution function with respect to a small change in the independent variable evaluated at
average values of the independent variables to facilitate interpretation.

[36]We included interaction terms for Latin America because the ordinary-least squares
regressions in Tables 1 and 2 pointed to structural differences between Latin America and
other regions in the impact of country characteristics on market outcomes. The results in

Countries with higher credit rating residuals (better credit ratings, other things equal) are more inclined to come to the market. Those with high and rising reserves are less inclined to float new issues, as if they already possess alternative sources of finance. Countries and companies from countries with higher external debt service ratios are more likely to issue bonds, as if they find the need for external finance more pressing. An exception is East Asian fixed-rate issuers, in whose case a high debt-service ratio reduces the probability of issue. It would appear that East Asian fixed-rate issuers are better able to time their borrowing to avoid accumulating excessive debt-service obligations; we return to this point momentarily.

Importantly, the log treasury rate is plausibly signed and highly significant in the full sample and each subsample. In each case, higher U.S. rates negatively affect the probability of an issue. The effect is particularly large for East Asian fixed-rate issuers, as if they were best able to time their bond issues to coincide with favorable market conditions, and as if issuers of fixed-rate notes had the most reason to worry about not locking in high borrowing costs. This is strong evidence for the interpretation favored by members of the external-factors camp.

D. Selectivity-Corrected Estimates

Table 4 reports the results of estimating equations (1) and (2) jointly by maximum likelihood. While most of the coefficients in the spreads equation are not radically different from those in Table 2, that on the U.S. treasury rate is now positive and significantly greater

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Table 3 confirm that these differences extend to the issue decision as well as pricing behavior.

than zero at the 90 per cent confidence level for Latin American fixed-rate bonds and positive if insignificant (albeit with a p-value of 0.20) for East Asian floating-rate issues.[37] In both cases the point estimate is about 0.35. Thus, an increase in U.S. treasury rates from 7.0 to 7.7 percent raises a 300 basis point spread by ten basis points (for a total increase in the interest rate of 80 basis points). For fixed-rate bonds issued by East Asian borrowers, the coefficient on the U.S. treasury rate remains negative, but insignificantly different from zero.

In both cases where the U.S. treasury rate coefficient has turned positive, there is a strongly negative coefficient on lambda.[38] Intuitively, bonds that the equations in Table 3 predict should not have come to the market given their observable characteristics, but which were issued nevertheless, appear to possess unobservable characteristics associated with unusually low spreads. That is, they appear to have been of unusually good credit quality. That lambda and the U.S. interest rate are correlated is evident in the change in the interest rate coefficient when the Inverse Mills Ratio is added to the set of regressors. For Latin American issuers of fixed-rate bonds, the negative coefficient on lambda is accompanied by a

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[37]Note also that the coefficient on the dummy variable for private issuers, which was positive and significant in the OLS regressions, is now statistically insignificant for these two subsamples. An inference is that private issues unable to restrict the supply of bonds pay a premium for entering the market in periods of high interest rates when demand for emerging market paper is low.

[38]Following Heckman, the parameters of the probit equation are used to generate the Inverse Mills Ratio, which is a proxy for variables that influence the spread but are not observed by the econometrician. Lambda is the Inverse Mills Ratio, calculated from the correlation between the error terms in the issue and spreads equations, normalized by the standard error of the residual in the spreads equation. A statistically significant coefficient on lambda is a sign of selecitivity bias.

sharp increase in the value of the interest-rate coefficient, suggesting that relatively poor

credit risks drop out of the market when U.S. interest rates rise.

These patterns lend themselves to an intuitive interpretation in terms of supply and

demand, as follows.[39] For Latin American fixed-rate (and, arguably, East Asian floating-rate)

issues, U.S. interest rates clearly affect investors' demand for bonds. Higher U.S. rates curtail

that demand by reducing the incentive to invest abroad. This puts upward pressure on

spreads -- equivalently, downward pressure on prices. This, then, is the standard search-for-

yield story in which higher U.S. yields encourage American investors to keep their money at

home, widening spreads and reducing capital flows by discouraging potential borrowers from

issuing new paper. At the same time, however, higher U.S. rates induce Latin American

borrowers and East-Asian floating-rate issuers seeking to minimize their debt-servicing costs

to slide down their supply curves, reducing the probability of observing an issue and limiting

