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The Sovereign Ceiling and Emerging Market Corporate Bond Spreads

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Abstract

We use the spreads of emerging market bonds traded in secondary markets to study investors' perception of country risk. Specifically, we ask whether investors apply the "sovereign ceiling," which says that no firm is more creditworthy than its government. To do this we compare the spreads of bonds issued by firms to those of bonds issued by the firms' home governments. We find several cases where a firm's bond trades at a lower spread than that of the firm's government, indicating that investors do not always apply the sovereign ceiling. Bonds for which this is true tend to have substantial export earnings and/or a close relationship with either a foreign firm or with the home government. For countries with lower perceived default risk, we find that investors do not believe that whenever the government defaults, the firm will default.

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In April 1997, the credit rating agency Standard & Poor's made a controversial announcement. It upgraded the debt of fourteen Argentinian firms, including three banks, to a rating higher than that accorded to Argentina's sovereign debt. This decision ran counter to the "sovereign ceiling" rule, a long-standing policy of the credit rating industry that no corporate debt can carry a rating higher than that of the firm's home government. Moody's, S&P's principal competitor, argued that the move was irresponsible, and many market participants agreed. One emerging market analyst stated, "It's a can of worms that S&P has opened up. They've blown their credibility." (Euromoney 1997).

This debate reveals considerable disagreement about the nature of corporate default risk in emerging markets. It is clear that in emerging markets, which country a firm is located in is one of the most important factors in determining its default risk. But there is no consensus as to exactly why.

The sovereign ceiling may seem like a reasonable rule of thumb, as a first cut at determining the credit risk of a firm in an emerging market. Most companies are almost certainly riskier than their governments. However the rule itself only matters when it binds, and for companies whose ratings are constrained by the ceiling it has real effects. The investment policies of pension funds and insurance companies are tied to credit ratings, so that ratings determine the pool of capital available to invest in a bond. Even apart from bond markets, investors' perception of country risk has important implications for every type of foreign investment in emerging markets. Decisions about bank loans, foreign direct investment, and portfolio investment in developing countries depend crucially on how investors perceive the risks associated with the home country of the borrower or project.

The sovereign ceiling rule is related to the common practice of using sovereign spreads to impute the country risk associated with projects undertaken in emerging markets. One popular way to incorporate country risk is to add a risk premium related to the sovereign spread on to the cost of capital, under the argument that sovereign yield spread proxies

for the firm's country-related default risk.[1] According to a survey conducted by Keck, Levengood and Longfield (1998), many practitioners add risk premiums into the discount rates to adjust for country risk. Once the sovereign ceiling rule was abolished, the spreads for the affected firms in Argentina narrowed by 30-50 basis points. If the sovereign ceiling affects the practitioners' adjustment of cost of capital in emerging market projects by 50 basis points, then it constitutes an economically significant constraint to emerging market investment.[2] Consider a project that yields an annuity cash flow of $100,000. With a 10% cost of capital, the project is worth $1 million. A decrease of the discount rate from 10% to 9.5% would increase the present value of the project by $52632. The method of accounting for country risk can thus have a big impact on what projects are undertaken in emerging markets.

Broadly speaking, there are two justifications for the sovereign ceiling. One is simply that a firm and its government operate in the same macroeconomic environment. An economy-wide downturn may lower the firm's prospects at the same time that it increases the likelihood of a government repayment crisis. Likewise, a currency devaluation will imply difficulties for both the firms and the government in meeting foreign currency obligations.

A more direct explanation is that a country's government has the power to tax firms, impose foreign exchange controls, or seize the firm's assets. If the government's repayment capacity falls, the government is more likely to exercise one or more of these rights, which in turn will lower the firm's repayment capacity. We refer to this effect as "transfer

[1] Another is to directly incorporate the potential sovereign risk impact on free cash flows. See Bekaert and Hodrick (2001) for a textbook example of the equivalence of the two. It should be noted also that adding a risk premium to the discount rate only makes sense theoretically when country risk is non-diversifiable. See Lessard (1996) for a discussion on the pros and cons of proxying for country risk through the incorporation of sovereign spread into the discount rate.

[2] Only the fourteen firms with credit ratings that were equal to the sovereign credit ratings found the sovereign ceiling rule binding, and it is these firms whose spreads subsequently narrowed. Similarly, the presence of sovereign ceiling may only affect the cost of capital for high-quality projects, which is likely to be the case in many joint ventures.

risk," that is, the risk that a sovereign borrower's repayment problems will be transferred to the firm.[3] Transfer risk arising from the possibility of currency controls is the main justification credit rating agencies use for the sovereign ceiling. Euromoney (1997) cites a senior analyst at Moody's: "From our standpoint, it's inevitable that controls would be imposed on private companies" when a government defaults on its debt, while S&P argued that this would be less likely in a dollarized economy.

In this paper we measure investors' beliefs about country risk using corporate bond prices for a panel of 108 firms in emerging markets. Each corporate bond is paired with a sovereign bond from the same country, enabling us to link investors' beliefs about a firm's default probability to their beliefs about the government's default probability. We use only bonds denominated in hard currencies, so that spreads above US bond yields represent default risk, rather than currency risk.[4] We use these data to examine the sovereign ceiling in two ways. First, we simply compare the yield spreads of corporate bonds to those of government bonds of similar maturities. In several cases, the corporate spreads are lower, indicating that the market assesses a lower default risk for the company than for its host government. The companies that command lower spreads than their governments have substantial overseas revenue, are closely tied to foreign companies, and/or are closely tied to the government.

We then use a more structured approach to examine the hypothesis that whenever a government defaults, firms in the country defaults. If this is true then a 1% increase in the sovereign spread should imply at least a 1% increase in the corporate spread, all else equal. To test this we regress the corporate yield spread on that of the government. For countries with relatively low spreads (that is, those countries that investors perceive to be relatively safe), we find that the coefficient on the government's spread is less than one, implying that investors view transfer risk as less than 100%. Thus investors seem supportive of Standard & Poor's decision. At least for some countries, firms' repayment capacity is not believed to be completely restrained by that of their government.

[3] IMF(1991)

[4] See Domowitz, Glen and Madhaven (1996), discussed below.

Though there is an established literature on the determinants of sovereign repayment capacity[5], very little research has looked specifically at the debt of firms in emerging markets. Eichengreen and Mody (1997) look at the determinates of debt prices for both sovereign and corporate bond issues, but do not look at the relationship between sovereign and corporate default. Ciocchini, Durbin and Ng (2002) study whether firms in countries that are more corrupt are subject to greater country risk. Domowitz, Glen and Madhaven (1996) isolate the country and currency risks incorporated in peso and dollar-denominated bonds issued by Mexican government. But they do not examine the country risk impact on the firms within the countries.

