Chapter Title: What Explains Changing Spreads on Emerging Market Debt?

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4 What Explains Changing Spreads on Emerging Market Debt?

Barry Eichengreen and Ashoka Mody

4.1 Introduction

The number and value of bonds issued by emerging market borrowers grew enormously in the course of the 1990s (table 4.1). They were a major source of capital for developing countries and had significant implications for the operation of international capital markets. The value of the bonds issued by developing countries rose from negligible levels in the 1980s (less than $3.5 billion in 1989) to $24 billion in 1992, more than $50 billion per year in 1993–95, an unprecedented $102 billion in 1996, and even higher levels in 1997.[1] Equity issues, while the subject of much attention, never reached comparable heights.

The market's ability to discriminate among borrowers and to price risk accordingly has been controversial, to say the least. Some observers

1. A preliminary estimate for the first three quarters of 1997 is $112.7 billion, or $150 billion at an annual rate. There is reason to anticipate a deceleration in the fourth quarter of 1997, of course, given the turmoil in Asian financial markets.

Table 4.1   **Bond Issues, Equity Issues, and Syndicated Loans to Emerging Markets (gross, US$ billions)**

	1991	1992	1993	1994	1995	1996	First Quarter 1997
Portfolio equity	5.6	7.2	11.9	18.0	11.2	16.4	3.2
Bonds	13.9	24.3	62.7	56.5	57.6	101.9	27.7
Western Hemisphere	7.1	12.9	28.8	18.0	23.1	47.1	11.9
Asia	4.1	5.9	22.0	29.9	25.3	43.1	12.7
Europe and Central Asia	2.1	4.8	9.7	3.5	6.6	7.4	2.8
Middle East	0.4	0	2.5	3.0	0.7	2.6	0.3
Africa	0.3	0.7	0.2	2.1	1.9	1.6	0
Syndicated loan commitments	50.7	42.5	43.0	55.1	74.9	79.7	21.3
Short-term commitments	5.2	8.2	11.9	14.3	21.6	30.5	7.4
Total	75.4	82.4	129.5	144.0	165.3	228.5	59.6

Source: IMF (1997).

emphasize that the information relevant for forecasting returns is costly to acquire and process. Investors, in this view, price bonds on the basis of incomplete knowledge of countries' economic and financial circumstances, a practice conducive to herding and market volatility.[2] Others insist that investors have powerful incentives to be informed and discriminating. As evidence they cite the differentials that exist between yields on bonds issued by countries with different credit ratings and economic characteristics.

Proponents of both views have advanced their preferred explanation for the decline in emerging market spreads that took place between 1995 and early 1997. The secondary-market spread between developing country sovereign bonds and high-yield U.S. corporate issues fell from 1,752 basis points in March 1995 to 537 basis points in December 1996.[3] (The declining spreads of stripped Brady bonds over U.S. treasury rates is shown in fig. 4.1.) Advocates of the "efficiently functioning markets" view explain this trend by pointing to improving macroeconomic and financial fundamentals in developing countries, which rededicated themselves to economic liberalization and structural reform and, following the Mexican crisis, redoubled their efforts to put their fiscal, monetary, and financial affairs in order. Better policies, in this view, implied reductions in the risk of investing in emerging market debt and justified the decline in spreads. Others, more skeptical of market efficiency, question whether fundamentals improved sufficiently to justify the striking decline in spreads and suggest that investors in their exuberance may have been snapping up emerging market debt in disregard of historical relationships between fundamentals and yields.[4]

2. Calvo and Mendoza (1995) suggest that the incentive to gather costly information is a declining function of opportunities for portfolio diversification, so the market's growth may reduce the information possessed by the individual investor about a particular country. (This result depends on the assumption that the cost of acquiring information about a country is independent of the size of the investment or that it at least involves significant fixed costs.) News can then disproportionately affect the allocation of funds across countries and the prices of particular bonds (assuming that portfolio diversification facilitates reallocation). Under these circumstances, one can imagine how investors might fail to raise the risk premium on a particular bond issue to reflect a gradual deterioration in economic conditions, how news about this trend could lead to a jump in prices, and how information about conditions in one country could lead investors to revise their expectations about the prospects of others with superficially similar characteristics. Chari and Kehoe (1997) argue that "hot money" results from "frictions" in information leading to herd-like behavior of investors in and out of countries on the margin, that is, countries that are not obviously attractive or definitely "no-no's." They contrast their model with that of Calvo and Mendoza where the ability to diversify limits incentives for information acquisition. Chari and Kehoe argue that their model predicts the types of countries that will experience hot money flows whereas Calvo and Mendoza predict only that hot money flows will occur. Herd behavior may also be observed for foreign direct investment (Kinoshita and Mody 1997).

3. Spreads continued to fall through the third week of February 1997, after which they reversed direction and began to fluctuate more widely.

4. One oft-heard justification for this view is that the Mexican rescue removed the need for investors to concern themselves with a potential borrower's credit worthiness, or at least left them with this belief, since the package engineered by the United States and the Interna-

The weight that should be attached to these interpretations is critical for how we regard the post-1995 surge of portfolio capital flows to emerging markets and its equally sudden halt (along with a sharp rise in spreads) toward the end of 1997. If increased lending and spread compression in the second half of 1996 and early 1997 reflected improved fundamentals in the borrowing countries, then there is no reason to think that these favorable trends cannot be sustained. As long as governments are richly rewarded for putting national policies on a firmer footing, there are few grounds for worrying that the trend toward policy reform will be reversed or that the demand for emerging market debt will dry up. But if the surge of capital flows and decline in spreads reflected mainly the effects of liberal credit conditions in the major money centers, then there was reason to worry about the effects of the eventual tightening of financial market conditions in the advanced industrial countries. Even more troubling would be evidence that the increased capital flows and reduced spreads of the period centered on 1996 reflected an arbitrary shift in pricing behavior, in which case there was no reason to rule out an equally sudden shift back and a corresponding curtailment of flows.

In this paper we analyze data on about 1,300 developing-country bonds launched in the years 1991–97, a period that spans the recent episode of heavy reliance on bonded debt. In contrast to previous studies, we pay special attention to problems of sample selection. We analyze both the issue decision of debtors and underwriters and the pricing decision of investors. We minimize selectivity bias by treating the two decisions jointly.

Overall, the results confirm that higher credit quality leads to a higher probability of issue and to lower spreads. This supports the presumption that the market discriminates among issuers according to risk. But the same explanatory variables have different effects in the principal debt-issuing regions (Latin America, East Asia, and Eastern Europe). And when it comes to changes in spreads over time, we find that these are explained mainly by shifts in market sentiment rather than by shifts in fundamentals. An obvious break point is the fourth quarter of 1994, when the Mexican crisis erupted and spreads moved sharply higher, before falling subsequently to lower levels than before. Comparing 1991:Q1 to 1994:Q3 with 1995:Q1 to 1995:Q4 (the pre– and post– Mexican crisis subperiods), we find that changes in spreads were dominated by sharp adverse shifts in market sentiment more than by changes in fundamentals. The same is true of the subsequent compression, which this time reflected favorable shifts in market sentiment.

