

Corporate Credit Spreads and the Sovereign Ceiling in Latin America

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Abstract

We exploit a panel of 72 US dollar-denominated bonds issued by Latin American publicly listed firms between 1996 and 2005 to answer the following three questions: 1) is sovereign risk an statistical and economically significant determinant of the corporate credit spread, controlling for firm and bond specific characteristics?, 2) If yes, do market participants apply the sovereign ceiling rule adopted by rating agencies in the pricing of our bond market data?, and 3) how do market views compare with the rating agencies ceiling policy for each corporate? We find strong evidence of an economically and statistically significant effect of sovereign risk on corporate spreads across different panel econometric specifications and bonds. Moreover, markets do not apply the ceiling rule in 77% to 90% of the bonds we sample and these findings are consistent with rating agencies' policies towards the latter for about 50% of the firms.

JEL codes: F34, G0, G1, G2.

Keywords: Emerging Bond Markets, Latin America, Credit risk models, Corporate bond spreads, Sovereign Ceiling.

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1. Introduction and Literature Review

Bond finance is becoming a more prominent source of funding for corporations in emerging and developing countries seeking out new investment opportunities, the expansion of their production capacity, and looking to meet the increasing demand for bond securities worldwide. The cost of bond financing is acknowledgeably a strategic variable for businesses when making capital budgeting decisions. In turn, the cost of bond capital raised on public markets impacts aggregate investment plans and future expected output growth. As corporate bond markets develop in emerging economies (see IMF, 2009) not only does the volume but also the cost of bond financing and in particular the spread of this cost attributable to firm or country specific risks become pervasive.

In this paper we aim to answer the following questions: 1) is sovereign risk an statistical and economically significant determinant of the corporate credit spread¹, controlling for firm and bond specific characteristics?, 2) If yes, do market participants apply the sovereign ceiling rule adopted by rating agencies in the pricing of our bond market data?, and 3) how do market views compare with the rating agencies ceiling policy for each corporate?

While there is a wealth of literature on the determinants of corporate bond spreads in mature markets², the question of what determines emerging markets corporate spreads, including the role of sovereign spreads as a major explanatory variable and the test for the sovereign ceiling hypothesis, has only been recently investigated. To the best of our knowledge, Durbin and Ng [1999 and 2005], Grandes and Peter [2005], and Cavallo and Valenzuela [2010] are the only contributions to this literature. A related strand of the literature on emerging market corporate creditworthiness (Ferri et al [2002] or Borensztein et al [2006]) has researched the determinants of corporate ratings instead of looking at market prices and yield spreads.

Durbin and Ng [1999 and 2005] study the relationship between secondary market spreads of foreign currency bonds issued by emerging market firms and by their countries. They span 108 bonds issued by 85 firms in 14 countries, including Latin American, Asian and Eastern Europe over the period of 1995-2000. Durbin and Ng find that market participants do not fully apply the sovereign ceiling, in contrast to the policy followed at the time by the rating agencies, in particular Standard & Poor's. The limitation of their study is that they can only evaluate the proposition that "firms are always riskier than governments" and not the origin of risk transferred from the government to the firm. Moreover, they do not control for firm-idiosyncratic determinants or global push factors such as risk aversion, liquidity or stock market volatility which could drive both corporate and sovereign spreads if omitted in the relevant econometric model.

Grandes and Peter [2005] study the importance of sovereign risk in explaining corporate spreads using a sample of 9 domestic currency bonds issued by 9 large South African firms in 2000-2003. They control for firm-specific variables and find that sovereign risk is the most significant and economically relevant variable to account for corporate

¹ This paper will use interchangeably the terms "corporate bond spreads", "(corporate) credit risk", "credit yield spreads" and "corporate default premium".

² For a survey of this literature we refer the reader to Elton et al [2001], Cossin and Pirotte [2001]...

spreads on South African local currency bonds. Furthermore, these authors find that the sovereign ceiling applies to banks and not to firms in other sectors such as oil and gas or mining. Notwithstanding this latter finding, the authors do not include international foreign currency bonds issued by the same firms wherever possible, and limit their study to a short sample without offering additional evidence on other emerging market corporations having recently issued local currency bonds domestically and globally.³

Cavallo and Valenzuela [2010] estimate the determinants of corporate bond spreads for 139 firms in 10 emerging market economies, 6 from Latin America and 4 from East Asia. Using quarterly data of Option-adjusted spreads (OAS) extracted from Bloomberg in the period from June 1999 to June 2006, they find that corporate bond spreads are mainly determined by firm-specific variables (i.e., profitability, equity volatility, etc), bond characteristics (time to maturity), and to a lesser extent by sovereign risk and global factors (e.g, US “junk” bonds yield spreads, Treasury yields). Cavallo and Valenzuela also confirm the sovereign lite theory [Borensztein et al 2006] which points out that there should be an asymmetric impact of sovereign spreads on corporate default risk when spreads go up compared to when they decrease. A shortcoming of their contribution is that they fail to control for the term structure of sovereign risk. They use the EMBI+ indicator of sovereign risk across all firms/bonds in a given country at a given time instead of matching corporate bonds with sovereign bonds according to their maturity or duration, or even their coupon structure. Besides this, the authors do not test for the sovereign ceiling hypothesis

In related literature, Ferri et al. [2002] evaluate the sensitivity of corporate rating changes to sovereign ones. They find the pass-through to be greater in low-income countries and particularly for downgrades. Borensztein et al [2006] also examine the link between corporate and sovereign ratings in foreign currency. In addition to emerging market borrowers also including advanced economies issuers over the past decade and conclude that the sovereign risk effect is pervasive and robust to macroeconomic conditions and firm financial strength indicators, non linear and stronger on banks than on industrial firms.

Taking Latin American firms as a case study, we make a manifold contribution to the literature on emerging-market corporate bond pricing a) we use a “new” panel of 22 firms and 72 global dollar-denominated bonds –most of them issued by industrial firms– over 1996-2004, b) we control for firm and bond-idiosyncratic variables derived from the structural approach to pricing risky debt securities, c) we estimate an unbalanced panel model to quantify the statistical and economic significance of these attributes and sovereign spreads, and d) we introduce an adjusted test for the sovereign ceiling hypothesis and compare our results to previous findings in the literature (i.e. Durbin and Ng [1999], Grandes and Peter [2005]).

The remainder of this paper is organized as follows. Section 2 sets out the theoretical framework. Section 3 describes our panel data features and explains how we the dependent variable (Latin American corporate bond spreads) and one of its determinants, the sovereign bond spreads. It also operationalizes the other control explanatory variables of corporate bond spreads. Section 4 presents the descriptive statistics of our

³ In a later unpublished version of their paper, Grandes and Peter [2006] are able to prove the robustness of their findings to the inclusion of global factors, namely the UST 10-year bond yield, the CBOE VIX measure of risk aversion and the volatility of global (MSCI) equity.

data set, and presents and discusses the results of the panel econometric regressions. Finally, Section 5 concludes.

2.Theoretical framework

2-1 Sovereign risk effect on corporate credit spreads and the sovereign ceiling

The main argument in this paper is that in an emerging market context, sovereign (default or credit) risk has to be factored into the corporate default premium equation as an additional determinant. All structural models of corporate credit risk pricing implicitly assume that government bonds are risk-free, i.e., that sovereign risk is absent. As these models are implicitly placed in a context of an AAA-rated country (typically the US or the European Union), this assumption seems justified. In analyzing emerging bond markets, however, the “zero-sovereign-risk” assumption does not hold water.

What is the economic rationale for sovereign risk to be a determinant of corporate default risk **in foreign-currency terms**? Empirically, there has been a high correlation between sovereign defaults and company defaults. That is, it has been very difficult for companies to avoid default once the sovereign of their jurisdiction has defaulted. This historical regularity has been used by all major rating agencies to justify their country or sovereign ceiling policy, which usually means that the debt of a company in a given country cannot be rated higher than the debt of its government. The economic rationale behind the sovereign rating ceiling for foreign-currency debt obligations is direct sovereign intervention risk, also called transfer and inconvertibility risk. The term transfer risk is usually only used in a foreign-currency context (recall that this paper studies Latin American dollar-denominated bonds). It refers to the probability that a government with (foreign) debt servicing difficulties will impose foreign exchange payment restrictions (e.g., debt payment moratoria) on otherwise solvent companies and/or individuals in its jurisdiction, forcing them to default on their own foreign-currency obligations.

Until 2001, the “big three” main rating agencies, Moody’s Investors Service, Standard & Poor’s, and Fitch Ratings –these latter two de facto-, followed their country or sovereign ceiling policy more or less strictly.⁴ They amended it, however, under increasing pressure from capital markets after the (ex post) zero-transfer-risk experience in Russia (1998), Pakistan (1998), Ecuador (1999), and Ukraine (2000) (see Moody’s Investors Service [2001b], Standard & Poor’s [2001], Fitch Ratings [2001] or more recently Moody’s [2006]). Moody’s—the last among the big three to abandon the strict sovereign ceiling rule—justified the policy shift as follows: “This shift in our analytic approach is a response to recent experience with respect to transfer risk in Ecuador, Pakistan, Russia, and Ukraine). Over the past few years, the behavior of governments in default suggested that they may now have good reasons to allow foreign currency payments on some favored classes of obligors or obligations, especially if an entity’s default would inflict substantial damage on the country’s economy.”⁵

⁴ Standard & Poor’s in 1997 allowed some emerging market firms to pierce the foreign currency long term rating ceiling under very strict conditions. Among these firms, some were from Latin America. See Standard & Poors [1997].