1. Data Description

Bonds became an important source of emerging market financing in the 1990's. From 1991 to 1996, the dollar amount of long-term bonds issued in emerging markets grew eight-fold, from $12.4 billion to $93.9 billion.[6] By comparison, new equity issues grew from $5.6 to $16.4 billion, and syndicated loan commitments, which were the traditional vehicle of emerging market financing during the 1980's, grew from $50.7 to $79.7 billion.

Our data set is built around the yield spread of corporate bonds paired with sovereign bonds issued by the government of the corporation's home country. We compute the yield spread for a given bond by taking its yield and subtracting the risk-free interest rate for bonds issued in the same currency. For example, given a dollar-denominated Mexican bond maturing in five years, we compute the yield spread by subtracting the yield on a five-year US Treasury bond.[7]

The markets for many of these bond issues are quite illiquid, and this is a source of noise in the data. However, we contend that despite illiquidity the bond prices are a rich source of information on investor beliefs about the default risk of individual firms in

[5] For example, see Edwards (1984) and Boehmer and Megginson (1990).

[6] Euromoney Bondware (1997). Bonds considered here, as well as in our sample, are those issued in hard currency.

[7] We use a fitted polynomial yield curve to find the appropriate risk-free yield.

emerging markets. Because we have a time series for each bond, we can make side-by-side comparisons of firm and government default risk at the same date. Looking at a panel also allows us to eliminate issuer-specific effects, thus eliminating the selection bias that affects data on launch prices.

Because we use bond yields to measure the perceived default risk of the issuer, we do everything we can to isolate the role of default risk in the pricing of the bond. We use only Eurobonds issued in hard currency.[8] We restrict our sample to the most standard category of bonds: those that pay a fixed interest rate, have no collateral or third-party guarantor, and contain no warrants or embedded options. Euromoney magazine identifies 727 corporate bonds launched between 1980 and 1997 that meet our criteria.

We then attempt to match each corporate bond with a sovereign bond in the same country (and meeting the same selection criteria). In the case of South Korea, which did not issue any sovereign debt prior to 1998, we use bonds issued by the Korea Development Bank as a proxy for sovereign debt.[9] Other countries with substantial corporate borrowing but little or no sovereign borrowing on the Eurobond market include India, Hong Kong, and Singapore. For these countries we were unable to find an obvious substitute for sovereign debt, so they do not appear in our data set.

The process leaves us with 659 corporate bonds. Of these, we were able to obtain time series data from January 1995 to June 2000 for 116 corporate bonds and sovereign counterparts. After eliminating some bonds that never traded during our sample period and observations that were too close to maturity, eight of these were dropped.[10] Where there was more than one sovereign bond available, we chose the one for which the maturities of the corporate and sovereign bonds are most closely matched.

[8] We consider only bonds issued in US, German, UK, Japanese, and Swiss currencies. Such bonds constitute 95% of the international bond issues listed by Euromoney. To exclude the interest rate risk associated with these currencies we look at spreads above risk-free rates; see below.

[9] Korean Development Bank debt is guaranteed by the Korean government, as outlined in Article 44 of the Korean Development Bank Act.

[10] One reason that we found so few series from Datastream is that they do not keep data for expired bonds. About half of these 659 eligible bonds expired before we first retrieved the data in fall of 1998.

Illiquid markets create two problems in using the data. One is the presence of liquidity risk in the risk premium associated with the bond. While we will discuss this in more detail later, for now we point out that on average sovereign issues are likely to be more liquid, so that corporate spreads will overstate default risk by more than sovereign spreads. A second problem is that because many bonds trade infrequently, the price we observe is not always current. This leads us to drop some observations, as discussed in Appendix A. Unfortunately, variables that would proxy for liquidity (such as bid/ask spreads and trading volume) are not available. We will discuss the role of illiquidity in more detail in the context of the results as we present them.

The home country of each firm refers to the home country of the entity legally obligated to repay the bond issue; cases where the bond's guarantor is different from the issuing entity were eliminated from the sample. In some cases of firms with foreign affiliates, however, legal obligations might not be the only consideration in case of default. Unfortunately we do not have reliable data on foreign affiliations, so we will not be able to examine the role of foreign affiliates in this study. We note that the sovereign ceiling rule, as applied by the credit rating industry, does not take foreign affiliates into account either, but is based only on the legal home of the corporation. For example, Moody's has explicitly stated that Telefonica de Argentina's debt rating should remain low despite its ownership by Telefonica de Espana, arguing that it could not necessarily rely on the Spanish company in the event of Argentinian currency controls.

Table 1 presents summary statistics for these 108 pairs of bonds. As we would expect, firms overall are riskier: corporate spreads are on average about 40% higher than sovereign spreads. The correlation between corporate and sovereign spreads is positive and fairly high, at 0.8. This is not too surprising and confirms the intuition that country risk plays an important role in emerging market corporate bonds. When we look at the bonds by country and industry, we see considerable variation. Comparing Argentina and Mexico, for example, we see that within our sample Mexican corporate debt reflects a much higher risk premium over sovereign debt than does corporate debt in Argentina.

Also, the covariance of sovereign and corporate debt is much lower in Mexico than in Argentina. Note that Russia is an outlier in our sample, reflecting the collapse that took place in 1998.

Looking at the industry breakdown, we see that oil & gas firms in fact have lower spreads, on average, than their host governments. The high average spreads for banks are partly explained by a couple of Russian banks with extremely high spreads. The bottom of the table shows average spreads by year. We see the effect of the Asian crisis in 1998 followed by a settling down of the markets by 2000.

Table 2 presents frequencies, by industry and country, both for bonds in our sample and in the larger Euromoney data set. The industry distribution is fairly reflective of the overall population of bonds: almost half of corporate bonds are issued by banks, indicating that financial institutions play an important role in providing hard-currency funds to developing country economies. Our sample is dominated by Latin American firms, in large part because Asian governments issue few hard-currency bonds. (Thus there is not a scarcity of East Asian corporate bonds, but of sovereign bonds to match them to). Countries outside of East Asia and Latin America represented in our sample are South Africa, Lebanon, Russia, Czech Republic and Romania. From Table 2, we can see that the only issuers of hard currency bonds in these countries are banks.

2. Do bond spreads reflect the sovereign ceiling?

In this section we compare the yield spread of individual corporate bonds to those of their associated sovereign bonds. This provides a direct test of whether investors apply the sovereign ceiling rule when evaluating a bond's value. If a government and corporate bond both promise identical cash flows, then the sovereign ceiling implies that the corporate bond should always be less expensive. If firms are always riskier than their governments, then there should be no instance in which a given corporate bond has a lower spread

than a sovereign bond issued by that firm's home government.[11]

Of course in practice we do not have pairs of bonds with identical cash flows. We try to get as close as possible, by considering only bonds issued in hard currency and by looking at yield spreads over risk-free rates. To avoid comparing bonds at different points in the yield curve, in this subsection we consider a subset of our data (28 bond pairs) for which the maturity dates are closely matched.[12] All of these bonds are bullet loans, so they do not have different amortization schedules.

