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Lending booms, reserves and the sustainability of short-term debt: inferences from the pricing of syndicated bank loans

Barry Eichengreen [a,b,*], Ashoka Mody [c]

[a] *Departments of Economics and Political Science, University of California, 549 Evans Hall, Berkeley, CA 94720-3880, USA*
[b] *NBER, USA*
[c] *Development Prospects Group, The World Bank, Washington, DC 20433, USA*

Abstract

This paper analyzes the determinants of spreads on syndicated bank lending to emerging markets, treating the loan-extension and pricing decisions as jointly determined. Compared to the bond market, our findings highlight the role of international banks in providing credit to smaller borrowers about whom information is least complete and, more generally, support the interpretation of bank finance as dominating that segment of international financial markets characterized by the most pronounced information asymmetries. Domestic lending booms and low reserves in relation to short-term debt have been priced in the expected manner by international banks. The high level of short-term debt in East Asia was supported by high growth rates but was characterized by a knife-edge quality. © 2000 Elsevier Science B.V. All rights reserved.

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* Corresponding author. Departments of Economics and Political Science, University of California, 549 Evans Hall, Berkeley, C.A 94720-3880, USA.

E-mail addresses: eichengr@econ.berkeley.edu (B. Eichengreen), amody@worldbank.org (A. Mody).

1. Introduction

Syndicated bank lending is the Chevy Cavalier of international financial markets. For the same reasons that *Motor Trend* devotes little space to basic transportation, academics pay little attention to international bank lending, preferring to concentrate on rapidly growing market segments like the sport-utility vehicle and the international bond market, or exotic products like high-performance sports cars and derivative credit instruments. What is relevant to the vast majority of consumers thus receives relatively little attention.

In this paper, we argue that more attention to international bank lending is warranted for three reasons. First, the syndicated bank loan remains one of the workhorses of international capital markets. As Table 1 shows, loan commitments have been every bit as important as bonds in the first half of the 1990s. While new bond issues rose from negligible levels at the beginning of the 1990s to more than $100 billion in calendar year 1996 and $128 billion in 1997 before falling back in the wake of the Asian crisis, loan commitments have also trended steadily upward, actually exceeding bond issues in every year through 1995 but one (1993) and nipping at the heels of new bond issues in both 1996 and 1997.

Second, international bank lending is particularly important for the private-sector borrowers whose participation is the distinctive feature of international capital markets in the 1990s and who are likely to dominate the market to an even greater extent in the future as the privatization of state enterprise and the liberalization of

Table 1
Emerging market bond issues and loan commitments (in billions of US dollars)

	1991	1992	1993	1994	1995	1996	1997	1997				1998		
								Q1	Q2	Q3	Q4	Q1	April	May
Bond issues														
Emerging markets	13.9	24.3	62.6	56.5	57.6	101.9	127.9	27.7	42.9	44.8	12.4	25.3	12.1	6.4
Africa	0.3	0.7	0.1	2.1	1.9	1.6	9.3	0.0	1.0	6.8	1.4	1.3	0.0	0.0
Asia	4.0	5.9	21.9	29.8	25.3	43.1	45.5	12.7	15.8	14.1	2.7	2.7	5.6	0.4
Europe	2.0	4.8	9.6	3.5	6.5	7.4	16.2	2.8	6.5	3.7	3.1	5.4	1.9	1.9
Middle East	0.4	0.0	2.0	2.9	0.7	2.5	2.6	0.2	0.7	0.2	1.3	1.0	0.0	0.0
W. Hemisphere	7.0	12.9	28.7	17.9	23.0	47.1	54.1	11.8	18.7	19.7	3.8	14.7	4.5	4.0
Loan commitments														
Emerging markets	41.6	31.4	40.6	56.9	82.9	90.7	123.5	23.2	32.8	29.8	37.5	8.1	5.2	2.2
Africa	4.2	2.5	1.1	0.6	6.7	3.1	4.5	1.0	0.4	0.7	2.4	0.1	0.0	0.0
Asia	15.6	15.0	26.9	38.1	46.7	56.2	58.9	14.9	15.6	16.2	12.1	2.4	2.1	0.4
Europe	7.2	3.4	4.3	7.0	9.6	12.5	18.4	1.1	6.1	3.7	7.4	1.3	1.3	0.2
Middle East	11.0	5.8	1.9	7.6	7.7	6.4	10.7	1.4	1.6	1.5	6.1	0.02	0.0	0.01
W. Hemisphere	3.3	4.5	6.3	3.5	12.1	12.3	30.8	4.7	8.9	7.6	9.4	4.1	1.7	1.5

International Monetary Fund, 1998.

capital markets proceed. Already, one of the striking contrasts between bond and bank lending is the extent to which sovereigns and other governmental borrowers continue to rely on the bond market, while private borrowers are disproportionately important to the market in international bank loans. This is what we should expect, of course, to the extent that private-sector borrowers about whom information is least complete establish long-term relationships with banks as a way of resolving information problems. However, it means that the emerging-market bond spreads on which most recent analysis focuses are likely to provide little, and for that matter potentially misleading, information about what is going on in this market segment (as Fig. 1 suggests).[1]

A third reason for focussing on loans is the controversy that has swirled around the behavior of international bank lending in the wake of the Asian crisis. Spreads on syndicated bank loans show relatively little variation compared to spreads on international bonds, raising questions about whether bank lenders are properly pricing country and credit risk. Low interest rates in Tokyo are said to have encouraged Japanese banks to develop an excessive appetite for emerging-market debt. Growing competition in Europe as a result of the single market is said to have eroded domestic margins and to have encouraged second-tier European banks to scramble into Asian markets in search of yield.[2] Moreover, with banks enjoying deposit insurance, lender-of-last-resort services, and in some cases implicit and explicit guarantees, along with the expectation that they will be able to withdraw their funds on demand insofar as the IMF injects offsetting resources in response to a crisis, it has been suggested that spread compression on syndicated bank loans to developing countries is an indication of the extent of moral hazard.

All these are reasons why bank lending to emerging markets is deserving of study. Yet, to our knowledge, there exists no systematic study of the determinants of the pricing of international bank loans in the 1990s that can be used to shed light on these issues. This paper takes a first step in that direction. It analyzes the pricing of over 4500 international loan commitments to developing countries

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[1] Fig. 1 plots average spreads on all new loan commitments and new bond issues in the 1990s. In only half the quarters do average spreads on loans and bonds move in the same direction. Note that average loan spreads are much smaller than those for bonds and move in a smaller band. A clue to the reason lies in the contrasting reactions to the Mexican and Asian crises. Following the devaluation of the Mexican peso in December 1994, bond and bank loan spreads in the primary market diverge. The decline in bond market spreads reflects a sharp change in the composition of the pool of borrowers: only the best quality issuers were able to tap the bond markets, leaving high-risk borrowers, from Latin America in particular, effectively rationed out of the market. In comparison, the commercial loan market, dominated by Asian borrowers, was less affected. By contrast, following the onset of the Asian crisis in the last quarter of 1997, new bank loan commitments fell sharply *and* spreads increased (to their highest quarterly level since the start of the time period under consideration). The response of primary bond market spreads was muted by comparison.

[2] Indeed, one of the striking features of bank lending to emerging markets, as we shall see, is the extent to which it is dominated by Asian borrowers.
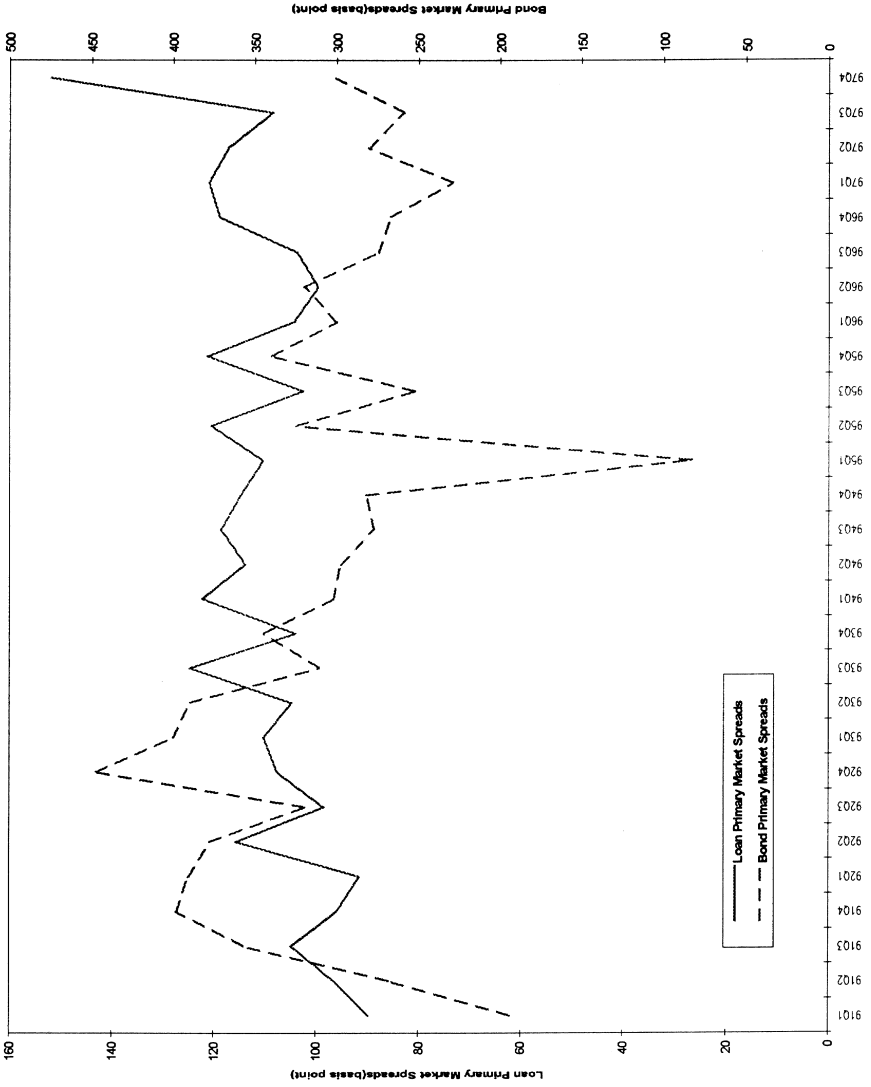
Fig. 1. Loan vs. bond primary market spreads.

between 1991 and 1997, years which span the recent period of heavy lending to emerging markets. This is, in principle, the entire population of bank loans to emerging markets. We pay special attention to problems of sample selection, since there are good reasons to suspect that borrowers that rely on loan commitments for external finance differ in important respects from other debtors. We analyze both the borrowing decision of enterprises and governments and the pricing decisions of their bank underwriters, addressing problems of selectivity bias by treating the two decisions jointly.