⁵ See Moody’s Investors Service [2001a, p.1].

Under specific and very strict conditions, rating agencies now allow firms to obtain a higher rating than the sovereign of their incorporation (or location). The conditions for “piercing” the sovereign foreign-currency rating are stricter than for the sovereign local-currency rating [Moody’s 2006]. Bank ratings are almost never allowed to exceed the sovereign ceiling (in both foreign and domestic currency terms) because their fate tends to be closely tied to that of the government. As a result, the default risk of any firm is likely to be a positive function of sovereign risk.

To test whether the sovereign ceiling applies in our dollar-denominated corporate spreads data, we resort to a result obtained by Durbin and Ng [1999]. In a simple theoretical model similar to the framework used in this section, Durbin and Ng [1999] show that a 100 percent transfer risk implies that a one-percent increase in the government spread should be associated with an increase in the firm spread of at least one percent. In other words, in a regression of corporate spread changes on corresponding sovereign spread changes, 100 percent transfer risk implies that the beta-coefficient (point estimate associated with sovereign spreads) should be greater than or equal to one. In the logic of their model, the size of this estimated coefficient can be interpreted as the market’s appreciation of transfer risk: a coefficient that is larger than one would imply that the market prices in transfer risk of 100 percent; a coefficient statistically significantly smaller than one would imply that the market judges transfer risk to be less than 100 percent.

In Section 4, we will first test whether the sovereign spread can be considered as an additional determinant of corporate credit spreads. We would expect the associated beta-coefficient ($\partial s / \partial s^{sov}$) to be positive, as increasing sovereign risk should be associated with higher corporate risk as well. Then, if the sovereign spread turns out to be a significant explanatory factor for corporate spreads, the size of the coefficient $\partial s / \partial s^{sov}$ will be a test of whether the sovereign ceiling applies or not: If $\partial s / \partial s^{sov} \geq 1$, the sovereign ceiling in spreads applies; $\partial s / \partial s^{sov} < 1$, the sovereign ceiling does not apply. In Section 4.2 we will present two tests of the sovereign ceiling hypothesis, one similar to the one performed by Durbin and Ng [1999 and 2005] or Grandes and Peter [2005], and the other a conditional test which improves the accuracy of the results and hence avoids potential biases in the conclusions about the transferability of sovereign default risk to corporate default risk.

2-2 Firm and bond-idiosyncratic control variables

To control for firm or bond specific factors we follow the structural approach to pricing defaultable fixed income securities (see Black and Scholes [1973], Merton [1974], Shimko, Tejima, and Van Deventer [1993] or Longstaff and Schwartz [1995])⁶.

⁶ Other theoretical frameworks are 1) the classical or actuarial (for a survey of these methods, see for instance Caouette, Altman, and Narayanan [1998]), and 2) reduced-form, statistical or intensity-based approach. Readers interested in *reduced-form* models are referred to the works of Pye [1974], Litterman and Iben [1991], Fons [1994], Das and Tufano [1996], Jarrow and Turnbull [1995], Jarrow, Lando, and Turnbull [1997], Lando [1998], Madan and Unal [1998], Duffie and Singleton [1999], Collin-Dufresne and Solnik [2001] and Duffie and Lando [2001], most of which are surveyed and nicely put into a broader context by Cossin and Pirrotte [2001], and Bielecki and Rutkowski [2002]. We choose the structural approach because the classical approach is both too subjective and too backward looking and the reduced-form approach is atheoretical with respect to the determinants of default risk.

In particular, Shimko, Tejima, and Van Deventer [1993] find that the corporate default premium $corpspread_t$ or s is essentially a function of four determinants: (i) firm leverage (measured by the quasi-debt ratio d); (ii) firm-value volatility σ_V ; (iii) remaining time to maturity of the bond τ ; and (iv) interest rate volatility σ_r (extending the Merton-Black and Scholes framework)⁷

$$corpspread_t = s_t = f(d, \sigma_V, \tau, \sigma_r). \quad (2)$$

It can be shown that the spread s is a positive function of firm leverage d and firm-value volatility σ_V , but can be either an increasing or decreasing function of interest rate volatility σ_r and remaining time to maturity τ , depending on the size of α (the speed of convergence of the risk-free rate r to its long-run mean γ), ρ , (the correlation between shocks to the firm-value returns and risk-free interest rate shocks), τ , σ_r , σ_V , and d in a complex and non-linear fashion.⁸ The economic intuition of these effects is as follows:

- **Firm leverage:** The higher a firm's debt in relation to the value of its assets (d), other things equal, the lower its net worth and, hence, the closer it is to default (i.e., bankruptcy) at any given moment in time. To be compensated against the higher probability of default (and, hence, expected loss), investors will ask a higher default premium (i.e., spread).
- **Firm-value volatility:** The higher the day-to-day fluctuations in the value of the firm's assets (σ_V), other things equal, the higher the probability that—purely by chance—the asset value is smaller than the value of the debt on the day the debt is due, that is, that the firm defaults. To be compensated against the resulting higher default probability and expected loss, investors will ask for a higher spread.
- **Interest rate volatility:** The corporate spread can be an increasing or decreasing function of interest rate volatility σ_r , depending on the firm's leverage d , its asset volatility σ_V , the correlation between asset return shocks and interest rate shocks ρ , and the term structure of interest rates. However, Shimko, Tejima, and Van Deventer [1993] note that “the credit spread is an increasing function of [interest rate volatility] for reasonable parameter values.”⁹ Moreover, the stronger the impact of σ_r on s the higher leverage is. To control for this

⁷ Shimko et al. [1993] assume that the short-term risk-free interest rates follows a stationary Ornstein-Uhlenbeck process of the form $dr = \alpha(\gamma - r)dt + \sigma_r dZ_{2,t}$, where γ is the long-run mean which the short-term interest rate r is reverting to, $\alpha > 0$ is the speed at which this convergence occurs, σ_r is the instantaneous variance (volatility) of the interest rate, and $dZ_{2,t} = \varepsilon_2 \sqrt{dt}$ is a second standard Gauss-Wiener process, whose correlation with the stochastic firm value factor, $dZ_{1,t}$, is equal to ρ , i.e., $dZ_{1,t} \cdot dZ_{2,t} = \rho dt$

⁸ Shimko, Tejima, and Van Deventer [1993] determine the signs of $\partial s / \partial d$, $\partial s / \partial \sigma_V$, $\partial s / \partial \tau$, and $\partial s / \partial \sigma_r$ through simulations.

⁹ Shimko, Tejima, and Van Deventer (1993), p. 59.

dependence, we will also include the interaction term $\sigma_v d$ in the (linearized) estimated equation in Section 3.2. We expect its coefficient to be positive.

- **Time to maturity:** The corporate default spread can also be an increasing or decreasing function of remaining time to maturity τ , depending on the same parameters as the impact of changes in interest rate volatility, on leverage d and σ_v : For small values of d or σ_v , the spread increases when time to maturity τ lengthens; for intermediate values of d or σ_v , the spread first increases sharply, then reaches a maximum and finally declines gradually as τ increases (producing a hump-shaped curve like in Sarig and Warga [1989]); for high d or σ_v , the spread declines as maturity increases. The economic intuition behind this theoretical result is as follows: If there is only a short time to go before maturity and leverage or firm-value volatility is high, the risk of default (and, hence, the spread) is high; the more time there is to go before maturity, the more opportunities the firm will have, with the same leverage (or asset return volatility), to increase earnings and reduce leverage and, hence, the lower its default risk and spread will be. To control for this dependence in the simplest possible way, we will also include the interaction term τd in the linearized estimating equation, along with time to maturity τ . We expect the coefficient of maturity alone to be positive because our average leverage values are relatively low (0,11, see Exhibit 3) and the one on the interaction term to be negative.¹⁰

2-3 Other Potential Determinants

These include liquidity, differential taxation of corporate and risk-free bonds, differences in liquidity of corporate and risk-free bonds, business cycle (macroeconomic) conditions, temporary bond market imbalances, and specific bond indenture provisions, such as when call options are embedded in corporate bonds or there is a presence of a sinking fund provision.¹¹

Taxation differentials between corporate and government bonds shall be reflected in the fixed or random effect of our panel model as they have stayed constant over the period we analyze. For instance, interests on domestic government bonds, are exempt from income tax in Argentina, Brazil and Peru.. However, in Chile, they are subject to income tax as well as corporate bonds. The latter are exempt from income tax in Argentina when publicly placed but are taxable in Brazil and Peru [Grosz [2009]].

As we rule out corporate bonds including call options or sinking fund provisions and we are unable to estimate temporary bond market imbalances given the available information, only potential differences in liquidity are controlled for explicitly in the present study. Liquidity refers to the ease with which a bond (issue) can be sold without a significant price discount. One might expect the risk-free bond issues to be larger (and

¹⁰ Also see Helwege and Turner (1989) who demonstrate through an experiment the existence of a positively sloped credit spread-to-maturity curve for speculative grade borrowers.

¹¹ These factors are dealt with in the literature on corporate default risk in mature markets, in particular the US corporate bond market. See for instance Athanassakos, George and Peter Carayannopoulos [2001].

more frequently traded) and thus more liquid than the corporate issues, such that the liquidity premium on corporate bonds will be larger than the one on comparable risk-free bonds. As a result, we would expect that the higher the liquidity, l , of a given corporate bond relative to that of a comparable risk-free bond, the lower the corporate spread would be.