Table 3a presents the mean firm and government spreads for the 28 bond pairs in our sample whose maturities are most closely matched to those of the sovereign. For 20 of the 28 bonds, the corporate spread is lower in at least one month. We do not read too much into a small number of violations for a single bond, because of measurement error arising from the bonds' illiquidity. However, in a third of the cases the *average* yield spread for the firm is lower than that of its host government, and for six bonds the difference is negative and significant at the 5% level. This is strong evidence that investors do not believe Moody's sovereign ceiling rule, since for an investor to apply the sovereign ceiling rule means to never pay more for a corporate bond than for a similar sovereign bond in the same country. On the face of it, these data imply that investors believe some firms are safer then their governments.

[11] We use spreads, though in most cases comparing the spreads is approximately identical to comparing the yields; there will be a difference when the bonds are issued in different currencies.

[12] Specifically, for this sample we consider only pairs of bonds whose maturities differ by less than 10%. That is, if t is the current date and T_i and T_s are the maturity dates of the firm and sovereign respectively, we require $|\frac{T_i - T_s}{T_i - t}| < 0.1$. Unlike the samples used for our regressions, we use the entire time series available for each bond to compute these means. We also looked at the relative durations of the bonds, to consider the impact of coupon structure on the effective maturity of the bond. The duration ratios were not substantially different from the maturity ratios.

2.1. Is there another explanation?

To have confidence that the results of table 3a reflect a violation of the sovereign ceiling, we need to be sure that the differences in spreads reflect only differences in default risk, and not other factors such as currency risk or liquidity risk. Therefore before going on we will look more carefully at the bonds for which the sovereign spread is greater than that of the corporate.

Table 3b presents more detailed characteristics of the eleven bonds for which the sovereign spread is greater than or equal to the corporate spread. The maturity dates of the bond pairs are listed; the corporate maturity and the sovereign maturity are all quite close to each other due to our selection criteria. Note that in all but two cases (bonds 1 and 20), both bonds are denominated in US dollars. This means that differences in the underlying riskless security are not a factor in the difference in yields, and also that the result cannot arise from errors in the yield curve estimates (since the same estimate is used for both bonds). For most of these bonds the coupon rates (and therefore the durations) are quite close. For bonds 1 and 12 the sovereign bond has a much higher coupon rate than the corporate bond, which is a possible explanation for the lower spread.

A serious concern is that because liquidity risk is an additional factor determining the price of a bond, the bond spreads we use will not reflect pure default risk. If the corporate bond is more liquid than the government bond, then the corporate's lower spread may reflect a difference in liquidity rather than in default risk. Unfortunately our data do not include good measures of liquidity, such as trading volume or bid/ask spreads. However, we can report limited data on trading frequency. We have noted before that many bonds in our sample do not trade on a daily basis. From Bloomberg, we are able to collect data for 9 of the 11 bonds on whether each bond was traded on a given day. From this, we calculated the fraction of days on which each bond traded over the sample period. This is listed in table 3b. In six cases the sovereign bond traded at least as often than the corporate bond, and in three cases (bonds 12, 13, and 19), the opposite is true. For these three bonds, it is possible that the apparent violation of the sovereign ceiling is in

fact driven by the greater liquidity of the corporate bond.

The fact that many bonds do not trade every day is a source of measurement error in our data, since the spread may not reflect corporate and sovereign default risk at the same moment. For example, suppose investors believe that the default probability of both the sovereign and the corporate has increased during the month, but that no one has traded the corporate bond for several days (while the sovereign bond has been actively traded). Since our data list the last traded price during the month, at the end of the month the quoted price of the sovereign bond will have fallen while that of the corporate will be the same as before. The quoted price for the corporate does not reflect current expectations, so it is possible that, even if investors see the corporate as more risky, the observed spread on the sovereign is higher. This might bias the average spread if there is a trend in the data or if periods of low liquidity correspond with jumps in default risk.

To check whether this influences our results, we re-compute the average spreads, considering only those observations for which both the sovereign and corporate spread are observed on the same day[13]. The results are included in the last two columns of table 3b. In all cases, the result remains: the sovereign bond has a higher spread than the corporate bond.

2.2. Why is the sovereign ceiling violated?

For five of the bonds in table 3b (numbers 3, 7, 8, 16, and 24), we can find no reason for the sovereign ceiling to be violated, apart from lower perceived default risk on the part of the corporate bond. Having identified that the sovereign ceiling is violated in several cases raises the question of why it might be violated. The main argument for the sovereign ceiling is that a government faced with a payments crisis will impose currency controls that make it impossible for firms to obtain the foreign currency necessary to

[13] In most cases, this means that both bonds were actively traded on the last trading day of the month. But it could also mean (for example) that both bonds traded on the 15th and neither traded thereafter.

repay their debt. If this is false, it is either the case that the government will not impose (such severe) currency controls, or that these controls will not prevent the firm from making debt payments.

Looking at the companies listed in table 3b can yield clues as to why the sovereign ceiling might be violated. The list includes two oil & gas firms, three telecoms, a bank, a steel producer, an electronics manufacturer, and a food company. Five are Argentinian companies. This coincides with S&P's relaxation of the sovereign ceiling in Argentina. S&P justified its move by the fact that Argentina's economy had become largely dollarized. They argued that when the US dollar or another currency replaces the local currency as the main instrument for transaction and savings, it would be much more disruptive for the government to impose foreign exchange controls. The possibility of government default without exchange controls is S&P's ultimate justification for deciding the sovereign ceiling should not apply.

Another factor that might lessen the impact of exchange controls would be that a company's revenues are principally in foreign currency. Many of the firms in table 3b have substantial foreign currency earnings. Korean firms Pohang Iron & Steel and Samsung produce largely for export markets. Mexico's Gruma is by far the largest seller of tortillas in the US, and the US market represents 50% of its sales. Astra and Perez sell oil and gas, which can be sold for hard currency. In fact, this argument - that export earnings mitigate transfer risk - underlies the practice of explicitly guaranteeing loan payments through securitizing future export revenues. Such securitized products are not subject to the sovereign ceiling. For firms that rely principally on export revenues, investors may not require such an explicit link in order to feel confident that hard currency will be available to repay loans.

By the same token, a firm with substantial overseas assets is less vulnerable to government expropriation. Perez owns substantial exploration rights in Venezuela and Peru, and Astra also has overseas assets. This could matter either as a potential source of hard currency, or because creditors could attach these assets.

