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BAILING-IN

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Attempts to bail-in private bond holders during Pakistan's Paris Club restructuring in early 1999 raise average sovereign yield spreads by 25–95 basis points for a broad sample of emerging market bonds. We use event study methodology and a simple reduced-form model of sovereign debt pricing to investigate whether observed spread increases can be attributed to moral hazard. Analysis of the cross-sectional variation in the data supports the following conclusions: (i) bailing-in causes investors to revise downward their expectations of official sector bailouts; (ii) this revision amounts to US$ 20–30 bn; and (iii) bailout expectations are driven primarily by an emerging market's official sector lending arrangements. Surprisingly, traditional macroeconomic proxies for country-level solvency and liquidity have little power to explain cross-country differences in the data. On the other hand, measures related to each country's *capital structure* (its external debt profile, undrawn IMF balances, etc) explain nearly a third.

Keywords: International debt markets; Eurobonds; moral hazard.

1. Introduction

Do the policies of the International Monetary Fund, the Paris Club, and other international financial institutions (collectively, the "official sector") affect sovereign bond prices around the world?[1] If so, does official sector crisis support result in "borrower moral hazard," encouraging risky policies by emerging market sovereigns, or does it induce "lender moral hazard" by providing implicit guarantees to international investors? If implicit guarantees to investors exist, can their magnitude be estimated? Many economists argue that official sector bailouts pay off private bond holders when crises occur and cause lender moral hazard. Private bond holders should share in the burden of restructuring sovereign debt during crises; instead of being bailed out they should be "bailed-in." Bailing-in, also known as "burden sharing" and "private sector involvement," is currently a hot topic for policy makers and academics.[2] But, which countries' bonds are most affected by bailouts and

[1] As discussed below, price changes for sovereign bonds are driven by changes in underlying risk-free rates and changes in required sovereign yield spreads. Since we control for changes in risk-free rates, "price changes" and "yield spread" changes are used interchangeably in the subsequent exposition

[2] Nouriel Roubini's website (http://www.stern.nyu.edu/globalmacro/) is an excellent reference point. Items with words in the title such as "bailing in," "burden sharing," "private sector involvement," "moral hazard," etc. generally provide good background material.

bail-ins? This paper seeks to answer each of the four questions posed above empirically.

1.1. *Do official sector policies affect sovereign bond prices in emerging markets?*

This simple question is integral to our understanding of asset pricing in international markets. Despite the controversy surrounding official sector bailouts and bail-ins, surprisingly little empirical work documents a clear link between official sector policies and bond prices. In fact, a few analytical papers have commented on the difficulty in measuring such effects. Roubini (2000) points out that "formal and systematic evidence . . . [of price distortions caused by official sector policies] . . . is hard to come up with." Jeanne and Zettelmeyer (2000) argue that the effects of bailouts which contain a transfer from international taxpayers are "likely to be empirically small." Portes (2000) notes that it is hard to see evidence that actual bailouts in 1997 and 1998 altered private investors' expectations. The author looks at aggregate data such as the volume of gross flows to emerging countries (rather than prices) and notes that little changes after the Asian crisis and subsequent bailouts.

In the first empirical study related to the above question, Zhang (1999) constructs a statistical model of emerging market bond spreads using quarterly data. He regresses yields on a constant, four macroeconomic variables (inflation, debt/exports, reserves/imports, and spreads), as well as an indicator variable that is zero before the Mexican crisis and one afterwards. Zhang (1999) finds the indicator variable is not statistically significant. He concludes that the 1995 Mexican bailout did not change bond prices (yields of sovereign debt) beyond what fundamentals might predict and, therefore, bailouts (from the official sector) do not affect sovereign bond prices. However, the regression constrains the coefficients on the macroeconomic variables to be equal before and after the crisis. Conceptually, this requires that the crisis did not change the structure of international debt markets, a constraint arguably inconsistent with the hypothesis being tested.

Since the first draft of this paper, a few empirical papers have been written. Dell'Ariccia *et al.* (2000) develop and implement a series of tests based on a statistical model. The authors conclude that "events between mid-1998 and early 1999 generally led to an increase in the levels of emerging markets bond spreads, controlling for fundamentals." Lane and Phillips (2000) use an event study methodology much like the one proposed in this paper (described in the next paragraph.) A paper by Eichengreen and Rühl (2001) focuses mainly on collective action clauses. Collective action clauses permit a bond's payment terms to be amended without unanimous consent of all bondholders. Without them, minority bondholders may be able to hold up a restructuring agreement and extort concessions from sovereign debtors or the official sector, regardless of any attempts to bail them in. Eichengreen and Rühl (2001) begin with the assertion that private lenders receive an implicit guarantee from the official sector, but do not attempt to document it empirically or estimate its magnitude.

Thus, this paper begins with a simple goal. We seek to test whether official sector policies actually affect sovereign bond prices around the world. Methodological shortcomings of the Zhang (1999) paper are addressed by taking a different approach to econometric testing. We use an event study methodology from financial economics and isolate a three-day window in early 1999, when for the first time, the official sector threatened to bail-in private bond holders. We focus on news releases surrounding Pakistan's rescheduling agreement with the Paris Club, the association of international trade creditors whose actions are closely coordinated with those of the IMF.[3] The announcement that Pakistan's private bondholders would have to restructure their debt (henceforth, the "Pakistan incident") raised *other* countries' borrowing costs by 25–95 basis

[3]Many sources have information on the Paris Club. A particularly straightforward description can be found on BradyNet. The URL is: http://www.bradynet.com/bbs/nonem/100000-0.html

points (bp) — even those countries with no trade links to Pakistan. These results are contrary to claims by Eichengreen and Rühl (2001) that official sector statements have been less than credible, and hence are largely ignored by private investors.

The event study methodology overcomes shortcomings of previous empirical studies. As sovereign bond markets developed throughout the 1990s, private lenders' expectations of official sector bailouts were incorporated into prices only gradually if at all. Sovereign bonds were not restructured in the early 1990s. They were not restructured after the Mexican crisis in the mid-1990s or the Asian financial crisis of the late 1990s. These "non-events" are likely to have contributed to a low-frequency accumulation of bailout expectations. The non-events make statistical detection very difficult as Zhang (1999) demonstrates. This paper addresses these problems by choosing a very specific event when expectations are quickly (and unexpectedly) reversed. To bolster confidence in our results, we address three possible concerns with the event study methodology we adopt: (i) we control for clustering when reporting statistical significance; (ii) we use an alternative (earlier) date that allows for partial anticipation of the event; and (iii) we control for changes in fundamentals around the world.

1.2. *What is the mechanism by which bail-ins affect sovereign bond prices?*

The debate surrounding official sector bailouts and bail-ins is typically framed in the language of *moral hazard*. In his speech to the American Economic Association and the American Finance Association, Fischer (1999) outlines two types of moral hazard that can arise from the presence of official sector creditors acting as international lenders of last resort. "Borrower moral hazard" results if implicit guarantees cause countries to over-invest or to invest in excessively risky projects. On the other hand, "lender moral hazard" results if these guarantees lead to insufficient risk assessment or monitoring by private sector lenders. Calomiris (1998) argues, that of the two, lender moral hazard "is the more pernicious" because it "removes the incentive for foreign banks to avoid lending to high-risk countries." Jeanne and Zettelmeyer (2000) extend the concept of international bailouts and moral hazard by differentiating between (i) transfers from international taxpayers to domestic taxpayers; and (ii) an emerging country providing liquidity during a time of crisis at the expense of domestic taxpayers. Roubini (2000) provides a good overview that summarizes all of these points.

Not surprisingly perhaps, the prospect of bail-ins for private bondholders, typically, has not been well received by emerging market sovereign debtors. If official sector bailouts are contingent on private sector bail-ins, they fear that private investors will expect greater losses in the event of sovereign default and increase the yields they require for holding sovereign debt. This increase in yields is consistent with lender moral hazard, but it ignores the possibility of borrower moral hazard. If borrower moral hazard exists, then bailing-in private bondholders should increase their monitoring activities and reduce incentives for emerging market policymakers to engage in overinvestment and inefficient risk-taking. With borrower moral hazard, a policy shift toward bail-ins should *lower* the probability of sovereign default and *reduce* required yields for emerging market sovereigns.

In Section 3.2 below, we formalize these assertions in terms of a simple reduced-form model of sovereign debt pricing. The model admittedly oversimplifies the relationship between moral hazard and sovereign debt pricing, but it offers a useful framework for investigating the mechanism through which the Pakistan incident affects sovereign debt prices (or yield spreads). It also motivates further cross-sectional analyses that help to distinguish the primary effects of bailouts and bail-ins. Linking moral hazard to default and loss rates in a more complete manner, or allowing them to be endogenously determined by underlying fundamentals, is a difficult analytical task that is best left for future research.

Our empirical tests provide overwhelming evidence that the Pakistan incident *increases*

yield spreads for virtually all emerging markets sovereigns, providing strong evidence for the existence of lender moral hazard. In principle, average yield spread increases could mask smaller *decreases* due to reductions in borrower moral hazard. We investigate this possibility further with the cross-sectional analyses of country-specific factors described below. Our event study findings seem at odds with Jeanne and Zettelmeyer (2000) who claim that transfers from international taxpayers to domestic taxpayers are less significant than transfers among domestic taxpayers during times of crisis. Prior to the Pakistan incident, lender moral hazard resulting from implicit official sector guarantees appears to provide emerging markets with large transfers from international taxpayers in the form of lower required yields for sovereign debt.

1.3. *Can we estimate the economic magnitude of "bailing-in" rather than "bailing out" private investors?*

If bailing-in private bondholders primarily affects the losses they expect in the event of default, we can use the reduced-form model of Section 3.2 to estimate the value of the official sector bailouts they expect to receive. Calibrating the model to aggregate external debt statistics for the emerging markets in our sample, and using typical values for market prices and yields, we estimate that the 30 bp increase in sovereign yield spreads observed during our event window equates to a reduction in expected bailouts of roughly US$20–30 bn.