In sum, the corporate default premium is a function of (i) sovereign risk, (ii) leverage, (iii) firm-value volatility, (iv) interest rate volatility, (v) remaining time to maturity, and (vi) liquidity, that is,

$$\text{Corpspread}_{t=s} = f(s_t^{\text{sov}+}, d^+, \sigma_V^+, \sigma_r^{+/-}, \tau^{+/-}, l^-). \quad (3)$$

The plus- or minus-signs on top of each of the right-hand-side variables indicates how each of these determinants is expected to influence the corporate default premium (or spread) according to the theory. In Section 4.2, we estimate a linearized version of Equation (3).

3- Data and econometric framework

3-1 Data set, variable operationalization and measurement issues

Matching bond market data extracted from Thomson Financial Datastream with balance-sheet data from Economatica we obtain an unbalanced panel of 667 quarterly observations for the period 1996-2004 containing information on corporate spreads, sovereign spreads, liquidity, leverage, time to maturity, firm-value volatility and risk-free interest rate volatility. The actual sample period is constrained by the intersection between the two datasets and other qualitative considerations: only those corporate bonds issued by firms with reliable balance sheet information were kept in the sample. This implies an important restriction on the number of available corporate bonds. The pre-requisite that a firm had to be listed on a stock market and post balance sheet data on a quarterly basis on the one hand, and that for reasons laid out above we choose to work with bonds denominated in US dollars on the other, led us to a database comprising 72 corporate bonds issued by 22 different firms from Argentina, Brazil, Chile and Mexico listed in at least one stock market¹².

Exhibit 1 summarizes our corporate bond database. It reports the number of issuers, splitting them into industrials and financials, and reports the number of corporate bonds for each country. Initially, we looked for corporate bonds from Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. However, we were forced to drop Colombian, Peruvian and Venezuelan bonds because of inaccurate data and/or missing balance sheet information. Note that most issuers and bonds are from Mexico (roughly 50% of the sample), followed, in order, by Brazil, Chile and Argentina.

3-1-1 Dependent Variable: How Corporate Default Spreads are Measured

¹² In Thomson Financial Datastream we found 171 firms having issued at least one bond. However, many of these bonds did not display yield to maturity and price data over the relevant period.

We first collect yield to maturity data for Latin American corporate bonds. Although it would be desirable to restrict the sample only to zero-coupon bonds, as theory prescribes, we mainly end up collecting yield to maturity observations on coupon-paying corporate bonds.¹³ This is because there are a small number of zero-coupon bonds issued by Latin American firms precisely because some of the default risk is translated into a regular coupon payment.

We attempt to circumvent the inexistence of firm zero-coupon bonds by finding the yield to maturity of the sovereign bond with the same coupon and the same maturity as the corporate borrower. Then, if there is coupon-specific risk in our dependent variable, it will also show up in our independent variable, namely sovereign risk. The problem is that such exactly corresponding sovereign bonds do not exist, except by chance. Therefore, we choose those liquid corporate bonds whose maturity dates and coupons are closest to the maturity dates of the sovereign bonds. As for the risk-free bond we need in order to compute the corporate yield spread, we use US Treasury bonds in US dollars.

Finally, we proceed to clear out our database from potential anomalies or data that might bias the results of our econometric estimation. First, we drop out of the sample all public companies (e.g., Petrobras, Pemex), because they hold the same riskiness as the sovereign borrower. Second, for some corporations we eliminate outlier data due to inconsistent price quotes or yield to maturity at given points in time. The firm's bonds, their main features, and the corresponding sovereign bonds used to calculate both corporate and sovereign default premia are summarized in Exhibit 2.¹⁴

Concerning corporate yield to maturity data, as mentioned before, we use daily observations from the period of August 1996 to December 2004.

As for US Treasury yields, we work with the US Treasury historical matrix of yield curves.¹⁵ Since the matrix only reports the observations at 1, 3 and 6 months, and 1, 2, 3, 5, 7, 10, 20, and 30 years maturity, we run a regression on a daily frequency basis in order to get an approximation of the yield curve and extrapolate the exact yield corresponding to the maturity of interest at each day.¹⁶

The corporate spreads are computed as follows:

$$\text{corpspread}_{j,M-t} = \text{corpyield}_{j,M-t} - \text{USrate}_{j,M-t} \quad (4)$$

¹³ Elton et al. [2001] argue that one should use spreads calculated as the difference between yield to maturity on a zero coupon corporate bond (called corporate spot rate) and the yield to maturity on a zero-coupon government bond of the same maturity (government spot rate) rather than as the difference between the yield to maturity on a coupon-paying corporate bond and the yield to maturity on a coupon-paying risk-free bonds.

¹⁴ We make an exception in the case of five Argentinean firms for which we choose sub-sovereign bonds instead of sovereign bonds as the corresponding sovereign instruments. We choose these bonds (issued by the City of Buenos Aires and Mendoza Province, see Exhibit 2) because they exhibited similar credit ratings to the Argentinean sovereign bonds over the period under analysis and because the corresponding maturities of those sub-sovereign bonds provided a much better match than sovereign bonds than we could have picked otherwise.

¹⁵ Available at <http://www.treas.gov/offices/domestic-finance/debt-management/interest-rate/yield.shtml>

¹⁶ The econometric specification we applied is $y_i = \beta_1 + \beta_2 \log(t_i) + \beta_3 t_i^2 + \varepsilon_i$ where y denotes each bond yield and t denotes time to maturity. The specification fits well the US Treasury estimation.

where j indicates each bond and $M-t$ indicates each bond's remaining time to maturity expressed in years or fractions of years. Since we use quarterly data in our econometric exercise, we proceed to compute quarterly averages of these yield spreads.

3-1-2 Explanatory Variables

A. Sovereign Default Premium

For this variable we also collect daily yield to maturity for the period from August 1996 to December 2004. We proceed as in the case of corporate default spreads, this is:

$$sovsread_{j,M-t} = sovyield_{j,M-t} - USrate_{j,M-t} \quad (5)$$

Note that the risk-free rate is the same in the calculation of both corporate and sovereign spreads. Again, as we use quarterly data in our econometric exercise, we proceed to compute quarterly averages of these yield spreads.

B -Other Determinants

Exhibit 3 sums up the operationalization, measurement, and subcomponents of these firm- or bond-specific determinants.¹⁷

3-2 Econometric framework

Using a linearized version of equation (3), we now examine the statistical and economic relevance of the main structural determinants of corporate bond spreads in our sample of Latin American bonds.

Following Grandes and Peter [2005], the estimating equation can be written as:

$$corpsread_{i,M-t} = \alpha_i + \beta_i sovsread_{i,M-t} + \sum_{j=1}^k \gamma_j X_{j,it} + \varepsilon_{i,t};$$

$$i = 1, 2, \dots, N; j = 1, 2, \dots, k \quad (6)$$

where $corpsread_{j,M-t}$ is the corporate spread of firm bond i at the end-month t ; $sovsread_{j,M-t}$ is the sovereign spread which best matches $corpsread_{j,M-t}$ (see 3-1-1 and 3-1-2); $X_{1,it}, \dots, X_{k,it}$ is the following set of $k = 7$ firm or bond control variables (including their interaction terms) :

- (1) Quasi-debt-to-firm-value (or leverage) ratio d^*_t
- (2) 2-Year rolling firm value volatility σ_v
- (3) 2-Year rolling volatility of the 3-month US T-bond yield to maturity (USTB-yield volatility) σ_r ¹⁸

¹⁷ A methodological note discussing in detail the operationalization and measurement of these determinants can be obtained from the authors upon request.

- (4) Years to maturity τ
- (5) Liquidity (% of day with transactions) l
- (6) Interaction 1: between years to maturity and leverage τd
- (7) Interaction 2: between USTB-yield volatility and leverage; $\sigma_r d$

α_i denotes the (unobservable) firm-specific effect (not included in OLS pooled regressions); β_i (with $\beta_i = \beta$ when specific sovereign spread coefficients are not allowed) and $\gamma_1, \gamma_2, \dots, \gamma_7$ are regression coefficients to be estimated; and ε_{it} are the regression residuals.

Ideally, we would want to estimate the coefficients α_i and β_i as well as separate γ_j -coefficients (i.e., $\gamma_{1,i}, \gamma_{2,i}, \dots, \gamma_{7,i}$ for $i = 1, \dots, N$) in individual time-series regressions for each of the different $N = 72$ bonds. However, with $36 > T > 1$ observations per bond (9 years times 4 observations per year), it would be difficult to obtain efficient and unbiased estimates. To reduce collinearity problems and increase the degrees of freedom and the efficiency of estimation, we pool the time series of our 72 bonds. However, pooling data amounts to imposing restrictions on the parameters. In a fully pooled model, for instance, we assume that the parameters α_i , β_i , and $\gamma_{1,i}, \gamma_{2,i}, \dots, \gamma_{7,i}$ are the same across all bonds, i.e., that $\alpha_i = \alpha$, $\beta_i = \beta$, and $\gamma_{j,i} = \gamma_j$ for all $i = 1, \dots, N$ bonds and $j = 1, \dots, k$ control variables. However, we can also have less restrictive pool-specifications, like the one proposed in Equation (6), where the intercepts α_i and the slope coefficients β_i of $sovs_{spread}_{j,M-t}$ are allowed to vary across the bonds. Letting β_i vary across bonds and firms enables us to give an answer to two of the three main questions we aim to answer in this study, namely:

- Is sovereign default risk an economically relevant and statistically significant factor to account for the cross-country and time-series variation in the corporate spreads of the firms in our sample?
- If yes, do bond market participants apply the sovereign ceiling rule to Latin American firms' bonds?