Section 2 reviews the theoretical literature on bank lending to emerging markets with the goal of identifying what is special about bank loan commitments as opposed to other forms of international borrowing and lending. Section 3 introduces our data set and describes its features. (More details appear in Appendix A.). Subsequent sections then consider the roles of short-term debt and domestic bank credit (Section 4), the determinants of access to international bank loans (Section 5), and the implications of analyzing the commitment and pricing decisions jointly, with a focus on differences in pricing across regions and over time (Section 6). The bond market providing the obvious benchmark for assessing our results, a summary of our parallel analysis of the bond issuance decision and launch spreads on emerging market bonds (Eichengreen and Mody, 1998a,b) is in Appendix B.

2. Thinking about loan commitments

While international bank lending is no new phenomenon, in the century preceding World War II, the role of banks was limited to underwriting bond issues and to extending trade credits and making interbank deposits. This changed in the 1970s with the rise of intermediate term, floating rate, general obligation syndicated bank loans to developing countries. Syndicated bank lending exploded from less than $50 billion in 1972 to more than $300 billion in 1982, when it was interrupted by Mexico's debt moratorium. Net capital flows then reversed direction. Only at the end of the 1980s, with the completion of the major Brady Plan reschedulings, did the volume of bank lending to developing countries recover significantly in tandem with the growth of the bond market.

The rise of syndicated bank lending is typically understood in terms of three factors: information asymmetries, contract enforcement, and moral hazard. In turn, changes in these factors are invoked to explain the growth of the bond market in the 1990s.

2.1. Information asymmetries

Bond and equity issues have the advantage of speed and low transactions costs. An infrastructure project needs only to be given a credit rating by a rating agency,

at which point it can be brought to the market. A syndicated bank loan, in contrast, must go through a lengthy process of approval by a series of internal loan committees. It is thus striking that relatively few infrastructure projects in emerging markets have secured financing through securities markets. Bank loans must have other advantages.

An obvious explanation is that banks have sunk the costs of investing in a technology for monitoring borrowers. The same theories of delegated monitoring that emphasize the informational role of banks vis-à-vis smaller, less reputable domestic borrowers similarly suggest a role for banks in providing external finance for precisely those foreign borrowers about whom market information is least complete. These "pecking order theories" of finance suggest that emerging market borrowers seeking external finance graduate from bank finance to bond finance and finally to equity finance as information about their credit worthiness becomes more complete.

One of the earliest formalizations of this notion, by Kletzer (1984), emphasized asymmetric information about the level of the debtor's external obligations. Kletzer pointed out that it can be important for creditors to know the aggregate amount loaned to a debtor (since that debtor may otherwise borrow in excess of its credit ceiling, at which point it will have an incentive to renege on its commitments), and similarly to know the terms of earlier loans. The role of the bank syndicate is to provide a mechanism through which lenders can pool information. Kletzer shows that when creditors can only observe their own loans, they will lend larger amounts at higher interest rates than when there is common information. Under relatively general conditions, the borrower is better off with observability, since the reduction in interest rates more than compensates it for the reduction in credit availability. Hence, where information is least complete, bank loan contracts will be incentive compatible.

This formulation is difficult to reconcile with the fact that developing countries often appear to be able to borrow more freely from banks than bond markets (Allen, 1990). This suggests that the emphasis should be placed not on the difficulty of verifying the level of indebtedness per se, but rather on the difficulty of obtaining and evaluating information about other borrower characteristics affecting the willingness and ability to repay. While it may be difficult for bondholders to evaluate the likely construction costs and prospective revenue stream associated with an infrastructure or manufacturing project, commercial and investment banks have the project-evaluation capability and the long-term relationship with the borrower needed to obtain the relevant information and carry out this evaluation.

Note that these theories of delegated monitoring, while they can explain the preference for bank over bond finance, cannot by themselves explain the preference for *syndicated* bank lending. To this one must add another consideration, like the assumption that individual emerging market loans are too large for individual banks to finance given capital requirements, restrictions on loan concentrations,

and prudent risk-management practices. Thus, syndicated bank lending provides both delegated monitoring and portfolio diversification services. The fact that even direct syndicates (in which there is no lead bank) usually appoint a manager or agent to act as the conduit for information between the syndicate and borrower is consistent with this interpretation.

It is then straightforward to explain the recent rise of the bond market in terms of improvements in the information environment. Emerging markets having strengthened auditing, accounting, and disclosure requirements for their banks and corporates, the informational advantages of the banks eroded. However, as the Asian crisis serves to remind, there remains a significant gap in auditing, accounting, and disclosure standards between emerging and advanced-industrial countries. It is not surprising that there remains a significant role for the banks.

2.2. Contracting and recontracting

Because the banks comprising a syndicate form a cohesive group (relative to bondholders who tend to be more numerous and heterogeneous), banks should be better positioned to enforce debt contracts (Edwards, 1986). If concerted lending is required to maximize the value of existing claims, a bank syndicate will be in a better position to undertake it than a large number of disbursed bondholders. Sachs and Cohen (1982) were among the first to argue that the cohesiveness of bank syndicates opens up opportunities for renegotiating defaulted debts. In their model, spreads on bank loans are lower than spreads on bonds, other things equal, since in the event of debt-servicing difficulties bank loans can be rescheduled, while in the case of bonds, there is only the option of default. The fact that the syndicated loan sector generally allows borrowers to raise larger sums than they would be able to obtain through the bond market is consistent with this view. So is evidence provided by Preece and Mullineaux (1996), who show that the response on capital markets to announcements of private financings declines with the number of lenders in the syndicate, as if rising numbers imply rising recontracting costs, consistent with the assumption that a role of bank syndicates is to lend where renegotiation is likely to be important.

Eaton and Gersovitz (1981) invert the argument, pointing out that default can be devastating for the borrower as well as the lender, so that the possibility of rescheduling bank loans encourages borrowers to engage in brinkmanship, which renders bank loans riskier than bonds. Bonds may be preferred to bank loans, in other words, because the absence of sharing, majority voting, and collective representation clauses heightens the cost of default and therefore provides a precommitment technology.

The obvious reconciliation is that both ex ante bonding and ex post recontracting have value. Debtors who value bonding will go through the bond market (the repetition in this sentence is purposeful), while debtors who place a high shadow price on the ability to recontract will borrow from banks.

2.3. Moral hazard

Finally, there is the possibility that lending to emerging markets is undertaken by banks because they are sheltered from the risks by the financial safety net. Among the first to emphasize moral hazard in international lending were Folkerts-Landau (1985) and Gutentag and Herring (1985), who argued that the risk premia charged on international bank loans were likely to be smaller than those on international bonds insofar as central banks and governments provide implicit or explicit insurance against the risks of international bank lending. This explanation has received considerable attention in the wake of the Asian crisis, academics and officials having argued that banks were inclined to lend (and debtors to borrow) because they enjoyed implicit and/or explicit guarantees.

3. Data

To shed further light on these interpretations, we consider the pricing of syndicated bank loans to emerging markets in the 1990s. We limit our attention to loans priced off the London interbank offer rate (LIBOR). Thus, the interest paid by the borrower is LIBOR plus a spread, which reflects the risk premium. Over the life of the loan, the spread stays fixed but the interest rate paid moves with LIBOR. Between 1991 and 1997, just over 5000 LIBOR-based loans were made to emerging markets. We are able to analyze the spreads on about 4500 loans, the subset of the population for which complete loan and country characteristics are available.

3.1. The loans: numbers, spreads, and issuers

East Asian borrowers have dominated the international loan market. Of the 5115 loans issued between 1991 and 1997, 3373 were to East Asia, followed by Latin America and the Caribbean with 543, and Eastern Europe, Middle East and North Africa, and South Asia each with about 350 loans.[3]

Table 2 shows that international loans have been made largely to private borrowers (especially in manufacturing and finance). Public sector borrowers (as distinct from sovereigns) have also borrowed in significant numbers, especially for infrastructure and other services (the category "Government" in Table 2 refers to borrowings supported by local or national governments without an identified sectoral use of proceeds).

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[3] East Asia has also been the most prominent floating-rate bond market issuer, although Latin America has a significant presence in the fixed-rate bond market.