Section 4.2 of the paper begins by reviewing the literature. Section 4.3

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tional Monetary Fund (IMF) allowed them to escape the 1994–95 Mexican crisis scot-free. If the same "chain of guarantees" is likely to again come into play in the event of future debt-servicing difficulties, bondholders have little reason to invest the time and effort needed to discriminate among bonds according to risk.
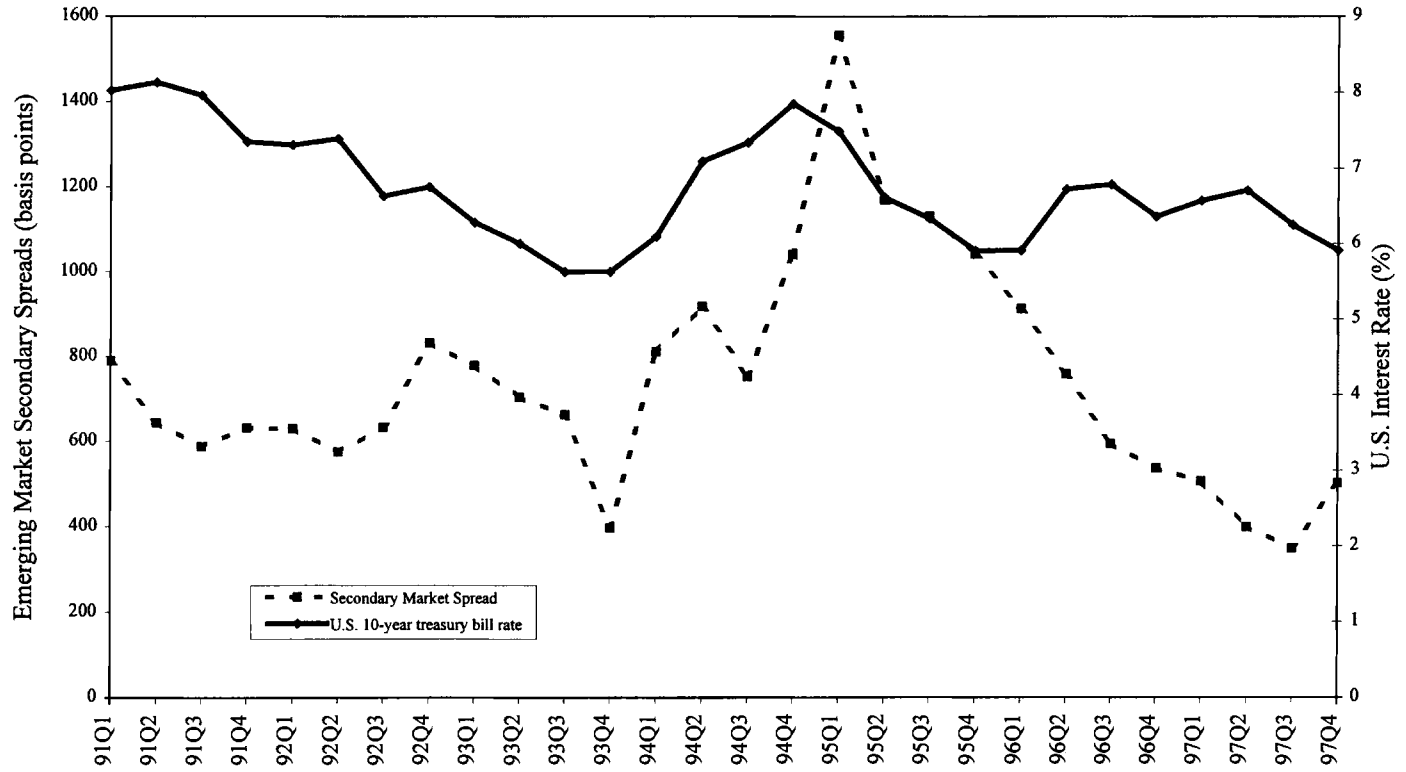
Fig. 4.1   Trends in emerging market secondary spreads and U.S. interest rates

describes the data and section 4.4 the issues of specification and estimation. Section 4.5 reports the basic results for both the issue decision and pricing behavior. Section 4.6 attempts to decompose the contributions of fundamentals and market sentiment to pricing behavior over time. Shifts in pricing behavior are also examined by comparing predicted and actual spreads both within the estimated sample and out of the sample. Section 4.7 draws out the implications of the analysis for how to think about emerging market debt.

4.2   The Literature

Despite the explosive growth of emerging market debt, there have been few systematic studies of the issue and pricing of developing-country bonds. This is in contrast to the secondary market for bank loans, about which there exist a significant number of studies (reflecting the dominance of banking lending in the period 1974–82).[5] But there is reason to think that the determinants of risk and therefore pricing behavior differ between bank loans and bonds. Models of delegated monitoring suggest that banks may have a comparative advantage in assembling and processing information about their clients and that this reputational asset may be incorporated into the secondary market prices of their claims. Pecking-order theories of finance suggest that claims with different degrees of seniority have different levels of risk and that their prices should bear a different relationship to fundamentals. Bonds typically have senior status, while the legal status of bank loans is more variable. Thus, the conclusions from studies of the market in bank loans may not carry over to the market in bonded debt.

The few extant studies of the market for developing-country bonds are subject to other limitations. For instance, Cantor and Packer (1995) analyze the determinants of spreads on sovereign bonds for forty-nine countries in 1995, relating spreads to per capita income, gross domestic product (GDP) growth, inflation, the fiscal balance, the external balance, and external debt, to indicators of economic development and default history, and to the average of Moody's and Standard & Poor's country credit ratings (CCRs). Limitations of this study include the fact that it considers developed as well as developing countries, that it analyzes only sovereign bonds and not also private issues, and that none of the macroeconomic variables is statistically significant when credit ratings are included. Cline (1995) limits his consideration to developing countries and includes corporate as well as government borrowers. However, he studies only highly indebted countries, whose representativeness may be questioned, and he considers only four economic determinants of interest rate spreads: inflation, per capita income, export growth, and GDP growth (along with dummy

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5. See Hajivassiliou (1989) and Huizinga (1989) for examples and surveys of the literature.

variables for private issues and participation in Brady plan debt reduction schemes). Because his sample ends with the second quarter of 1993, he has only 92 bond issues, and some of his estimates are for just 68 bonds. Of his four economic variables, only export growth and GDP growth differ significantly from zero at standard confidence levels. A follow-up study (Cline and Barnes 1997) uses more recent data and a somewhat longer list of explanatory variables but is otherwise subject to many of the same limitations. In addition, it uses data for selected Western European borrowers as well as emerging markets, raising questions about the homogeneity of the sample.

Eichengreen and Portes (1989) analyze a larger sample of 375 international bonds issued in the 1920s, the last time bond markets were a leading vehicle for international lending. But the fact that their sample includes both developing and advanced industrial countries and that the information and regulatory structure of the market has changed over time limits the relevance of this study for present purposes. Edwards (1986) analyzes bond spreads in 1976–80, but since there did not then exist an active market in developing-country debt, he has data for only thirteen countries and 167 bonds. And it is not clear that we should expect pricing performance to remain the same over time.[6] New investors have entered the market since the period Edwards analyzes: while banks held fully 97 percent of all emerging market debt at the end of the 1980s, their share had fallen to less than two-thirds by the mid-1990s (Bernstein and Penicook 1996). New issuers entered as well.[7]

Finally, a study by Kamin and van Kleist (1997) analyzes launch spreads on 304 bonds (and 358 syndicated bank loans) issued in the 1990s. The authors relate spreads to Moody's and Standard & Poor's CCRs (as a summary measure of the macroeconomic determinants of country credit worthiness) and industrial country interest rates (as a measure of international financial conditions). They find that Latin American spreads are on average 39 percent higher than on otherwise comparable Asian issues, a result suggestive of market segmentation. Surprisingly they find that the coefficient on industrial country interest rates tends to be significantly negative or insignificantly different from zero, but never positive.

The fact that country participation in the bond market has risen over time suggests that ordinary least squares (OLS) estimates of the relationship between spreads and country characteristics will suffer from selectivity bias. The same changes in economic and financial conditions that affect the price of issues can also affect the decision to enter the market. Bond traders often remark that a rise in U.S. treasury rates raises spreads on

6. As emphasized above in section 4.1.

7. Potentially accentuating the trade-off between portfolio diversification and information acquisition emphasized by Calvo and Mendoza (1995).

developing-country bonds less than proportionately, for example, because high-risk borrowers are discouraged from coming to the market. Focusing exclusively on the determinants of the pricing decision to the neglect of the impact of those same factors on the decision to enter the market may therefore be a source of selectivity bias. In the next sections we employ a data set and methodology designed to ameliorate these problems.

4.3   Data and Sample Characteristics

The bonds we study are fixed income securities with a specified maturity, face value, and coupon.[8] While issued by emerging market borrowers, they are placed on international markets and are denominated in developed country currencies (dominantly in U.S. dollars). Although the bulk of this market consists of bonds placed in the Euromarkets (mainly the Eurodollar market), over our sample period a growing number of countries floated bonds on the U.S. public market for foreign issuers (the Yankee market) and the U.S. private placement market (under provisions of Rule 144a); there was also some growth in issues denominated in deutsche marks and yen. The bonds are typically underwritten by a syndicate of investment banks who commit to placing them with investors. After placement they trade on the secondary market and may be listed on an exchange.