Based on the “triangulation” or sensitiveness approach¹⁹, we regress Equation (6) resorting to 8 alternative estimators, namely ordinary least squares (OLS), random effects (RE), fixed effects (FE), fixed effects corrected for serial correlation (FE-AR), first difference (FD), random effects corrected for serial correlation (RE-AR) and generalized least squares (GLS-RE and GLS-FE) estimators -which remedy both serial correlation and heteroskedasticity.

¹⁸ We do not control for global risk aversion because the short term volatility in U.S. interest rates is highly correlated with the former. Moreover, global risk aversion as for instance measured by the VIX index and UST bond yields at both ends of the curve have been found to be significant determinants of sovereign spreads. Therefore, their potential effect on corporate bond spreads should already be captured by those sovereign spreads.

¹⁹ Hammersley and Atkinson [1983] state that “what is involved in methodological triangulation is not the combination of different types of methodologies per se, but to correct the potential weaknesses that may limit the validity of the analysis.” For Fielding and Fielding [1986], the conventional idea of triangulation is that if diverse types of data or methods sustain the same conclusion, the trustworthiness of the results is increased.

The residual and specification tests we perform help pin down the “best” estimator although these tests do not come without shortcomings of diverse nature and extent. Indeed, 1) we test for both global significance (for all covariates) and potentially significant, unobserved individual heterogeneity (pooled vs. fixed effects), 2) we conduct the standard Hausman [1978] test to check whether the RE estimator is consistent or not, 3) we test for pooled and panel serial correlation applying the Breusch-Godfrey [1978] and the Wooldridge (2002) statistics, respectively, 4) we perform a modified Wald test for group-wise residual heteroskedasticity (see Green [2003]), 5) we test for independent specific slopes in sovereign spreads (a Wald-chi2 test after seemingly unrelated regressions (SUR)), and 6) we also test for the hypothesis of the existence of either a global or specific bond sovereign ceiling (using again a Wald-chi2 test with linear restrictions).

4-Empirical results

4-1 Data

In Exhibit 4 we show the mean, standard deviation and the median of the corporate bond spread, the corresponding sovereign spread and its structural determinants by country and for the entire sample (pooled data). Note that the average, median and standard deviation values of the 2-Year rolling volatility of the 3-month UST-bond yield (USTB-yield vol) should be the same across countries but they differ slightly because the panel is unbalanced.

Mean corporate bond spreads are slightly higher (and generally more volatile) than their corresponding sovereign spreads with the exception of Chile, where corporate spreads are more than two times higher than sovereign spreads, and Argentina, where corporate spreads are almost 400 basis points lower than sovereign spreads over the relevant period due to the sovereign debt default and later restructuration.. Corporate bonds are traded between 22% and 53% (Argentina) of the calendar working days and display a large standard deviation.

The average time to maturity expressed in years is roughly 10. In Exhibit 4, we present further evidence on the term-structure distribution across countries.

We observe an unconditional, unadjusted for credit-quality negative correlation between corporate spreads and time to maturity that can be fitted using all available observations in our sample. Exhibit 5 depicts the second order polynomial approximation of this relationship. Exhibit 6 displays the fitted curves by country and sub-periods. We can see there is a significantly negative (unconditional) correlation between corporate spreads and time to maturity but, 1) it is highly unstable over time and (Exhibit 6, Panel a), 2) it appears to be mainly driven by cross-country differences (Exhibit 6, panel b), and 3) in general these curves lend support to the standard hump-shaped credit spread-to-maturity curves predicted by Merton [1974] or Shimko et al [1993] and tested by Sarig and Warga [1989b] in the case of risky bonds.

4-2 Econometric Results

In this section we estimate Equation (6) over the full sample (667 observations in 1996-2004) using 8 different estimators, and we perform a number of specification and residual tests as said above (Exhibits 7 and 8). Then we present and discuss the econometric output of the multivariate analysis of the determinants of Latin American corporate spreads and the sovereign ceiling test, emphasizing their statistical and economic significance in that order.

From Exhibits 7 and 8 (with and without allowing for specific sovereign spread coefficients, respectively) we can see that the relatively “best-performing” estimator is GLS-RE²⁰. As we are primarily interested in assessing the idiosyncratic effect of sovereign spreads on corporate spreads, we limit our results discussion to the regressions with bond-specific sovereign spread coefficients (Exhibit 8).

4-2-1 Statistical significance of sovereign spreads and the sovereign ceiling test

The coefficient associated with the **sovereign spread** becomes extremely statistically significant when bond-idiosyncratic slopes are allowed, as Exhibit 8 shows (with each specific coefficient displayed in Exhibit 13). The use of different slopes for sovereign spreads is supported by the result of the joint-Wald test for different slopes across bonds. We strongly reject the null hypothesis of non-significant differences across slopes, i.e., we conclude the point estimates associated with sovereign spreads are significantly statistically different. In addition, we can see from Exhibits 7 and 8 that allowing for different slopes in sovereign spreads sizably increases the adjusted-R².

Notwithstanding the statistically significant positive impact of sovereign risk on corporate bond spreads, Exhibit 10, Exhibit 11 and Exhibit 12 show that market participants seem not to be applying the sovereign ceiling rule for most Latin American bonds/firms included in our sample. The test is performed over the GLS-RE estimator. Exhibit 11 presents two alternative methodologies to test for the sovereign ceiling hypothesis. First, we use the approach followed by Durbin [2005] and Grandes and Peter [2005]: the null hypothesis of sovereign ceiling cannot be rejected when the sovereign spread coefficient (β_1) is positive and $\text{Prob.}(\beta_1=1) > 0.05$ or $\text{Prob.}(\beta_1=1) < 0.05$ and $\beta_1 > 1$. These results are presented in Column (b) of Exhibit 11. In Column (a) we introduce the additional (but reasonable) constraint that $\text{Prob.}(\beta_1=0)$ must be lower than 0.05 to avoid sovereign ceiling rejection when we shouldn't reject it (otherwise, we would not only be able to reject that $\beta_1 \geq 1$, but it would also be impossible to reject that $\beta_1 = 0$). When we follow the methodology adopted by Grandes and Peter [2005], rejection rates range from 0.38 in Chile to 0.8 in Argentina. However, when we introduce the “new” conditional approach, rejection rates fluctuate between 0.77 and 0.9, i.e., market participants do not assess transfer risk as binding in 77% to 90% of the bonds. Overall, our results are in line with Durbin and Ng [2005], who also use US dollar-denominated bonds issued in jurisdictions such as New York or London.

The new sovereign ceiling test yields the following results when contrasted with the actual rating ceilings adopted by Standard and Poor's. First, it is not surprising that the sovereign ceiling hypothesis is rejected most of the time because nearly all firms (21) in

²⁰ We make this choice despite rejecting the null of the Hausman test, which favours the FE estimator to RE as the latter is inconsistent though efficient under the alternative hypothesis. The Hausman's test may not be reliable under certain conditions. Given that RE-GLS remains efficient and unbiased and corrects for both serial correlation and heteroskedasticity we prefer to retain this estimator.

our sample are industrial, and most are multinational and tradable good producing corporations. This is a necessary, but not sufficient condition for firms to pierce the sovereign ceiling, as explained in Durbin and Ng [2005], Grandes and Peter [2005] or Moody's [2006]. For seven of these firms (38 bonds) the market views appear consistent with the successive relaxations of the rating ceiling policy for some sub-periods or over the full sample, namely YPF SA (Argentina) in 1997-2004, Telenorte (Brazil) from June 2003 until November 2003, Televisa Group (Mexico) from June 2004 until January 2005, Kimberley Clark (Mexico) from July 1999 until November 2005, America Movil (Mexico) from August 2002 until January 2005, Coca Cola Femsa (Mexico) from October 1996 to date, and CEMEX (Mexico) from November 1997 until January 2005.²¹

Second, Unibanco, a Brazilian financial corporate, has bonds for which the sovereign ceiling hypothesis holds (2) and some (7) for which it does not. We would have expected the sovereign ceiling to be applied across all bonds issued by Unibanco, as banks and financial companies are typically more exposed to government risk, and generally to systemic risk. To our surprise, we realize that Unibanco pierced the rating ceiling for a short period of time, i.e., June 2003-November 2003. The bond market participants may regard Unibanco as unconstrained overall by the ceiling, despite viewing that the rule is applicable to two bonds around the period 2002-2004 which post the highest relative liquidity records (26% and 23.5% of days with transactions). This result may have to do with the shortness of the sample.

Third, besides Unibanco, there are other firms for which there is mixed evidence regarding the rejection of the sovereign ceiling hypothesis: Comercial del Plata (an Argentinean industrial holding, the ceiling binds in one out of three bonds), Enersis (a private Chilean utility, the ceiling binds in one out of six bonds), Andina (a Chilean food and beverage producer, the ceiling binds in two out of three bonds) and Hylsamex (a Mexican steel and metal manufacturer, the ceiling binds in two out of three bonds). There are no episodes of actual piercing of the rating ceiling for any of these firms. Regarding Andina and Hylsamex, we think that these seemingly counterintuitive results may be explained by the different number of observations available for each bond, and sometimes by the corresponding sovereign bond with which the matching could be sub-optimal (different coupon size, diverging maturities, etc). Still, if we picked their most liquid bonds, the conclusion would be to accept the null of the applicability of the sovereign ceiling. The case of Enersis is different because the ceiling binds in one out of six bonds and because we reject the null of sovereign ceiling when we keep its most liquid bond (44% of days with transactions). Finally, we would –similarly to Andina and Hylsamex- conclude, should we choose the bond associated with the longest span (1996q3-2001q1) and the highest liquidity (20.55% of days with transactions), that the markets do apply the ceiling rule to Comercial del Plata

Summing up, sovereign risk is a very statistically significant factor to explain corporate bond spreads (we will see later that indeed it is the single most important explanatory variable), but the sovereign ceiling hypothesis does not generally hold.