Several of the firms in our sample are affiliated with foreign companies, and this may constitute another reason for the sovereign ceiling to be violated. Mexico's Gruma is 22% owned by ADM and involved in various joint ventures with the US company. At the time of our sample, Telefonica de Argentina, Banco Rio de la Plata, Astra, and Telecom Argentina were all partially owned by European companies. In the case of Telefonica de Argentina and Banco Rio de la Plata, the firms were eventually taken over by their foreign affiliate (Telefonica SA and Banco Santander Central Hispano respectively, both Spanish firms). Investors may expect that a foreign partner might take responsibility for a debt issue in the case of sovereign default. Moreover, if investors anticipate takeover by a foreign firm, then they may ignore the sovereign ceiling simply because they expect the firm's nationality to change. Moody's does not consider foreign ownership in determining whether to apply the sovereign ceiling, noting that the parent company is not legally liable for the debts of a subsidiary. But investors certainly might expect the parent to honor its subsidiary's debts, if only for the sake of reputation.

A final reason the sovereign ceiling might be violated is close ties between the firm and its government. Korea Telecom is 40% government-owned, and Pohang Iron & Steel is partially owned by the government and has a history of close ties to the government. If investors see these companies as essentially part of the government, then default risk would depend on government priorities. If the government sees telecommunication as a "strategic" sector, for example, it might allow Korea Telecom's bonds to be repaid even if the government is in default.

None of these three explanations - hard currency revenue, foreign affiliation, or government ties - is sufficient to explain why the sovereign ceiling would be violated in all the cases here. But they suggest factors that mitigate country risk.

Even if investors do not observe the sovereign ceiling strictly, the sovereign ceiling seems like a sensible rule of thumb in most countries. The rationales described above may apply only in "more developed" countries, in which all-out government expropriation of private firms is deemed less likely. Accordingly, we will next consider the possibility that

sovereign risk is more important for firms in some countries than in others.

To do so, we group countries into three different groups based on their "risk categories". That is, we rank the countries in our sample by the average spread on sovereign debt and divide them into three categories based on this ranking.[14]

Table 4 reports summary statistics for these three groups. Mean government spreads in the "safest" category were 2.5, compared to a mean spread of 10.8 in the riskiest category. Mean corporate spreads increase in step with mean sovereign spreads. The correlation between sovereign and corporate spreads is also larger the riskier the grouping, confirming our intuition that there is more transfer risk in less-stable countries. We will see that this carries through to the regression results below.

3. Transfer risk and the relationship between corporate and sovereign spreads

Broadly speaking, a firm can default for two reasons: because its income is insufficient to repay its debt, or because the government prevents it from repaying. The sovereign ceiling follows from the conviction that "firms are always riskier than governments," that is, that these two sources of risk combine to make every firm riskier than its government. However, Moody's justification for the statement that firms are *always* riskier follows from the idea that "firms will always default when the government defaults." We refer to this as the hypothesis that firms face "100% transfer risk".This implies that firms are always riskier than governments, and is certainly a justification of the sovereign ceiling rule, but is not implied by it. If the 100% transfer risk hypothesis is false, then it is

[14]Looking at the overall average of sovereign spreads would imply some selection bias, since some of the countries in our sample appear only later in our sample period, when all emerging market bond spreads were relatively high. We based our ranking on the mean sovereign spread from January 1999 to the end of our sample, though looking at other windows did not change the ranking much. The one country that was affected was South Korea, but changing South Korea's categorization did not affect the regression results substantially.

possible that the sovereign ceiling still makes sense, but that a very safe company could hypothetically violate the rule. Under Moody's justification, no matter how great the firm's repayment capacity, it can never be safer than the government.

In this section we argue that as long as the government's and the firm's repayment capacities are not negatively correlated, 100% transfer risk implies that a 1% increase in the government spread means at least a 1% increase in firm spread (on average). To demonstrate this, consider two bonds, a corporate bond (indexed by c) and a sovereign bond (g), both expiring at the same date and with identical coupon rates. Each bond has a constant probability of default in any given period, δ_c and δ_g, respectively. Let δ_i represent the probability that the firms defaults for idiosyncratic reasons, unrelated to government repayment. The statement that "the firm always defaults when the government defaults" implies that the corporate default probability can be written as $\delta_c = \delta_g + \delta_i(1-\delta_g)$. Define s_c (s_g) as the spread of the corporate (sovereign) bond.

Proposition 3.1. *Suppose that the firm defaults whenever the government defaults. Then*

$$\frac{ds_c/d\delta_g}{ds_g/d\delta_g} \geq 1. \tag{3.1}$$

The proof is in Appendix B.

The intuition behind this result simply comes from the fact that if transfer risk is 100%, then the situations in which the government defaults are a subset of those situations in which the firm defaults. Thus if the probability of government default goes up by 1%, this implies a commensurate increase in the probability of firm default. This logic extends to the firm and government spreads as functions of default probabilities.

This does *not* rule out the possibility that in a given month the government default risk increases, while at the same time the firm's idiosyncratic default risk falls. But we argue that this is unlikely to happen consistently, since it is likely that bad news for the government (for example, a decrease in economic growth) is also bad news for the

firm. The implied one-to-one relationship gives us a way to test for 100% transfer risk by regressing changes in the firm's spread on changes in the government spread.

We will test the implications of this proposition directly in the next section. If we find that there is less than a one-to-one correspondence between changes in sovereign and corporate spreads, then it must be that 100% transfer risk does not hold. Notice that it is quite possible that the default probability of the firm is greater than that of the government, but that there is not 100% transfer risk. Firm-specific factors may make the firm riskier than the government, even if the sources of risk are completely different. If firm-specific risk makes firms generally less creditworthy than the government, then the sovereign ceiling may make sense as a rule of thumb. Thus testing this relationship is not a test of the sovereign ceiling per se, but a test of its justification that "whenever the government defaults, it will cause the firms to default."

4. Regression results

To test the 100% transfer risk hypothesis we will use the basic regression form

$$\triangle s_{it}^F = \beta \triangle s_{it}^G + u_{it} \tag{4.1}$$

where $\triangle s_{it}^F$ is the change in the spread of the firm's bond from period $t-1$ to period t, and $\triangle s_{it}^G$ is the change in the spread of the corresponding sovereign bond. By taking differences of the spreads, we control for any systematic firm-specific component of the firm default probability. Inequality (3.1) implies that if the rationale for the sovereign ceiling is strictly believed by investors, then we must have $\beta \geq 1$.[15]

[15] This regression is equivalent to using the difference between corporate and sovereign spreads as the dependent variable:

$$\triangle (s_{it}^F - s_{it}^G) = \gamma \triangle s_{it}^G + u_{it}.$$

$\beta \geq 1$ in regression (4.1) is equivalent to $\gamma \geq 0$.