Table 2
Number of loan commitments 1991–1997

Year	Manufacturing				Finance				Infrastructure				Other services				Government			
	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All
1991	2	19	26	47	1	16	55	72	3	30	12	45	0	26	36	62	6	39	0	45
1992	1	14	30	45	0	25	75	100	3	31	18	52	1	44	27	72	5	35	0	40
1993	5	14	37	56	2	37	120	159	2	45	31	78	0	54	38	92	5	37	0	42
1994	2	34	94	130	2	52	147	201	0	48	42	90	0	43	55	98	14	54	1	69
1995	5	26	152	183	4	73	255	332	2	68	96	166	0	45	91	136	15	47	0	62
1996	2	37	246	285	1	85	371	457	6	87	136	229	0	57	139	196	20	71	1	92
1997	4	54	230	288	1	113	334	448	2	86	131	219	0	71	140	211	23	66	2	91
Total	21	198	815	1034	11	401	1357	1769	18	395	466	879	1	340	526	867	88	349	4	441

The average spread above LIBOR is 112 basis points. For emerging market bonds issued during the same period, spreads were significantly larger, averaging 256 basis points (Table 3). The average spread on loans remained relatively steady, ranging from a low of 98 basis points in 1991 to a high of 117 basis points in 1994. Thus, bond spreads are larger on average and more variable. Interestingly, the ratio of bond to loan spreads declined over the period, from more than three between 1991 and 1993 to about two between 1994 and 1997, perhaps indicating some maturing of the bond market. The higher bond spreads do not simply reflect the regional composition of loans and bonds: in fact, loan spreads are lower than bond spreads within each region. Loans also have significantly shorter maturities than bonds (3–4 vs. 8–10 years on average).

Private borrowers typically pay higher spreads than public borrowers (Table 4), and spreads are lower for loans contracted by financial institutions. Except where contracted directly by sovereigns, loans for infrastructure and utilities command higher spreads than loans for investment in other sectors, a somewhat surprising finding in view of the generally assumed stability of earnings in this sector. (The longer tenor of the loans in this sector (Table 5) may partly explain the higher spreads, as we show below.)

3.2. Explanatory variables

We used a variety of macroeconomic and financial indicators to study the loan commitment and pricing decisions. Throughout, our goal was to keep the empirical specification as comparable as possible to that used in our previous work on international bonds. Thus, we regressed the loan spread (including fees) on standard macroeconomic characteristics of the country of the borrower using data

Table 3
Spreads on loans and bonds 1991–1997 (basis points)

Region	Year							Average 1991–1997
	1991	1992	1993	1994	1995	1996	1997	
Africa	153	166	na	130	113	82	82	102
Caribbean	142	114	115	88	63	82	131	104
East Asia	82	92	95	101	95	94	93	94
East Europe	120	212	230	212	175	188	240	211
Latin America	150	131	178	231	231	165	158	174
Middle East and North Asia	113	119	120	140	145	93	104	115
South Asia	125	160	146	123	132	97	97	110
West Europe	71	65	66	46	na	22	24	43
All loans	98	104	110	117	113	107	121	112
All bonds	270	339	354	228	218	240	229	256

Table 4
Average spreads on loans 1991–1997 (basis points)

Year	Manufacturing				Finance				Infrastructure				Other services				Government			
	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All	Sovereign	Public	Private	All
1991	110	117	139	128	100	66	83	79	91	102	108	103	na	90	115	104	73	80	na	79
1992	130	92	115	108	na	84	89	88	30	116	137	118	81	109	130	117	173	89	na	99
1993	104	114	120	117	130	84	95	93	138	107	184	138	na	106	132	117	90	96	na	96
1994	172	124	148	142	99	120	93	100	na	113	123	118	na	104	137	122	94	103	140	102
1995	140	124	150	146	105	75	91	87	86	117	124	121	na	98	142	128	122	104	na	108
1996	114	98	114	112	45	94	102	101	87	102	120	112	na	83	119	108	125	93	124	101
1997	102	119	110	111	70	141	130	133	42	124	115	118	na	85	145	125	141	93	95	105
Total	121	114	125	123	99	105	104	104	79	112	124	118	81	95	133	118	121	94	113	100

Table 5
The maturity (in years) of international loans 1991–1997

Year	Manufacturing				Finance				Infrastructure				Other services				Government			
	Sove-reign	Public	Private	All	Sove-reign	Public	Private	All	Sove-reign	Public	Private	All	Sove-reign	Public	Private	All	Sove-reign	Public	Private	All
1991	1.0	4.4	5.8	5.0	4.0	4.7	2.4	3.0	7.7	6.7	9.9	7.7	na	8.2	4.3	5.9	6.1	5.5	na	5.6
1992	1.0	6.0	6.4	6.1	na	3.9	2.8	3.1	12.2	6.2	8.6	7.4	4.0	7.3	5.0	6.4	3.8	5.4	na	5.2
1993	1.6	4.5	4.3	4.1	11.0	5.2	2.9	3.6	7.5	4.9	9.1	6.6	na	7.7	3.9	6.1	8.3	4.7	na	5.1
1994	2.2	4.0	4.5	4.3	5.0	4.9	3.8	4.1	na	4.6	7.0	5.7	na	7.3	3.6	5.3	6.3	3.9	1.0	4.3
1995	0.9	4.7	4.6	4.5	3.5	5.0	3.8	4.0	3.0	5.3	8.1	6.9	na	7.7	4.5	5.6	6.7	3.8	na	4.5
1996	2.0	4.4	5.2	5.1	3.0	3.9	3.6	3.7	3.0	4.5	6.6	5.7	na	4.7	4.4	4.5	4.8	3.6	3.0	3.9
1997	1.0	4.9	5.0	4.9	5.0	3.5	3.4	3.4	6.2	4.7	6.5	5.8	na	5.4	4.5	4.8	3.8	3.9	4.0	3.9
Total	1.3	4.6	4.9	4.8	5.3	4.3	3.5	3.7	6.2	5.0	7.3	6.2	4.0	6.6	4.3	5.2	5.3	4.2	3.0	4.4

assembled principally from the World Bank's *World Debt Tables* and *Global Development Finance* and the IMF's *World Economic Outlook* data base and *International Financial Statistics*, although where necessary, we used national sources to supplement these data. As in our previous work, we included the ratio of debt to GNP, whether the country had rescheduled in the preceding year, the ratio of debt service to exports (the lagged rate of GDP growth in 1990 prices, denominated in domestic currency), and the variance of export growth. To proxy for other more-difficult-to-quantify characteristics of country credit worthiness, we included the residual from a first stage regression of the most recent sovereign credit rating (gathered from *Institutional Investor Magazine* and published each March and September) on a vector of standard economic and financial determinants.[4] We also considered the share of short-term debt in total commercial bank debt (provided by the *Bank of International Settlements*) and the ratio of domestic credit to GDP, two variables that turn out to be important in what follows.

As for the characteristics of the issuer, we considered whether it was a private entity, whether it was a supranational, and whether it had borrowed previously on the syndicated loan market. As a measure of global credit conditions, we included the log of the 3-year US treasury rate (the average maturity for loans being between 3 and 4 years). As for the characteristics of the loan, we included its amount, maturity, and currency of denomination. Finally, we included the industrial classification of the borrower (manufacturing, financial services, infrastructure and other utilities, other services, and government).

4. Basic results

We use ordinary least squares regressions to highlight some of the basic relationships in the data. Column 1 of Table 6 shows that loan spreads decline with the amount loaned (reflecting economies of scale) and rise with loan maturity (reflecting greater risk as maturity increases and suggesting that lenders value the liquidity of short-term loans and their ability to discipline borrowers). Private loans and Latin American borrowers pay higher spreads.

The second column introduces a variable designed to capture the importance of relationship banking. The first time a borrower appears during the 1991 to 1997 time frame, the variable takes the value 1; it is then incremented each time the borrower reappears. Repeated borrowings (the number of times the borrower has come to the bank loan market previously) have a very strong negative effect

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[4] We included only the residual component of the credit rating since the raw credit rating is highly correlated with a number of other economic and financial indicators in the equation; indeed, it is well known that the rating agencies rely on those indicators when doing the rating exercise. In identifying explanatory variables for the first-stage regression, we followed the literature on the standard determinants of sovereign credit ratings (e.g. Cantor and Packer, 1996 and Haque et al., 1996).

Table 6
Spreads on primary loan issues: descriptive regressions (*t*-statistics in parentheses)

Log amount	−0.079	−0.079	−0.079	−0.072
	(−8.412)	(−8.687)	(−8.690)	(−7.804)
Maturity	0.008	0.008	0.009	0.002
	(2.760)	(3.084)	(3.228)	(0.810)
Log of 3-year	−0.202	−0.168	−0.166	−0.172
US treasury rate	(−2.881)	(−2.452)	(−2.425)	(−2.513)
Dummy for private	0.064	0.010	0.008	0.033
borrower	(3.245)	(0.535)	(0.435)	(1.541)
Dummy for	0.481	0.435	0.430	0.379
Latin America	(14.666)	(13.550)	(13.338)	(11.371)
Number of		−0.025	−0.025	−0.026
borrowings		(−16.220)	(−16.186)	(−16.637)
Yen issue			−0.359	−0.345
			(−5.095)	(−4.806)
Deutsche Mark			−0.079	−0.062
issue			(−1.267)	(−1.002)
Dummy for			−0.303	−0.107
supranational			(−0.941)	(−0.333)
Industrial sectors				
Dummy for				−0.053
manufacturing				(−1.722)
sector				
Dummy for				−0.209
financial				(−7.297)
services sector				
Dummy for				−0.010
other services				(−0.332)
Dummy for				−0.107
government				(−2.721)
Constant	5.036	5.114	5.118	5.223
	(38.816)	(40.404)	(40.514)	(40.469)
Number of	5010	5010	5010	4888
observations				
Adjusted R^2	0.051	0.098	0.103	0.118

consistent with the notion that relationship banking is used to overcome informa-
tion asymmetries.[5] Though many borrowers came to the market only once during

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[5] This interpretation should be held cautiously, for a number of reasons. For one, we have only been
able to construct a variable for repeated bank borrowings, not repeated borrowings from a syndicate
headed by the same loan arranger. Second, there is the possibility that those who are repeatedly able to
borrow from the banks differ in other ways that are not readily observed by the econometrician but are
well known to all participants in financial markets, and not just to bank lenders.

this period (of the 5115 borrowings, 2173 were from one-time borrowers), several borrowed on multiple occasions.[6] The point estimate in column 2 of Table 6 suggests that an additional loan commitment reduces the spread by 2.4%, other things equal. Note that the coefficient on the "private" dummy becomes less significant when the relationship variable is introduced, reflecting the higher incidence of multiple borrowing by private borrowers.[7]

Table 6 also indicates that borrowings in yen, and to a lesser extent Deutsche marks, carry lower spreads, other things equal. This is consistent with the presumption that supply-side conditions (low Japanese funding costs, declining margins in Europe) helped to fuel lending to emerging markets.[8] Financial institutions also pay lower spreads on their borrowings, consistent with the emphasis some observers have placed on the influence of implicit and explicit guarantees. When sectoral dummies are added, the significance of the maturity variable declines since, as noted, maturities vary between sectors. Note that the longer maturity of lending for infrastructure projects can help explain the unusually high spreads on such loans (referred to above), although spreads on loans for infrastructure (the omitted sectoral control) still remain unusually high.