1.4. *Which countries' bonds are particularly affected by a policy shift towards bailing-in?*

Our analysis concludes with a cross-sectional examination of the changes in yield spreads observed in the data. First, we use sovereign credit ratings and country-level solvency and liquidity indicators to further identify the mechanism by which bailing-in affects sovereign bond prices. The results provide additional support for lender moral hazard, and virtually no evidence that borrower moral hazard is present in the data. Subsequent analyses shed light on the manner in which investors form bailout expectations. Spread increases are larger for countries with considerable amounts of Paris Club debt and external bonds outstanding. Increases are even greater for countries with outstanding IMF credits. They are greatest of all for countries with *undrawn* balances with the IMF. In all of these cases, results are difficult to reconcile with borrower moral hazard. Instead, it seems investors systematically evaluate expected losses in light of an emerging market's official sector lending agreements.

Our cross-sectional analyses address a number of unanswered questions in the paper by Dell'Ariccia *et al.* (2000). The authors note that increases in spreads are generally not uniform across countries. They find "increases in spreads [are] mainly found in countries with weak fundamentals, while countries with traditionally stronger fundamentals [experience] constant and even decreasing spreads." We take the analysis further. Controlling for borrower credit quality, we find that spread increases are directly linked to *country* capital structure (the composition of its external debt and undrawn IMF credit lines), providing strong evidence that investors consider official sector lending decisions in assessing the losses they expect to incur on emerging market bonds. Our results are indirectly related to recent work that balance-sheet effects are very important during times of crisis. Dornbusch (1999) claims that national balance sheets are a central reason behind recent crises. Similarly, Krugman (1998) blames the Asian crisis on "financial intermediaries — institutions whose liabilities were perceived as having an implicit government guarantee." Finally, Harvey and Roper (1999) explain how the recent Asian crisis was exacerbated by Asian managers who increased their firms' leverage through the use of US dollar-denominated Eurobonds. Our results suggest that characteristics of *sovereign* balance sheets might also have played a significant role by influencing bailout expectations and distorting prices in the increasingly large market for sovereign bonds.

The paper proceeds as follows. Section 2 describes the data used in this paper. Section 3 presents the methodology and results and is structured around the four questions posed above. Section 4 carries out a number of robustness checks to confirm our findings. Finally, Section 5 concludes.

2. Data

This paper examines the price movements of 402 different bonds from countries *other than* Pakistan (see Table 1 for an overview and summary statistics). We choose non-Pakistani bonds to focus on emerging markets whose underlying macroeconomic fundamentals cannot reasonably be expected to have been impacted by the Pakistan incident. By focusing on the primitive (underlying) securities rather than constructed yield or price indices, we are able to test a broader range of hypotheses and to control for country-specific and bond-specific factors. The disadvantages of working with bond-level data, however, are plentiful. Bond data are notoriously difficult to obtain since bonds rarely trade on organized exchanges (as opposed to equities).

Assembling a list of bonds: Our database of bonds is constructed in the following manner. First, we focus only on sovereign bonds. Second, we identify a list of emerging market countries as the union of countries listed by: (i) the Emerging Market Trading Association (EMTA); (ii) datastream under the lists "Brady" and "Brady-Z"; and (iii) Bloomberg under its list of Brady bonds. The final list of 41 countries is shown in Appendix A. Third, we search data provided by Datastream, Bloomberg, and EMTA and record all bond issues from these countries. Survivorship bias is addressed by using old lists of bonds from the same sources. Fourth, we limit our study to sovereign bonds that are backed by a federal government. Fifth, we eliminate all but US dollar bonds in an effort to eliminate differences caused by currency movements. Finally, no strips are included since price information is not obtainable for the myriad of bond strips that can be created from a single Brady bond. We are very careful about data-snooping biases. Inclusion of a country does not ensure that our sample contains US$-denominated, sovereign bonds. In the case of the Czech Republic, India, Morocco, Romania, and Taiwan, for example, the countries are included but no bonds are identified. The final tally consists of 410 individual bond issues (402 not from Pakistan). Many of these bonds are lightly traded. Rather than culling our data any further we simply note *ex post* whether a bond has price/yield information or not — see Appendix A. For the purposes of this paper, we also ignore Pakistani bonds and focus on price/yield movements for the *rest* of the world.

Cross-section data: For each bond (whenever possible) the following data are recorded: (i) International Security Identification Number (ISIN); (ii) datastream number; (iii) issuing country; (iv) currency — always US$ in

Table 1. Overview of bond data.

	Bonds (#)	Bonds w/ issue amount information (#)	Average issue amount (US$)	SD issue amount (US$)
All bonds (ex. Pakistan)	402	385	1.15 bn	1.86 bn
EMTA Euro	28	28	1.23 bn	1.15 bn
EMTA Brady	86	85	0.92 bn	1.12 bn
DS Brady	21	21	1.08 bn	0.98 bn
DS Brady-Z	89	87	0.94 bn	1.12 bn
B-Berg Brady	106	104	0.92 bn	1.08 bn

This table presents an overview of the bond data used in this paper. Bonds are chosen by first combining countries listed by the EMTA, Datastream in its "Brady" list, Datastream in its "Brady-Z" list, and Bloomberg in its list of Brady bonds. We focus only on US dollar-denominated bonds from each country. Individual bond issues are then found by searching EMTA, Datastream, and Bloomberg. We consider only emerging market bonds from countries other than Pakistan. While there is some information on all 402 individual bonds, only 385 of these bonds have information regarding the size of issue.

this paper; (v) amount issued in US dollars; (vi) issue market — Euro, Yankee, Global, etc.; (vii) coupon type — fixed, floating, variable, zero, etc.; (viii) a dummy if the bond has put or call features; and (ix) a dummy if the bond has sinking fund features. Appendix B presents various bond-level descriptive statistics of our data.

Time series data: For each bond (whenever possible) the following data are collected at a *daily* frequency: (i) price — the clean trading price;[4] and (ii) yield — the discount rate that equates the dirty trading price to the present value of future coupon and principal payments. Although we collect price data, we concentrate on yields in this paper. For Brady bonds, the sovereign yield is more complicated to calculate. Many include rolling guarantees, collateralized with high-grade commercial paper, which cover the following three coupon payments. The final repayment of principal is also typically collateralized with a US Treasury strip. Therefore, the present value of these cash flows must be subtracted from the bond's quoted price. The remaining (unguaranteed) payments are used to calculate the "stripped Brady yield." Bloomberg performs these calculations on a daily basis using J.P. Morgan's methodology. Our dataset begins on January 1, 1994 and ends March 31, 2000 which represents 1631 trading days. The following US Treasury strip yields are also collected at a daily frequency: 3 month, 6 month, 1 year, 2 year, 5 year, 10 year, 20 year, and 30 year are used to calculate spreads. A bond's "spread" or "spread to treasury" can be calculated at any point in time by subtracting the US Treasury yield from the bond's quoted yield. We follow Bloomberg's convention and subtract the yield of a US Treasury strip that matches the duration (as opposed to remaining life) of the bond. Spreads that do not fall exactly on the eight strips are calculated by linear interpolation.

Country-specific data: Our dataset also includes the following macroeconomic and external debt variables for each of the 41 countries in our sample: (i) Institutional Investor credit rating where "0" is worst and "100" is the best; (ii) imports and exports in US$ mm; (iii) GDP; (iv) imports from and exports to Pakistan; and (v) the external debt statistics from the joint BIS–IMF–OECD–World Bank database on external debt. For a detailed description of the data fields, please see Appendix C and D.

3. Methodology and Results

This paper first conducts an event study to test whether or not official sector policies affect sovereign bond prices in emerging markets. It then formalizes borrower and lender moral hazard in terms of a simple reduced-form model of risky debt. The model allows us to investigate the mechanism by which bailing-in affects prices, and to estimate the magnitude of expected future bailouts. Finally, we use the model to motivate additional cross-sectional analyses. The results help determine which countries' bonds are most affected by official-sector bailouts and bail-ins, and shed additional empirical light on how moral hazard affects emerging market sovereign bond yields.

3.1. *The event study — official sector policies* do *affect sovereign bond prices in emerging markets*

Many (most) event studies in financial economics focus on abnormal returns of equities surrounding a pre-defined event. Abnormal returns, in turn, are defined in reference to an underlying market model such as the capital asset pricing model. There is no consensus on an appropriate theoretical model for valuing sovereign bonds. Following the seminal work by Eaton and Gersovitz (1981), most authors conclude that some combination of the benefits of a reputation for repayment and the costs of creditor sanctions induce repayment in equilibrium. Early "structural" models of sovereign debt pricing, in the spirit of Merton's (1974) analysis of risky corporate bond pricing, use these concepts to derive a maximum debt capacity for each sovereign in terms of underlying "fundamentals." Often, these

[4]A bond's clean price is exclusive of accrued interest. The dirty price is inclusive of accrued interest.

fundamentals are linked to the value of external trade or the benefits of inter-temporal consumption smoothing, under the assumption that sovereigns who refuse to repay can be excluded from international trade or finance. The relationship between a country's debt capacity and its total outstanding sovereign debt determine debt prices or, equivalently, determine the yield premium investors require for holding sovereign debt. As in the corporate bond context, these structural models perform poorly in explaining the data.[5]

Fortunately, our event study methodology obviates the need to identify the underlying "fundamentals." None are likely to change systematically during our three-day event window. In that case, "normal" returns should be earned on all bonds in our sample, implying that sovereign yield spread should remain the same. More formally, we define the yield spread for bond i at time t as $YS_{i,t} = Y_{i,t} - R_t$, where $Y_{i,t}$ is bond i's yield to maturity and R_t is the yield to maturity of a US Treasury strip (zero coupon bond) with the same duration. *Abnormal* returns are earned whenever yield spreads widen or narrow. Defining bond i's change in yield spread, $\Delta YS_{i,t}$, as

$$\Delta YS_{i,t} = YS_{i,t} - YS_{i,t-1} \tag{1}$$

we conclude that investors enjoy high returns whenever $\Delta YS_{i,t}$ is negative. They suffer abnormally low returns whenever $\Delta YS_{i,t}$ is positive. There are a number of alternative ways of measuring emerging market sovereign spreads. Often a US Treasury security with the same *maturity* is used instead of a strip, particularly in references to sovereign spreads in the popular press. Sovereign yield spreads can also be measured in terms of differences in log yields, as we do below to motivate our cross-sectional analyses. For consistency with Bloomberg, our primary source of market data, we use the measure in Eq. (1) for our main event study results.