We emphasize that this is not a test of whether investors observe the sovereign ceiling per se, but of whether they believe in a specific justification for the sovereign ceiling, i.e. that whenever the government defaults, the firms default. A finding that β is less than one would mean that investors do not believe in 100% transfer risk. But it does not rule out the possibility that they still think every firm is riskier than its government.

Ideally, we would want to compare corporate and sovereign bonds that have identical maturities. When we compared mean yield spreads, we limited ourselves to those corporate bonds in our sample with a maturity very close to that of the corresponding sovereign bond. In this subsection we use the entire panel of 108 bonds, and therefore we will attempt to control for maturity differences. If the yield curve is fixed over time, the maturity difference will represent a fixed effect that will disappear when we take first differences. However, a fixed yield curve would be a very strong assumption. As a partial correction, we allow a linear, time-varying yield curve.[16] [17]

We now present results of the basic regression form

$$\Delta s_{it}^F = \beta \Delta s_{it}^G + \varphi \Delta Z(t) + u_{it} \tag{4.2}$$

where Δs_{it}^F is the change in the risk premium for firm i in period t, Δs_{it}^G is the change in the corresponding sovereign risk premium, and $\Delta Z(t)$ is the vector of yield curve

[16] We do this by including a term which is a month dummy variable interacted with the maturity difference of the two bonds. Consider a pair of firm and government bonds with yield spread $s_{it}^{F,m}$ and $s_{it}^{G,n}$ where the firm yield spread has m years to maturity and the government yield spread has n years to maturity. We assume that the yield curve for all securities in period t is represented by:

$$s_{it}^{G,m} - s_{it}^{G,n} = \omega_t (m - n)$$

Then we run the following regression:

$$\Delta s_{it}^{F,n} = \beta \Delta s_{it}^{G,m} + \varphi \Delta Z(t) + \epsilon_{it}$$

where $\Delta Z(t) = Z(t) - Z(t-1)$ and $Z(t) = D(t) * (m - n)$ where $D(t)$ is a month dummy.

[17] This assumption, while restrictive, is more general than existing literature. For example, Eichengreen and Mody (1998) assume a linear yield curve that is constant over time. For our data, an F-test statistic rejects the hypothesis that the yield curve is not time varying at 1% level.

variables.

β represents the ratio of the firm's and sovereign's sensitivities to events that affect the government's likelihood of repayment. Note that we do not claim to be measuring a causal relationship. Changes in sovereign bond spreads do not directly cause changes in corporate spreads. Rather the two are influenced by (some of) the same unobserved factors.

Column (a) of Table 5 gives the results of this regression. The estimated coefficient is greater than one, consistent with the predictions for 100% transfer risk.

In principle, each firm has a separate β_i: firms are likely to differ in their sensitivity to macroeconomic conditions and in the degree to which they might be taxed by the government in bad times. In the previous regression we constrained all firm β's to be equal. Next we will allow for different coefficients in different groups of countries.

We want to find out whether investor beliefs about transfer risk are different for a relatively "safe" country than for a country perceived as more volatile. That is, we want to consider the possibility that countries that are considered to be safer overall might have less transfer risk by allowing for different coefficients within three "risk categories". Column (b) of Table 5 reports the results of the regression allowing separate coefficients for the different risk categories. We now see that only the high-risk group has a coefficient larger than one, and the coefficient for the other two risk categories are significantly lower than one, leading us to reject the hypothesis that investors believe transfer risk is 100% for those groups of countries. This seems to confirm S&P's decision to abolish the sovereign ceiling for certain countries.

These results are subject to two caveats. First, as we have discussed, our data suffer from measurement error due to the bonds' illiquidity. This will tend to bias our coefficient estimates toward zero. Unfortunately we do not have a very good measure of liquidity and so no way to correct for this. However, we do not believe the extent of measurement error is sufficient to invalidate the results. Our coefficient estimates for β are .52 for the medium-risk group and .45 for the low-risk group of countries. For measurement error

to account for the estimate that $\beta < 1$, it would have to be that measurement error accounts for roughly half of the variation in the change of the sovereign spread[18], and this seems extreme.

A second concern is that the bond spreads are capturing other sources of risk apart from default risk. Changes in spreads could then reflect changes in these omitted factors. One such factor is the liquidity premium. Another is pointed out by Elton, et al. (2001), who show that for US corporate bonds, much of the spread reflects not default risk but a risk premium associated with fact that expected default loss covaries with the stock market. For our bonds default risk is much higher; many are rated below investment grade. This leads us to expect that changes in default risk are the dominant factor in determining changes in the spread. To the extent that the spread changes do reflect changes in risk premia or the liquidity premium, these changes are likely to be positively correlated. Whether this would bias our estimate upward or downward is ambiguous.

While we would like to use these data to test some of the hypotheses presented in section 2 about why the sovereign ceiling might be violated, we do not have data for the full sample on export earnings or foreign ownership. However we can allow different coefficients for firms in different industries. A summary from a practitioner's standpoint of the importance of industry sector is given in Copeland, Koller and Murrin (2000), who note, "many country risks don't apply equally to all companies in a given country. For example, banks are more likely to be nationalized than retailers; or some companies may benefit from a devaluation (raw materials exporters) while others will be damaged (raw materials importers)." In general, firms should have greater country risk if they are closely related to the government, serve the domestic market, or are in procyclical industries. Examples would include utilities (with domestic cash flows and higher likelihood of nationalization) or the construction industry (which is very

[18] Define Δs_{it}^G as the change in the default spread of the government bond, and suppose than instead we observe $\Delta s_{it}^G = \Delta \hat{s}_{it}^G + \nu_{it}$, where ν_{it} is a random error in measuring the change in the default spread. The "true" coefficient that we are interested in is given by $\beta = \frac{cov(\Delta s^G, \Delta s^F)}{var(\Delta s^G)}$, whereas the biased estimate is given by $\hat{\beta} = \frac{cov(\Delta s^G, \Delta s^F)}{var(\Delta s^G)+var(\nu)} = \beta \frac{var(\Delta s^G)}{var(\Delta s^G)+var(\nu)}$.

dependent on the domestic business cycle). Firms whose business is international and whose revenues are in foreign currency, such as oil & gas firms, would be expected to have a lower level of country risk.

We are particularly interested in the banking industry. There are many reasons to believe that country risk is closely related to the banking system (including the one cited in the quote above), and many analysts feel that the sovereign ceiling is particularly relevant to banks.[19] Banks may face higher transfer risk if the government sees them as the most readily accessible source for foreign exchange. The risk of a banking crisis may also exacerbate country risk, as a financial crisis will make it more difficult for the government and firms to repay debt (cf. Mishkin (1996)). Krugman (1998) suggests that this is the main factor behind the recent Asian crisis. If either of these effects is present, we should expect a stronger relationship between the risk premia of banks and the government than between non-banks and the government.