In Table 7, we introduce a number of country characteristics to further explain the spreads charged. The majority of these carry over from our earlier analysis of bond spreads (Eichengreen and Mody, 1998a,b). The three debt variables (the debt/GNP ratio, a dummy for debt rescheduling if one occurred in the previous year, and the debt service/export ratio) show that, as for bonds, spreads rise with debt levels, a history of rescheduling, and higher debt service in relation to exports. High country growth rates enhance the ability to repay and reduce spreads; highly variable export growth, on the other hand, raises the risk of non-payment and increases the spread. The credit rating residual, which measures the effect of country credit rating factors not explicitly included in our analysis, always gives a strong negative sign: a larger residual implies a better rating and a lower spread. The directional influence of these variables is robust across subsam-

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[6] Over a thousand borrowings represented between the fourth and 10th borrowings and about 500 were for borrowers who were entering into a loan contract on more than the 10th occasion.

[7] However, the significance on the private dummy reappears when country characteristics are introduced.

[8] We were also able to identify for about 3500 borrowers the nationality of the lead loan arranger. These results are not presented because many observations are lost. However, the results for a subset of loans do tend to show, contrary to suggestion, that the existence of cross-default clauses and proportional sharing rules have rendered bank loans to LDCs homogeneous — in other words, that the value and pricing of a loan is not affected by the identity of the lender — that there is strong evidence here that the identity of the arranger affects the level of the spread. Consistent with the low cost of funds in Japan and the urgency of Japanese banks' search for yield, spreads on loans originated by Japanese banks consistently display the smallest spreads.

Table 7
Influence of country characteristics on loan spreads (OLS regressions, *t*-statistics in parentheses)

Log amount	−0.087	−0.092	−0.092	−0.078	−0.078
	(−10.178)	(−10.796)	(−10.646)	(−9.284)	(−9.276)
Maturity	0.018	0.019	0.020	0.019	0.020
	(6.766)	(7.447)	(7.853)	(7.714)	(7.810)
Log of 3-year US treasury rate	−0.211	−0.147	−0.155	−0.100	−0.088
	(−3.377)	(−2.357)	(−2.495)	(−1.649)	(−1.450)
Dummy for private borrower	0.225	0.195	0.195	0.225	0.218
	(10.707)	(9.183)	(9.117)	(10.732)	(10.381)
Dummy for Latin America	0.142	0.157	0.120	0.112	0.071
	(3.889)	(4.350)	(3.324)	(3.162)	(1.978)
Number of borrowings	−0.012	−0.013	−0.013	−0.052	−0.053
	(−8.819)	(−9.130)	(−9.040)	(−6.935)	(−7.171)
Country characteristics					
Credit rating residual	−0.024	−0.028	−0.027	−0.026	−0.022
	(−24.914)	(−26.447)	(−24.692)	(−23.990)	(−17.411)
Debt/GNP	0.451	0.462	0.469	0.600	0.632
	(7.185)	(7.233)	(7.358)	(9.473)	(9.981)
Dummy for debt rescheduling	0.552	0.536	0.532	0.461	0.403
	(14.091)	(13.468)	(13.276)	(11.734)	(10.005)
Debt service/exports	0.416	0.396	0.502	0.673	0.643
	(4.675)	(4.220)	(5.214)	(7.112)	(6.815)
GDP growth	−12.591	−11.413	−11.357	−20.237	−15.153
	(−10.330)	(−9.349)	(−9.080)	(−4.352)	(−3.221)
Standard deviation of export growth	0.555	0.724	0.714	0.443	0.348
	(6.156)	(7.692)	(7.551)	(4.684)	(3.643)
Reserves/short-term debt		−0.052	−0.047	−0.044	−0.040
		(−7.672)	(−6.884)	(−6.471)	(−5.853)
Ratio of short-term debt to total debt		0.111	0.057	0.842	0.967
		(1.268)	(0.575)	(4.635)	(5.312)

Ratio of domestic credit to GDP			−0.002	−0.212	−0.390
			(−0.301)	(−12.911)	(−11.751)
Number of borrowing ∗ ratio of short-term debt to total debt				0.065	0.067
				(5.474)	(5.686)
GDP growth ∗ ratio of short-term debt to total debt				−38.088	−47.338
				(−4.141)	(−5.099)
GDP growth ∗ ratio of domestic credit to GDP				14.672	16.637
				(14.893)	(16.126)
Ratio of domestic credit to GDP ∗ ratio of domestic credit to GDP					0.022
					(6.163)
Constant	5.068	4.976	4.988	4.712	4.793
	(40.433)	(35.927)	(35.893)	(30.409)	(30.946)
Number of observations	4656	4650	4551	4551	4551
Adjusted R^2	0.327	0.338	0.345	0.380	0.385

Note: all regressions include dummies for industrial sectors, currencies of denomination, and supranational borrowers as defined in Table 6.

ples (as discussed below), although their relative importance and statistical significance vary.[9]

To get closer to some hypotheses which have been featured in the debate over Asian crisis, we added measures of the country's short-term indebtedness and the ratio of domestic bank credit to GDP. Some observers have argued that prior to the crisis, neither bank lenders nor other markets participants appreciated the risks associated with short-term debt. Our findings cast some doubt on this assumption: for the full set of loans, a low ratio of international reserves to short-term debt significantly raises spreads, while a larger share of short-term debt in the country's total outstanding bank debt has a strong, significant, positive impact on spreads. This is a robust result that holds across regions, with the noteworthy exception of East Asia in recent years (as we discuss below). Overall, however, banks appear to have attached a higher risk premium to borrowers in countries with large amounts of short-term debt even before the factor was highlighted by the crisis.[10]

A high ratio of domestic bank credit to GNP is a proxy for the existence of deep domestic financial markets. Other things equal, the presence of deep markets should reduce spreads on international bank borrowing by implying a more stable financial environment and more local competition for foreign lenders (Levine and Zervos, 1998). While our findings confirm this presumption, the effect is small and statistically insignificant (see column 3 of Table 7). To further examine the relationship between international bank spreads and domestic bank credit, we therefore added to the regression the interaction of the growth rate with the bank credit stock/GDP ratio (and its square). It appears that where rapid growth and high levels of bank credit are both present, spreads are higher (Columns 4 and 5). An interpretation is that high GNP growth rates fueled by the expansion of domestic credit (domestic credit booms) were viewed by the market with concern. Note that with the addition of the non-linear terms, the bank credit stock/GDP ratio now has a negative and significant sign while the squared term is positive and significant. In other words, at low levels of financial development and low growth rates, policy measures to improve financial intermediation bring value and reduce the costs of external borrowing, but when they spill over into unsustainable credit booms, they are regarded by the markets with alarm and worsen the terms of access to external funds.

Comparing these findings with our earlier results for the bond market (reproduced in Appendix B), one is struck by the similarity of the determinants of

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[9] Relative to Edwards (1986), we find the same signs on the coefficients for loan size, loan maturity, GDP growth, debt/GDP ratio, and the debt-service-to-export ratio but generally stronger and more robust effects.

[10] The coefficient on the interaction of short-term debt with the "relationship" variable shows that high short-term debt lowers the value of familiarity to the market. High growth reduces the risk premium associated with high-short term debt, although here, too, regional variations are important.

spreads. The debt variables, the growth of GDP, and the variance of export growth all enter with the same signs and significance in equations for the full set of bank loans and bonds. At the same time, some of the differences between the two data sets are consistent with the notion that borrowers and lenders resort to bank intermediation to attenuate information problems. The coefficient for private borrowers is smaller in the bank-loan equations, as if banks are better able to overcome the special information obstacles to lending to private entities. The effect of the country credit rating residual is smaller for bonds than bank loans, as if characteristics that are readily observable by the credit-rating agencies play a smaller role in this market.

5. Determinants of loan commitments

Since the (unobserved) characteristics of those who borrow from international banks are likely to be different from those that do not, we also estimate the spreads equation after correcting for selectivity bias. The procedure requires estimating a probit equation, which distinguishes borrowers from non-borrowers. To estimate the probit, we created a set of observations for which the dependent variable took the value "zero" when a loan commitment did not materialize. If no loan was made to a specific type of issuer (private, public, or sovereign) in a particular country in a particular quarter, then a zero was recorded; where a loan commitment was made, we recorded a one.

Results are reported in Table 8.[11] We see that a rise in the US treasury rate significantly increases the probability of observing a new loan commitment. This is very different from the finding for the bond market, where the treasury rate (for 10-year maturity, in keeping with the tenor of bonds issued) showed a strong negative sign. In Eichengreen and Mody (1998b), we noted that the primary effect of a rise in US interest rates was through a decline in the issuance of bonds. Some have interpreted this phenomenon as a flight to quality: high interest rates lead bondholders to shun risky investments; in addition, risky borrowers may prefer to wait for better market conditions. For bank loans, in contrast, borrowers appear to be willing to pay higher rates in order to retain access to the market, which is plausible insofar as these are floating rate instruments (so that borrowing in periods of tight global credit conditions does not lock them into high interest rate).