Choosing the bailing-in event date: We choose a very specific event in early 1999 — an event identified by official sector statements and the press as central to the bailing-in debate. Prior to 1999, a "typical" pattern of sovereign debt restructuring had emerged. Troubled debtors first agree to IMF programs if a current program is not in place. This step fulfills the Paris Club's "appropriate conditionality" pre-condition. Debtor countries then seek Paris Club agreements to reschedule official bilateral debt. In the 1970s, concerns over the possibility that the Paris Club might be "bailing out banks" with public money led to the requirement that the debtor countries reschedule their commercial bank debt on comparable terms to those of the Paris Club — see Vitale (1996). This negotiation is conducted under the auspices of the so-called "London Club." Comparable restructuring is also required of all other significant sovereign creditors as a pre-condition for Paris Club support. Claims of official multilateral lenders — the IMF, the World Bank, and regional development banks — are the sole exception. They are exempt from rescheduling since their role is presumably to provide new loans to the debtor. Prior to 1999, sovereign bonds had been dismissed by the Paris Club as *de minimis*, or too small in magnitude to be included in the formal restructuring agreement.

This typical pattern of restructuring changed in early 1999. From January 27–30, 1999, officials from Pakistan's Ministry of Finance met with representatives of the Paris Club to negotiate a rescheduling (restructuring) agreement for the country's official, bilateral debt. Throughout the 1990s, emerging markets came to rely less on commercial banks and more on bond markets to meet external borrowing needs. Consistent with its requirements for commercial banks, the Paris Club stipulated for the first time that Pakistan must also restructure its sovereign Eurobonds on "comparable" terms. Though not large in absolute terms, Pakistan's US$750 million in Eurobonds and floating rate notes (FRNs) were not judged *de minimis* in comparison to its US$3.2 billion of official debt rescheduled by the Paris Club. Initial press accounts focused

[5]Appendix 7 reviews a number of empirical analyses that seek to estimate "market models" based on country-specific macroeconomic variables and proxies for global "market conditions."

Table 2. Timeline of events.

Aug 17, 98	WSJ Europe	Russia devalues ruble. Russian Eurobonds drop roughly 30%.
Sept 24, 98	Dow Jones	News of previous day's LTCM bailout surfaces.
Oct 02, 98	G-22	G-22 Working Groups submit reports on strengthening financial architecture. Working Group on International Financial Crises stresses need for private sector involvement, and endorses IMF "lending into arrears" to private creditors.
Oct 12, 98	Business Wire	S&P lowers its long-term, foreign currency, issuer credit, and senior unsecured ratings for the Islamic Republic of Pakistan from CCC to CCC−.
Oct 30, 98	G-7 Communiqué	G-7 pledges concrete steps to strengthen international financial architecture, including new procedures for greater private sector involvement in crisis resolution.
Nov 10, 98	Euromoney	Article on possible/probable Eurobond defaults. Isolated cases may not have systematic risk.
Dec 2, 98	Dow Jones	Pakistan in technical default on US$13.6 mm Eurobond coupon. Attributed to clerical error.
Dec 9, 98	Dow Jones	Promoting greater participation of the private sector in financial crisis resolution cited as one of the pillars of the "new financial architecture" discussed by the G-10.
Dec 14, 98	Dow Jones	Paris Club agrees in principle to reschedule debt after formal IMF loan approval.
Jan 13, 98	Financial Times	Brazil devalues currency by 8%.
Jan 27, 99	US Treasury	Summers testifies before the Senate Foreign Relations Committee and emphasizes the need to ensure greater private sector burden sharing in considering role of IMF.
Jan 27–30, 99	US Treasury	Paris Club negotiators agree to reschedule Pakistani debt. Implications of comparability explicitly not spelled out.
Jan 29, 99	Associate Press	Brazilian real drops beneath R$2.00 for the first time since devaluation and suffers worst single day depreciation.
Jan 29, 99	Dow Jones	S&P changes its long-term and short-term foreign currency issuer credit rating for the Islamic Republic of Pakistan to SD — selective default. It is not known whether Pakistan's Eurobonds and FRNs will be affected.
Jan 30, 99	Financial Times	IMF's Fischer departs from World Economic Forum in Davos to Brazil to discuss further IMF support.
Jan 30, 99	Asian WSJ	Pakistan finance minister announces terms of deal. Claims the most generous terms ever granted by Paris Club.
Feb 3, 99	Financial Times	Brazil replaces central bank governor in move to regain market confidence.
Feb 5, 99	Financial Times	Mexico and Argentina take advantage of market stability to issue sovereign bonds. Issuance is the first for Mexico since Russian crisis and the first for Argentina since Brazil's devaluation.
Feb 6, 99	Economist	Worries about defaulting or restructuring Russian Eurobonds. Claim that Pakistan is now being asked to do it.
Feb 8, 99	Financial Times	Russian private bank, Uneximbank, defaults on Eurobond payment. First Eurobond default for Russian private company.
Feb 13, 99	Economist	Economist article reviews debt negotiations over the past 1–2 weeks. Discusses comparability at length.
Feb 17, 99	Dow Jones	S&P expects sovereign bond defaults and rescheduling.
Feb 20, 99	G-7 Communiqué	Stresses involvement of private sector in crisis resolution, and specifically references creditor comparability in Russian context. Pledges early March international working group to address private sector involvement in crisis resolution, exchange rate regimes, and strengthening the IMF and World Bank.

Table 2. *continued*

Feb 21, 99	WSJ	Pakistani and Indian Prime Ministers conclude weekend summit pledging to reduce risk of accidental nuclear war. First trip to Pakistan by Indian Prime Minister since 1989. Tensions escalated previously with rival nuclear tests by both nations in May, 1998.
Feb 25, 99	S&P News Wire	Brady Bonds could be hit by Paris Club Comparability.
Feb 26, 99	Dow Jones	Pakistan debt deal "opens gate for Eurobond restructuring" according to Dow Jones Emerging Markets report.
Feb 26, 99	Dow Jones	Russian Eurobond prices falling. Fears come from a clause in Pakistan's rescheduling with Paris Club.
Mar 4, 99	Dow Jones	French Finance Minister Dominique Strauss-Kahn announces that debt relief must include all private creditors, including Eurobond holders.
Mar 11, 99	G-7 Communiqué	G-7 hosts international working group in Germany to identify mechanisms for private sector involvement in financial crises.
Mar 17, 99	IMF	IMF Executive Board meets to discuss "Involving the Private Sector in Forestalling and Resolving Financial Crises." Paper released April 15 (see below).
Mar 24, 99	Moody's	Moody's issues a report claiming that Pakistan Paris Club decision represents a new paradigm for burden sharing.
Apr 12, 99	IIF	IIF Managing Director sends letter to Finance Ministers and Central Bank Governors in advance of month-end IMF/World banks meetings. Letter warns that Pakistan's forced bond restructuring was ill-advised and that similar actions could hinder market access.
Apr 13, 99	IIF	IIF releases "Involving the Private Sector in the Resolution of Financial Crises in Emerging Markets." Paper expresses concerns about "dirigiste approaches that attempt to force private market participation."
Apr 15, 99	IMF Press Release	Advanced copies of "Involving the Private Sector in Forestalling and Resolving Financial Crises" released.
Apr 21, 99	US Treasury	US Treasury Secretary Rubin details financial architecture reform in speech. Private sector involvement in crisis resolution is highlighted as first of five "concrete further steps" needed. Rubin states "there is no reason why one category of unsecured private creditors should be regarded as inherently privileged ... claims of bondholders should not be viewed as necessarily senior to claims of banks."
Apr 21, 99	The Independent (UK)	In separate speech, UK Chancellor of the Exchequer also calls for specific proposals for burden-sharing to be agreed by year end.
Apr 26, 99	G-7	Statement of G-7 Finance Ministers and Central Bank Governors cites need for greater participation of the private sector in crisis containment and resolution in discussion of strengthening international financial and monetary systems.
Apr 27, 99	IMF Communiqué	Communiqué of the Interim Committee of the Board of Governors of the International Monetary Fund echoes G-7 call for greater private sector involvement. Indicates willingness to lend into arrears on private debt.

This table outlines some of the major events surrounding the renegotiations of Pakistan's debt. Dates come from news wires (Dow Jones, AP, etc.) and are found by searching Dow Jones News Retrieval and Lexis/Nexis. Searches look in both the title and text of the article. Search words include: Pakistan, Eurobonds, Pakistan & Paris Club, Pakistan & debt, burden sharing, and financial architecture.

exclusively on the generous terms the Paris Club granted in restructuring its official, bilateral debt. Later, the extension of Paris Club comparability to Pakistan's Eurobonds became publicly known.[6] Table 2 presents a timeline of events surrounding the Paris Club negotiations.

[6]Interviews with US Treasury officials confirmed that the full extent of the negotiations was not initially released to the public.

Care is taken to identify exactly when the event became publicly known. For this study we focus on February 25, 1999. This date is consistent with internal official sector reports. More directly, it is the date the "comparability," or bailing-in, issue hit the financial news wires.

Choice of event: The Pakistan incident described above represents an ideal natural experiment for a number of reasons. It was the first time that the Paris Club demanded comparable treatment of private bond holders during a debt renegotiation. Second, interviews with Treasury officials confirm the centrality of this event in the bailing-in debate. Third, a debt crisis in a country as small as Pakistan's can hardly be expected to have worldwide effects. Pakistan's GDP is only 8.2% of Brazil's and 22.8% of Russia's. Pakistan's main trading partners are the United States, United Arab Emirates, and Germany, so a disruption of payments should not affect countries in our sample. Given the event window's very short duration, as argued above, structural fundamentals altering sovereign debt pricing for the nations in our sample should not have changed appreciably either. Finally, the size of Pakistan's Eurobonds also makes this an ideal natural experiment. At the time of the Paris Club negotiations, the country had just US$750 mm of Eurobonds and FRNs outstanding, of which only US$300 mm was due in 2000. This number was large enough to warrant the attention of the Paris Club (who rescheduled US$3.2 bn of debt). But it is difficult to argue that rearranging the associated payments could have created a liquidity shock large enough to affect other countries' debt prices (yields).