To examine whether different industries have different country risk coefficients, we run the regression

$$\Delta s_{it}^F = \beta_0 \Delta s_{it}^G + \gamma' D_i \Delta s_{it}^G + \varphi \Delta Z(t) + u_{it} \tag{4.3}$$

where D_i is a vector of dummy variables describing industry groups and $\gamma' = \{\gamma_1, ...\gamma_j, ...\gamma_J\}$ is the vector of industry coefficients.

Column (c) of Table 5 presents results from the regression with industry effects. Though the standard errors are large, we get some idea of how country risk differs across industries. The industries with the highest country risk include energy production (utilities) and construction, firms with primarily domestic business. Oil and gas companies, which sell on global markets and earn revenues in hard currency, tend to have lower country risk. Telecommunication companies seem to have very low country risk, probably reflecting heavy foreign investment in this industry, as well as perhaps its strategic

[19] Euromoney (1997) cites an official with IBCA: "If there was a major recession, who would be hit? The banks would have big bad loans. They're in no position to be in a better credit rating than the sovereign." Note also discussion from Copeland, et al. (2000) above.

importance to governments. An F-test examining whether country risks are the same for all six industries strongly rejects this hypothesis. While the large standard errors preclude us from drawing sharp conclusions about country risk for different industries, this result suggests that for international capital budgeting purposes, incorporating the same sovereign risk premiums to all different industries is likely to "overstate the risk for some and understate it for others."[20]

Column (d) of Table 5 presents the results for the regression including only the industry effect for banks or financial institutions. Surprisingly, the bank interaction coefficient is not significantly different from zero; we find that banks do not have significantly higher country risk than non-bank firms. This runs counter to our intuition and to conventional wisdom, and we believe it merits further study.

5. Conclusion

There is a lack of consensus among credit rating agencies about how the creditworthiness of firms depends on their host governments. We study investors' view of the question by comparing the spreads of bonds issued by corporations in emerging markets to those of their governments over the past 5 years. We find that sovereign and corporate bond spreads are not consistent with the application of the sovereign ceiling: several firms have bonds that trade at a lower risk premium than that of their government.

We then look more closely at what determines how much corporate spreads depend on sovereign spreads. In particular, we ask whether firms in countries with lower perceived default risk are less effected by changes in sovereign spreads. To answer this we regress changes in a corporate bond's spread on changes in the spread of a bond issued by the corporation's home government. Though we find a strong relationship between sovereign and corporate default risk, for relatively low-risk countries it is less than the one-for-one response that we would expect if firms faced 100% transfer risk. So while our results indicate that market participants do believe that country risk is important, they do not

[20] See discussion of Copeland et al. (2001) above.

believe the statement that firms will always default when the government defaults.

This paper takes a first step in understanding the asset pricing implications of emerging market government on their firms. Large emerging market companies typically constitute major proportion of GDP in these countries. It is extremely important to understand the factors that affect their default risk. Understanding the risk factors underlying these firms also casts light on market finance overall. Since firms' stock returns are driven partly by their risks of financial distress, the government default risk should impact the stock prices of these firms as well. A future research project is to characterize the importance of government bond yields on the stock returns in different countries. Beyond looking at asset prices, a better understanding of government default risk is vital to understanding both direct and portfolio investment in emerging markets.

6. Appendix

6.1. Appendix A (Dealing with bonds that do not trade)

The prices we use (taken from Datastream) represent the most recent traded price as of the final day of the month (or in some cases an average of bid and ask prices). In many cases, we can observe that the price of the bond does not change from one month to the next, which we interpret as meaning that the bond did not trade at all in this time.[21] We eliminate such observations from the data set, so that every observation in our data set represents a traded price from sometime within the last month. This is still imperfect, since it is possible (for example) that for a given bond/month, we observe the government's spread as of the end of the month, but the corporation's spread as of the first of the month (if it did not trade at all for the next 29 days.) This problem can be characterized as measurement error: at any point in time the observed price of a bond will be an imperfect measure of investors' current risk assessment. We discuss the

[21] Of the 108 bonds, there are 78 where either the sovereign or the corporate bond price stayed constant in more than 10% of the months we observe, and in 27 cases one of the bonds did not trade in at least half of the months we observe.

implications of this in more detail when we report the results.

6.2. Appendix B (Proof of Proposition 3.1)

Proof: Assume that agents are risk neutral. Consider a bond expiring at time T, and define P_0 as the initial price of the bond, $\{A_t\}$ as the promised stream of payments, and r as the risk-free interest rate. The yield of the bond at time 0, y_0, is then defined by

$$P_0 = \sum_{t=0}^{T} \frac{A_t}{(1+y)^t} = \sum_{t=0}^{T} \frac{A_t}{(1+r)^t}(1-\delta)^t.$$

Given this, we can express the spread as $s(= y-r) = \delta\frac{1+r}{1-\delta}$. we can rewrite the corporate spread as

$$s_c = [\delta_i + \delta_g(1-\delta_i)]\frac{1+r}{1-\delta_i-\delta_g(1-\delta_i)}$$

$$\frac{ds_c}{d\delta_g} = \frac{(1+r)(1-\delta_i)}{(1-\delta_c)^2}$$

$$\frac{ds_g}{d\delta_g} = \frac{1+r}{(1-\delta_g)^2}$$

Now, we can look at the ratio

$$\frac{\frac{ds_c}{d\delta_g}}{\frac{ds_g}{d\delta_g}} = \frac{(1-\delta_g)^2}{(1-\delta_c)^2}(1-\delta_i)$$

Note that the denominator can be rewritten

$$(1-\delta_c)^2 = [1-\delta_g-\delta_i(1-\delta_g)]^2 = (1-\delta_g)^2(1-\delta_i)^2$$

so we have

$$\frac{\frac{ds_c}{d\delta_g}}{\frac{ds_g}{d\delta_g}} = \frac{1}{1-\delta_i} \geq 1$$

This says that, if investors believe that the corporation defaults whenever the government defaults, then a 1% increase in the government spread must be associated with (more than) a 1% increase in the corporate spread, holding the firm's idiosyncratic default probability constant.

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Table 1

All statistics are based on yield spreads of hard-currency denominated bonds over risk-free bonds of the same currency and same maturity. CORSPREAD refers to the corporate spread and GOVSPREAD refers to the government spread. Each corporate bond is matched to a single government bond in the same country. The sample is an unbalanced panel of 108 bonds from 1995:1 to 2000:6, representing 85 different firms. The sample does not include observations in which the price of a bond has not changed since the preceding month.