The regional variation is of some importance. For the East Asian subsample, the coefficient on the US treasury rate, though positive, is not statistically different from zero; and, in some specifications, a higher interest rate lowers the probability

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[11] The reported coefficients for the probit 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 variable to facilitate interpretation.

Table 8
Determinants of the probability of a loan issue (*t*-statistics in parentheses)

	All	East Asia	Latin America	East Europe		South Asia
Log of 3-year	0.154	0.008	0.283	0.163	0.122	0.390
US treasury rate	(3.370)	(0.360)	(3.380)	(0.860)	(0.640)	(1.750)
Dummy for	0.331	0.194	0.310	0.279	0.279	0.081
private borrower	(25.090)	(17.620)	(12.610)	(6.730)	(6.760)	(1.280)
Dummy for	−0.380					
Latin America	(−17.580)					
Credit rating	0.014	0.006	0.017	0.010	0.014	0.002
residual	(20.100)	(11.050)	(10.930)	(3.180)	(5.380)	(0.200)
Debt/GNP	−1.038	−0.292	−0.254	−1.209	−1.316	−1.729
	(−26.620)	(−8.490)	(−3.880)	(−3.670)	(−4.010)	(−4.34)
Dummy for debt	−0.107	−0.121	−0.114	0.194		
rescheduling	(−4.630)	(−4.900)	(−4.720)	(2.780)		
Debt service/	0.909	−0.002	0.525	0.354	0.290	1.341
exports	(15.080)	(−0.030)	(7.920)	(1.440)	(1.170)	(1.520)
Reserves/imports	0.044	0.060	0.139	0.401	0.404	0.455
	(5.950)	(7.890)	(10.290)	(7.550)	(7.580)	(7.390)
Reserves/	−0.005	−0.051	−0.062	−0.006	−0.007	−0.113
short-term debt	(−3.820)	(−12.100)	(−3.480)	(−3.830)	(−4.760)	(−3.400)
Ratio of short-term	−0.267	−0.668	−0.183	0.279	0.530	1.341
debt to total debt	(−5.640)	(−16.250)	(−1.870)	(1.360)	(2.900)	(3.290)
Ratio of domestic	0.086	0.019	0.020	−0.027	−0.114	1.270
credit to GDP	(12.580)	(4.320)	(1.300)	(−0.560)	(−3.060)	(2.260)
Number of	8055	3623	1485	684	684	588
observations						
Pseudo R^2	0.357	0.338	0.428	0.187	0.179	0.571

Note: coefficients reported are the changes in the probability of an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for a dummy variable.

of a bank loan commitment in East Asia, as in our analysis of the bond market, though the effect is rarely significant. An interpretation is that East Asian borrowers had relatively favorable access to the market (prior to the recent crisis) and were better able to wait for global credit conditions to improve. The East Asian coefficient contrasts with that for Latin America and South Asia, where higher interest rates increase the probability of new loan commitments. Our spreads equation with the correction for selectivity confirms that there is little significant impact of US treasury rates on spreads, in contrast to the selectivity corrected results for the bond market. The credit rating residual, the debt-to-GDP ratio, and the absence of recent debt rescheduling appear to act as screening variables in all regions, with favorable values increasing the probability of a loan.[12] In regions other than East Asia, a higher debt-to-export ratio is associated with a higher probability of borrowing. Strikingly, higher domestic bank credit appears to be more strongly associated with foreign borrowing in East Asia than in other regions. As discussed in IMF (1998), this may reflect the extensive reliance of East Asian domestic financial systems on international credit, ironically for economies with such high savings rates.

In light of the recent attention paid to the level of international reserves (Feldstein, 1999), we examine their role from two perspectives. The ratio of reserves to short-term debt relates the adequacy of reserves to short-term obligations on capital account, while the ratio of reserves to imports measures reserve adequacy for trade-related obligations.[13] The two reserve ratios turn out to be important in different ways. The lower level of reserves in relation to imports, the more limited is access to international loans, as if countries in more fragile payment positions find it more difficult to borrow. While this is a significant effect in the full sample and for each region, the differences across regions are noteworthy. Low reserves reduce access most dramatically in the relatively closed economies of South Asia and least in highly export-oriented East Asia. However, when reserves are viewed in relation to short-term external debts, the opposite seems to be true. More short-term debt does not screen out borrowers; rather, borrowers in countries with relatively low reserves relative to short-term debt are more likely to borrow again.[14]

Overall, then, the results for bank borrowing are similar to those for the bond market. The greater tendency for a heavy debt burden to ration borrowers out of

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[12] The exception is recent debt rescheduling in Eastern Europe, which appears to be associated with a higher rather than a lower probability of observing subsequent loan commitments. South Asia did not reschedule debt in the period analyzed.

[13] As Fischer (1999) notes, "countries need to set their reserve holdings on the basis of capital, as well as current, account variables".

[14] Fischer (1999) points out that the demand for reserves will increase as capital accounts become more open. Our finding cautions that some part of the build-up in reserves may be unstable if it occurs through increases in private external short-term obligations.

Table 9

	All	Asia	Latin America	East Europe	South Asia
(a) Determinants of spreads with selectivity correction (t-statistics in parentheses)					
Log amount	−0.077	−0.0852	−0.024	−0.166	0.004
	(−9.240)	(−9.273)	(−0.636)	(−4.904)	(0.120)
Maturity	0.020	0.021	−0.014	0.049	0.047
	(7.854)	(7.868)	(−1.101)	(3.766)	(4.689)
Log of 3-year	−0.100	−0.140	0.593	−0.268	0.183
US treasury rate	(−1.631)	(−2.133)	(1.699)	(−0.773)	(0.723)
Dummy for	0.192	0.108	0.151	0.403	0.349
private borrower	(6.561)	(2.708)	(1.335)	(4.735)	(4.286)
Dummy for	0.090				
Latin America	(2.276)				
Number of borrowing	−0.054	−0.033	−0.196	0.021	−0.013
	(−7.257)	(−3.596)	(−2.102)	(0.254)	(−0.344)
Credit rating residual	−0.023	−0.027	−0.014	−0.043	−0.004
	(−15.622)	(−11.583)	(−1.912)	(−5.435)	(−0.215)
Debt/GNP	0.712	0.346	0.088	0.632	3.147
	(7.816)	(2.415)	(0.223)	(0.847)	(4.274)
Dummy for debt	0.418	0.082	−0.135	0.711	
rescheduling	(10.014)	(1.163)	(−1.114)	(3.881)	
Debt service /	0.582	1.912	0.125	1.872	5.246
exports	(5.366)	(8.248)	(0.453)	(3.450)	(3.253)
GDP Growth	−14.666	−6.535	29.298	29.373	348.086
	(−3.126)	(−0.558)	(1.240)	(1.275)	(1.543)
Standard deviation of	0.356	0.503	1.510	1.639	0.856
export growth	(3.735)	(4.854)	(1.682)	(3.344)	(1.126)
Reserves /	−0.036	−0.015	−0.044	−0.052	0.019
short-term debt	(−5.132)	(−1.245)	(−0.616)	(−3.003)	(0.372)
Ratio of short-term	1.028	0.442	0.887	1.573	−3.102
debt to total debt	(5.543)	(0.940)	(1.234)	(1.632)	(−2.057)

	All	East Asia	Latin America	East Europe	South Asia
Ratio of domestic	−0.393	0.109	−0.105	−1.280	31.178
credit to GDP	(−11.727)	(1.275)	(−0.554)	(−3.242)	(1.537)
Ratio of domestic	0.022	−0.014	0.012	0.496	−13.099
credit to GDP ∗ ratio of	(6.171)	(−1.676)	(0.853)	(3.755)	(−1.311)
domestic credit to GDP					
Number of borrowing ∗ ratio of	0.068	0.037	0.244	−0.079	−0.022
short-term debt to total debt	(5.761)	(2.646)	(1.492)	(−0.388)	(−0.250)
GDP growth ∗ ratio of short-term	−47.930	−23.843	−18.210	−130.096	224.259
debt to total debt	(−5.181)	(−1.282)	(−0.403)	(−1.853)	(1.889)
GDP growth ∗ ratio of domestic	16.467	1.128	−28.947	−11.860	−444.711
credit to GDP	(15.966)	(0.475)	(−2.582)	(−1.449)	(−2.081)
Constant	4.814	4.642	3.643	4.509	−15.586
	(30.448)	(15.626)	(3.642)	(4.855)	(−1.464)
Lambda	−0.062	−0.203	0.126	0.332	0.238
	(−1.171)	(−2.217)	(1.091)	(4.218)	(3.766)
Number of loans	4551	3100	443	287	319
Log likelihood	−6936.000	−2888.684	−977.150	−559.022	−351.951

	All	East Asia	Latin America	East Europe	South Asia
(b) Marginal effects, evaluated at the mean values					
GDP growth	−14.366	−18.708	−12.604	−35.362	78.179
Ratio of short-term	0.844	0.173	1.255	2.866	−0.435
debt to total debt					
Ratio of domestic	−0.198	0.089	−0.398	−0.787	14.217
credit to GDP					

Note: all regressions include dummies for industrial sectors, currency of denominations and supranational borrowers as defined in Table 6.

the market in Latin America than East Asia is the same as we previously obtained using an entirely different data set for the bond market. Similarly, the ratio of debt service to exports strongly increases the probability of observing new loan commitments and new bond issues for Latin America but has a more modest effect in East Asia.