4.3.1   The Bonds: Numbers, Spreads, and Issuers

Our data are initial offer or "launch" spreads for bonds offered between January 1991 and December 1997 by fifty-five countries, obtained from Capital Data Bondware and further processed by the Emerging Markets Division of the IMF. That they are launch spreads is important. Figure 4.2 shows that launch spreads move differently over time than spreads on secondary markets. While there is some tendency for primary spreads to follow secondary spreads with a lag of three of four quarters, the two series frequently diverge. In poor market conditions, when secondary spreads rise, primary spreads do not rise proportionately; indeed, sometimes they fall. This reflects the tendency for the number of issues to fall and for only the most credit worthy borrowers to remain in the market. In other words, factors that increase the risks of investing in emerging market debt, while raising secondary market spreads, may have the opposite effect on launch spreads insofar as riskier borrowers are rationed out of the market, leaving only low-risk, low-spread borrowers to launch new issues. This makes it important to control for the likelihood of new issues by different classes of borrowers.

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8. The share of international bond issues with convertible and floating rates did in fact rise slightly after 1993, but we exclude these from the sample on the grounds that the risks and relationship to fundamentals are different and warrant a separate analysis.
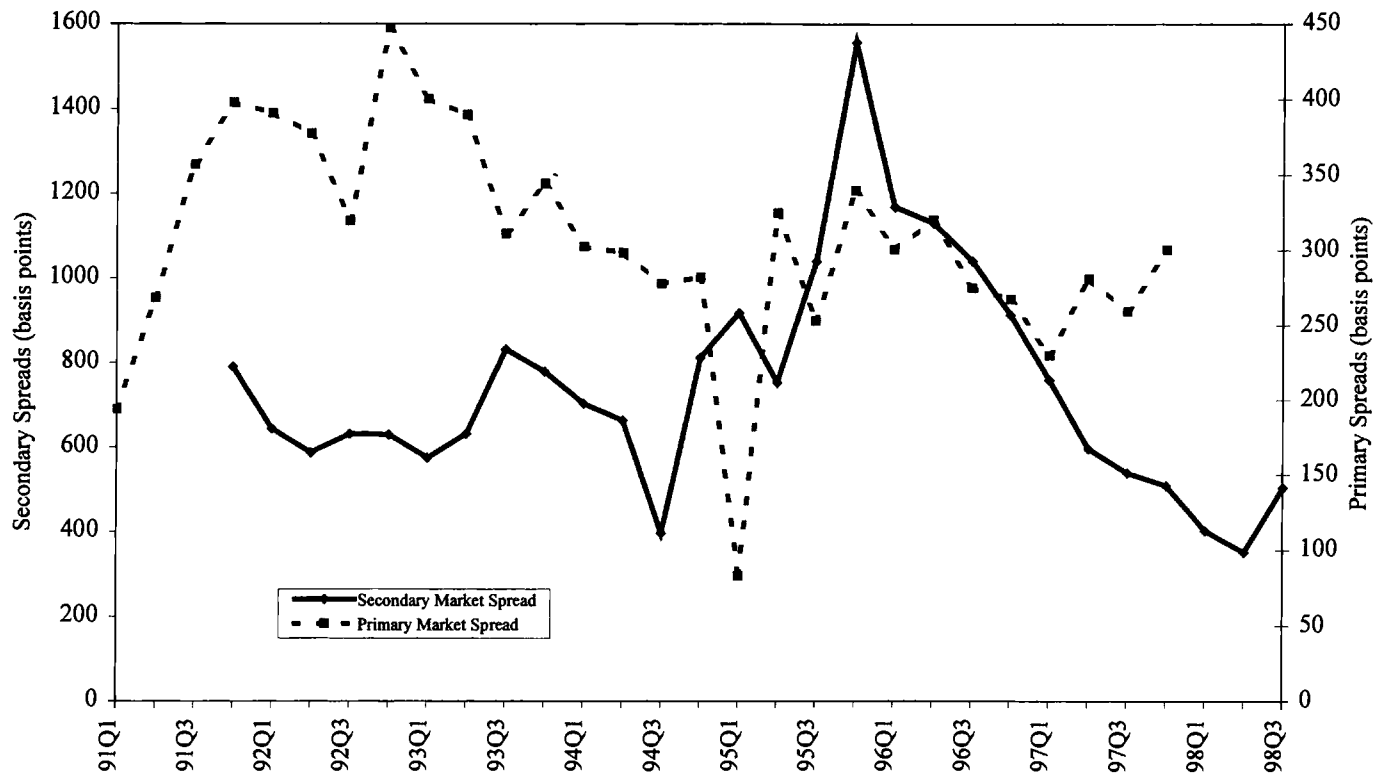
Fig. 4.2 Primary (contemporary) versus secondary spreads (moved three quarters forward)

Table 4.2   Launch Spreads, 1991–97 (basis points)

Region	1991	1992	1993	1994	1995	1996	1997	Average
Africa	200	166		197	151	140	94	159
East Asia	110	74	173	145	125	149	178	152
Eastern Europe	226	211	222	191	269	238	332	266
Latin America	376	448	410	369	413	390	307	384
Middle East			17	119	216	219	196	167
South Asia				385	190	233	174	212
Average	338	387	356	288	289	291	265	306
Number of bonds								
Bonds with spreads	52	118	239	163	170	302	314	1,353
Total bonds	84	165	332	202	203	342	369	1,697

Notes: A blank indicates that no bond was issued. A bond's spread is estimated by first calculating that bond's yield to maturity using the market price at the time of issue and then subtracting the yield on a "riskless" sovereign security of comparable maturity in the currency of issue.

Our source provides data for 1,697 bonds over the period 1991–97 (table 4.2). The number of bonds issued grew rapidly from 84 in 1991 to 332 in 1993 before falling to just over 200 in 1994 and 1995 (the Mexican crisis contributing to poor market conditions in 1995). Bond issuance rose sharply in 1996 and was set to record a banner year in 1997 before the Asian crisis hit. In our analysis we were able to use just over 1,300 bonds. No spreads were publicly available for 339 bonds. Also, for some bond issues ancillary information on country conditions was incomplete. Our results are based on data for 1991 through 1996, for which we have 1,033 usable bonds. We use 277 bonds issued in 1997 for out-of-sample forecasting.

Latin America accounts for about 60 percent of the bonds issued (1,000 of the 1,697). The main Latin issuers were Argentina, Brazil, and Mexico. East Asia is a distant second with 416 bonds (Korea being a leading issuer in that region). Eastern Europe had 180 bonds in this period, with 1997 an especially active year for the region.

Latin America has also had the highest spreads. Annual average spreads were more than 350 basis points in all the years from 1991 to 1996 and fell for the first time below that level to 307 basis points in 1997. In contrast, East Asian spreads were always less than 200 basis points even in 1997 when they rose to their highest level. That said, there is considerable variation within East Asia; the standard deviation of spreads relative to the mean is typically higher for East Asia than Latin America. Eastern European spreads have consistently been between those of Latin America and East Asia.

Table 4.3 summarizes sample characteristics by type of issuer. Three categories are distinguished: sovereign, other public, and private. The majority of the issues are by private borrowers, although public entities in East Asia have a relatively high propensity to issue bonds. Sovereign issues

Table 4.3   **Spreads and Bonds by Type of Issuer (basis points for spreads; numbers for bonds issued)**

Sector	Region					
	Africa	East Asia	Eastern Europe	Latin America	Middle East	South Asia
Sovereign	166	94	237	302	106	385
Bonds with spreads	6	32	88	127	30	1
Total number of bonds	10	38	130	175	37	1
Public	131	91	239	325	223	168
Bonds with spreads	5	147	20	131	9	3
Total number of bonds	11	194	27	181	10	4
Private	205	226	410	416	284	207
Bonds with spreads	2	145	21	572	11	8
Total number of bonds	6	184	23	644	11	11

dominate in Eastern Europe and the Middle East. Sovereign issues do not necessarily carry higher spreads than the other public issues, which partly reflects variations in country composition, although the regression analysis to follow suggests other factors may also be at work. We would expect private issues to carry higher spreads, reflecting the benchmark status of public issues and private bonds' greater perceived riskiness.[9] The averages for all regions except South Asia confirm this presumption, as does the regression analysis.