²¹ Note that among the industrial firms, Braskem (Brazil) appears as the only inconsistent case. Although its credit rating pierced the sovereign ceiling from June 2003 until November 2003, market views seem to reflect the opposite, as we accept the null hypothesis that market participants apply the sovereign ceiling rule to the Braskem's bond.

4-2-2 Statistical significance of firm and bond-idiosyncratic determinants

Liquidity is the most statistically significant variable, with a negative impact on corporate spreads which significant at 5%. A 10 percentage point increase in the number of days with transactions reduces corporate bond spreads by 8 basis points. This result contrasts with Grandes and Peter [2005] who found that liquidity is not significantly correlated to South African corporate spreads in local currency. However, our result is in line with Longstaff, Mithal and Neis [2005] who find “... *a significant non-default component in corporate spreads...[which] is strongly related to measures of bond-specific illiquidity*”.

The **quasi-debt to firm-value (leverage) ratio** is also very significantly statistically correlated to corporate spreads Its ultimate impact on corporate spreads depends on the interaction with the **risk-free interest rate volatility** and, mainly, with the remaining **time to maturity**. The stand alone effect is positive: one percentage point increase in our leverage ratio (d rises by 0,01) increases the dependent variable by **0,17 basis points**. The **interaction effect with the risk-free interest rate volatility** is positive but insignificant while the **interaction with time to maturity** is negative and very statistically significant.

The standalone effect of maturity on corporate spreads is positive and very significant but is unusually high and inconsistent across the estimators. When interacted with leverage, we notice however a consistently negative impact on corporate risk meaning that for increasingly leveraged firms (i.e., for a representative firm with a quasi-debt to firm ratio value equal to the whole sample average (0,11)), one year increase in time to maturity will reduce required corporate bond spreads by 80 basis points, that is the interaction term effect will counter the standalone positive (but not robust) effect..

The other structural determinants (risk-free interest rate volatility and firm-value volatility) are not statistically significant.

4-2-3 Economic significance

Here we compute the part of the explained variance of corporate bond spreads that is accounted for by each determinant. Performing three alternative variance decomposition methods based on OLS and GLS-RE estimators, and the R-squared coefficient (see Wooldridge [2002]) we find that that the **sovereign spread is the major determinant** of corporate bond spreads in our sample (Exhibit 12) explaining on average 40% of the corporate spread fitted variance. This result is similar to that obtained by Grandes and Peter [2005] and (to some extent) Collin-Dufresne et al. [2001]. However, it disagrees with Cavallo and Valenzuela [2010] where firm-specific factors account for the largest share of corporate default risk, followed by industry and country fixed effects.

As for the control variables, we find that the **quasi-debt to firm-value (leverage) ratio is the most economically significant** structural determinant of corporate bond spreads. It accounts for 7 to 22% (adding up direct and interaction effects) of the corporate bond spread total variance, depending on the variance decomposition method and the econometric estimator. Among the other covariates, only **time to maturity** appears to have a significant (albeit indirectly through the interaction with the quasi-debt to

firm-value ratio) economic impact on corporate bond spreads. Liquidity only accounts for less than 2% of the total variance in corporate spreads.

5- Summary and conclusions

Exploiting a sample of 72 US dollar-denominated corporate bonds issued by 22 Latin American firms –predominantly industrial- from Argentina, Brazil, Chile, and Mexico over the period 1996-2004, this paper aims to answer three questions: 1) Is sovereign risk an statistical and economically significant determinant of the corporate credit spread, controlling for firm and bond specific characteristics?, 2) If yes, do market participants apply the sovereign ceiling rule adopted by rating agencies in the pricing of our bond market data?, and 3) how do market views compare with the rating agencies ceiling policy for each corporate?

Our main findings can be summarized as follows:

1.- **Sovereign spreads** -a proxy for systematic risk in our debt pricing context- are economically far more relevant than firm-specific or firm/bond idiosyncratic factors to explain the variation in corporate spreads (40% on average). Moreover, we find a very statistically significant impact of sovereign risk on corporate spreads when we allow for different impacts of the former on the latter across firms and bonds. This finding is in line with Grandes and Peter [2005]. By contrast, our results go counter to Cavallo and Valenzuela [2010], who, for a different sample of emerging-market corporations (including Latin America) and time span (1999-2006), find that firm and bond-specific variables explain the largest part of the corporate spreads variability. Recent rating upgrades and spreads compression in countries like Brazil and Mexico may explain part of these divergent findings.

2.- We find strong evidence against the application of the “**sovereign ceiling rule**” by market participants. In principle, this should not come as a surprise because 21 of the 22 sampled firms are industrial, multinational corporations, some of which have parent support and produce tradable goods. The percentage of rejection of the sovereign ceiling rule ranges from 77% (Chile) to 90% (Argentina) over the 72 bonds issued by the 22 firms we study. Moreover, for seven out of twenty two firms (representing 38 bonds) we checked that market views were consistent with the rating agencies’ policy of allowing these corporations to pierce the sovereign ceiling for at least a sub-period within our sample.²² As for the other firms, the only puzzling result is Unibanco. Rating agencies allowed this Brazilian bank to pierce the ceiling from June 2003 and until November 2003. Normally, banks are rated at or below the sovereign rating, yet we come up with mixed evidence from the market views pointing to the acceptance of the sovereign ceiling hypothesis in the case of the most liquid bonds (2 of 9) issued by Unibanco.

²² These firms are: YPF SA (Argentina) from 1997 to 2004, Telenorte (Brazil) from June 2003 until November 2003, Televisa Group (Mexico) from June 2004 until January 2005, Kimberley Clark (Mexico) from July 1999 until November 2005, America Movil (Mexico) from August 2002 until January 2005, Coca Cola Femsa (Mexico) from October 1996 to date, and CEMEX (Mexico) from November 1997 until January 2005.

We must stress that we reject the sovereign ceiling hypothesis even for most Chilean bonds/firms (Exhibit 14) where we observed the largest positive differential between corporate and sovereign bond spreads (Exhibit 3). This result is useful to recall that corporate bond spreads higher than sovereign spreads do not necessarily imply that bond market participants apply the sovereign ceiling rule. A firm may bear a relatively high stand-alone risk, which may be reflected in wider spreads and hence higher expected or unexpected losses in case of default. These relatively higher corporate spreads might be the consequence of poor management and weak firm performance, rather than the result of a 100% sovereign transfer risk (1% increase in sovereign increase corporate spreads by the same amount).

3.- Regarding the firm and bond-specific variables, *liquidity* is the most statistically significant, and enters the econometric estimations with the expected negative coefficient, i.e., more liquid corporate bonds command lower spreads, hence lower corporate cost of debt, all else equal. Nevertheless, its economic significance is less, as it accounts for about 2% of the total variation in corporate bond spreads. On the other hand, the financial *leverage* (quasi-debt to firm-value) ratio is slightly less statistically significant than liquidity, but it is quite relevant from an economic point of view, displaying a strong positive impact on corporate spreads, namely that increasingly leveraged firms will raise more expensive debt capital all else equal. Furthermore, when we take into account the interaction effects of leverage with the risk-free interest rate volatility and, mainly, with time to maturity, we find that leverage accounts for up to 22% of total variation in corporate bond spreads. Finally, *time to maturity* is also economically relevant-but only indirectly-through the above mentioned interaction effect with leverage, explaining between 5 to 11% of the corporate spreads' total variation. When significant, its impact on corporate spreads is mostly negative, which validates our preliminary (unconditional) findings regarding a negatively sloped corporate spread to maturity curve. In other words, highly leveraged firms can also decrease their spreads and ultimately their cost of bond finance by lengthening the maturity of their bond liabilities.

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Exhibit 1: Sample Issuers and Issues by Country

Country	Number of Firms	Industrials or Utilities	Financials	Total number of Corp. Bonds
Argentina	3	3	0	10
Brazil	5	4	1	14
Chile	5	5	0	14
Mexico	9	9	0	34
Full sample	22	21	1	72