	Number of bonds	CORSPREAD		GOVSPREAD		
		Mean	SD	Mean	SD	Cor(C, S)
Total	108	5.44	9.25	3.87	4.68	0.79
By country						
South Africa	2	1.97	0.54	2.39	0.57	0.57
Argentina	29	4.24	2.72	3.76	2.06	0.70
Brazil	22	4.99	3.80	3.90	2.81	0.65
Mexico	22	4.44	3.27	2.57	1.41	0.41
Venezuela	2	5.89	5.55	3.60	3.29	0.76
Lebanon	1	1.88	0.81	1.79	0.42	0.64
Indonesia	4	20.32	25.52	5.44	3.75	0.54
Korea	7	3.00	2.43	2.86	2.12	0.81
Malaysia	2	4.40	3.86	2.93	2.71	0.71
Philippines	9	3.78	2.20	3.40	1.45	0.71
Thailand	1	7.37	1.20	2.84	1.70	0.25
Russia	5	26.53	31.96	16.88	17.07	0.90
Czech Rep.	1	1.25	0.68	1.32	0.79	0.52
Romania	1	10.73	17.29	8.72	13.71	0.97
By industry						
Banking & Fin.	49	7.15	14.28	4.81	7.06	0.80
Construction	8	3.66	2.63	2.50	1.41	0.49
Energy/Utility	5	4.44	3.23	3.13	2.24	0.76
Manufacturing	18	5.23	4.36	3.42	2.25	0.78
Oil & Gas	7	3.65	2.04	3.94	2.01	0.77
Telecom	10	3.88	2.36	2.79	1.55	0.77
Other	11	5.07	3.58	3.75	2.06	0.24
By time						
1995	14	7.07	2.58	5.86	1.39	0.06
1996	64	3.82	2.13	3.00	0.85	0.53
1997	105	2.41	1.55	2.09	1.08	0.47
1998	100	7.40	12.77	5.25	7.98	0.71
1999	70	9.16	14.77	4.91	6.03	0.58
2000	49	4.76	3.80	3.29	2.26	0.56

Table 2

Distributions of bonds by region and industry

	East Asia		Latin America		Other		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Our sample								
Banking & Fin.	5	10	34	69	10	20	49	100
Manufacturing	8	44	10	56	0	0	18	100
Energy/ Utility	2	40	3	60	0	0	5	100
Oil & Gas	1	14	6	86	0	0	7	100
Telecoms	5	50	5	50	0	0	10	100
Construction	0	0	8	100	0	0	8	100
Other	2	18	9	82	0	0	11	100
Total	23	21	75	69	10	9	108	100
Euromoney data								
Sovereign	84	13	245	40	294	47	623	100
Public	86	56	15	10	53	34	154	100
Banking&Fin.	744	45	643	40	251	15	1638	100
Manufacturing	141	42	162	49	31	9	334	100
Energy/Utility	59	36	52	33	49	31	160	100
Oil & Gas	39	21	125	68	20	11	184	100
Telecoms	23	32	45	64	3	4	71	100
Construction	25	37	42	63	0	0	67	100
Other	116	49	110	47	9	4	235	100
Total	1317	38	1439	42	710	20	3466	100

Table 3 a

Average spreads of bond pairs with similar maturities

This table reports yield spreads of hard-currency denominated bonds over risk-free bonds of the same currency and same maturity. CORSP refers to the corporate spread and GOVSP refers to the government spread. Each corporate bond is matched to a single government bond in the same country. The 28 bonds here comprise all those in our sample for which the times to maturity of the corporate and sovereign bonds differ by less than 10%. The industries are: OG (Oil and Gas), BF (Banking and Finance), TC (Telecommunication), MN (Manufacturing), CN (Construction) & OT (Other). Diff refers to the difference in spreads (Corporate spread – sovereign Spread). * means that the mean difference<0 at a 5% significance level. Fraction of months is the number of months when Corporate spread is lower than Government spread over the total number of months.

		Country	Industry	Mean Corsp	Mean Govsp	Fraction of month Corsp < Govsp	Mean Diff	SE Diff
1	Astra – Compania Argentina de	Argentina	OG	3.14	3.14	12/32	0.00	0.23
2	Banco Bansud SA	Argentina	BF	5.89	3.09	2/22	2.80	0.91
3	Banco Rio de la Plata SA	Argentina	BF	4.62	4.74	47/66	-0.12	0.09
4	Bridas Corp	Argentina	OG	4.02	3.34	3/17	0.67	0.44
5	Compania Naviera Perez Companc	Argentina	OG	3.96	3.65	4/8	0.31	0.23
6	Multicanal SA	Argentina	TC	5.95	4.96	3/36	1.00	0.23
7	Perez Companc SA	Argentina	OG	3.73	4.12	29/42	-0.38*	0.12
8	Perez Companc SA	Argentina	OG	3.16	4.51	17/17	-1.35*	0.19
9	Sociedad Comercial del Plata	Argentina	MN	3.91	2.33	0/20	1.58	0.17
10	Sodigas Pampeana / Sodigas Sur	Argentina	EN	10.95	6.42	0/6	4.53	1.41
11	Telecom Argentina STET-France	Argentina	TC	3.39	3.68	25/36	-0.29*	0.09
12	Telefonica de Argentina SA	Argentina	TC	6.47	8.82	3/3	-2.35*	0.18
13	Telefonica de Argentina SA	Argentina	TC	3.62	3.92	30/44	-0.30*	0.15
14	Banco Real SA	Brazil	BF	4.4	4.11	3/15	0.30	0.65
15	Daewoo Corp	Korea	MN	1.05	0.48	0/7	0.57	0.1
16	Korea Telecom	Korea	TC	0.6	1.79	16/26	-1.19*	0.42
17	Pohang Iron & Steel Co Ltd	Korea	MN	3.13	2.85	7/41	0.28	0.11
18	Pohang Iron & Steel Co Ltd	Korea	MN	2.75	2.54	9/36	0.21	0.11
19	Pohang Iron & Steel Co Ltd	Korea	MN	3.03	3.18	9/28	-0.15	0.17
20	Samsung Electronics Co Ltd	Korea	MN	3.06	3.21	17/35	-0.15	0.2
21	Yukong Ltd	Korea	OG	4.67	3.28	0/7	1.40	0.35
22	Cemex SA de CV	Mexico	CN	5.83	3.71	0/7	2.12	0.05
23	Empresas ICA Sociedad Controla	Mexico	CN	3.45	2.32	1/20	1.13	0.14
24	GRUMA SA de CV	Mexico	OT	3.27	3.44	5/8	-0.17	0.31
25	Grupo Elektra SA de CV	Mexico	OT	4.5	2.48	0/16	2.02	0.15
26	Grupo Tribasa SA de CV	Mexico	CN	9.63	3.15	0/16	6.47	0.63
27	Transportacion Maritima Mexica	Mexico	OT	3.26	2.65	3/22	0.61	0.13
28	Transportacion Maritima Mexica	Mexico	OT	3.15	2.49	0/2	0.66	0.06

Table 3b

Detailed Characteristics of bond pairs with similar maturities

This table reports details of the bond pairs from Table 3a for which the sovereign yield is above the corporate yield on average over the sample. The characteristics of each sovereign bond are displayed immediately below those of the corresponding corporate bond. These characteristics included the currency denominations of the bonds, the coupon rates, the maturity dates, the starting and ending months, the total no of months within this window, the no of monthly observations included in the analysis, the issue amount in millions of dollars, the fraction of days in which a bond is traded in a given month, the number of observations where the two bonds are traded on the same days, and the mean corporate and sovereign spreads limited to those observations for which both prices come from the same day.