Event study results: Given this background, we test the following hypothesis:

$$\mathbf{H}_0: \text{ The Paris Club announcement does not affect emerging market bond prices} \quad (2)$$

Table 3 presents the results of the event study and clearly rejects H_0 at all standard levels of significance. We run the study with a number of different groups of bonds (all denominated in US$). Although we present results from all relevant groups, we focus on the EMTA Eurobonds since these are the benchmark issues that are tracked by the industry trade association. In column 3, we see an average spread increase of 95.63 bp over the 3 day event window. Due to the heavier trading of the EMTA Eurobonds, it may not be surprising that they show the largest and most statistically significant change. Liquid Brady bonds show a smaller change in yield spread of 25–40 bp. Note that we are measuring changes in yield spreads over 3 days: February 24, 1999, February 25, 1999, and February 26, 1999. To do this we use the difference in closing

Table 3. Yield spread change and event window surrounding February 25, 1999.

Bond group	(1) Total # of bonds	(2) # of Bonds w/spread info.	(3) Average change in spread (bp)	(4) *t*-Stat based on sample size of N	(5) *t*-Stat based on bootstrap Monte Carlo	(6) % of bonds with spread change <0	(7) *t*-Stat based on empirical portfolio
All bonds (ex. Pakistan)	402	180	27.90	4.47	4.45	11.67	3.05
EMTA Euro	28	28	95.63	3.79	3.96	10.71	6.05
EMTA Brady	86	64	29.10	3.77	3.83	4.69	2.33
DS Brady	21	18	41.31	4.61	4.53	0.00	2.68
DS Brady-Z	89	53	25.70	2.83	2.98	7.55	2.24
B-Berg Brady	106	71	29.65	4.14	4.17	5.63	2.40

This table presents the results of an event study surrounding the Pakistan debt rescheduling/negotiations. Under the null hypothesis, news regarding specifics of the Pakistan negotiations should not affect prices of other countries' sovereign bonds. This is especially true for the news announcement concerning Paris Club demanding "comparable" treatment (i.e. sharing of losses) by holders of Pakistan's Eurobonds. This table reports the change in bond spreads over a 3 day event window (changes measured from Feb 23, 1999 to Feb 26, 1999.) For Brady bonds, this is the difference between the stripped Brady yield and US Treasuries. For other sovereign bonds, this is simply the difference between the bond's yield and the yield of a US Treasury strip (zero coupon bond) with the same duration.

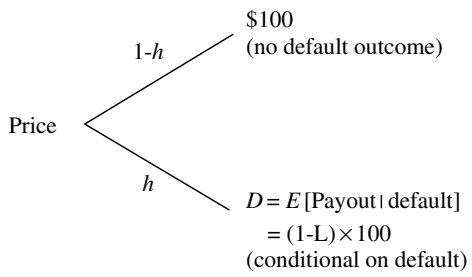
prices (and yields) between February 26, 1999 and February 23, 1999.

Statistical significance: Because we are examining only one event/date, we approach statistical significance in four different ways. In column 4, we provide a traditional t-stat based on the null hypothesis that price (yield spread) changes are independent across bonds. This can be thought of as an upper bound, since our sample contains multiple bonds from some countries. Column 5 performs a bootstrap test by making 1000 draws (with replacement) from our empirical distribution of price (yield spread) changes. This test also assumes independence. In column 6, we provide a non-parametric statistic that simply counts the number of bonds that experience a drop in yield spread during the event window. The results can be likened to p-values and are surprising — not one of the 18 Brady bonds tracked by Datastream experiences a narrowing of yield spread. Finally, in column 7, we follow Lo (1999) and form an equal-weighted portfolio of bonds within each group (e.g. EMTA Euro, Datastream Brady, etc.) We measure the historical volatility of the portfolio and use this measure to calculate the standard error of the average change in yield spread. This methodology specifically takes into account the correlations among bonds within each group. Due to the disruption to the international bond markets during the Russian/LTCM crisis and the Brazilian devaluation (see Table 2), we choose our estimation window to be the first half of 1998 (from the beginning of January to the end of June.) We see that the revised t-stats are less than in column 4 due to correlation among bonds. But t-stats still remain statistically significant at all traditional levels. The one exception to this pattern is the group of "EMTA Euro" bonds. For these bonds the t-stat actually goes up. Historically, bonds within this group are (slightly) negatively correlated in such a way that the portfolio variance is very low. During our event window, 89% of the bonds experience a non-negative change in yield spread with considerable dispersion. Thus, the traditional t-stat based on a sample size of 28 is actually lower than that based on the historical, standard deviation of a portfolio of the same bonds.

3.2. *The mechanism by which bailing-in affects sovereign bond prices*

The initial hypothesis, H_0, intentionally places no sign restriction on the change in bond prices (or yield spreads) associated with the Pakistan incident. Consistent with the discussion in Section 1.2 above, we expect bailing-in to increase spreads if lender moral hazard has the greatest impact on sovereign bond yields. We expect it to lower spreads if borrower moral hazard has a larger effect.

To clarify these potentially offsetting effects, we formalize lender and borrower moral hazard in terms of a simple one-period model of sovereign bond pricing. To avoid unnecessary complexity, we opt for a reduced-form modeling approach and consider a sovereign bond that pays $\$D$ in the event of default and \$100 otherwise. In this case, the loss rate, L, is equal to an investor's expected loss in default — expressed as a percent of face value — and can be written as $L = (1 - D/100)$. Assuming default occurs with constant probability h (for "hazard rate"), the bond's payments can be represented by the following payoff diagram:



The bond's price, P, is the present value of its payoffs. Its yield to maturity, Y_i, is simply its rate of return, assuming payment in full. Using these facts, the bond's price and yield to maturity, Y_i, can be written as

$$P = \frac{100}{1+R}(1 - hL) = \frac{100}{1+Y_i} \qquad (3)$$

While admittedly oversimplified, Eq. (3) incorporates the essential features of virtually all reduced-form pricing models: a hazard rate, h,

a loss rate, L, and the returns investors require for bearing default risk, R.[7] Intuitively, the bond's yield to maturity, Y_i, ensures they are adequately compensated given required returns, R, and their expected loss of principal due to sovereign default.

To keep things simple, assume that investors are risk-neutral with respect to sovereign default risk, or that this risk is perfectly diversifiable.[8] In either case, investors only demand compensation for their expected losses, and R can be interpreted as the risk-free rate of return. Rearranging Eq. (3), the bond's (gross) yield spread can be written as

$$\frac{1+Y_i}{1+R} = \frac{1}{(1-hL)} \tag{4}$$

To investigate the determinants of percentage changes in yield spreads, we take logs of both sides of Eq. (4) and totally differentiate (ignoring higher order terms):

$$d(y_i - r) \cong L\,dh + h\,dL \tag{5}$$

Equation (5) introduces definitions $y_i \equiv \log(1+Y_i)$ and $r \equiv \log(1+R)$ for notational convenience, and the approximation relies on the fact that $\log(1+x) \cong x$ for small x. As a final step, assume both h and L are functions of underlying fundamentals, Z, and expected bailouts, B. Since fundamentals do not change during the event window, $dZ = 0$. By construction, changing bailout expectations, dB, are the sole cause of changes in yield spreads observed during the event window.

Expressing dh and dL in Eq. (5) in terms of underlying changes in bailout expectations, we arrive at the following relationship:

$$d(y_i - r) \cong L(Z,B)\frac{dh}{dB}dB + h(Z,B)\frac{dL}{dB}dB \tag{6}$$

Equation (6) is more intuitive than it seems. Changes in yield spreads following changes in bailout expectations are driven by two components. The first reflects reductions in borrower moral hazard. The second reflects reductions in lender moral hazard. As demonstrated below these components work in opposite directions.

Borrower moral hazard and h: The borrower moral hazard argument asserts that expected official sector bailouts lead to excessive risk-taking by emerging market policy makers. In principle, this risky behavior could have an impact on both the probability of default and the losses that investors expect when default occurs. It seems most consistent with typical arguments, however, to define borrower moral hazard in terms of the effects of bailout expectations on an emerging market's hazard rate, h. In that case, borrower moral hazard posits that expected bailouts increase the probability of default, implying $(dh/dB) > 0$. Bailing-in reduces expected bailouts, implying $dB < 0$. Loss rates, L, are between zero and one for all bonds, so the borrower moral hazard component of Eq. (6) is negative. Equation (6) simply formalizes the intuition described above in Section 1.2. If borrower moral hazard leads policy makers to take too many risks, bailing-in makes sovereign bonds safer investments and reduces required sovereign yields. As long as sovereign bond markets are fairly efficient, investors should incorporate this new risk profile during the three-day event window, and yield spreads should narrow following the Pakistan incident.

Lender moral hazard and L: The lender moral hazard argument asserts investors ignore the risks of lending to emerging markets due to official sector bailouts. Arguably, this could affect their assessment of both default probabilities and loss rates. They may assume default probabilities are lower than they are, affecting h. It is more consistent with the lender moral hazard argument, however, to assume investors count on official sector bailouts to minimize their losses when defaults actually occur. More specifically, assume bailouts directly increase investors' recoveries, so they expect recoveries of $0 \leq D_0 \leq 100$ without bailouts, and $0 \leq D_0 + B \leq 100$ with them. Also,

[7] For a formal derivation of reduced-form bond pricing in a continuous time setting see Duffie and Singleton (1999).

[8] Equation (5) can also be derived from the assumption that the yield premium investors demand for holding sovereign default risk does not change over the event window.

assume expected bailouts, B, are measured as dollars per \$100 of face value. From the definition above, $L = (1 - D/100)$, so $(dL/dB) = -0.01$. Expected loss rates increase by a percent for each percent reduction in expected bailouts. Bailing-in reduces expected bailouts, implying $dB < 0$. Both h and L are between zero and one for all countries, so the lender moral hazard component of Eq. (6) is positive. This simply formalizes the simple intuition given in Section 1.2. Where lender moral hazard is significant, reduced bailouts imply greater expected losses for investors in the event of default. As long as default probabilities are positive for all emerging markets, bailing-in causes investors to revise upward the yields they require for holding sovereign debt. Since this revision occurs as soon as the news of the Pakistan incident reaches the market, we are able to witness a rapid *unwinding* of bailout expectations, while Zhang (1999) and other authors have had difficulty measuring their gradual accumulation with lower frequency data over a much longer time horizon.