6. Results with selectivity correction: differences across regions and over time

Following Heckman, we assume that the error terms in the two equations are bivariate normal with standard deviations s_1 and s_2 and covariance s_{12}^2 (where $p_2 = s_{12}^2 / s_1 s_2$). The model can then be identified by the non-linearity of the fitted probability in the selection equation and by the inclusion of independent variables in the selection equation that are not also included in the pricing equation. We estimated the system using maximum likelihood. Table 9 reports the same pricing equation as before, this time with the selectivity correction. The coefficients are reasonably robust to the selectivity correction, and by the standards of the bond market, syndicated bank lending exhibits little interregional instability.[15]

The t-statistic of the coefficient on lambda, the Inverse Mills Ratio, summarizes the importance of selectivity. An insignificant lambda implies that the error terms in the probit and spreads equations are not correlated and that there is little selection bias. This appears to be the case when the full loan set is considered: lambda is small and statistically insignificant (the correlation between the error terms in two equations is negative 0.06). However, evidence of selectivity is stronger when we disaggregate regions. While the East Asian lambda is negative, that for the other regions is positive (which explains the absence of an effect in the full sample). The normal presumption would be a positive coefficient: entities with characteristics that make them unlikely borrowers but who come to the market anyway will be charged higher spreads. This is what we find for Latin American, Eastern Europe, and South Asia. In East Asia, however, borrowers who are not expected to come to the market but do so anyway are paradoxically charged unusually low spreads.[16]

The bottom panel of Table 9 shows the point estimates at the regional mean values for GDP growth, short-term debt ratio, and the bank credit stock, all of

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[15] It will be noted, though, that the coefficients for Latin America are estimated imprecisely and that some of the South Asian coefficients are counterintuitive (e.g., that on the growth rate). Multicollinearity appears to be responsible for these problems. In the next section, we show that a pared down specification produces plausible results.

[16] This may reflect hard-to-measure characteristics of these countries associated with unusually favorable growth prospects ("Asian values"), implicit guarantees, or some other factor. Note, however, that the statistical significance of this coefficient is marginal.

which are entered interactively. For the full set of loans, we find the same signs on these variables as when there are no interaction terms: faster GDP growth and a higher bank credit stock reduce spreads, other things equal, while a higher ratio of short-term debt raises spreads. These results have plausible explanations, as discussed earlier. For East Asia, the high GDP growth rate has a double pay-off: not only does it have the direct effect of reducing spreads, but it mitigates the effect of short-term debt. Thus, while East Asia has the highest ratio of short-term debt of all regions (0.65 compared to 0.55 in Latin America and 0.43 in Eastern Europe), the impact on spreads is (on the margin) smaller in Latin America or Eastern Europe. However, the high domestic-bank-credit-to-GDP ratio (2.9 compared to 1.1 in Latin America and 0.7 in Eastern Europe) coupled with high growth carries a penalty in terms of raising spreads.[17]

Considering the probit and spreads equations together allows us to interpret the impact of variables entering both equations in terms of supply and demand. Henceforth, we use "demand" to refer to the demand by commercial banks for emerging market exposure and the term "supply", in keeping with our bond market terminology ("supply of bonds"), to refer to the willingness by emerging market borrowers to contract for international loans. The credit rating residual, the debt/GDP ratio and the debt rescheduling variable all affect the demand by commercial banks for exposure to emerging markets. Better credit, a larger credit rating residual, a smaller debt/GDP ratio, and absence of recent debt rescheduling increase the probability of observing a new loan commitment while lowering the spread. This result parallels that for bonds.

For the full set of loans, the US treasury rate appears to shift the demand curve − a rise in US interest rates increases the probability of loans while lowering the spreads, suggesting that when interest rates rise banks are willing to lend more at lower spreads.[18] However, regional differences are significant. For East Asia, the supply effect seems to predominate in the market for loans (as in the market for bonds): while a rise in the US treasury rate narrows spreads, the change in the number of new loans is statistically insignificant, suggesting that the East Asians are able to move along a relatively inelastic commercial bank demand curve. For Latin America, the supply shift dominates as well, although it works in the opposite direction. With a rise in interest rates, the Latin American supply curve shifts out, increasing the number of loans while also requiring borrowers to pay higher spreads. The result for Latin American loans is thus in contrast to that for bonds, where a rise in interest rates was associated with *lower* issuance and higher spreads, indicating a fall in demand. The results suggest that in periods of high

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[17] The signs for Latin America and Eastern Europe are the same as for the full set of loans. The within-South-Asia results are harder to interpret: the signs on all three variables are the opposite of those for the full loan set.

[18] Note, of course, that though the spreads decline, the overall interest rate charged to emerging market borrowers rises.

Table 10
Rolling regressions: East Asia

	1991–1994	1994–1997	1995–1996	1996–1997:2
Part I: means and standard deviations (in parentheses)				
GDP growth	0.020 (0.007)	0.018 (0.005)	0.018 (0.005)	0.016 (0.004)
Ratio of short-term debt to total debt	0.636 (0.202)	0.660 (0.142)	0.664 (0.140)	0.658 (0.124)
Ratio of reserves to short-term debt	2.609 (6.590)	1.867 (3.823)	1.756 (2.995)	1.700 (1.985)
Ratio of domestic credit to GDP	2.654 (1.114)	3.071 (1.368)	2.963 (1.293)	3.140 (1.384)
Part II: marginal effects, evaluated at the mean values				
GDP growth	−20.03	−12.94	−10.85	−4.58
Ratio of short-term debt to total debt	0.19	−0.07	−0.59	−1.00
Ratio of reserves to short-term debt	−0.011	−0.037	−0.057	−0.080
Ratio of domestic credit to GDP	0.28	0.11	0.05	0.10

interest rates, high quality borrowers (traditionally from East Asia and non-emerging-market countries) withdraw from the syndicated bank loan market temporarily, but Latin American issuers seek to retain access, for which they are willing to pay a higher price.

Another variable that mainly shifts the supply curve (as for bonds) is the ratio of debt service to exports: a higher ratio typically raises the number of new loans while increasing spreads. A variable that was not included in our earlier bond analysis, the ratio of reserves to short-term debt, also serves to shift supply: when reserves fall in relation to short-term debt, the number of new loans increases along with spreads. For East Asia, the increases in stock of domestic bank credit in relationship to GDP are associated with shifts in supply for international loans.

Finally, we consider changes over time in an attempt to see if the data throw some light on recent events. We estimate the same model as in Table 9 for East Asian loan commitments for different time periods. For each of these periods, we then calculate the marginal effect of the variables of interest. (Table 10).[19] Consider, for example, the impact of the ratio of short-term bank debt, which we can relate to total bank debt or to the level of reserves. The marginal effect is to raise the spreads in the early years, but this effect falls after 1994 and turns negative in 1995–1997, due to high growth in the region (see the bottom panel of Table 10). An interpretation is that international bankers, while typically cautious of high short-term debt, appear to have been taking an optimistic view in East Asia

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[19] Variables whose coefficients we do not report tended to show no significant changes over time.

on account of the ability of borrowers in the region to service the debt through rapid growth. Ultimately, of course, growth expectations declined, and the high short-term debt ratios suddenly came to be seen as unsustainable.[20]

These results make it easier to understand why investors should have become so concerned about the level of short-term debt in various East Asian countries in the mid-1990s. While high levels of short-term debt had been characteristic of East Asia for some time, there was a certain knife-edge quality to their sustainability. Rapidly growing firms value the flexibility of short-term loans, while lenders for their part are comforted by the relationship built through rolling over the loans and by the growth prospects for servicing them in the future. However, if doubt is cast on the ability to service these loans and their supply is summarily cut off, growth can fall sharply, further depressing confidence in the ability to repay.

7. Extensions and sensitivity analyses

We explored the robustness of our results in several ways. Our finding that bank lending increases with a rise in the relevant US treasury rates led us to examine the influence of the yield curve. We then focussed on alternative measures of the adequacy of reserves. Finally, for two regions, Latin America and South Asia, where the full set of variables gave somewhat imprecise results, we examined more parsimonious models.

7.1. Yield curve

An important difference between our results for bank loans and bonds is the different response to US interest rates. While bond issuance appears to fall with the US treasury rate (for 10-year maturity), bank lending appears to rise with the treasury rate (the relevant maturity in this case being 3 years). The possibility that our different results reflect the use of different interest rates led us to add a measure of the yield curve, the difference between the 10-year and 1-year treasury rates. Note from Table 11 that the sign on the yield curve is negative and highly significant, while the sign on the 3-year treasury rate now becomes negative (though not significant). In other words, bank lending now appears to increase when 3-year treasury rates fall or when the yield curve becomes flatter.[21] This result points to the possibility that when the yield curve is compressed, expecta-

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[20] This unsustainability is also evident in the behavior over time of reserves to short-term debt. Both the mean and the coefficient on the ratio of reserves to short-term debt move to raise spreads: reserves decline in relation to short-term debt and the penalty for low reserves in relation to short-term debt increases.

[21] Since a rise in the 3-year rate is typically accompanied by compression of the yield curve, the two different channels of influence are not easy to distinguish.