4.3.2   Explanatory Variables

We used a variety of macroeconomic indicators to analyze the determinants of the issue decision and the spread. As a proxy for the risk-free rate, we used the yield on ten-year U.S. treasury bonds (at time of issue). Several country characteristics were used to proxy for credit quality (for details, see the data appendix). Data were obtained principally from the World Bank's *World Debt Tables* and *Global Development Finance* and the IMF's *International Financial Statistics* and *World Economic Outlook* on the ratio of total external debt to gross national product (GNP), the ratio of debt service to exports, a dummy variable for whether a country concluded a debt restructuring agreement with either private or official creditors in the previous year, the ratio of international reserves to GNP, the growth rate of GDP (at constant 1990 prices, denominated in domestic currency), and the budget deficit as a share of GDP.

Sovereign credit ratings were gathered from *Institutional Investor.* Pub-

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9. This is consistent with the procedures of bond rating agencies, which are reluctant to grant private borrowers higher credit ratings than sovereigns on the grounds that a sovereign with transfer problems will frequently interrupt the access of private domestic debtors to supplies of foreign exchange; see Levey (n.d.).

lished each March and September, these ratings are based on a survey of international bankers, who assign a numerical value ranging from 0 to 100 (with 100 indicating zero probability of default). For each observation we used the most recent credit rating prior to the bond's date of issue. But rather than include the raw CCR, we employ the residual from a first-stage regression of the credit rating on country and issuer characteristics. We utilize only the orthogonalized component because the credit rating is correlated with other issuer characteristics that are included separately as explanatory variables (see, e.g., Cantor and Packer 1994 and Haque et al. 1996).[10] Because a preliminary look at the data suggested different behavior on the part of issuers in Latin America and the Caribbean, we considered Latin American and East Asian issues separately as well as together.

4.4 Specification and Estimation

A standard model of spreads is a linear relationship of the form

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

where the dependent variable is the logarithm of the spread, X is a vector of issue and issuer characteristics, and u_1 is a random error. The vector X comprises *bond characteristics* (the maturity of the bond, principal amount, and whether it was privately placed); *global economic conditions* proxied by the ten-year rate on U.S. treasuries; *country characteristics* like the sovereign credit rating residual, the ratio of debt to GDP, the ratio of debt service to exports, a dummy variable if the country underwent a debt restructuring in the previous year, and the GDP growth rate; and *issuer characteristics* including the region of the borrower, whether the borrower is sovereign, other public, or private, and the currency in which the bond was issued.

The conditions under which this linear equation provides an unbiased estimate of the relationship of issuer characteristics to spreads may not be met, for not all potential issuers will be in the sample at all points in time.

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10. The estimated equation was

credit rating = 36.93 + 12.45 reserves/GNP − 6.99 debt reschedule
          (59.42)   (19.04)   (−5.04)

          − 11.75 debt/GNP + 252.96 GDP growth − 12.15 (reserves/GNP) * LAC
          (−12.82)   (10.88)   (−4.67)

          + 3.75 (debt reschedule) * LAC − 10.28 (debt/GNP) * LAC
          (1.98)   (−5.27)

          − 520.89 (GDP growth) * LAC,
          (−7.38)

R^2 = 0.48, t-statistics are in parentheses.

The spread and its relationship to issue and issuer characteristics will be observed only when positive decisions to borrow and lend are made. We assume that spreads are observed when a latent variable β crosses a threshold β' defined by:

$$(2) \qquad\qquad \beta' = gX' + u_2,$$

where X' is the vector of variables that determines the desire of borrowers to borrow and willingness of lenders to lend (which we refer to as determinants of bond supply and demand, respectively), and u_2 is a second error term. If the error terms are bivariate normal with standard deviations s_1 and s_2 and covariance s_{12}^2 (where $\rho_2 = s_{12}^2/s_1 s_2$), this is a standard sample selection model, à la Heckman (1979). The model can be identified by the nonlinearity of the fitted probabilities in the selection equation and by the inclusion of elements in X' that are not also in X.[11]

Estimating the probit requires information on those who did not issue bonds. To address this problem we used the following approach. For each country we allowed for three types of issuers: sovereign, public, and private. For each quarter and country where one of these issuer types did not come to the market, we recorded a zero. Table 4.4 highlights the characteristics of issuers ($is = 1$) relative to non-issuers ($is = 0$). It suggests, plausibly, that issues are more likely when U.S. interest rates are low, when the borrower is of better quality credit (with higher credit rating residuals and lower debt levels), and when reserves are low and budget deficits are larger (creating a public-sector demand for foreign funds).

We estimate equations (1) and (2) jointly using maximum likelihood. Implemented with the full sample, the maximum-likelihood estimates converge nicely. When performing sensitivity tests using smaller samples, the full maximum-likelihood estimates do not always converge; in this case we perform the conventional two-step procedure, first estimating a maximum-likelihood probit model and then a regression using the estimated inverse Mills ratio (with full-information standard errors). Where estimates are obtained using both procedures, we find little difference in the results.

4.5   Results

The coefficients for the probit in table 4.5 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 of the coefficients. We report separate equations for the full data set and for the Latin American and

11. Ozler and Huizinga (1992) estimate a similar model on data for the secondary-market prices of bank loans.

Table 4.4 **Descriptive Statistics of Issuers ($is = 1$) and Nonissuers ($is = 0$)**

	All		Latin America and East Asia		Latin America		East Asia		Eastern Europe	
	$is = 1$	$is = 0$	$is = 1$	$is = 0$	$is = 1$	$is = 0$	$is = 1$	$is = 0$	$is = 1$	$is = 0$
Spread	305.94		319.10		384.25		152.18		265.82	
Amount	187.69		174.77		165.96		195.95		257.47	
Maturity	7.01		6.71		5.81		8.88		6.32	
Private placement	0.40		0.42		0.46		0.32		0.29	
U.S. treasury rate	6.50	6.77	6.50	6.79	6.50	6.78	6.49	6.81	6.51	6.75
Credit rating	43.82	37.12	44.46	40.42	37.10	28.97	62.15	63.14	40.67	33.34
Credit rating residual	6.93	−0.97	8.01	2.05	4.87	−2.15	16.41	11.12	2.69	−5.49
Debt/GNP	0.35	0.43	0.34	0.45	0.36	0.54	0.27	0.26	0.43	0.28
Dummy for debt rescheduling	0.20	0.13	0.22	0.21	0.30	0.28	0.05	0.08	0.08	0.07
Debt service/exports	0.36	0.19	0.38	0.22	0.48	0.28	0.12	0.11	0.31	0.12
GDP growth rate	0.01	−0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	−0.05
Reserves/GNP	0.37	0.55	0.35	0.62	0.28	0.38	0.53	1.12	0.42	0.51
Deficit/GDP	−0.01	−0.02	0.00	0.00	0.00	−0.01	0.00	0.02	−0.05	−0.01
Latin America	0.59	0.26	0.71	0.66	1.00	1.00	0.00	0.00	0.00	0.00
Public	0.25	0.34	0.26	0.34	0.18	0.35	0.47	0.32	0.15	0.34
Private	0.52	0.33	0.58	0.30	0.64	0.31	0.44	0.29	0.13	0.35
Yen	0.16		0.14		0.05		0.37		0.30	
Deutsche mark	0.07		0.05		0.06		0.03		0.22	