Interpreting the event study results: As evident in Table 3, yield spreads increase for all groups of bonds considered in the three days following the Pakistan incident. Equation (6) provides an initial interpretation of these results. Hazard rates and loss rates are both between zero and one. The reduction in expected bailouts is also the same for both borrower and lender moral hazard components. Since spreads rise for virtually all emerging markets, initial results provide evidence for lender moral hazard in the data. Bailing-in appears either to have no effect on borrower moral hazard, or to have an effect that is too small to detect in the aggregate results. This latter possibility is examined further in the cross-sectional analyses below.

3.3. *Estimation of economic magnitudes*

We argued in the previous section that the rise in yield spreads due to the Pakistan incident can be attributed to an increase in losses expected in the event of default. Under this assumption, the 25–95 bp increase in yields can also be translated directly into dollar terms. Table 4 presents a rough calculation based on available data, market rates, and our results. For each of 41 countries in our universe, we use the total value of external debt securities (bonds, private placements, MTN, and Brady Bonds) of the as calculated by the Bank of International Settlements (BIS). We then assume a hazard rate of 30%, a duration of 5 years, a riskfree rate of 7.00%, and a required market yield of 12.00%. Given these assumptions, we solve for the price of debt, the expected payout, and the expected payout given default (recovery rate).

We then consider a (conservative) shift in the loss rate that corresponds to a shift of 30 bp in the required market yield from 12.00% to 12.30%. We recalculate the price and expected payout. The *key* number is the change of expected payout given default, also called the "estimate of expected bailouts." This number is calculated using the change in expected payout given default before and after the 30 bp shift in yields. The difference represents the reduction in investors' expected bailouts (expressed in US dollars.) For a hazard rate of 30%, the estimate of expected bailouts is US\$17.46 bn for the debt for these 41 countries.

Investors may not expect hazard rates as high as 30%. Lower (assumed) hazard rates increase the magnitude of our estimate of expected bailouts. A hazard rate of 20%, for example, corresponds to an estimate of expected bailouts of US\$26.19 bn. Overall, the results are important. As of January 31, 1999, IMF credit outstanding totaled nearly US\$89 bn. Thus, if hazard rates are rate low, small changes in prices (yield spreads) can mask very large changes in expected bailouts on a worldwide, dollar scale. In fact, with plausible hazard rates, expected bailouts could be as high as total IMF credit outstanding.

Other static comparisons can be made using Table 4. For example, increasing the assumed duration to 10 years makes our estimate of expected bailouts equal to US\$27.60 bn. Also, reducing the initial yield spread to 300 bp, while keeping the change in spreads at 30 bp, makes our estimate of expected bailouts equal to US\$19.45 bn. Finally, using a large change in

Table 4. Economic impact.

Base case					
Hazard rate:	30.00%	(assumed)	Riskfree Rate:	7.00%	(assumed)
Duration:	5.00 yrs	(assumed)	Yield:	12.00%	(assumed)
Face value of debt:	US$495.32 bn	(assumed, from BIS)	Spread:	500.00 bp	(Yield, Riskfree Rate)
Price of debt	56.74	(per US$100 calculated from assumptions)			
Expected payout	79.58	(per US$100, calculated from assumptions)			
Expected payout | Default	31.95	(per US$100, calculated from assumptions)			
Expected payout | Default	US$ 158.25 bn	(equals 495.32 × 31.95/100.00)			
Yield shift of 30 *bp*					
Hazard rate:	30.00%	(same as above)	Riskfree Rate:	7.00%	(same as above)
Duration:	5.00 yrs	(same as above)	Yield:	12.30%	(increased yield)
Face value of debt:	US$495.32 bn	(same as above)	Spread:	530.00 bp	(Yield, Riskfree Rate)
Price of debt	55.99	(per US$100, calculated from assumptions)			
Expected payout	78.53	(per US$100, calculated from assumptions)			
Expected payout | Default	28.42	(per US$100, calculated from assumptions)			
Expected payout | Default	US$140.79 bn	(equals 495.32 × 28.42/100.00)			
Results — Estimate of expected bailout					
Change in expected payout |Default:		US$17.46 bn for a hazard rate of 30% (as shown above = 158.25 bn – 140.79 bn)			
		US$26.19 bn for a hazard rate of 20% (calculations not shown)			

This table presents estimates of the economic impact (magnitude) of a shift in yield spreads similar in magnitude to findings presented in this paper. We are conservative and consider a 30 bp shift in yield spreads. In order to calculate the impact we use external debt (securities, private placements, MTNs, and Brady Bonds) for each of the 41 (emerging market) countries in our universe as obtained from the BIS. The total (face value) of the debt is US$495 bn. We then provide a rough calculation based on assumptions of hazard rates, recovery rates, yields, and yield spreads.

spreads, such as 95 bp, greatly increases our estimate of expected bailouts.

3.4. *Cross-sectional analyses of spread changes*

Our final empirical analyses consist of a series of cross-section regressions of observed spread changes on country-specific and bond-specific factors. Our primary goals are twofold. First, we attempt to further distinguish between borrower and lender moral hazard to shed additional light on how official sector bailouts affect sovereign debt prices. Next, we draw inferences about how investors formed bailout expectations prior to the Pakistan incident by examining cross-country differences in how these expectations appear to be revised after it occurs. Our methodology is to test specific hypotheses separately because we have bonds from only 29 countries. We conclude with a joint specification. Standard errors in all cross-section regressions are corrected for heteroscedasticity and clustering across bonds

from a single country. The correction for clustering seems particularly important for regressions with country-specific factors as we have more bonds in our sample than countries.

3.4.1. *Trade linkages with Pakistan*

Prior to investigating further hypotheses, we test a simple fundamentals-based alternative explanation for the spread increases we see. Given the short duration of our event window, we assume that the underlying fundamentals that determine yield spreads for each country do not change. Clearly, this assumption is inappropriate for Pakistan, where the restructuring agreement may well represent a macroeconomic shock capable of increasing its sovereign spread. As a result, we omit Pakistan's bonds from our event study analysis. As a further control, we regress spread increases for each remaining country against a constant and the share of that country's trade that is conducted with Pakistan. We estimate a coefficient that is negative and insignificant.[9] If trade with Pakistan transmits the adverse macroeconomic shock to trading partners, we would expect a coefficient which is positive and significant. As a result, we reject the trade linkage hypothesis, and omit trade with Pakistan from further specifications.

3.4.2. *Country credit ratings and country-level solvency and liquidity*

Our aggregate event study results provide evidence for lender moral hazard. These results, however, may mask a smaller underlying spread decrease for some countries through a reduction in borrower moral hazard. Fortunately, this possibility can be investigated by exploiting cross-country differences in credit quality. Both the default probability, h, and loss rate, L, are decreasing in credit quality, since emerging markets with higher credit ratings default less frequently and provide higher recoveries to investors when they do. Both h and L are also between 1 (for emerging markets with the worst quality) and 0 (for the best). Under some fairly general conditions, this implies that both h and L are decreasing at a decreasing rate. This fact, along with Eq. (6), implies that changes in spreads are *decreasing* in credit quality if lender moral hazard exists, and *increasing* in credit quality if borrower moral hazard exists. A simple regression (not shown) of observed spread increases on the log of the institutional investor credit rating results in a coefficient estimate that is negative and strongly significant. This variable alone explains nearly 21% of the variance in the data, providing further evidence for lender moral hazard.

As an additional check, we include various country-level solvency and liquidity indicators (such as the ratio of external debt to GDP, short-term debt to exports, etc.). If illiquid or insolvent emerging markets are more likely to "gamble" with risky policies, these indicators should proxy for a country's susceptibility to borrower moral hazard. Of all proxies investigated, only the ratio of total debt to reserves has a positive coefficient. None of the proxy coefficients is statistically significant.[10] From these results we conclude that little or no evidence for borrower moral hazard exists in our data.

3.4.3. *External debt composition*

Table 5 presents results for cross-section regressions that investigate whether the composition of a country's external debt helps explain differences in spread changes for the countries in our sample. Having provided evidence above for a lender moral hazard-based interpretation of the Pakistan incident, we investigate how investors appear to form their bailout expectations in the first place. In regression 1, reported in the first column of Table 5, we report results for a regression that includes country credit rating (as above) along with outstanding external bonds, Paris Club debt, and London Club

[9]Previous versions of the paper present results for this regression, as well as an additional specification that includes Institutional Investor sovereign credit ratings as a further control. Results are available upon request.

[10]Once again, all regression results were reported in a previous version of the paper and are available from the authors upon request.

Table 5. External debt composition.

	(1)	(2)
ln(Credit rating)	−148.53	−118.87
(t-Stat)	*(−6.38)*	*(−6.22)*
External bonds/tot. external debt	165.93	105.27
(t-Stat)	*(4.01)*	*(2.38)*
"Paris Club" debt/Tot. external debt	145.52	134.59
(t-Stat)	*(2.14)*	*(2.20)*
"London Club" debt/Tot. external debt	54.67	43.18
(t-Stat)	*(1.76)*	*(1.11)*
IMF GRA credit/Tot. external debt	–	312.55
(t-Stat)	–	*(2.21)*
"Development debt"/Tot. external debt	–	−58.52
(t-Stat)	–	*(−1.07)*
Constant	*Y*	*Y*
R^2	0.26	0.28

This table presents results for cross-section regressions of spread changes observed during the 3 day event window on the following variables: (i) country credit rating; (ii) the share of "external bonds" in total external debt; (iii) the share of "Paris Club" debt in total external debt; (iv) the share of "London Club" debt in total external debt; (v) the share of IMF GRA credit in total external debt; and (vi) the share of "Development Debt" in total external debt. Variables in quotations are constructed proxies. Appendixes C and D describe how each proxy is constructed, and provide data sources for all variables. Standard errors are corrected for heteroscedasticity and clustering.

Dependent Variable: $\Delta YS_{i,t}$ over the event window (in bps).

debt. All debt variables are expressed as a share of total external debt to obtain values that are comparable across countries. The fraction of Paris Club debt is significant at conventional levels. London Club debt is less significant (t-stat = 1.76).[11] The share of "External Bonds" in external debt is also positive and strongly significant (t-stat = 4.01).[12] Given the Paris Club's focus on cases in which bonds represent non-*de-minimis* credits, the significance of the external debt and Paris Club coefficients provides strong support for the conclusion that abnormal price changes (spread increases) during our primary event window result from revised bailout expectations associated with the Pakistan incident.