Table 11
Sensitivity analyses (*t*-statistics in parentheses)

	Probit (all)	Spread (all)			Spread (Latin America)	Spread (South Asia)
Log amount		−0.077	−0.077	−0.076	−0.028	0.006
		(−9.088)	(−9.091)	(−9.118)	(−0.745)	(0.195)
Maturity		0.019	0.019	0.019	−0.023	0.030
		(7.720)	(7.681)	(7.720)	(−1.812)	(3.067)
Log of 3-year	−0.056	−0.177	−0.152	−0.097	0.525	0.037
US treasury rate	(−1.140)	(−2.719)	(−2.446)	(−1.596)	(1.479)	(0.150)
Log (10 year–1 year)	−0.140	−0.020				
treasury rate	(−11.550)	(−1.244)				
Dummy for private borrower	0.323	0.140	0.141	0.229	0.223	0.352
	(24.210)	(4.118)	(4.156)	(8.851)	(1.945)	(4.272)
Dummy for Latin American loan	−0.389	0.119	0.126	−0.033		
	(−17.730)	(2.745)	(2.592)	(−0.753)		
Number of borrowing		−0.058	−0.058	−0.057	−0.055	−0.029
		(−7.822)	(−7.722)	(−7.702)	(−3.709)	(−6.089)
Credit rating residual	0.014	−0.024	−0.024	−0.021	−0.017	−0.039
	(19.980)	(−14.139)	(−13.535)	(−14.983)	(−2.685)	(−2.902)
Debt/GNP	−1.018	0.921	0.915	0.569	0.854	
	(−25.810)	(9.119)	(9.069)	(6.974)	(2.673)	
Dummy for debt rescheduling	−0.099	0.462	0.464	0.404		
	(−4.230)	(10.852)	(10.937)	(9.873)		
Debt service/exports	0.934	0.515	0.515	0.587	0.399	2.461
	(15.290)	(4.305)	(4.322)	(5.796)	(1.779)	(2.758)
GDP growth		−12.930	−13.016	−11.275	−10.432	−30.433
		(−2.759)	(−2.726)	(−2.384)	(−2.261)	(−2.804)
Standard deviation of		0.380	0.363	0.346	1.147	1.879
export growth		(3.942)	(3.805)	(3.639)	(1.326)	(2.789)
Reserves/imports	0.042		−0.002	0.071		
	(5.720)		(−0.197)	(4.965)		

Reserves/	−0.005			−0.067		
short-term debts	(−4.010)			(−7.355)		
Ratio of short-term	−0.296	1.385	1.370	0.919	1.151	0.199
debt to total debt	(−6.190)	(8.046)	(7.863)	(4.981)	(2.854)	(0.396)
Ratio of domestic	0.086	−0.432	−0.428	−0.404	−0.342	−0.263
credit to GDP	(12.510)	(−12.999)	(−12.763)	(−12.151)	(−5.513)	(−0.370)
Ratio of domestic		0.024	0.024	0.023		
credit to GDP ∗ ratio of		(6.836)	(6.741)	(6.637)		
domestic credit to GDP						
Number of repeated		0.074	0.074	0.072		
borrowing ∗ ratio of short-term		(6.326)	(6.249)	(6.200)		
debt to total debt						
GDP growth ∗ ratio of short-term		−51.986	−51.739	−53.567		
debt to total debt		(−5.617)	(−5.488)	(−5.760)		
GDP growth ∗ ratio of		16.605	16.494	16.322		
domestic credit to GDP		(15.983)	(15.930)	(15.869)		
Constant		4.799	4.762	4.817	3.473	3.574
		(28.555)	(28.673)	(30.934)	(4.472)	(4.451)
Lambda		−0.197	−0.198	0.025	0.087	0.289
		(−2.899)	(−2.896)	(0.632)	(0.740)	(5.521)
Number of observations/loans	8055	4551	4545	4545	443	319
Log likelihood	−3447.289	−6947.429	−6948.183	−6923.735	−989.023	−365.182

Note: all regressions include dummies for industrial sectors, currency of denomination and supranational borrowers as defined in Table 6.

Table 12
Correlation matrix

All	Credit rating residual	Debt/GNP	Dummy for debt rescheduling	Debt service/ exports	GDP growth	Standard deviation of export growth	Ratio of short-term debt to total debt	Ratio of domestic credit to GDP	Reserves/ imports	Reserves/ short-term debts
Credit rating residual	1									
Debt/GNP	−0.01	1								
Dummy for debt rescheduling	−0.02	0.24	1							
Debt service/ exports	−0.07	0.52	0.20	1						
GDP growth	0.00	−0.23	−0.14	−0.26	1					
Standard deviation of export growth	0.01	0.05	−0.01	−0.01	−0.02	1				
Ratio of short-term debt to total debt	0.19	−0.27	−0.16	−0.38	0.14	−0.20	1			
Ratio of domestic credit to GDP	0.33	−0.28	−0.26	−0.46	0.35	−0.03	0.40	1		
Reserves/imports	−0.05	−0.01	−0.03	0.17	0.13	0.02	−0.03	0.13	1	
Reserves/ short-term debts	−0.26	−0.07	−0.04	−0.10	−0.04	0.04	0.01	−0.08	0.07	1
Latin America	Credit rating residual	Debt /GNP	Dummy for debt rescheduling	Debt service/ exports	GDP growth	Standard deviation of export growth	Ratio of short-term debt to total debt	Ratio of domestic credit to GDP	Reserves/ imports	Reserves/ short-term debts
Credit rating residual	1									
Debt/GNP	0.18	1								
Dummy for debt rescheduling	0.06	0.12	1							

Debt service/ exports	0.24	0.08	0.03	1						
GDP growth	0.15	−0.11	0.23	−0.12	1					
Standard deviation of export growth	0.17	−0.11	−0.13	−0.28	−0.09	1				
Ratio of short-term debt to total debt	−0.30	−0.14	−0.01	−0.27	−0.01	0.16	1			
Ratio of domestic credit to GDP	0.32	0.70	−0.09	0.06	−0.03	0.01	−0.04	1		
Reserves/imports	0.04	−0.16	−0.07	0.10	0.12	−0.19	−0.25	−0.05	1	
Reserves/ short-term debts	−0.40	−0.22	−0.01	−0.33	0.13	0.18	−0.07	−0.20	0.24	1

South Asia	Credit rating residual	Debt/GNP	Debt service/ exports	GDP growth	Standard deviation of export growth	Ratio of short-term debt to total debt	Ratio of domestic credit to GDP	Reserves/ imports	Reserves/ short-term debts
Credit rating residual	1								
Debt/GNP	−0.37	1							
Debt service/exports	0.33	−0.60	1						
GDP growth	0.05	−0.42	−0.01	1					
Standard deviation of export growth	0.13	0.53	−0.26	−0.16	1				
Ratio of short-term debt to total debt	−0.70	0.65	−0.52	−0.24	0.34	1			
Ratio of domestic credit to GDP	0.68	−0.52	0.53	0.16	−0.16	−0.59	1		
Reserves/imports	0.18	−0.45	−0.11	0.59	−0.33	−0.35	0.05	1	
Reserves/ short-term debts	−0.62	0.25	−0.68	0.00	−0.10	0.46	−0.62	0.29	1

tions of future interest rate increases are dampened, thus increasing the propensity to borrow. Column 2 of Table 11 suggests that the yield curve shifts do not significantly influence the spreads charged.

7.2. Influence of reserves on spreads

Columns 3 and 4 of Table 11 add the reserve/import ratio to the spreads equation. The reserve/import ratio enters positively, the reserves/short-term debt ratio negatively. The coefficients are almost the same in magnitude, as if when short-term debt increases to finance imports and reserves remain unchanged, then there is no impact on spreads, but that when short-term debt rises for reasons unrelated to a trade transaction, it then raises spreads.

7.3. Alternative Latin American and South Asian models

For both Latin America and South Asia, the interaction terms included in the spreads equation were a source of multicollinearity. Moreover, the correlation (Table 12) among the country variables is high. Columns 5 and 6 of Table 11 therefore present more parsimonious versions of the Latin American and South Asian spread equations. The results are now consistent with the pattern observed for the full sample and other regions. The coefficients for Latin America also display greater statistical significance. For South Asia, the "wrong" sign on GDP growth disappears and higher growth is seen to produce a statistically significant and quantitatively large reduction in spreads. Thus, the more parsimonious specification, by reducing multicollinearity, eliminates some of the anomalous results reported above.[22]

8. Conclusion

Our analysis of spreads charged by international banks to emerging-market borrowers reveals a market that reacts to macroeconomic and financial information in much the same manner as the bond market. The close correspondence between the two sets of empirical results for capital flows intermediated by different institutions is surprising, even striking. Institutional connections between the two markets may help to explain this finding. Banks are sometimes the main sub-

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[22] An alternative approach to identifying the cases of non-lending is to consider for each country and each quarter the different industrial sectors as issuers. We grouped the data into five industrial categories, as described above. Thus, each country in each quarter has five potential borrowers. If a loan is observed for any of these borrowers, a "one" is generated; otherwise a "zero" is recorded. This then becomes the basis for the probit and the joint estimation of the probit and the spreads equation. The results remain virtually unchanged.

scribers to emerging market bonds, while traditional bond market investors, such as insurance companies and pension funds, increasingly participate in what are misleadingly referred to as bank syndicates. Such convergence will only increase over time as financial mergers bring "bond" and "bank" market participants under one corporate roof.

That said, the relationship between macroeconomic and financial variables on the one hand and pricing behavior on the other is more stable over time for bank loans than bonds. It is tempting to interpret this in terms of the relatively long period for which bank lending has been underway and the greater maturity of that segment of the capital market.

The large number of small bank loans issued in the 1990s, in comparison with the smaller number of larger bond issues, highlights the role of international bankers in dealing with the ongoing production and trade financing requirements of small borrowers in particular. In other words, international banks continue to play an important role in meeting the external financing needs of their borrowers in ways that the bond market cannot duplicate.

East Asia's special relationship with the international banking system is evident from the raw numbers and from the statistical relationships alike. The evidence points to East Asia's greater historical ability to time its entry and exit from the market. Where borrower heterogeneity is important, East Asian borrowers are seen to benefit from their unobserved credit characteristics.

Is there evidence of moral hazard affecting international bank lending? We do see evidence of growing bullishness in the first half of the 1990s by bank lenders to East Asia, which may reflect moral hazard. However, on this issue, it is fair to say that the jury remains out.