Table 4.5   **Determinants of the Probability of a Bond Issue, 1991–96**

	All	Latin America and East Asia	Latin America	East Asia	Eastern Europe
Log of U.S.	−0.602	−1.340	−0.734	−1.270	−0.224
treasury rate	(−6.44)	(−6.79)	(−5.24)	(−6.79)	(−2.58)
Credit rating	0.018	0.00	0.023	0.00	0.003
residual	(16.65)	(0.00)	(9.66)	(0.00)	(2.18)
Debt/GNP	−0.289	−0.021	−1.251	−0.019	−0.018
	(−3.92)	(−0.11)	(−13.35)	(−0.11)	(−0.15)
Dummy for debt	−0.049	−0.190	0.024	−0.168	−0.034
rescheduling	(−1.09)	(−2.01)	(0.69)	(−2.01)	(−1.01)
Debt service/	0.721	−1.40	1.420	−1.327	0.446
exports	(6.53)	(−3.24)	(14.22)	(−3.24)	(4.20)
Reserves/GNP	−0.080	−0.504	−0.172	−4.780	−0.117
	(−3.44)	(−8.76)	(−1.99)	(−8.76)	(−2.82)
Deficit/GDP	−0.263	0.285	0.126	0.270	−0.471
	(−1.79)	(0.48)	(0.30)	(0.48)	(−2.24)
Public issuer	−0.035	0.403	−0.015	0.386	−0.117
	(−1.44)	(7.30)	(−0.36)	(7.30)	(−6.95)
Private issuer	−0.062	0.403	0.332	0.400	−0.144
	(−2.49)	(7.29)	(8.99)	(7.29)	(−7.59)
Latin America	0.154	−0.914			
	(0.54)	(−3.00)			
		Latin American Interactions			
Log of U.S.	0.027	0.618			
treasury rate	(0.18)	(2.57)			
Credit rating	0.0004	0.023			
residual	(0.17)	(5.61)			
Debt/GNP	−0.693	−1.21			
	(−6.65)	(−5.82)			
Dummy for debt	0.074	0.230			
rescheduling	(1.29)	(2.12)			
Debt service/	0.393	2.79			
exports	(2.19)	(6.32)			
Reserves/GNP	−0.055	0.334			
	(−0.77)	(3.25)			
Deficit/GDP	0.362	−0.161			
	(1.00)	(−0.22)			
Public issuer	0.024	−0.352			
	(0.57)	(−6.07)			
Private issuer	0.381	−0.078			
	(8.46)	(−1.17)			
Number of					
observations	4,120	2,504	1,744	760	689
Pseudo R^2	0.386	0.415	0.4642	0.2960	0.4863

Note: Numbers in parentheses are *t*-statistics.

Caribbean (henceforth referred to as Latin America), East Asian, and Eastern European subsamples.

When the U.S. treasury rate is high, the volume of new issues declines significantly. This finding is consistent with a "search for yield" view of the market—the idea that when U.S. interest rates fall there is a greater appetite for higher-yielding emerging market bonds. This appears to be uniformly the case, although the strength of the relationship varies across the regions. A sharp decline in issues following a rise in U.S. treasury rates is most evident for East Asia, suggesting the possibility that the East Asian issuers hold back the supply of bonds when U.S. interest rates rise and their borrowing costs go up.[12] The higher the credit rating residual, the greater the probability of issuance in all regions except East Asia, where the effect is insignificant. Higher debt levels reduce the probability of issue especially in Latin America. For East Asia, higher debt service is associated with lower probability of issue. On the supply side, low reserves, higher deficits, and, for Latin America and Eastern Europe, higher debt service levels tend to increase bond issuance.

Table 4.6 presents OLS estimates of the spread equation and table 4.7 the full model with the selectivity correction. The coefficients once again reveal differences in pricing across regions. For Latin America the coefficient on the issue amount indicates plausibly that larger issues command smaller spreads (consistent with the existence of economies of marketing and distribution and the greater liquidity of larger issues on the secondary market). Latin American private placements enter the spreads equation with a positive sign, consistent with the fact that these bonds are issued in markets with less stringent disclosure requirements. Disclosure requirements for private placements are less stringent because trading in those bonds is restricted to "qualified investors," that is, investors capable of managing the associated risk. Also, the bonds for this reason are less liquid. Because the private placement market is narrower and because information on issuer characteristics may be somewhat less complete, the presumption is that purchasers of bonds placed in that market will demand a higher spread. Latin American issues typically having been relatively short term; there is little evidence of a well-defined yield curve until 1996. The picture is different for East Asian issuers, who had by then placed several long-term issues for which they paid higher spreads. There is a large negative coefficient in the spreads equation on the dummy variable for Israel, reflecting the fact that its issues are guaranteed by the U.S. government. Supranational bonds (guaranteed by entities beyond the countries' borders) also have lower spreads.

Recent studies have found, somewhat surprisingly, a negative influence

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12. We will have more to say on the identification of demand and supply effects of U.S. interest rates below when we consider the spread and issues decisions together.

Table 4.6   **Determinants of Spreads, 1991–96, OLS Regressions**

	All	Latin America and East Asia	Latin America	East Asia	Eastern Europe
Log amount	0.009	0.015	−0.054	0.074	−0.018
	(0.309)	(0.479)	(−1.898)	(0.878)	(−0.205)
Maturity	0.010	0.007	−0.006	0.019	−0.024
	(1.729)	(1.092)	(−0.897)	(1.368)	(−1.287)
Private placement	0.119	0.088	0.153	−0.061	0.029
	(2.492)	(1.787)	(3.774)	(−0.385)	(0.132)
Log of U.S. treasury rate	−0.199	−0.160	−0.041	−0.703	−1.417
	(−0.992)	(−0.728)	(−0.227)	(−1.059)	(−2.429)
Credit rating residual	−0.038	−0.043	−0.032	−0.033	−0.002
	(−14.118)	(−12.871)	(−7.945)	(−4.204)	(−0.183)
Debt/GNP	0.085	0.437	−0.067	−1.089	−1.255
	(0.488)	(2.054)	(−0.295)	(−1.529)	(−1.367)
Dummy for debt rescheduling	0.211	0.147	0.155	0.100	0.124
	(3.558)	(2.351)	(3.147)	(0.272)	(0.334)
Debt service/ exports	1.355	1.400	0.929	5.323	1.237
	(7.201)	(6.381)	(4.565)	(4.055)	(1.765)
GDP growth	−4.799	2.253	−1.010	13.894	−14.250
	(−1.607)	(0.616)	(−0.325)	(0.922)	(−1.954)
Israel	−2.371				
	(−13.001)				
Supranational	−0.671	−0.710	−0.734		
	(−2.341)	(−2.467)	(−3.489)		
Public issuer	−0.231	−0.192	−0.215	0.325	−0.250
	(−3.161)	(−2.228)	(−2.759)	(1.422)	(−1.169)
Private issuer	0.156	0.182	0.057	0.882	−0.362
	(2.145)	(2.167)	(0.772)	(3.703)	(−1.366)
Yen issue	−0.180	−0.207	0.036	−0.339	0.266
	(−2.442)	(−2.504)	(0.370)	(−2.111)	(1.460)
Deutsche mark issue	−0.193	−0.259	0.070	−2.11	−0.105
	(−2.262)	(−2.541)	(0.842)	(−5.950)	(−0.669)
Latin America	0.229	0.221			
	(3.014)	(2.060)			
Constant	5.306	5.056	5.837	4.893	8.552
	(12.420)	(10.924)	(14.331)	(3.612)	(6.363)
Number of bonds	1,033	903	670	233	81
Adjusted R^2	0.5902	0.5920	0.2234	0.5035	0.0869

Note: Numbers in parentheses are *t*-statistics.

of the U.S. interest rate on emerging market spreads (see, e.g., Kamin and van Kleist 1997). The OLS results presented in table 4.6 are consistent with this finding. Among the possible interpretations of the negative sign is the change in composition of bonds issued when interest rates vary. Since higher interest rates are seen to reduce bond issuance (as in the probit above), it is possible that the bonds that do come to the market have some unobserved credit features that make them attractive and hence

Table 4.7   **Determinants of Spreads, 1991–96, with the Selectivity Correction**