Specification 2 moves beyond Paris Club and London Club debt. It also includes loans from the IMF's General Resources Account (GRA) as well as total development debt.[13] Again values are expressed as a share of total external debt. The coefficient on GRA credit is strongly significant. Its magnitude is also important to consider. It is over twice the size of the Paris Club debt coefficient, and roughly six times the coefficient for the London Club debt. The implications of the Pakistan incident were *not* confined narrowly to situations in which emerging markets restructure

[11]Non-bank trade credits reported by 21 OECD nations serve as our proxy for "Paris Club debt." Since the 21 OECD nations include all Paris Club creditors, the proxy is nearly perfect. Total bank loans of the 18 BIS reporting nations — calculated on a balance of payments basis — represent our proxy for "London Club" debt. It includes total bank loans — including those usually exempt from restructuring. See Appendix D.

[12]We use BIS data for debt securities issued abroad as a proxy for external bonds throughout the cross section analyses. See Appendix D for details.

[13]Total development debt includes multilateral and bilateral loans made on highly concessional terms. See Appendix 3D for a description of IMF facilities.

their Paris Club. Bailout expectations are revised even more strongly for countries with large loans outstanding from the IMF.[14] Interestingly, the same conclusion does not extend to development loans. Investors seem *not* to expect greater losses in poor countries that receive considerable amounts of development debt. This may reflect a belief that the official sector cannot credibly threaten to withhold further lending to these countries even if private bond holders refuse to restructure their debt.

3.4.4. *Undrawn IMF balances*

In Table 6 we consider the *undrawn* portion of lending agreements arranged with the IMF. We further distinguish between undrawn balances in Stand-By Arrangements, Extended Fund Facilities (EFF), and Enhanced Structural Adjustment Arrangements (ESAF). Again, all balances are expressed as a share of total external debt to facilitate cross-country comparisons. Under Stand-By Arrangements, countries implement (usually for 1–2 years) a program that includes macroeconomic policy changes to resolve its balance of payments problems. The country, in consultation with the IMF staff, designs the program to achieve its goals. To continue to receive the financing under the agreement, the member must meet performance criteria that mark its successful implementation of the program (i.e. "policy conditionality"). The country repays the money it has borrowed over $3\frac{1}{4}$–5 years. The IMF provides financial support to its members for longer periods and in generally larger amounts under the EFF. Extended Arrangements, which normally run for 3 years but can be extended for a fourth, are designed to correct balance of payments problems that stem largely from structural problems and take longer to correct. Access to approved EFF loan balances is also contingent on the recipient country meeting longer-term policy targets. Financing for both Stand-By and Extended Arrangements is drawn from the IMF's General Resources Account (GRA). Through

Table 6. Undrawn IMF balances.

	(1)
ln(Credit rating)	−90.56
(t-Stat)	*(−4.08)*
Undrawn Stand-By/tot. external debt	938.36
(t-Stat)	*(9.27)*
Undrawn EFF/tot. external debt	709.13
(t-Stat)	*(2.39)*
Undrawn ESAF/tot. external debt	−3238.88
(t-Stat)	*(−4.14)*
Constant	Y
R^2	0.29

This table presents results for a cross-section regression of spread changes observed during the 3 day event window on the following variables: (i) country credit rating; (ii) undrawn Stand-By balances; (iii) undrawn EFF balances; and (iv) undrawn ESAF balances. See Appendix C and the text for a description of the data. We focus on undrawn Stand-By and EFF balances since both are associated with strict policy conditionality. Where these balances are high, spread increases can be most closely identified with lender moral hazard. Our evidence suggests that investors revised sharply downward the bailouts they expect from undrawn Stand-By and EFF balances. This result is not observed for undrawn ESAF balances, consistent with the lack of policy conditionality associated with these loans. Standard errors are corrected for heteroscedasticity and clustering.

Dependent variable: $\Delta YS_{i,t}$ over the event window (in bps).

[14]Interviews with US Treasury officials revealed institutional support for this assertion. Paris Club policies are closely coordinated with those of the IMF. In many cases, the same Finance Ministry officials serve as liaison to both institutions.

the ESAF, the IMF provides concessional financial support for low-income member countries with persistent balance of payments problems. ESAF resources are intended to support strong medium-term structural adjustment programs, and policy conditionality is not usually included in the lending agreement.[15]

By singling out Stand-By and EFF Arrangements, we zero in on lender moral hazard. The strict policy conditionality associated with both, leaves emerging market sovereigns with little scope for excessive risk-taking. Arguably, where such agreements are in place, borrower moral hazard has already been severely curtailed. What remains, if anything, is lender moral hazard. We strongly reject the hypothesis that undrawn balances are *not* associated with changes in spreads. Additional undrawn Stand-By balances equivalent to 1% of a typical country's external debt correspond to increases in spreads that are more than nine *hundred* bps larger. Similar results are obtained for undrawn EFF balances. Interestingly, we also reject the null hypothesis for ESAF balances. In this case, however, significantly *smaller* spread increases are observed for countries with large undrawn ESAF balances. Additional undrawn ESAF balances equivalent to 1% of a country's external debt correspond to increases in spreads that are 30% *smaller*.[16] A consistent interpretation is that investors — knowing that ESAF funds are committed to poor nations to facilitate long-term structural reforms — expect that these balances can*not* be withheld from countries in the event of financial distress. In other words, for these countries, investors cannot be bailed-in.[17] Thus, after the Pakistan incident, undrawn balances in ESAF accounts became relatively *more* valuable to private bondholders. Perhaps most interestingly, undrawn balances with the IMF explain even more of the variance in observed spread increases than existing balances with all other creditors combined (adjusted R^2 of 0.29 versus 0.28). We interpret this as strong support that investors' expectations about official sector bailouts are driving the results.

3.4.5. *Combined specification*

Table 7 presents the results of a combined specification that includes the country-specific variables described above along with controls for bond size and maturity. As discussed in Section 4 below, we include bond size, measured as the log of the bond's aggregate dollar value outstanding, to control for both liquidity and non-trading effects. We include bond maturity to control for potential term structure effects. Regression 1 includes all variables previously considered and continues to support the hypothesis that lender moral hazard explains the results we observe. The share of bonds in total external debt remains strongly significant (identifying observed changes with the Paris Club's non-*de minimis* criterion). Outstanding Paris Club debt and undrawn Stand-By balances remain strongly significant as well. Issue size remains significant at the 10% level of significance. Undrawn EFF balances and outstanding GRA credit balances are highly collinear, since both are closely linked to the aggregate size of the IMF's GRA account. Regression 2 drops undrawn EFF balances and, not surprisingly, existing GRA balances becomes statistically significant. In the second specification, issue size also becomes statistically insignificant suggesting the proxy effects that size had previously captured are more strongly associated with alternative, country-specific variables. In general, we find these results to be surprising. With limited degrees of freedom, we explain a large proportion of observed changes in spreads (the adjusted R^2 is 0.32). Regressions (3) and (4) and the effects of non-trading are discussed along with other robustness checks in Section 4 below.

[15]See: http://www.imf.org/external/pubs/ft/survey/sup1999/index.htm

[16]In part, this result is driven by the fact that ESAF loans are typically very small in magnitude. Even so, its size and significance are somewhat surprising.

[17]Of course, the negative coefficient could also reflect the impact of borrower moral hazard. Since spreads for virtually all countries increase, however, the interpretation in the text is more consistent with the data.

Table 7. Combined specification.

	(1)	(2)	(3)	(4)
ln(Size)	4.22	3.88	5.26	4.65
(t-Stat)	*(1.71)*	*(1.63)*	*(1.81)*	*(1.65)*
Maturity	0.18	0.18	0.24	0.23
(t-Stat)	*(0.875)*	*(0.88)*	*(1.04)*	*(1.01)*
ln(Credit rating)	−111.18	−117.05	−121.06	−129.77
(t-Stat)	*(−4.72)*	*(−5.78)*	*(−5.41)*	*(−6.29)*
External bonds/tot. external debt	105.92	108.78	168.23	164.94
(t-Stat)	*(2.28)*	*(2.42)*	*(3.05)*	*(3.20)*
"Paris Club" debt/tot. external debt	141.69	160.53	251.34	269.12
(t-Stat)	*(2.81)*	*(2.92)*	*(4.03)*	*(4.01)*
"London Club" debt/tot. external debt	60.60	64.33	105.95	105.09
(t-Stat)	*(1.61)*	*(1.66)*	*(2.74)*	*(2.73)*
IMF GRA credit/tot. external debt	211.30	325.28	430.06	581.38
(t-Stat)	*(1.32)*	*(2.25)*	*(2.29)*	*(3.68)*
"Development debt"/tot. external debt	−25.37	−32.21	3.50	−8.56
(t-Stat)	*(−0.65)*	*(−0.88)*	*(−0.09)*	*(−0.23)*
Undrawn Stand-By/tot. external debt	776.95	747.95	842.61	802.72
(t-Stat)	*(6.26)*	*(6.07)*	*(6.99)*	*(6.16)*
Undrawn EFF/tot. external debt	249.61	–	340.51	–
(t-Stat)	*(0.88)*	–	*(1.05)*	–
Undrawn ESAF/tot. external debt	−1453.16	−1347.39	−480.80	−466.25
(t-Stat)	*(−1.33)*	*(−1.21)*	*(−0.44)*	*(−0.39)*
Constant	*Y*	*Y*	*Y*	*Y*
R^2	0.32	0.32	0.43	0.43

This table presents results for cross-section regressions of spread changes observed during the 3 day event window on the explanatory variables included in Tables 5 and 6, along with (log) bond size and maturity. The results of the combined specification continue to support lender moral hazard as an explanation of the spread increases observed during the event window. Regression (1) includes all previous country- and bond-specific variables. Regression (2) omits undrawn EFF balances because of collinearity with GRA credit. Regressions (3) and (4) repeat results with a weighted least squares methodology. Weights are given by each bond's observed trading frequency during a 100 day window before the primary event window. Standard errors are corrected for heteroscedasticity and clustering across bonds from a given country.

Dependent variable: $\Delta YS_{i,t}$ over the event window (ln(size) and maturity in %; all others in bps).