Finally, our results point to the riskiness of high levels of domestic debt. High short-term debt can coexist for extended periods with rapid growth but is liable to unravel if perceptions of sustainability shift. The results thus caution once again excessive dependence on short-term debt.

Acknowledgements

Appendix A. Data sources and construction of variables

A.1. Loan characteristics

   The loan data set, obtained from Capital Data Loanware and further processed by the Emerging Markets Division of the International Monetary Fund, covers the period 1991 to 1997 and includes: (a) average weighted margins plus fees (in basis points, where one basis point is one-hundredth of a percentage point); (b) the amount of the issue (millions of US$); (c) the maturity in years; (d) whether the borrower was a sovereign, other public sector entity, or private debtor; (e) number of borrowings by an entity during the period under consideration; (f) currency of issue; (g) borrower's industrial sector: manufacturing, financial services, utility or infrastructure, other services, or government (where government, in this case, refers to subsovereign entities and central banks, which could not be classified in the other four industrial sectors); and (h) the country and regional identity of the borrower.

A.2. Country characteristics

Variable	(billions)	Periodicity	Source	Series
Total external debt (EDT)	US$	annual	WEO	D
Gross national product (GNP, current prices)	US$	annual	WEO	NGDPD
Gross domestic product (GDPNC, current prices)	National	annual	WEO	NGDP
Gross domestic product (GDP90, 1990 prices)	National	annual	WEO	NGDP_R
Total debt service (TDS)	US$	annual	WEO	DS
Exports (XGS)	US$	annual	WEO	BX
Exports (X)	US$	monthly	IFS	M#c | 70_ _dzf
Reserves (RESIMF)	US$	quarterly	IFS	q#c | _1l_dzf
Imports (IMP)	US$	quarterly	IFS	q#c | 71_ _dzf
Domestic bank credit (CLM_PVT)[23]	National	quarterly	IFS	q#c | 32d_ _zf
Short-term bank debt (BISSHT)[24]	US$	semi-annual	BIS	

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[23] Credit to private sector.
[24] Cross-border bank claims in all currencies and local claims in non-local currencies of maturity up to and including 1 year.

Total bank debt (BISTOT)[25]	US$	semi-annual	BIS
Credit rating (CRTG)	Scale	semi-annual	Institutional investor
Debt rescheduling (DRES)[26]	Indicator	annual	WDT/GDF

Constructed variables	
Debt/GNP	EDT/GNP
Debt service/exports	TDS/XGS
GDP growth	$0.25\ln[GDP90\_t/GDP90\_{t-1}]$
Standard deviation of export growth	Standard deviation of monthly growth rates of exports over six months
Reserves/imports	RESIMF/IMP
Reserves/short-term debt	RESIMF/BISSHT
Ratio of short-term debt to total debt	BISSHT/BISTOT
Ratio of domestic credit to GDP	CLM_PVT/(GDPNC/4)

Sources:

International Monetary Fund's World Economic Outlook (WEO) and International Financial Statistics (IFS),
World Bank's World Debt Tables (WDT) and Global Development Finance (GDF), and
Bank of International Settlements' The Maturity, Sectoral and Nationality Distribution of International Bank Lending.

Credit ratings were obtained from Institutional Investor's Country Credit Ratings.

Missing data for some countries were completed using the US State Department's Annual Country reports on Economic Policy and Trade Practices (which are available on the internet from http:www.state.gov/www/issues/economic/trade_reports/).

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[25] Total consolidated cross-border claims in all currencies and local claims in non-local currencies.
[26] Indicator variable, which is equal to one if a debt rescheduling took place in the previous year and zero otherwise.

Appendix B. Determinants of bond issuance and spreads

B.1. Determinants of the probability of a bond issue (*t*-statistics in parentheses)

	Fixed rate			Floating rate		
	All	Latin America	East Asia	All	Latin America	East Asia
Log of US treasury rate	−0.725	−0.740	−1.337	−0.172	−0.079	−0.661
	(−7.28)	(−5.41)	(−6.94)	(−3.37)	(−1.90)	(−3.19)
Credit rating residual	0.013	0.013	0.001	0.009	0.003	0.014
	(13.46)	(6.30)	(0.32)	(16.28)	(4.87)	(3.89)
Debt/GNP	−0.382	−1.417	0.023	−0.189	−0.061	−0.560
	(−5.35)	(−15.19)	(0.12)	(−4.88)	(−3.29)	(−2.95)
Dummy for debt rescheduling	−0.206	0.024	−0.216	−0.090	0.001	
	(−5.09)	(0.70)	(−2.67)	(−4.42)	(0.07)	
Debt service/exports	−0.541	1.792	−1.589	−0.038	0.173	0.611
	(5.03)	(18.83)	(−3.55)	(−0.62)	(8.53)	(1.46)
Reserves/GNP	−0.109	−0.074	−0.543	−0.034	−0.065	−0.240
	(−5.02)	(−0.86)	(−10.36)	(−3.59)	(−2.60)	(−5.69)
Private issuer	−0.033	0.321	0.241	0.166	0.075	0.536
	(−1.42)	(10.66)	(5.22)	(12.86)	(5.77)	(13.46)
Latin America	−0.212			−0.120		
	(−0.73)			(−0.70)		
Latin American interactions						
Log of US treasury rate	0.086			−0.009		
	(0.56)			(−0.08)		
Credit rating residual	−0.002			0.003		
	(−1.05)			(1.82)		
Debt/GNP	−0.841			0.048		
	(−7.81)			(0.84)		
Dummy for debt rescheduling	0.295			0.246		
	(4.69)			(3.68)		
Debt service/exports	1.006			0.432		
	(7.43)			(5.62)		
Reserves/GNP	0.045			−0.114		
	(0.58)			(−1.97)		
Private issuer	0.348			−0.016		
	(8.92)			(−0.73)		
Number of observations	3904	1762	717	3140	1042	789
Pseudo R^2	0.3498	0.4687	0.2695	0.3826	0.3165	0.3481

Source: Eichengreen and Mody (1998b).

B.2. Determinants of spreads with selectivity correction (*t*-statistics in parentheses)

	Fixed rate			Floating rate	
	All	Latin America	East Asia	All	East Asia
Log amount	0.030	−0.018	0.067	−0.128	−0.185
	(1.00)	(−0.72)	(0.83)	(−3.55)	(−4.96)
Maturity	0.011	0.000	0.020	0.025	0.030
	(1.96)	(0.06)	(1.52)	(2.14)	(2.71)
Private placement	0.110	0.089	0.009	−0.089	−0.033
	(2.32)	(2.41)	(0.06)	(−1.28)	(−0.45)
Log of US treasury rate	−0.249	0.330	−1.048	−0.090	0.375
	(−1.19)	(1.68)	(−1.55)	(−0.31)	(1.23)
Credit rating residual	−0.038	−0.034	−0.021	−0.034	−0.058
	(−13.22)	(−8.55)	(−2.13)	(−5.65)	(−10.82)
Debt/GNP	0.535	1.548	−1.126	0.024	0.596
	(2.71)	(7.05)	(−1.68)	(0.12)	(1.89)
Dummy for debt rescheduling	0.305	0.085	0.136	0.547	
	(5.12)	(1.62)	(0.38)	(3.70)	
Debt service/exports	1.488	−0.308	5.809	1.410	1.934
	(6.70)	(−1.43)	(4.45)	(5.12)	(3.42)
GDP growth	−9.541	0.447	−1.292	−13.646	−36.093
	(−3.21)	(0.17)	(−0.08)	(−3.12)	(−4.70)
Variance of export growth	1.525	1.557	1.372	0.384	0.920
	(4.74)	(4.26)	(1.91)	(1.20)	(3.02)

B.2 (*continued*)

	Fixed rate			Floating rate	
	All	Latin America	East Asia	All	East Asia
Private issuer	0.353	−0.029	0.689	0.436	0.119
	(6.19)	(−0.57)	(4.51)	(4.73)	(1.24)
Latin America	0.326			0.090	
	(4.28)			(0.066)	
Israel	−2.299				
	(−12.78)				
Yen issue	−0.159	−0.010	−0.361	−0.323	−0.344
	(−2.20)	(−0.13)	(−2.33)	(−2.26)	(−2.95)
Deutsche mark issue	−0.127	0.106	−2.130	−0.209	−0.538
	(−1.52)	(1.54)	(−6.22)	(−1.02)	(−1.51)
Supranational	−0.668	−0.604			
	(−2.34)	(−4.24)			
Lambda	0.062	−0.550	0.306	0.138	−0.466
	(1.00)	(−19.52)	(1.54)	(1.46)	(−6.05)
Constant	4.49	5.068	5.181	4.844	5.221
	(10.61)	(11.77)	(3.91)	(8.69)	(9.07)
Number of bonds	1025	663	233	525	415
Log likelihood	−2679.062	−1165.464	−682.423	−1350.864	−687.122

Source: Eichengreen and Mody (1998b).

A.3. US interest rates

http://www.bog.frb.fed.us/releases/H15/data/b/tcm3y.txt

Countries that issued loans: Algeria, Angola, Argentina, Bangladesh, Bahrain, Barbados, Bolivia, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Czechoslovakia, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ghana, Hong Kong, Hungary, India, Israel, Indonesia, Iran, Jamaica, Kazakstan, Kenya, South Korea, Kuwait, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Malaysia, Mauritius, Macedonia, Mexico, Moldova, Morocco, Oman, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Qatar, Romania, Russia, Saudi Arabia, Senegal, Seychelles, Singapore, Slovenia, South Africa, Sri Lanka, Taiwan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, Uruguay, Vietnam, Venezuela, Zambia, Zimbabwe. Other countries included in the analysis, but which were not recorded as having issued loans are: Costa Rica, Ethiopia, Guatemala, Nigeria, Paraguay and Slovak Republic.

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