Exhibit 2: Main characteristics of corporate and related sovereign bonds

Corporate Bond Features							Related Sovereign Bond Characteristics					
Bond Id	Country	Firm	Sector	Coupon	Issue Date	Redemp. date	Issuer Rating History	Name	Coupon	Issue Date	Redemp. date	Issuer Rating History
101	Argentina	Alpargatas	Textile	9	02/11/1993	26/11/1996	NA	Argentina (2) 1993 8 1/4% 02/08/00 S	8.25	07/07/1993	02/08/2000	21/03/2003 CCC-; 03/12/2001* DDD; 06/11/2001* C; 02/11/2001* CC; 30/10/2001 CC; 09/10/2001 CCC-; 12/07/2001* B-; 12/07/2001 B-; 11/07/2001* B-; 08/05/2001 B; 28/03/2001* B+; 26/03/2001 B+; 20/03/2001* BB-; 14/11/2000 BB-; 21/09/2000* BB; 03/12/1997* BB; 28/05/1997* BB; 02/04/1997 BB
105		Comercial del Plata	Other sectors	8.75	01/12/1993	14/12/1998	NA	Argentina (2) 1993 8 1/4% 02/08/00 S	8.25	07/07/1993	02/08/2000	02/10/2006 B+; 24/03/2006 B; 01/06/2005 B-; 29/10/2004 CCC-; 20/09/2004* NR; 10/04/2002* C; 02/11/2001* CC; 01/11/2001 CC; 10/10/2001 CCC-; 13/07/2001 B-; 12/07/2001* B-; 08/05/2001 B; 28/03/2001* B+; 08/08/1997 BB
106			Other sectors	10.75	29/02/1996	06/03/1998		Argentina (2) 1993 8 1/4% 02/08/00 S	8.25	07/07/1993	02/08/2000	
107			Other sectors	11.5	01/05/1996	09/05/2000		Argentina (2) 1993 8 1/4% 02/08/00 S	8.25	07/07/1993	02/08/2000	
108		Oil and Gas	Oil and Gas	7	26/03/1997	26/10/2002	03/06/2003 BB; 23/01/2002 B+; 13/07/2001 BB; 08/05/2001 BB; 26/03/2001 BB+; 22/04/1997 BBB-	Mendoza Province 1996 10% 25/07/02 Q	10	08/08/1996	25/07/2002	24/03/2006 B; 01/06/2005 B-; 21/03/2003 CCC-; 13/07/2001 B-; 08/05/2001 B; 26/03/2001 B+; 14/11/2000 BB-; 14/03/2000 BB; 17/03/1997 BB-
109			Oil and Gas	7.5	06/10/1995	26/10/2002		Mendoza Province 1996 10% 25/07/02 Q	10	08/08/1996	25/07/2002	
110		Oil and Gas	7.75	25/08/1997	27/08/2007	Mendoza Province 1997 10% 04/09/07		10	02/09/1997	04/09/2007		
111		YFF	Oil and Gas	9.125	20/02/1999	24/02/2009		Buenos Aires 2000 13 1/4% 29/03/10 Registered	13.25	16/03/2000	29/03/2010	
112			Oil and Gas	8	02/02/1994	15/02/2004		Argentina 1999 FR04/04 144a Q	8.25	15/03/1999	06/04/2004	See Above
113			Oil and Gas	7.25	04/03/1998	15/03/2003		Mendoza Province 1996 10% 25/07/02 Q	10	08/08/1996	25/07/2002	See Above

Exhibit 2: Main characteristics of corporate and related sovereign bonds (cont.)

Bond Id	Country	Corporate Bond Features					Related Sovereign Bond Characteristics						
		Firm	Sector	Coupon	Issue Date	Redemp. date	Issuer Rating History	Name	Coupon	Issue Date	Redemp. date	Issuer Rating History	
202	Brazil	Braskem	Chemical products	11.75	22/01/2004	22/01/2014	03/11/2005 BB; 19/09/2004 BB-; 19/06/2003 B+	Brazil-CBond (SRL) Front Loaded Interest FD 8% 15/04/14	8	15/04/1994	15/04/2014		
205		Gerdau Metalurgica	Steel and Metals	10.25	02/11/1993	23/11/2001	03/11/2005 BB+; 01/09/2005 BB-	Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		
206				11.125	20/05/1996	24/05/2004		Brazil 1999 11 5/8% 15/04/04 S	11.625	23/04/1999	15/04/2004		
207		Tele Norte	Telecommunications	8	10/12/2003	18/12/2013	03/11/2005 BB; 19/09/2004 BB-; 03/07/2002 B+	Brazil (Exit) 1988 6% 15/09/13	6	15/09/1988	15/09/2013		
212		Uibanco	Finance and Insurance	7.75	12/08/1997	14/08/2000	28/02/2006 BB; 19/09/2004 BB-; 03/07/2002 B+; 04/01/2001 BB-; 14/01/1999 B+; 21/05/1997 BB-	Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		
213				8.75	30/08/2000	30/08/2002		Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		05/02/2007* BB; 28/06/2006* BB; 28/02/2006 BB; 14/12/2005* BB-; 11/10/2005* BB-; 11/07/2005* BB-; 28/09/2004* BB-; 17/09/2004 BB-; 06/11/2003* B+; 03/06/2003* B; 02/07/2002 B+; 03/01/2001 BB-; 14/01/1999 B+; 02/04/1997 BB-; 18/07/1995 B+; 30/11/1994 B
214				8.875	12/04/2000	26/04/2002		Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		
215				9	29/06/2000	31/12/2001		Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		
216				7	18/04/2001	18/10/2002		Brazil 1996 8 7/8% 05/11/01 S	8.875	31/10/1996	05/11/2001		
217				9.375	22/04/2002	30/04/2012		Brazil-Dbn.(Series-L) F/R15/04/04-12 S	6.125	15/04/1994	15/04/2012		
219				9.375	22/04/2002	30/04/2012		Brazil-Dbn.(Series-L) F/R15/04/04-12 S	6.125	15/04/1994	15/04/2012		
220		7.375	05/12/2003	15/12/2013	Brazil (Exit) 1988 6% 15/09/13	6	15/09/1988	15/09/2013					
221		3	28/01/2004	10/08/2005	Brazil Realty 1997 10.05% 22/07/05 F07/02	10.05	15/07/1997	22/07/2005					
222	Usiminas	Steel and Metals	6.375	29/09/2003	07/04/2005	18/05/2006 BB+; 03/11/2005 BB; 19/09/2004 BB-; 14/01/2004 B+	Brazil 2001 9 5/8% 15/07/05 S	9.625	12/05/2001	15/07/2005			

Exhibit 2: Main characteristics of corporate and related sovereign bonds (cont.)

Bond Id	Country	Firm	Sector	Corporate Bond Features			Issuer Rating History	Related Sovereign Bond Characteristics				
				Coupon	Issue Date	Redemp. date		Name	Coupon	Issue Date	Redemp. date	Issuer Rating History
301	Chile	Eneris	Electricity	6.9	26/11/1996	01/12/2006	21/02/2003 BBB; 11/12/2002 BBB; 31/05/2002 BBB+; 11/07/1995 A; 09/11/1994 BBB+	Chile 2002 5 5/8% 23/07/07 S	5.625	18/04/2002	23/07/2007	09/03/2006* A; 14/12/2005* A; 28/03/2005* A; 02/02/2004* A; 14/01/2004 A; 24/02/2003* A; 20/12/2001* A; 11/07/1995 A; 20/12/1993 BBB+; 17/08/1992 BBB
302				7.4	26/11/1996	01/12/2016		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
303				6.6	26/11/1996	01/12/2026		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
304				7.375	19/11/2003	15/01/2014		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
305				7.375	19/11/2003	15/01/2014		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
306				7.375	24/11/2003	15/01/2014		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
307		Embonor	Food and Beverages	9.875	15/09/1999	15/03/2006	09/06/2005 NR; 25/02/2004 BB+; 04/06/2003 BBB; 11/03/1999 BBB	Chile 2002 5 5/8% 23/07/07 S	5.625	18/04/2002	23/07/2007	
308		Andina	Food and Beverages	7	01/10/1997	03/10/2007	28/04/2006* A; 24/04/2006* A; 11/05/2005* A; 21/04/2004* A; 12/05/2003* A; 29/10/2002* A; 24/07/1995 BBB+	Chile 2002 5 5/8% 23/07/07 S	5.625	18/04/2002	23/07/2007	
309				7.625	03/10/1997	01/10/2027		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
310				7.875	03/10/1997	01/10/2097		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
311		Endesa	Electricity	8.625	23/07/2003	01/08/2015	09/02/2005* BBB; 01/07/2004* BBB; 14/05/2003* BBB; 21/02/2003 BBB-	Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
312				8.35	23/07/2003	01/08/2013		Chile 2003 5 1/2% 15/01/13 S	5.5	09/01/2003	15/01/2013	
314		CTC	Telecommunications	7.625	15/07/1996	15/07/2006	01/09/2004 BBB+; 06/05/2004 BBB+; 10/03/2004 BBB+; 09/09/2003 BBB+; 27/11/2002 BBB+	Chile 2002 5 5/8% 23/07/07 S	5.625	18/04/2002	23/07/2007	
315				8.375	09/01/1999	01/01/2006		Chile 2002 5 5/8% 23/07/07 S	5.625	18/04/2002	23/07/2007	

Exhibit 2: Main characteristics of corporate and related sovereign bonds (cont.)