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[39]Again, we focus on the interest-rate coefficients. The other coefficients can also be
interpreted in terms of bond supply and bond demand. For example, a larger credit rating
residual (a better credit rating, other things equal) increases the probability of an issue and
reduces the spread—that is, countries with an inferior credit rating find it both more difficult
and costly to come to the market—as if its main effect is on bond demand. (We refer here to
the equations for the full sample of bonds.) A higher debt/GNP ratio reduces the probability
of an issue and increases the spread, again as if it affects mainly demand. On the other hand,
in Latin America a recent rescheduling has a positive effect on the probability of an issue
while at the same time raising the spread, as if its main effect is to encourage the supply of
bonds. Finally, the coefficient on lambda, which is significantly negative for Latin America
but significantly positive for East Asia, suggests that unobserved characteristics of issuers
correlated with the spread tend to be mainly unobserved arguments of supply in the Asian
case (since when they increase the probability of an issue they also raise the spread and
should therefore be thought of shifting the bond supply schedule to the right) but observed
arguments of demand in the Latin case (since when they increase the probability of an issue,
they also reduce the spread and should be thought of as shifting the bond demand schedule to

the flow supply of new placements. Other things equal, this puts upward pressure on prices

(downward pressure on spreads). That previous studies have not generally attempted to

distinguish these supply- and demand-side effect helps to account for their failure to detect a

significant interest-rate response.

In addition, there is an effect of the composition of supply: those Latin American

fixed-rate and East Asian floating-rate bonds that our placements equation predicts should

not have been issued, given the level of U.S. interest rates and other determinants, but which

come to the market in any case tend to be of unusually high credit quality and are therefore

command unusually low spreads. A rise in U.S. interest rates tends to be accompanied, in

other words, by an improvement in credit quality, as potential issuers with difficult-to-

observe characteristics associated with high spreads drop out of the market. The tendency

for poor credit risks to drop out of the market puts downward pressure on spreads, other

things equal. Failure to account for this compositional effect also helps to explain why

previous studies have failed to obtain the expected interest-rate response.

For East Asian fixed-rate issues the main effect of higher U.S. rates is to discourage

new issues, and strongly so. Constricting the supply of placements puts upward pressure on

prices and downward pressure on spreads. The negative and statistically insignificant

coefficient in the spreads equation, in contrast to the positive coefficient for Latin America,

suggests that there is relatively little impact on demand. Thus, the dominant effect in the East

Asian (fixed-rate) case has been the ability of borrowers to time their issues to restrict supply

the right).

to coincide with favorable market conditions. Historically, the economies of East Asia have been less heavily indebted, less dependent on external finance, and more able to respond flexibly to changes in global credit conditions -- although whether this will still be true in the post-Asian-crisis era remains to be seen. Moreover, it is plausible that these supply-side factors should be most clearly evident in the fixed-rate segment of the East Asian market, where the timing of new issues has the greatest impact on debt-servicing costs.

V. Conclusion

Qualitative accounts have long emphasized the state of global financial markets, as proxied by interest rates in the advanced industrial countries, as a determinant of capital flows to emerging markets and the pricing of external debt. Curiously, econometric studies relying on disaggregated data have lent little support to this emphasis. The present paper seeks to reconcile these findings.

Textbook economics emphasizes the need to look at both blades of the supply-demand scissors. In the present context this means looking not just at international investors' appetite for developing-country debt but also the borrowers' decision to supply these obligations. It means looking at both the issue and pricing decisions.

Our analysis, which takes this approach to the market for international bonds, confirms that global credit conditions have had an important impact on the market for developing-country debt. There is a negative impact of higher U.S. rates on the demand by international investors for fixed-rate issues by Latin American borrowers, as predicted by the

search-for-yield hypothesis. The same effect is apparent for East Asian floating rate issues, although the evidence there is not robust.

But this effect is evident only upon controlling for the impact of U.S. interest rates on the decision of developing-country borrowers to issue debt. Higher interest rates in the major money centers have a negative impact on the borrowers' issue decision. This effect is strongest for East Asian issuers of fixed-rate securities, who appear to have been best able to withhold new placements when U.S. interest rates rise, curtailing the supply of emerging-market paper and putting upward pressure on bond prices — equivalently, limiting the rise in spreads. In addition, there is a tendency for relatively poor credit risks to drop out of the market in periods of relatively high U.S. rates, which, other things equal, puts downward pressure on spreads, suggesting to the unwary observer failing to control for this tendency that there is no positive association between U.S. interest rates and emerging-market spreads.