	All	Latin America and East Asia	Latin America	East Asia
Log amount	0.017	0.018	−0.045	0.061
	(0.54)	(0.62)	(−1.80)	(0.75)
Maturity	0.008	0.006	−0.003	0.017
	(1.47)	(0.96)	−(0.52)	(1.26)
Private placement	0.121	0.084	0.114	−0.102
	(2.52)	(1.85)	(3.30)	(−0.67)
Log of U.S. treasury rate	−0.169	0.173	0.342	−1.483
	(−0.80)	(0.82)	(1.83)	(−2.03)
Credit rating residual	−0.041	−0.053	−0.041	−0.025
	(−11.00)	(−16.69)	(−10.39)	(−2.77)
Debt/GNP	0.357	1.043	1.386	−1.370
	(1.43)	(5.25)	(6.51)	(−1.93)
Dummy for debt rescheduling	0.187	0.084	0.090	0.164
	(3.09)	(1.41)	(1.80)	(0.45)
Debt service/ exports	1.274	0.979	−0.028	5.690
	(4.95)	(4.78)	(−0.13)	(4.36)
GDP growth	−2.907	0.676	−0.74	21.32
	(−0.96)	(0.20)	(−0.28)	(1.41)
Israel	−2.37			
	(−13.02)			
Supranational	−0.679	−0.589	−0.650	
	(−2.35)	(−2.37)	(−4.74)	
Public issuer	−0.200	−0.231	−0.151	0.660
	(−2.65)	(−2.88)	(−2.02)	(2.55)
Private issuer	0.169	0.024	−0.096	1.170
	(2.24)	(0.311)	(−1.37)	(4.55)
Yen issue	−0.187	−0.214	−0.064	−0.389
	(−2.55)	(−2.86)	(−0.78)	(−2.47)
Deutsche mark issue	−0.198	0.278	0.069	−2.10
	(−2.35)	(−2.99)	(0.97)	(−6.02)
Latin America	0.188	0.133		
	(2.28)	(1.31)		
Constant	5.21	4.88	5.38	5.59
	(12.13)	(11.10)	(13.17)	(3.99)
ρ	−0.06	−0.55	−0.87	0.48
λ	−0.038	−0.368	−0.485	0.452
	(−0.42)	(−48.0)	(−18.25)	(2.62)
Number of bonds	1,033	903	670	233
Log likelihood	−2375.52	−1872.26	−989.10	−612.93

Note: Numbers in parentheses are *t*-statistics.

reduces observed spreads. If this interpretation is correct, then the negative sign should be significantly attenuated when we correct for the selection bias. Indeed, comparing the coefficients in tables 4.6 and 4.7, we find for Latin America that the negative coefficient on the U.S. treasury rate turns positive and significant at the 10 percent level. This is consistent with the idea that selection bias plays a role in driving the observed result.

For East Asia, in contrast, the negative coefficient on the U.S. interest rate persists even after correcting for selectivity. To interpret this finding, it is useful to consider the probit and the spreads equation together, for this leads to an intuitive interpretation in terms of supply and demand.[13] For Latin America, a higher interest rate reduces the probability of an issue and raises spreads (after correction for the selection bias). The implication is that when interest rates rise, the demand for Latin American bonds falls and their price therefore declines (equivalently, the spread rises). For East Asia, in contrast, a rise in U.S. interest rates appears to shift the supply curve inward, raising the price and reducing the spread.

For other variables that appear in both the issue and spreads equations, it is once again useful to ask whether they work in the same or opposing directions. In the regressions using the full sample of bonds, a larger credit rating residual (a better credit rating, other things equal) increases the probability of an issue and reduces the spread, as if countries with inferior credit ratings find it both more difficult and costly to borrow. Similarly, and especially in Latin America, a higher debt to GNP ratio both reduces the probability of an issue and increases the spread. In Latin America, debt rescheduling has a weak positive effect on the probability of an issue (i.e., those rescheduling debt are apt to come to the capital market quickly) while at the same time raising the spread that successful issuers are forced to pay. The dummy variable for Latin America behaves similarly: Other things equal, Latin American borrowers issue more bonds but pay higher spreads. Finally, although the magnitude and the significance of ρ—the correlation coefficient of the errors in the two equations—varies by time period and sample, it is generally negative. The implication is that unobserved factors that cause an issue to come to the market also reduce the spread and should be interpreted as unobserved determinants of demand.

In contrast, variables whose coefficients work in offsetting directions influence mainly the supply of bonds. For example, while countries that have recently rescheduled tend to have accumulated an unsatisfied appetite for borrowing and therefore supply additional new issues, the corresponding outward shift in the supply reduces the price of their bonds, increasing the spread. Similarly, the regional dummies suggest that Latin American countries have continent-specific characteristics, not otherwise quantified, that cause them to supply an unusually high volume of bonds; this works, other things equal, to drive down the prices of their issues and increase the spreads they are charged.

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13. We invoke this interpretation sparingly and with caution, for in a market with imperfect information and enforcement, it is possible for the demand to bend back and for movements along that portion of the demand schedule to look like movements along a supply curve. (Note that we frame our discussion in terms of *bond* supply and *bond* demand, not in terms of *credit* supply and *credit* demand, as in textbook models of credit rationing. The distinction is of only terminological importance, but its significance is great; it leads us to speak of a "backward bending demand curve" rather than a "backward bending supply curve.")

The supply and demand effects vary noticeably by region. Note, for example, that the coefficients for issues denominated in yen and deutsche marks have significant negative signs for East Asia but not so elsewhere. Thus, for East Asia, it appears access to the yen-denominated markets (and to the deutsche mark markets) has proved an easy source of funds. With that source of funds available, the East Asian issuers are better able to time their bond issues. Another example of differential effects between East Asia and Latin America is the sign on ρ, the correlation between the error terms in the spread and probit equations. For Latin America this term behaves much like the credit rating residual—a low probability of issue is associated with a higher-than-predicted spread. For East Asia, in contrast, ρ is positive. An interpretation is that Asian bonds with a low probability of issue that come to the market anyway are not penalized with higher spreads. In fact, they are able to obtain lower-than-predicted spreads, perhaps reflecting the desire of investors, for reasons of diversification, to acquire East Asian bonds that are not in plentiful supply.

4.6   Changes in Spreads over Time

A central question in the literature on capital flows to emerging markets is whether changes in spreads are explicable by changes in fundamentals or whether there have been changes in pricing behavior over time. If a better credit rating, lower debt or debt service ratios, and fewer debt restructurings can explain the reductions in spreads that occurred between 1995 and 1997, then there may be reason to be relatively sanguine about the market's pricing behavior and, for that matter, about the sustainability of capital flows. If, on the other hand, recent capital inflows were encouraged by a not otherwise explicable shift in pricing in favor of developing country debt, then there is no a priori reason to rule out a sudden and equally dramatic shift back and a corresponding curtailment of flows.

4.6.1   The Contribution of Fundamentals and Sentiment

The change in spreads between two periods, denoted $S_1 - S_2$, can be expressed as follows:

$$(3) \qquad S_1 - S_2 = \beta_1 X_1 - \beta_2 X_2.$$

Adding and subtracting $\beta_1 X_2$ and rearranging, one obtains the familiar Oxaca decomposition:

$$(4) \qquad S_1 - S_2 = \beta_1 (X_1 - X_2) + X_2 (\beta_1 - \beta_2).$$

The first term on the right side of equation (4) is the contribution to the change in spreads of the change in their economic determinants $(X_1 - X_2)$; this can be thought of as the contribution of the change in fundamentals.

The second term is the contribution of the change in coefficients (β_1 − β_2). This can be thought of as the contribution of changes in market sentiment—in the way the markets regard the credit worthiness of countries with given characteristics. To aid interpretation, we further break these effects into subcategories. Among changes in sentiment, we distinguish the impact on spreads of changes in the constant term (C_1 − C_2), which can be thought of as blanket changes in sentiment as emerging market bonds come into or fall out of favor, from the impact of changes in the coefficients on the independent variables [$X_2(\beta_1 - \beta_2)$], which can be thought of as changes in sentiment toward countries with given macroeconomic characteristics (as, for example, the issues of relatively risky borrowers come to be regarded as more attractive). Similarly, we distinguish changes in the average inverse Mills ratio (which can be thought of as a measure of sample selectivity) versus changes in the average value of the other variables. Finally, we distinguish changes in the effect of a given level of the inverse Mills ratio (which can be thought of as the impact on spreads of having in the sample an issue that our selection equation predicts should not be included) from changes in the effect of other regressors. Intuitively, a rising coefficient on the inverse Mills ratio suggests that the market is growing more discriminating.