Bond Id	Country	Corporate Bond Features					Related Sovereign Bond Characteristics					
		Firm	Sector	Coupon	Issue Date	Redemp. date	Issuer Rating History	Name	Coupon	Issue Date	Redemp. date	Issuer Rating History
501	Mexico (1)	Comercial Mexicana	Wholesale and retail trade	8.75	01/04/1993	21/04/1998	27/01/2005* BBB-; 15/04/2003* BBB-; 07/02/2002 BBB-; 13/03/2000 BB+; 31/03/1998 BB	Mexico 1993 7 1/4% 16/03/98	7.25	24/02/1993	16/03/1998	14/12/2005* BBB; 07/12/2005* BBB; 31/01/2005 BBB; 22/11/2004* BBB-; 24/09/2003* BBB-; 07/02/2002 BBB-; 15/01/2002* BBB-; 03/05/2000* BB+; 10/03/2000 BB+; 30/08/1996* BB; 10/02/1995 BB; 29/07/1992 BB+
502				9.375	13/04/1998	14/04/2005		United Mexico States 1999 9 3/4% 06/04/05 S	9.75	26/03/1999	06/04/2005	
508		Posadas Grupo	Other sectors	10.375	06/02/1997	13/02/2002	15/07/2004 BB-	Mexico 1992 8 1/2% 15/09/02 S	8.5	15/09/1992	15/09/2002	
511		Televisa Qo	Other sectors	10	26/10/1992	09/11/1997	17/06/2004* BBB; 30/03/2004* BBB-; 18/09/2003* BBB-; 18/02/2003* BBB-; 15/02/2002 BBB-; 06/04/2000 BB+; 26/04/1996 BB	United Mexico States 1972 8 1/8% 01/12/76-97 S	8.125	01/12/1972	01/12/1997	
512				8.625	02/08/2000	08/08/2005		United Mexico States 1999 9 3/4% 06/04/05 S	9.75	26/03/1999	06/04/2005	
513				8.625	02/08/2000	08/08/2005		United Mexico States 1999 9 3/4% 06/04/05 S	9.75	26/03/1999	06/04/2005	
514				8	07/09/2001	13/09/2011		United Mexico States 2002 7 1/2% 14/01/12 S	7.5	08/01/2002	14/01/2012	
515				8	13/09/2001	13/09/2011		United Mexico States 2002 7 1/2% 14/01/12 S	7.5	08/01/2002	14/01/2012	
518				Hysamex	Steel and Metals	11		28/01/1993	23/02/1998	17/11/2004 BB-; 09/06/2004 B; 02/01/2003 CCC-	Mexico 1993 7 1/4% 16/03/98	
519		10.5	23/04/2002			15/12/2010	United Mexico States 2001 8 3/8% 14/01/11 S	8.375	10/01/2001		14/01/2011	
520		9.25	24/09/1997			15/09/2007	United Mexico States 1998 8 5/8% 12/03/08	8.625	06/03/1998		12/03/2008	
522		Kimberly Clark	Paper and pap. related products	8.875	28/07/1999	01/08/2009	03/11/2005 A; 07/02/2002 BBB+; 14/03/2000 BBB; 20/07/1999 BBB-	Mexico WWV 10 3/8% 17/02/09 Early	10.375	10/02/1999	17/02/2009	
523				8.875	03/08/1999	01/08/2009		Mexico WWV 10 3/8% 17/02/09 Early	10.375	10/02/1999	17/02/2009	
526		Vitro	Non-metallic minerals	10.75	16/07/2004	23/07/2011	; 23/03/2006 B; 08/03/2005 B; 26/09/2003 B+; 19/05/2003 BB; 22/04/1997 BB	United Mexico States 2002 7 1/2% 14/01/12 S	7.5	08/01/2002	14/01/2012	
527	11.75			22/10/2003	01/11/2013	United Mexico States 2003 5 7/8% 15/01/14 S		5.875	08/10/2003	15/01/2014		

Exhibit 2: Main characteristics of corporate and related sovereign bonds (cont.)

Bond Id	Country	Firm	Sector	Corporate Bond Features			Issuer Rating History	Related Sovereign Bond Characteristics				
				Coupon	Issue Date	Redemp. date		Name	Coupon	Issue Date	Redemp. date	Issuer Rating History
532	Mexico (2)	America Movil	Telecommunications	4.125	02/03/2004	01/03/2009	03/11/2005 BBB+ ; 30/09/2005* BBB ; 22/02/2005* BBB ; 31/01/2005 BBB ; 28/10/2004* BBB ; 11/06/2004* BBB ; 21/10/2003* BBB ; 29/08/2002* BBB	Mexico WW 10 3/8% 17/02/09 Early	10.375	10/02/1999	17/02/2009	
533				5.5	02/03/2004	01/03/2014		United Mexico States 2003 5 7/8% 15/01/14 S	5.875	08/10/2003	15/01/2014	
539				5.7735	20/04/2004	27/04/2007		Mexico 1997 9 7/8% 15/01/07 Early	9.875	14/01/1997	15/01/2007	
542		Coca Cola Femsa	Food and Beverages	8.95	01/11/1996	01/11/2006	14/12/2004* BBB+ ; 07/02/2002 BBB ; 13/03/2000 BBB ; 18/10/1996 BB+	Mexico 1997 9 7/8% 15/01/07 Early	9.875	14/01/1997	15/01/2007	
543				9.5	01/07/1992	22/07/1997		Mexico 1993 6.97% 12/08/00 S	6.97	02/04/1993	12/08/2000	
544		Genrex SA	Non-metallic minerals	10	21/10/1992	05/11/1999	22/02/2005* BBB ; 27/09/2004* BBB ; 29/01/2004* BBB ; 12/08/2002* BBB ; 26/05/2000 BBB ; 25/11/1997 BB+ ; 02/02/1995 BB ; 22/10/1992 BB+	Mexico 1993 6.97% 12/08/00 S	6.97	02/04/1993	12/08/2000	
545				8.5	16/08/1993	31/08/2000		Mexico 1993 6.97% 12/08/00 S	6.97	02/04/1993	12/08/2000	
546				8.875	27/05/1993	10/06/1998		Mexico 1993 7 1/4% 16/03/98	7.25	24/02/1993	16/03/1998	
547				9.5	07/09/1994	20/09/2001		Mexico 1996 9 3/4% 06/02/01 Registered S	9.75	06/02/1996	06/02/2001	
548				10.75	17/07/1996	15/07/2000		Mexico 1993 6.97% 12/08/00 S	6.97	02/04/1993	12/08/2000	
549				12.75	16/07/1996	15/07/2006		United Mexico States 2000 8 1/2% 01/02/06 S	8.5	25/07/2000	01/02/2006	
550				12.75	17/07/1996	15/07/2006		United Mexico States 2000 8 1/2% 01/02/06 S	8.5	25/07/2000	01/02/2006	
551				9.25	10/06/1999	17/06/2002		Mexico 1992 8 1/2% 15/09/02 S	8.5	15/09/1992	15/09/2002	
552				9.625	01/10/1999	01/10/2009		United Mexico States 2000 9 7/8% 01/02/10 Tranche 4	9.875	24/01/2000	01/02/2010	
553				9.625	24/09/1999	01/10/2009		United Mexico States 2000 9 7/8% 01/02/10 Tranche 4	9.875	24/01/2000	01/02/2010	
554		9.625	25/09/1999	01/10/2009	United Mexico States 2000 9 7/8% 01/02/10 Tranche 4	9.875	24/01/2000	01/02/2010				
555		8.625	13/07/2000	18/07/2003	Mexico 1992 8 1/2% 15/09/02 S	8.5	15/09/1992	15/09/2002				
556	8.625	18/07/2000	18/07/2003	Mexico 1992 8 1/2% 15/09/02 S	8.5	15/09/1992	15/09/2002					
557	4.25	05/10/1994	01/11/1997	United Mexico States 1972 8 1/8% 01/12/76-97 S	8.125	01/12/1972	01/12/1997					

Exhibit 3: Data Sources and Measurement of Variables

Determinant		Sub-components		Source
Variable	Measurement	Symbol	Explanation	
Corporate credit spread (<i>corpspread</i>) (Dependent Variable)	$corpspread_{j,M-t} = corpyield_{j,M-t} - USrate_{j,M-t}$	<i>corpyield</i>	Yield to maturity of corporate bond. Sample is restricted to US dollars denominated bonds.	Thomson Financial Datastream
		<i>USrate</i>	Risk free interest rate proxied by the yield to maturity of a US Treasury bond. (Using the US Treasury yield curve data)	US Treasury
Sovereign credit spread (<i>sovsread</i>)	$sovsread_{j,M-t} = sovyield_{j,M-t} - USrate_{j,M-t}$	<i>sovyield</i>	Yield to maturity of a government bond. For each corporate bond in the sample a government bond is selected according to its maturity and coupon characteristics in order to match as close as possible corporate bond characteristics. See Exhibit 13.	Thompson Financial Datastream
Leverage (quasi-debt-to-firm -value ratio) (<i>d_t</i>)	(1)	<i>B1, B2</i>	Face value of total firm debt (B2 includes customer deposits for the financial institutions)	Economatica
		<i>PRF</i>	Price of risk-free bond that pays one dollar at maturity.(assuming a coupon equal to the one of the corporate bond)	Calculation
		<i>E</i>	Market value of firm equity. We use total market capitalization.	Economatica.
		<i>PT</i>	Market price of traded debt	Economatica
		<i>V1, V2</i>	Value of the firm	Own calculation
	(2)			

Firm-value volatility (σ_v)	(1) $\sigma_v = \text{Stdev}(\log(\frac{V_t}{V_{t-1}}))$ over 8 quarters rolling window, .		Standard deviation of the log return of the firm value, calculated over 2-years rolling windows. V1 or V2 values of the firm are used respectively for each firm as explained above,	Own calculation
Interest rate volatility (σ_r)	$\sigma_r = \sqrt{\text{Var}(\Delta r)} * 2$ over 8-quarter rolling window	r	Instantaneous standard deviation of the risk-free rate. Calculation follows Shimko et al [1993], Where Δr stands for the (absolute) quarterly change. We use the US yield curve with fixed maturity of 3 months.	US Treasury
Time to maturity (τ)	M		Number of days from settlement date until maturity date (expressed in years)	Thompson Financial Datastream
Liquidity (l)			This is the percentage of trading days with transactions (with reported price and volume)	Economica

Exhibit 4: Descriptive statistics by country 1996-2004. Simple averages.