In sum, the fact that both supply and demand responses have been important and that the balance between them has differed by region and between fixed- and floating-rate issues goes a long way toward explaining why previous analyses which have overlooked these distinctions have failed to identify an interest-rate effect.

Table 1: Spreads on primary bond issues: descriptive regressions

(t-statistics in parentheses)

Dependent Variable: log of spreads

Log amount	-0.054 (-1.99)	-0.053 (-1.98)	-0.054 (-1.99)
Maturity	-0.002 (-0.42)	-0.002 (-0.40)	-0.003 (-0.46)
Private Placement	0.165 (3.63)	0.165 (3.65)	0.166 (3.66)
Log of U.S. treasury rate	-0.359 (-1.84)	-0.584 (-2.06)	-0.777 (-2.06)
Log of U.S. treasury rate* Latin America		0.426 (1.09)	0.586 (1.33)
Log of U.S. treasury rate* Float			0.381 (0.78)
Private	0.315 (6.78)	0.317 (6.81)	0.314 (6.73)
Latin America	1.04 (20.37)	0.241 (0.33)	-0.060 (-0.07)
Float	-0.515 (-9.72)	-0.512 (-9.67)	-1.231 (-1.33)
Constant	5.47 (13.73)	5.54 (10.64)	6.264 (8.58)
Number of observations	1573	1573	1573
Adjusted R-squared	0.451	0.451	0.451

Table 2: Determinants of Spreads: OLS Regressions
(t-statistics in parentheses)

	Fixed Rate			Floating Rate	
	All	Latin America	East Asia	All	East Asia
Log amount	0.032 (1.07)	-0.035 (-1.24)	0.075 (0.90)	-0.130 (-3.56)	-0.195 (-5.07)
Maturity	0.011 (1.96)	-0.005 (-0.81)	0.021 (1.51)	0.025 (2.08)	0.032 (2.73)
Private placement	0.113 (2.35)	0.142 (3.49)	0.024 (0.16)	-0.095 (-1.35)	-0.056 (-0.72)
Log of U.S. treasury rate	-0.197 (-0.96)	-0.129 (-0.71)	-0.743 (-1.12)	0.005 (0.02)	-0.040 (-0.14)
Credit rating residual	-0.039 (-14.36)	-0.032 (-8.04)	-0.028 (-3.26)	-0.041 (-11.45)	-0.041 (-9.51)
Debt/ gnp	0.646 (3.91)	0.067 (0.29)	-0.992 (-1.46)	0.215 (1.45)	-0.008 (-0.03)
Dummy for debt rescheduling	0.299 (5.01)	0.158 (3.15)	0.148 (0.40)	0.576 (3.88)	
Debt service/ exports	1.370 (7.21)	0.884 (4.26)	5.438 (4.14)	1.233 (4.87)	2.944 (5.77)
Gdp growth	-9.605 (-3.20)	1.569 (0.482)	-5.479 (-0.35)	-14.343 (-3.24)	-28.417 (-3.65)
Variance of export growth	1.514 (4.66)	1.713 (3.86)	1.339 (1.81)	0.368 (1.13)	0.933 (2.79)
Private issuer	0.335 (6.14)	0.196 (3.91)	0.642 (4.21)	0.343 (5.07)	0.486 (6.82)
Latin America	0.317 (4.15)			0.108 (0.78)	
Israel	-2.294 (-12.64)				
Yen issue	-0.160 (-2.19)	0.100 (1.08)	-0.347 (-2.17)	-0.324 (-2.23)	-0.344 (-2.74)
Deutche Mark issue	-0.125 (-1.48)	0.123 (1.52)	-2.136 (-6.06)	-0.201 (-0.97)	-0.414 (-1.12)
Supranational	-0.644 (-2.24)	-0.620 (-2.97)		-0.479 (-0.77)	
Constant	4.459 (10.49)	5.433 (12.93)	5.008 (3.71)	4.922 (8.77)	5.217 (9.38)
Number of bonds	1025	663	233	525	415
Adjusted R-squared	0.585	0.217	0.504	0.463	0.456

Table 3: Determinants of the probability of a bond issue
(t-statistics in parentheses)