The decompositions are computed for two periods before and after the Mexican crisis, and before and during the 1996–97 period of spread compression (see table 4.8). Note that when the spread in the first period is larger than in the second (spreads are falling), a positive change in log spread is recorded. Launch spreads declined following the Mexican crisis;

Table 4.8   Decomposition of the Change in Spreads

	Change in Fundamentals	Change in β's	Change in Spread
The Mexican Crisis (1991:Q1–1994:Q3 to 1995:Q1–1995:Q4)			
Bond features	0.02	0.25	0.27
U.S. treasury rate	0.00	2.71	2.71
Country characteristics	1.13	0.17	1.30
Dummy variables	0.22	0.58	0.81
Inverse Mills ratio	0.00	−0.07	−0.07
Constant		−3.83	−3.83
Total	1.37	−0.18	1.18
Irrational Exuberance? (1995:Q1–1995:Q4 to 1997:Q1–1997:Q4)			
Bond features	0.00	−0.81	−0.81
U.S. treasury rate	0.04	−6.92	−6.88
Country characteristics	−0.70	0.06	−0.64
Dummy variables	−0.20	−0.24	−0.44
Inverse Mills ratio	0.01	0.31	0.32
Constant		8.22	8.22
Total	−0.85	0.62	−0.23

that decline was especially sharp in 1995, when only high-quality issues were brought to the market. (Recall that secondary spreads skyrocketed in 1995. That shift in sentiment against developing countries is reflected in issue behavior, as discussed below.)

Consider first the period preceding the Mexican crisis (1991:Q1–1994: Q3) compared to the period immediately following (1995:Q1–1995:Q4). While secondary market spreads rose sharply in 1995, launch spreads actually fell, as can be seen from the first panel of table 4.8 (again, according to our convention, a positive change in spread represents a decline in spreads from the first to the second period). This decline in spreads reflected five broad factors. First, market sentiment moved strongly against emerging markets: the constant term in the spread equation increased greatly and, all else equal, would have increased primary spreads considerably (in parallel with trends in the secondary markets). Second, this poorer market sentiment was offset by a change in the coefficient on U.S. treasury rates. For given U.S. treasury rates, in other words, the market was willing to charge lower spreads for the issues that were brought to the market. Third, the fundamentals of issuers coming to the market during the post-crisis period were better than those of issuers in the market prior to the crisis. Fourth, the market seems to have taken a more benign view of fundamentals immediately following the crisis. An exception to that was a more negative view of high debt service. Finally, there were compositional shifts in the issues that came to the market that lowered average spreads. Proportionately fewer Latin American issues and private issues and a greater share of yen-denominated and deutsche mark–denominated issues reduced the average level of spreads observed.

Secondary market spreads declined in 1996 and in the first half of 1997, a trend that was viewed by some as "irrational exuberance." But though secondary market spreads were falling, primary spreads show a small increase. But once again, this increase is composed of offsetting factors (see the bottom panel of table 4.8). Overall market sentiment (as summarized by the constant) improves. Again, as new, less credit worthy issuers came to the market, this shift in market sentiment was moderated by two offsetting factors: the reduced sensitivity of spreads to changes in U.S. interest rates, and a higher premium on the poorer risks entering the market.

4.6.2   Was the Market Irrationally Exuberant in 1996 and 1997?

The sharp decline in spreads in the second half of 1996 and continuing through at least the first half of 1997 led some observers to ask whether the market was irrationally exuberant. The decline in spreads was exceptionally rapid, and an unusual number of new issuers entered the market. Our estimates allow us to compare these outcomes with predictions.

We first estimated the equation for Latin America and East Asia up to

1995 and used the estimates to generate within-sample forecasts for 1995 and out-of-sample forecasts for 1996. The difference between predicted and actual spreads (in basis points) is presented in table 4.9. When the observed spread is less than predicted (an entry with a positive sign in table 4.9), we infer that the market is growing increasingly exuberant. Actual spreads were above predicted spreads and were especially high in late 1995 and early 1996. This is consistent with the earlier observation that primary launch spreads lag the changes in secondary market prices. Following a sharp decline in new issues as secondary spreads rose, primary issues started coming back to the market at higher spreads. In the second half of 1996, the divergence between actual and predicted spreads narrowed, foreshadowing the "irrational exuberance" of 1997.

We next repeated the estimates up to 1996 (as in table 4.7) and generated in-sample predictions for 1996 and out-of-sample predictions for 1997. The aggressive fall in spreads is evident for Latin America. Actual spreads fall below predicted with the gap increasing up to the third quarter of 1997. In the final quarter of 1997, the gap falls. With the East Asian crisis of the summer of 1997 spreading to Latin America, spreads rose, bringing them closer to the predicted spreads. For East Asia, we see clearly the effect of the crisis, with actual spreads rising rapidly above predicted spreads in the second half of 1997.

Table 4.9   **The Swings in Market Sentiment**

		Predictions Based on Sample for 1991–95		Predictions Based on Sample for 1991–96	
		Latin America	East Asia	Latin America	East Asia
1995					
	Q1	87	2		
	Q2	−40	−23		
	Q3	−6	−18		
	Q4	−117	−59		
1996					
	Q1	−61	−59	−4	−33
	Q2	−69	15	−10	45
	Q3	−33	−29	34	19
	Q4	34	−30	84	3
1997					
	Q1			145	60
	Q2			134	−6
	Q3			179	−70
	Q4			147	−229

Note: Values represent differences between predicted and actual spreads in basis points.

4.7   Conclusions and Implications

We have studied the determinants of launch spreads on emerging market debt using a framework that accounts for the joint determination of the issue and pricing decisions and controls for selectivity. Factors that increase the probability of observing an issue and raise the spread we interpret in terms of the supply of bonds, while those that increase the probability of an issue while reducing the spread we interpret in terms of demand. The results confirm the importance of both blades of the scissors. But the results for Latin America and East Asia are different, especially toward the beginning of the 1990s. For example, there is evidence that the supply of bonds by Latin American issuers is less responsive to changing market conditions. There is some sign that the extent of this regional differentiation has narrowed as the market has grown deeper. Other signs of a maturing market include the appearance of a well-defined yield curve for Latin America, and evidence that borrowers are exploiting scale economies when issuing bonds.

Our most striking finding is that changes in market sentiment not obviously related to fundamentals have moved the market by large amounts over short periods. Changes in observable issuer characteristics and in the responsiveness of spreads and issues to those characteristics do not provide an adequate explanation for changes over time in the value of new bond issues and launch spreads. In important periods, such as the wake of the Mexican and Asian crises, blanket shifts in sentiment play the dominant role.

The obvious implication for policy is that governments should exercise caution when contemplating an economic policy strategy that relies on continuous inflows of foreign capital intermediated by the international bond market. Large quantities of foreign credit may be available when sentiment shifts in their favor, but it can also shift against them for reasons beyond their control, making it impossible to finance large current account deficits and forcing a difficult adjustment. There is an argument for insuring against the capriciousness of the bond market by diversifying sources of international borrowing to include foreign direct investment, equity investment, and syndicated bank loans. And it would be prudent to insure against the sudden evaporation of foreign financing and the sudden appearance of a painful adjustment burden by taking steps to limit the size of the current account deficit.

The first round of empirical work for this paper was done in the first half of 1997, a period of large-scale bond issues by emerging market borrowers and dramatic spread compression. There were but a few voices in the wilderness warning that this favorable state of affairs could come to a sudden end at any time. In a sense, this was the central prediction of our empirical work. It came true in the final quarter of that year.

Data Appendix

Bond Characteristics

The bond data set, obtained from Capital Data Bondware and further processed by the Emerging Markets Division of the IMF includes (a) spreads (in basis points, where one basis point is one-hundredth of a percentage point) over "risk-free" issue denominated in the same currency and of about the same maturity; (b) the amount of the issue (millions of US$); (c) the maturity in years; (d) a dummy variable taking the value 1 if the bond was "privately placed" and 0 otherwise; (e) currency of issue; and (f) whether the issuer was a sovereign, a public agency, or a private party.

Issuer Characteristics

The following variables were constructed from Bondware.