4. Robustness Checks

In this section we perform a battery of robustness checks. Naturally, we worry that our choice of event window, non-trading probabilities, and the US interest rate environment might be affecting the results.

4.1. *Event study — results from alternate window*

We worry about information leakage between the actual meetings and our primary event window. To address this, we also focus on an article in *The Economist* dated February 6, 1999. This article, published the week after the Paris Club negotiations concluded, mentions for the first time that Pakistan's Eurobond holders may also be required to restructure their claims. Our hesitations about using this date are threefold. First, comparability did not surface in any other publication we were able to identify during this time period. Newswires point to February 25, 1999 as the date markets were informed. Second, interviews with staff at the US Treasury confirm that comparability for Eurobond holders was not publicly discussed until well after the Paris Club negotiations had concluded. Finally, from an econometric point of view, the aftermath of the Brazilian devaluation likely adds noise

to emerging market asset prices in late January and early February. Despite these hesitations, an event study using February 6, 1999 produces results that are similar to those in Table 3 (the new results are not reported, but are available from the authors upon request.) The magnitude and sign of the announcement effect is comparable to the first event study. For example, in Table 3 the average spread for all bonds (ex. Pakistan) is 27.90 bp using February 25, 1999 and it is 20.53 bp using February 6, 1999. The average spread is 95.63 bp for EMTA Eurobonds in Table 3 and it is 54.50 bp using February 6, 1999. The estimates, while smaller, still maintain statistical significance using the four tests shown in Table 3. We note that estimates are also less precise, consistent with our expectations. Nonetheless, abnormal spread increases are still statistically significant using the date around the earlier *Economist* article. A table of results using the earlier date is available from the authors upon request.

4.2. *Event study — stale prices and non-trading*

The EMTA Eurobonds are selected by a trade association because of their liquidity. Other bonds in our sample may not trade as frequently. Our prior is that non-trading may bias the event study results to zero. In order to be sure, we perform the following tests and re-run our event study in three different ways. We use Column 3 from Table 3 for comparison purposes. We then measure the change in spreads for bonds that experience price movements during our event window. This procedure is a rough means of addressing the possibility that bond prices do not move during the event window simply because the bonds are not traded. In this case, the quoted (observed) price reflects the last traded (stale) price. With this new measure, average spread increases are between 42 and 95 bp. For example, all bonds experience an increase of 27.90 bp in Table 3, but experience an increase of 42.56 bp if we condition on observing a change in spread (any positive or negative change).

For each bond issue, we also calculate the percentage of days the observed price moves during a 100 day estimation window *immediately preceding* our event window. We then measure the weighted average change in spread where weights are equal to the percentage of days we observe a price movement. If we believe the percentage of days a price moves is a proxy for the probability that the bond trades during the event window, then this procedure provides the strongest results yet. We now measure change in spread of 36.57 bp for all bonds. In Table 3, the Datastream Brady-Z bonds show a 25.70 bp increase in spread. Using the new method that focuses on liquid bonds, the observed change in yield is 39.73 bp, a substantial revision upward. A table of results relating to adjustments made for stale trading prices are available from the authors upon request.

4.3. *Event study — the US interest rate environment*

This paper measures an increase in the spread of US$-denominated sovereign bonds over US Treasury yields. It is possible that the measured increase comes from a sudden drop in US Treasury yields. If sovereign bonds in emerging markets trade infrequently, an econometrician may measure an increase in spreads purely due to a fall in the underlying US Treasury rates. The first two rows of Appendix F show that this scenario does not affect measurements during the relevant event windows. In fact, US Treasury yields increase during our event windows further strengthening our results.

4.4. *Event study — shocks to the demand of high-yield investors*

Although benchmark rates move up during the event window, it is possible that high-yield investors experience a shock to demanded returns during the same period. Such an event could have a profound influence on our results. In Appendix F, rows three and four, we look at default spreads in the United States. The first measure (row three) is the difference between corporate bonds rated BBB2 and those rated AAA.

The second measure (row four) is the default spread associated with BB2-rated bonds. The earlier event window actually has a compression of default spreads which greatly strengthens our results. During the February 23–26, 1999 event window, there is a slight increase in spreads, though this increase hardly seems capable of accounting for the full 25–95 bp increase presented in Table 3.

4.5. *Cross-section results — bond-specific factors*

As an additional consistency check we regress observed spread increases on various bond-specific factors. We consider issue size (as a possible proxy for liquidity), issue maturity (to capture possible term structure effects), and a dummy representing Eurodollar issues. Issue size is positive and significant. If this represents a liquidity effect, a consistent interpretation is that changing bailout expectations cause larger expected losses for more liquid bonds. Another interpretation — also consistent with the liquidity hypothesis — is that liquid bonds are more likely to trade during our event window, and thus more likely to *reveal* the expected loss associated with the Pakistan incident.[18] Maturity and the Eurobond dummy are both insignificant. This result is not surprising since we concern ourselves with spread *changes* rather than *levels*, and it is consistent with the Pakistan incident inducing a *parallel* shift of sovereign yield curves. A table of results is not reported, but is available from the authors upon request.

4.6. *Cross-section results — the effects of non-trading*

As a final robustness check, we re-do the combined specification using weighted least squares. Each observation is weighted by the bond's observed trading frequency during a 100 day window that precedes the event window. This procedure addresses concerns of possible biases introduced by different bond liquidities. Results in Table 6 regressions (3) and (4) are virtually identical to those presented in Table 6 regressions (1) and (2) with improved statistical significance. In both weighted least squares regressions, for example, the share of London Club debt and IMF GRA credit also become strongly significant. R^2 also increases to 0.43 from 0.32. The weighted least squares results suggest our cross-sectional inferences are actually *strengthened* by considering the effects of non-trading.

5. Conclusion

This paper began with four questions — we now have answers. The Pakistan incident provides an ideal natural experiment with which to demonstrate that official sector policies *do in fact* affect the value of privately-held sovereign debt. Following the announcement that Pakistan's Eurobonds were to be restructured as part of the country's Paris Club agreement — over an event window too short to permit meaningful changes in underlying "fundamentals" — we observe statistically robust and economically meaningful increases in sovereign spreads for a sample of 41 emerging market nations. To isolate these changes we examine a reduced-form model for pricing risky bonds. There is ample evidence that the bailing-in process affects investors' expectations of future losses, consistent with the lender moral hazard hypothesis. To identify which countries' assets are likely to be most affected by the official sector's attempts to bail private investors in, we present cross-section regressions using observed yield spread changes as the dependent variable. The Pakistan incident again appears to have influenced sovereign spreads by altering bondholders' expectations of future bailouts. We use our findings to estimate that investors lowered their expectations of future bailouts by approximately US$20 bn.

Our results shed light on existing research. For example, Eichengreen and Rühl (2001) argue the efforts to bail-in private bondholders by the official sector have been less than credible. They go on to argue that the only way to credibly initiate a bailing-in process is to make restructuring

[18]The price of some bonds in our sample does not move during our event window. We subsequently address the implications potential non-trading in following robustness check.

of sovereign bonds less difficult by altering their contractual terms. They suggest the adaptation of collective actions clauses as a means to this end.[19] Our paper provides empirical evidence against this proposition. Spreads actually do increase over a very short window following the Pakistan incident. Investors *must* have attached some credibility to the simple announcement of an official-sector policy shift. The two papers can be reconciled by attempting to determine whether spreads returned to pre-incident levels over a longer window (this is a difficult topic left for future research). If spreads did revert, this would indicate that markets overreacted to the initial announcement (in itself an interesting finding).

Finally, these results are related to recent studies of contagion. After the Asian financial crisis in 1997 and 1998, many academics studied the existence of contagion (that is prices moving together in the absence of fundamentals moving together). Our event study provides a perfect example of a time when asset prices around the world *should* move together (i.e. "rational contagion"). That is, in a world with an international lender of last resort, we would expect policy changes by the lender to affect many assets simultaneously. The co-movement becomes accentuated at exactly those times when the lender of last resort becomes more important (i.e. during crisis periods). This is precisely what we observed during the Asian crisis. Clearly, we have much more to learn about the manner in which official sector policies influence and distort the prices of emerging market securities.

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Appendix A

Included Countries and Bond Information

This paper looks at individual bonds from emerging markets around the world. Countries are chosen if their sovereign bonds appear in an Emerging Market Trading Association (EMTA) list, Datastream list of Brady Bonds, Brady Plan documents, or Bloomberg list of Brady Bonds.

Country	# of Bonds	# of Bonds w/ yield info during any time-period	# of Bonds w/ yield info during our window/event
Albania	2	0	0
Argentina	65	26	14
Brazil	23	16	12
Bulgaria	13	5	5
Chile	1	0	0
China	9	9	9
Colombia	23	14	8
Costa Rica	8	6	4
Croatia	4	4	4
Czech Republic	0	0	0
Dominican Republic	3	2	2
Ecuador	11	4	4
Hong Kong	1	1	1
Hungary	1	1	0
India	0	0	0
Indonesia	2	2	2
Israel	10	4	3
Ivory Coast	6	2	2
Jordan	3	3	3
Korea (South)	3	2	2
Malaysia	4	4	3
Mexico	39	25	21
Morocco	0	0	0
Nigeria	3	1	1
Pakistan*	8	5	0
Panama	31	11	9
Peru	8	4	4
Philippines	19	18	12
Poland	13	7	7
Romania	0	0	0
Russia	26	17	16
Slovakia	4	1	1
Slovenia	2	0	0
South Africa	4	3	0
Taiwan	0	0	0
Thailand	7	4	4
Turkey	12	11	7
Ukraine	3	0	0
Uruguay	14	10	6
Venezuela	22	12	12
Vietnam	3	2	2
Total	410	236	180
Total ex. Pakistan	402	231	180

Appendix B

Descriptive Bond Statistics

Breakdown of bonds by market of issue

	# of Bonds
Emerging markets	136
Euro MTN	11
Eurodollar	55
Global	80
Non-US, Domestic	50
Private placement	40
Yankee	30
Total bonds with market information	402

Breakdown of bonds by issue size (US$)

From	To	# of Bonds
2,000,000,000		63
1,000,000,000	2,000,000,000	46
500,000,000	1,000,000,000	61
100,000,000	500,000,000	147
50,000,000	100,000,000	26
5,000,000	50,000,000	21
100,000	5,000,000	16
	100,000	5
Total bonds with issue information		385

Breakdown of bonds by third-party groupings

	# of Bonds
EMTA Euro	28
EMTA Brady	86
Datastream Brady	21
Datastream Brady-Z	89
Bloomberg Brady	106

Appendix C

Country-Level, Macro-Economic Data

For each of the 41 countries in our universe, we collect country-specific and macro-economic data. These data are from the IMF's International Financial Statistics and *World Economic Outlook* databases.