	Fixed Rate			Floating Rate	
	All	Latin America	East Asia	All	East Asia
Log of U.S. treasury rate	-0.725 (-7.28)	-0.740 (-5.41)	-1.337 (-6.94)	-0.172 (-3.37)	-0.661 (-3.19)
Credit rating residual	0.013 (13.46)	0.013 (6.30)	0.001 (0.32)	0.009 (16.28)	0.014 (3.89)
Debt/ gnp	-0.382 (-5.35)	-1.417 (-15.19)	0.023 (0.12)	-0.189 (-4.88)	-0.560 (-2.95)
Dummy for debt rescheduling	-0.206 (-5.09)	0.024 (0.70)	-0.216 (-2.67)	-0.090 (-4.42)	
Debt service/ exports	0.541 (5.03)	1.792 (18.83)	-1.589 (-3.55)	-0.038 (-0.62)	0.611 (1.46)
Reserves/ gnp	-0.109 (-5.02)	-0.074 (-0.86)	-0.543 (-10.36)	-0.034 (-3.59)	-0.240 (-5.69)
Private issuer	-0.033 (-1.42)	0.321 (10.66)	0.241 (5.22)	0.166 (12.86)	0.536 (13.46)
Latin America	-0.212 (-0.73)			-0.120 (-0.70)	
Latin American interactions					
Log of U.S. treasury rate	0.086 (0.56)			-0.009 (-0.08)	
Credit rating residual	-0.002 (-1.05)			0.003 (1.82)	
Debt/ gnp	-0.841 (-7.81)			0.048 (0.84)	
Dummy for debt rescheduling	0.295 (4.69)			0.246 (3.68)	
Debt service/ exports	1.006 (7.43)			0.432 (5.62)	
Reserves/ gnp	0.045 (0.58)			-0.114 (-1.97)	
Private issuer	0.348 (8.92)			-0.016 (-0.73)	
Number of observations	3904	1762	717	3140	789
Pseudo R-Squared	0.3498	0.4687	0.2695	0.3826	0.3481

Table 4: Determinants of spreads with selectivity correction
(t-statistics in parentheses)

	Fixed Rate			Floating Rate	
	All	Latin	East Asia	All	East Asia

	America			
Log amount	0.030 (1.00)	-0.018 (-0.72)	0.067 (0.83)	-0.128 (-3.55)	-0.185 (-4.96)
Maturity	0.011 (1.96)	0.000 (0.06)	0.020 (1.52)	0.025 (2.14)	0.030 (2.71)
Private placement	0.110 (2.320)	0.089 (2.41)	0.009 (0.06)	-0.089 (-1.28)	-0.033 (-0.45)
Log of U.S. treasury rate	-0.249 (-1.19)	0.330 (1.68)	-1.048 (-1.55)	-0.090 (-0.31)	0.375 (1.23)
Credit rating residual	-0.038 (-13.22)	-0.034 (-8.55)	-0.021 (-2.13)	-0.034 (-5.65)	-0.058 (-10.82)
Debt/ gnp	0.535 (2.71)	1.548 (7.05)	-1.126 (-1.68)	0.024 (0.12)	0.596 (1.89)
Dummy for debt rescheduling	0.305 (5.12)	0.085 (1.62)	0.136 (0.38)	0.547 (3.70)	
Debt service/ exports	1.488 (6.70)	-0.308 (-1.43)	5.809 (4.45)	1.410 (5.12)	1.934 (3.42)
Gdp growth	-9.541 (-3.21)	0.447 (0.17)	-1.292 (-0.08)	-13.646 (-3.12)	-36.093 (-4.70)
Variance of export growth	1.525 (4.74)	1.557 (4.26)	1.372 (1.91)	0.384 (1.20)	0.920 (3.02)
Private issuer	0.353 (6.19)	-0.029 (-0.57)	0.689 (4.51)	0.436 (4.73)	0.119 (1.24)
Latin America	0.326 (4.28)			0.090 (0.066)	
Israel	-2.299 (-12.78)				
Yen issue	-0.159 (-2.20)	-0.010 (-0.13)	-0.361 (-2.33)	-0.323 (-2.26)	-0.344 (-2.95)
Deutche Mark issue	-0.127 (-1.52)	0.106 (1.54)	-2.130 (-6.22)	-0.209 (-1.02)	-0.538 (-1.51)
Supranational	-0.668 (-2.34)	-0.604 (-4.24)			
Lambda	0.062 (1.00)	-0.550 (-19.52)	0.306 (1.54)	0.138 (1.46)	-0.466 (-6.05)
Constant	4.49 (10.61)	5.068 (11.77)	5.181 (3.91)	4.844 (8.69)	5.221 (9.07)
Number of bonds	1025	663	233	525	415
Log of likelihood	-2679.062	-1165.464	-682.423	-1350.864	-687.122

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