	Country	Curr.	Coupon	Maturity Date	Start & end Months	Months in Window	Months of Observations	Issue amt ($m)	fraction of days bond traded	Trade on same day obs	Trade on same day spreads
1 Astra - Compania Argentina de	Argentina	$US	11.625	199912	9601-9904	40	32	100	n/a	n/a	n/a
		Yen	7.1	199912				152	n/a		
3 Banco Rio de la Plata SA	Argentina	$US	8.75	200312	9501-0006	66	66	250	.53	31	3.89
		$US	8.375	200312				1000	.91		4.10
7 Perez Companc SA	Argentina	$US	9	200401	9701-0006	42	42	300	.87	37	3.59
		$US	8.375	200312				1000	.99		3.90
8 Perez Companc SA	Argentina	$US	8.125	200707	9707-9811	17	17	400	.87	15	3.04
		$US	11	200609				1000	1.00		4.42
11 Telecom Argentina STET-France	Argentina	$US	8.375	200010	9501-9805	41	36	500	n/a	n/a	n/a
		$US	8.25	200008				100	n/a		
12 Telefonica de Argentina SA	Argentina	$US	11.875	200411	9501-9503	3	3	300	.68	2	6.59
		$US	8.375	200312				1000	.29		8.94
13 Telefonica de Argentina SA	Argentina	$US	8.375	200010	9501-9811	47	44	300	.96	20	2.45
		$US	8.25	200008				100	.73		2.46
16 Korea Telecom	Korea	$US	7.4	199912	9604-9806	27	26	100	.37	4	0.71
		$US	8.65	200001				500	.67		1.30
19 Pohang Iron & Steel Co Ltd	Korea	$US	7.375	200505	9706-0005	36	28	250	.76	22	2.89
		$US	6.75	200512				200	.63		3.04
20 Samsung Electronics Co Ltd	Korea	DM	5.375	200111	9703-0003	37	35	200	.18	3	0.80
		$US	7.9	200202				500	.74		0.89
24 GRUMA SA de CV	Mexico	$US	7.625	200709	9803-0001	23	8	250	.99	21	3.65
		$US	8.625	200803				1000	.99		3.96

Table 4

All statistics are based on yield spreads of hard-currency denominated bonds over risk-free bonds of the same currency and same maturity. CORSPREAD refers to the corporate spread and GOVSPREAD refers to the government spread. Each corporate bond is matched to a single government bond in the same country. The sample is an unbalanced panel of 108 bonds from 1995:1 to 2000:6, representing 85 different firms. The sample does not include observations in which the price of a bond has not changed since the preceding month. Observations are weighted so that each firm receives a weight of 1 in each period; if a firm has n bonds, the weight for each bond is 1/n.

Countries are grouped into three categories based on the average spread of government bonds. We rank countries based on the average government spread, and define the countries with the five lowest spreads as the "low-risk" group, the next five as the "intermediate risk" group, and the three with the highest spreads as the "high-risk" group. The countries comprising each group are listed as the last row of the table.

	Low-risk group	**Intermediate group**	**High-risk group**
Number of observations	771	1517	172
Corporate Spread			
Mean	3.62	4.35	22.83
Std. dev.	2.93	3.06	29.95
Gov. Spread			
Mean	2.54	3.73	10.77
Std. Dev.	1.59	2.24	13.68
Cor(C, G)	0.48	0.67	0.71
No of Countries	5	5	3
Countries	Czech Rep., Korea, Mexico, South Africa, Thailand	Argentina, Brazil, Lebanon, Malaysia, Venezuela	Indonesia, Romania, Russia

Table 5

Estimates are based on monthly yield spreads of hard-currency-denominated bonds over risk-free bonds of the same currency and same maturity. The data set is an unbalanced panel of 108 bonds issued by 85 firms, from 1995:1 to 2000:6. The sample does not include observations in which the price of a bond has not changed since the preceding month, and does not include one bond that is an outlier.

The regression form used is

$$\Delta COR_{it} = b_0 \Delta GOV_{it} + \gamma \square D_i \Delta GOV_{it} + \delta \Delta Z_t + e_{it}$$

where ΔCOR_{it} refers to the change in the spread of firm i's bond in period t and ΔGOV_{it} refers to change in government spread for firm i's home country. D_i is a vector of dummy variables representing country risk level or industry category. Countries are ranked by average government spread and divided into three risk categories: the five lowest, the next five, and the three highest. ΔZ_t is a term that allows for a time-varying yield curve as described in the text. In some regressions D_i includes the two risk level dummies representing the lowest-risk and highest-risk group (the middle group, which is largest, is excluded). The coefficients for these terms are γ(GovLow) and γ(GovHigh), respectively. Column (a) presents the basic regression results. For the regression in column (b), D_i allows for different coefficients for countries in different risk categories. Column (c) allows for different country and industry categories (firms in industries classified "other" are omitted). Column (d) reports the results including only the bank interaction term, as well as the risk level dummies. Observations are weighted so that each firm receives a weight of 1 in each period; if a firm has n bonds, the weight for each bond is 1/n. Robust standard errors reported.

	(a)	(b)	(c)	(d)
b_0	1.07	0.53	0.30	0.56
SE	(0.19)	(0.07)	(0.32)	(0.07)
γ(Bank)			0.22	-0.04
SE			(0.33)	(0.12)
γ(Telecom)			0.17	
SE			(0.33)	
γ(Construction)			0.48	
SE			(0.36)	
γ(Energy)			0.42	
SE			(0.35)	
γ(Manufacturing)			0.32	
SE			(0.34)	
γ(Oil & Gas)			0.22	
SE			(0.37)	
γ(GovLow)		-0.07	-0.06	-0.10
SE		(0.17)	(0.18)	(0.16)
γ(GovHigh)		0.85	0.86	0.87
SE		(0.29)	(0.29)	(0.29)
Rsq.	0.34	0.39	0.39	0.39
DF	2286	2284	2278	2283

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