Variable name	Source	Description
Credit rating	Instit. Investor	Countries rated from 0 (worst) to 100 (best).
Imports and exports	IMF/WEO	Amounts in US$ mm
GDP	IMF/WEO	Amount in US$ mm
Trade with Pakistan	IFS	Both imports and exports collected Amounts in US$ mm
ESAF	IFS	Enhanced Structural Adjustment Facility: provides loans to highly indebted countries on highly concessional terms. Included in (E) in Appendix D
Undrawn ESAF	IFS	Undrawn portion of agreed ESAF loans
GRA	IFS	IMF General Resources Account: provides standard Credit Tranche loans as well as loans under Stand-By Agreements and Extended Fund Facilities. All GRA credit is included in (E) in Appendix D
Stand-By drawings	IFS	Stand-By Agreement: loans arranged with the IMF under Stand-By Agreements are designed to fix short-term (1–2 year) balance of payments problems. Disbursements are tranched and subsequent disbursements are made only if debtor meets often stringent policy objectives. Stand-By loans are most associated with IMF "bailouts" in response to financial crises.
Undrawn Stand-By bal.	IFS	Portion of arranged Stand-By Agreements that can be withheld if policy conditionality is not met.
EFF drawings	IFS	Extended Fund Facility: EFF loans are designed to correct balance of payments problems stemming from longer-term structural problems that take longer to correct. Policy conditionality tied to longer-term goals.
Undrawn EFF	IFS	Undrawn portion of EFF

Appendix D

Country-Level Data on External Debt

The, descriptions and data presented in this table come directly from the joint BIS–IMF–OECD–World Bank statistics on external debt. The statistics are the result of an inter-agency task force. For convenience, we refer to items by the same lettering system as the joint task force ("A" through "N"). We also group debt in the same categories as the joint task force. Descriptions are taken directly for task force documents.

External debt — all maturities		
(A) Bank Loans	BIS	Loans from banks resident in 18 major industrialized countries and 6 offshore centers.
(B) Debt securities issued abroad	BIS	Money market instruments, bonds, and notes issued in international markets by both public and private sector borrowers.
(C) Brady bonds	World Bank	Bonds issued to restructure commercial bank debt under the 1989 Brady Plan. Also called "Bradys" in our tables for brevity.
(D) Non-bank trade credits	OECD	Official and officially guaranteed non-bank export credits from 21 OECD countries.
(E) Multilateral claims	African Dev. Bank, Asian Dev. Bank, IDB, IMF, World Bank	Loans from the African Dev. Bank, Asian Dev. Bank, and Inter-Amer. Dev. Bank, use of IMF credit, and IBRD loans and IDA credits from the World Bank.
(F) Official bilateral loans	OECD	Concessional (aid) and other loans provided mainly for developmental purposes by the 21 member countries of the OECD Development Assistance Committee
Debt due within a year		
(G) Liabs. to Banks	BIS	Liabilities to banks which are nationals of (i.e. headquartered in) 18 major industrialized countries and which report their claims on a worldwide consolidated basis. The data include holdings of short-term securities which are also included in line H.
(H) Debt Securities Issued Abroad	BIS	Money market instruments, bonds, and notes issued in international markets by both public and private sector borrowers. The data include securities held by foreign banks which are also included in line G. Also referred to as "Short-term External Bonds" in our tables.
(I) Non-bank trade credits	OECD	Official and officially guaranteed non-bank export credits from 21 OECD countries. Also referred to as "Short-term Trade Credits" in our tables.
Memorandum items		
(J) Total liabs. to banks locational	BIS	Liabilities to banks resident in 18 major industrialized countries and 6 offshore centers (i.e. line A plus banks' holdings of debt securities which are partly included in line B plus other claims which are not loans or debt securities)
(K) Total liabs. to banks consolidated	BIS	Liabilities to banks which are nationals of (i.e. headquartered in) 18 major industrialized countries and which report their claims on a worldwide consolidated basis, both short-term (line G) and long-term liabilities.
(L) Total trade credits	OECD	Official and officially guaranteed export credits from 21 OECD countries.
(M) Total claims on banks	BIS	Claims on banks resident in 18 major industrialized countries and 6 offshore centers.
(N) International reserve accounts	IMF	Monetary authorities' holdings of SDRs, reserve position in the Fund and foreign exchange assets. Also referred to as "Reserves" or "Gross Reserves" in our tables.

Our constructed variables and proxies	
total external debt	A + B + C + D + E + F
"Development debt"	E + F — IMF's GRA (see Appendix C)
"External bonds"	B
"Paris Club debt"	D
"London Club debt"	A

Appendix E

Previous Empirical Studies of Sovereign Spreads

A.1.1. *Estimating spreads for sovereign syndicated loans*

Systematic attempts to estimate credit spreads in sovereign debt markets largely focus on syndicated bank loans. Studies of bond spreads are relatively rare, perhaps due to the relative insignificance of bonds in sovereign debt finance prior to the mid-1990s.

Consistent with the growth of the syndicated loan market, a large body of empirical work on syndicated loan spreads emerged in the 1970s and 1980s. Discretionary default used to be considered inconceivable, so these studies viewed spreads as default risk premia and attempted to explain them with macroeconomic analogs to the type of solvency and liquidity indicators used in a corporate context. Edwards (1984), for example, finds that proxies for a country's solvency, debt service capacity, liquidity, and investment intensity significantly impact spreads. Similar empirical analyses are presented in Feder and Ross (1982) and McFadden *et al.* (1985).

Boehmer and Megginson (1990) broaden this line of research to reflect contemporary analytical work on sovereign debt. Their study considers monthly secondary syndicated loan spreads for a sample of ten countries from July 1985 to November 1988. They attempt to identify, *inter alia*, whether "capacity" or "willingness" to pay determines secondary prices for syndicated loans. The study follows earlier work and includes various solvency and liquidity indicators as proxies for the former. Boehmer and Megginson's empirical results are limited by (crude) proxies for willingness to repay (which they identify, but cannot satisfactorily distinguish between enforcement mechanisms based on reputation or sanctions).[20] They do, however, provide strong support for indicators of macroeconomic solvency versus liquidity, and explain a great deal of the variation in their sample data (adjusted R^2 is 0.96).

A.1.2. *Estimating spreads for sovereign bonds*

Existing empirical analyses of sovereign bond spreads are subject to various limitations. Cantor and Packer (1996) present a cross-sectional analysis of the determinants of spreads on sovereign bonds for 49 countries in 1995. They relate spreads to per capita income, GDP growth, inflation, fiscal balance, external balance, and external debt. They also consider indicators of economic development and default history. None of the study's macroeconomic indicators are significant when the authors include the average of the Standard & Poor's and Moody's country credit ratings. The study also considers both industrial and developing country bonds, raising questions about sample homogeneity.

Cline and Barnes (1997) adopt a panel approach, similar to many of the studies of sovereign loan spreads considered above. They present a simple model of sovereign bond spreads using quarterly data from 1992 to mid-1996. Their sample includes a panel of 11 emerging market and 6 European industrial countries. Following earlier work, they relate spreads to various

[20]The variables considered are an indicator of whether or not the country has incurred payment arrears on external debt and various country-specific dummies for unilateral actions such as debt moratoria, etc.

country-specific macroeconomic indicators. They also include the US T-Bill rate to capture global liquidity conditions. Though straightforward in methodology, Cline and Barnes' model explains roughly two-thirds of the variation in quarterly spreads over the sample period. Cline and Barnes' chief objective is to identify whether improved "fundamentals" or "market conditions" drive the sharp decreases in bond spreads that lead up to the 1997 crises. They calibrate their empirical model using data to mid-1996, then use parameter estimates to obtain predicted spreads for the second quarter of 1997. Despite improved fundamentals, they conclude, a considerable portion of the spread compression was driven by market conditions.

Eichengreen and Mody (2000) consider the same fundamental question as Cline and Barnes. However, they use a much broader sample of bonds — sovereign, public, and private — and a wider variety of indicators of country "creditworthiness." Because their data comprise launch spreads, rather than secondary market spreads, the econometric methodology must account for the joint determination of bond issuance and pricing.

The authors consider a panel of macroeconomic indicators, comprised of typical solvency and liquidity indicators and (once again) US T-Bill rates. Unlike previous studies, they consider the possibility of structural breaks in the data, and estimate rolling regressions for successive 10 month periods. Some parameter estimates are surprisingly stable, but their main proxies for solvency and liquidity — the debt/GNP and debt service/exports ratios — vary considerably. The conclusions Eichengreen and Mody draw from their analysis are qualitatively similar to those of Cline and Barnes. Despite improved "fundamentals" in the period leading up to the Asia crises, much of the observed compression in sovereign bond spreads must be attributed to shifts in "market sentiment."

Appendix F

Interest Rate and Spread Environment

This table presents background information about the general interest rate and spread environment during the two event windows discussed in this paper. The first event window is from February 3, 1999 to February 8, 1999 and the second window is from February 23, 1999 to February 26, 1999. This table serves as an informal test that the increases in sovereign bond yields around the world in our study are not the result of changes in the underlying, US Treasury market nor are they the result of demand shocks on the part of high-yield investors.

Description	Event window February 3–8, 1999			Event window February 23–26, 1999		
	Feb. 3, 1999 (%)	Feb. 8, 1999 (%)	Change (bp)	Feb. 23, 1999 (%)	Feb. 26, 1999 (%)	Change (bp)
US Treasury 10 yr strip	5.18	5.27	9.00	5.45	5.64	19.00
US Treasury 30 yr strip	5.44	5.82	8.00	5.63	5.76	13.00
Medium-yield 10 yr default spread (BBB2-AAA)	0.99	0.92	−7.00	0.98	1.01	3.00
High-yield 10 yr default spread (BB2-AAA)	2.36	2.24	−12.00	2.13	2.20	7.00