S	Sovereign
P	Private
O	Other

LAC	Latin America and Caribbean
ECA	Eastern Europe and Central Asia
AFR	Africa
SAS	South Asia
EAP	East Asia and Pacific

Country Characteristics

edt	total external debt (US$)
gnp	gross national product in current prices
reserves	total foreign reserves minus gold
gdp90	gross domestic product in 1990 prices and national currency
gdpnc	gross domestic product at current prices in national currency
gdp	gross domestic product in current prices and denominated in US$
deficit	total budget deficit (national currency)
dres	indicator variable to denote whether a debt rescheduling took place the previous year
edtgnp	ratio of edt to gnp
ggdp90	gross domestic product growth
defgdp	deficit/gdp
resgnp	reserves/gnp
tdsxgs	total external debt service/total exports
tb	10 yield of ten-years treasury bond
crtg	credit rating

Reserves, gdp90, gdpnc, and deficit are reported quarterly in the IMF's *International Financial Statistics.* Where quarterly data were not available, annual data were converted to quarterly figures by multiplying the "log difference" by one-fourth.

The two main sources for these variables were the World Bank's *World Debt Tables* (WBDT) and the International Monetary Fund's *International Financial Statistics* (IFS).

The exact series are

edt	WBDT vol. 2, series called "EDT"
gnp	WBDT vol. 2, series called "GNP"
tdsxgs	WBDT vol. 2, series classified under Topic 4, Debt Indicators
resimf	IMF IFS, series number "1l.d"
gdp90	IMF IFS, series number "99b.p"
gdpnc	IMF IFS, series number "99b"
deficit	IMF IFS, series number "80"
dres	WBDT vol. 1: table A3.3 "Multilateral debt relief agreements with official creditor, Jan. 80–Jan. 96," pp. 66–72 of the 1996 issue; table A4.4, "Multilateral debt relief agreements with commercial banks, Jan. 80–Dec. 95," pp. 78–82 of the 1996 issue

Credit ratings were obtained from the Bureau of Public Debt of the Department of Treasury, web address: http://www.publicdebt.treas.gov/of/ofrt102.htm.

Other specific sources included:

1. For Argentina, Hong Kong, Hungary, Israel, Korea, Singapore, and South Africa, data were obtained from IMF country desks.

2. Brazil's deficit/ratio was obtained from the Central Bank of Brazil, the Brazilian Ministry of Finance, and Garantia as reported by Dornbusch in *Brookings Papers on Economic Activity,* no. 1 (1997), 387, table 5.

3. For Hong Kong, additional data were obtained from the *Quarterly Report of Gross Domestic Product Estimates* published by the Census and Statistics Department, Hong Kong, August 1997.

4. Data for Taiwan were obtained from the December 1996/January 1997 *Balance of Payments of Taiwan District, the Republic of China,* published by the Central Bank of China (Taiwan).

Countries included in the analysis are Argentina, Bahrain, Barbados, Bolivia, Brazil, Chile, China, Colombia, Congo, Costa Rica, Croatia, Cyprus, Czechoslovakia, the Czech Republic, the Dominican Republic, Ecuador, Estonia, Guatemala, Hong Kong, Hungary, India, Indonesia, Israel, Jamaica, Kazakhstan, Latvia, Lebanon, Liberia, Lithuania, Malaysia, Malta, Mexico, Moldova, Morocco, Oman, Pakistan, Panama, Peru, the Philippines, Poland, Qatar, Romania, Russia, Singapore, Slovakia, South Africa, South Korea, Taiwan, Thailand, Trinidad and To-

bago, Tunisia, Turkey, Ukraine, Uruguay, and Venezuela. Other countries included in the analysis but not recorded as having issued bonds are Ghana, Jordan, Mauritius, Saudi Arabia, and Sri Lanka.

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Comment   Sylvia Maxfield

This paper fits into a growing body of literature exploring the determinants of capital flows into and from emerging market countries. One of the main points of debate is over when and to what extent "pull" and "push" factors or irrationality operate in the rapidly growing international market for developing country bonds. "Pull" refers to investors attracted by the fundamental characteristics of the issuing country. In this case one could assume a globally stable appetite for emerging market country bonds where demand, prices, and yields for a particular country's bonds depend on investors' careful evaluation of that country's past, present, and future creditworthiness. "Push" refers to investors turning to the emerging market asset class when their risk-free rate falls below a certain threshold. Here the price of bonds depends to a greater extent on the strength of demand for the emerging market bond asset class. When global liquidity falls and the risk-free rate rises, capital will move more or less indiscriminately out of emerging market bonds. These studies focus varyingly on bond prices, balance of payments, trade balances, actual flows as best as they can be measured, and other variables.

What is new in this paper is an effort to explain the likelihood of a new issue and variation in bond yields at the time of new issue launching. This emphasis should make the authors' effort interesting to Wall Street, but is perhaps not as exciting as an effort to predict variation in spreads as bonds trade in the secondary market. The authors have also assembled a huge number of observations. The paper is replete with interesting findings pointing to valuable follow-up work.

The authors' model includes a number of variables standard to Wall Street's own models of spread behavior. These capture the fundamental variables shaping credit worthiness such as the debt service ratio or GDP growth. These fundamentals are what is expected to motivate investors who are "pulled" into emerging market investment. U.S. Treasury yields are also included to control for changes in the risk-free investment rate and the "push" logic. The model explains cross-national variation better than change over time and points to some interesting differences between

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Latin America and Asia. The "pull" logic appears to operate more consistently in Asia than Latin America.

For example, the debt service ratio has the expected positive impact on spreads in Asia but not Latin America. Investors do not behave as though they expect conventional market discipline to operate in Latin America. One possible explanation is a belief that the higher the debt burden, the more likely an international bailout and the lower the default risk. Another explanation is that irrational exuberance operated to a greater extent in Latin America than Asia. Another result is that GDP growth has a negative effect on spreads in Asia and positive one in Latin America, suggesting that investors believe Asians will harness growth to help repay debt but Latin Americans might not. Overall these results could be interpreted as suggesting that, for the period studied, the market for Asian international bonds behaved more in line with expectations than the Latin American markets. This should not be surprising given that the period covers the Mexican peso crisis. The data on error term correlation suggest that unobservables are doing much of the work to explain new issue launch spreads in Latin America.

The authors also use their results to tell a novel story about demand and supply in international markets for developing-country bonds. They find that as U.S. interest rates rise, new issue launch spreads fall. This contravenes the "push" logic that investors buy emerging market assets when the risk-free rates falls. Their explanation is that when U.S. rates rise only the more credit worthy issuers come to the market. Supply is constricted and spreads compress.

This result suggests the need for more nuanced study of the interaction of supply and demand for emerging market assets. Wall Street refers to these considerations as "technical" factors, while determinants of credit worthiness such as debt service ratios are called "fundamentals." Most experienced fixed income traders will tell you that in any relatively illiquid market, technicals (supply and demand considerations) are key to price behavior. An interesting extension of Eichengreen and Mody's research would be to separate the sample according to the extent of liquidity. The conventional Wall Street wisdom is that technical factors matter more the less liquid the market. A related consideration is variation in the size of the issue and the issuers' total outstanding bond stock. Larger issues will be more liquid. If diversification is an important investor motive, demand could be unexpectedly high and spreads tight for issues from countries with few bonds outstanding.

The results also suggest a different and to me more plausible conclusion than the one offered by the authors. This explanation returns to the demand side and is simply that investor exuberance swamped the rate differential logic throughout the entire period studied. Perhaps the impact of

the risk-free rate on investors' behavior corresponds not to simple variation in the rate but to accumulated changes in the risk-free rate over time. The authors might consider looking for threshold levels that trigger changes in demand; this would, however, require longer time series than we have available. The authors' suggestion about supply behavior is striking and counterintuitive, but on Wall Street and for issuing country debt managers the more interesting question would be whether spreads in the secondary market follow the same logic.

In summary this paper contributes to the debate on determinants of investment in foreign currency denominated emerging market bonds. It suggests that "pull" logic operated more strongly in Asia than Latin America. Future research should aim to illuminate whether this happened due to cross-regional differences, informational inefficiency, moral hazard, irrationality, or some other factor. The paper also suggests a need to explore the interaction between global liquidity, the risk-free rate, and exuberance.