Variable	Country	Mean	Std. Dev.	Median
Corporate spread (basis points)	Argentina (1996q3-2004q3)	736.07	1762.48	352.15
Sovereign spread (basis points)		1143.25	1413.11	624.61
Liquidity (% of day with transactions 1=100%)		0.53	0.45	0.68
Quasi-debt to firm value ratio		0.07	0.07	0.04
Years to maturity		3.96	2.98	3.47
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield vol)		0.62	0.40	0.50
2-Year rolling firm value volatility		0.14	0.06	0.12
Corporate spread (basis points)	Brazil (1996q4-2004q3)	481.06	441.12	447.41
Sovereign spread (basis points)		461.79	297.10	397.22
Liquidity (% of day with transactions 1=100%)		0.26	0.41	0.00
Quasi-debt to firm value ratio		0.32	0.09	0.34
Years to maturity		7.86	5.53	7.46
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield vol)		0.64	0.41	0.50
2-Year rolling firm value volatility		0.29	0.08	0.29
Corporate spread (basis points)	Chile (2002q3-2004q3)	295.89	225.93	310.14
Sovereign spread (basis points)		124.84	89.55	126.16
Liquidity (% of day with transactions 1=100%)		0.34	0.44	0.00
Quasi-debt to firm value ratio		0.10	0.10	0.07
Years to maturity		14.50	16.36	10.97
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield vol)		0.67	0.42	0.51
2-Year rolling firm value volatility		0.15	0.10	0.13
Corporate spread (basis points)	Mexico (1996q3-2004q3)	355.53	601.04	266.16
Sovereign spread (basis points)		340.12	499.72	260.01
Liquidity (% of day with transactions 1=100%)		0.22	0.40	0.00
Quasi-debt to firm value ratio		0.06	0.05	0.05
Years to maturity		10.03	6.11	9.69
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield vol)		0.66	0.42	0.51
2-Year rolling firm value volatility		0.20	0.08	0.18
Corporate spread (basis points)	Full sample (1996q3-2004q3)	417.57	832.55	300.75
Sovereign spread (basis points)		424.41	656.33	283.78
Liquidity (% of day with transactions 1=100%)		0.27	0.41	0.00
Quasi-debt to firm value ratio		0.11	0.11	0.06
Years to maturity		9.96	8.76	9.17
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield vol)		0.66	0.42	0.51
2-Year rolling firm value volatility		0.19	0.09	0.17

Exhibit 4: Years to maturity distribution across countries

Percentil	Argentina	Brazil	Chile	Mexico	Full sample
1%	0.04	0.06	0.33	0.16	0.10
5%	0.23	0.39	1.83	1.17	0.83
10%	0.58	0.89	3.42	2.48	1.83
25%	1.55	2.90	6.75	5.27	4.59
50%	3.33	7.59	10.72	9.17	8.79
75%	5.52	12.35	16.43	12.72	12.84
90%	8.29	15.45	27.64	16.71	16.97
95%	10.04	16.60	92.94	18.76	22.14
99%	12.04	18.30	99.69	32.31	91.27

Exhibit 5: Unconditional spread to maturity curves for the full sample. A second order polynomial approximation.

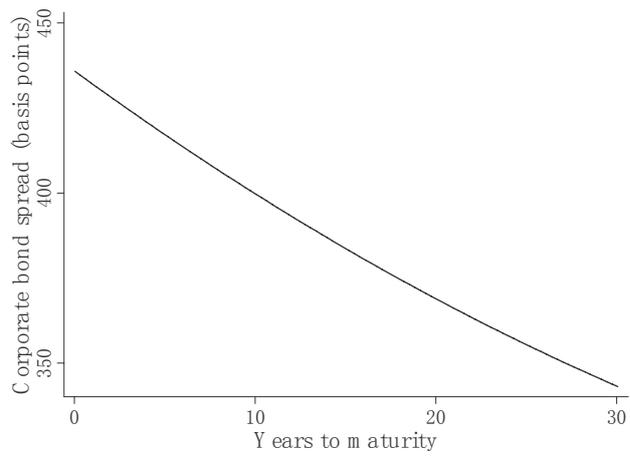
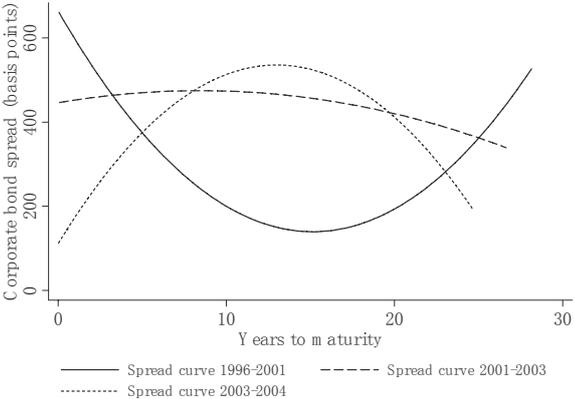
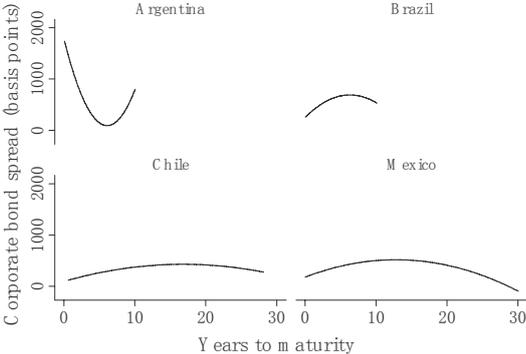


Exhibit 6: Unconditional spread to maturity curves by period and country. A second order polynomial approximation.



(a)



(b)

Exhibit 7: The Determinants of Corporate Bond Spreads in Latin America. Econometric Results-Full Sample

Covariate	[1]OLS	[2]FE	[3]RE	[4]FD	[5]FE-AR	[6]RE-AR	[7]GLS-RE	[8]GLS-FE
Sovereign spread (in basis points)	0.079*** [0.022]	-0.043 [0.070]	0.059 [0.065]	0.06 [0.062]	0.069 [0.063]	0.055 [0.063]	0.122*** [0.020]	0.082*** [0.026]
Liquidity: % of day with transactions	-2.436 [4.504]	-7.876*** [1.806]	-5.060*** [1.822]	-2.624*** [0.878]	-1.940** [0.944]	-3.067*** [0.959]	-0.630*** [0.220]	-1.137*** [0.372]
Quasi-debt to firm value ratio (as % of firm value)	48.068** [21.354]	119.579*** [14.617]	49.488*** [9.957]	-12.425 [9.373]	-3.632 [9.772]	6.105 [8.328]	6.029* [3.128]	9.920* [5.564]
Years to maturity	-27.853*** [5.001]	-91.894*** [29.048]	-21.749*** [8.008]	4,832.983*** [1,834.180]	-301.808*** [113.559]	-32.983*** [10.442]	2.155 [6.736]	-12.601 [10.717]
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield volatility)	280.146*** [78.227]	199.171* [112.533]	220.497* [113.657]	49.297 [93.574]	39.405 [98.042]	32.541 [99.150]	28.872 [20.879]	46.539 [28.531]
2-Year firm value volatility	42.673 [464.939]	-6.611 [532.481]	-160.124 [474.326]	436.624 [335.441]	281.142 [362.819]	283.617 [341.096]	205.738*** [75.628]	173.671* [96.916]
Interaction 1: Quasi-debt to firm value - Years to maturity	-0.943 [1.189]	-8.116*** [1.096]	-2.934*** [0.809]	0.069 [0.790]	-1.173 [1.039]	-0.869 [0.694]	-0.253 [0.229]	-1.218*** [0.438]
Interaction 2: Quasi-debt to firm value - USTB-yield volatility	-24.444** [11.126]	0.21 [8.397]	-9.669 [7.939]	7.689 [6.154]	14.389** [6.779]	6.507 [6.313]	1.087 [2.187]	7.074** [3.067]
Constant	318.328 [313.339]	604.406** [277.997]	419.727* [214.823]	1,248.939*** [456.328]	1,962.393*** [51.964]	709.469*** [184.299]	226.829*** [57.455]	3,109.61 [1,983.237]
Observations	667	667	667	574	591	667	662	662
Number of bonds	76	76	76	71	71	76	71	71
R-squared	0.17	0.203	0.16	0.09	0.05	0.14		
Log likelihood							-3993.95	-4206.66
Prob > F [GLOBAL SIGNIFICANCE]	0.00							
Prob > chi2 - [SOV-CEILING]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prob > F [POOLED SERIAL CORRELATION]	0.00							
Prob > F - [POOLED OLS VS. FIXED EFFECTS]		0.00						
Prob > chi2 - [HETEROSKEDASTICITY]							0.00	
Prob > F - [SERIAL CORRELATION]					0.00			
Prob > chi2 - [FIXED VS RANDOM EFFECTS]			0.00					

Note: The dependent variable is the corporate bond spread. Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. OLS, RE, FE, FD, FE-AR, RE-AR, GLS-RE and GLS-FE stand for ordinary least squares, random effects, fixed effects, first differences, fixed effects with serial correlation corrections, random effects with serial correlation corrections, generalized least squares with random effects, and generalized least squares with fixed effects estimators, respectively.

Exhibit 8: The Determinants of Corporate Bond Spreads in Latin America. Econometric Results-Full Sample- allowing for different slopes in sovereign spreads

Covariate	[1]OLS	[2]FE	[3]RE	[4]FD	[5]FE-AR	[6]RE-AR	[7]GLS-RE	[8]GLS-FE
Liquidity: % of day with transactions	-5.889*** [1.920]	-9.220*** [1.892]	-5.889*** [1.920]	-2.565*** [0.947]	-2.114** [1.061]	-3.683*** [1.038]	-0.764** [0.353]	-149.21*** [0.000]
Quasi-debt to firm value ratio (as % of firm value)	29.489*** [11.029]	108.782*** [16.332]	29.489*** [11.029]	-15.299 [10.499]	-15.049 [11.646]	9.306 [9.906]	17.645*** [3.660]	
Years to maturity	-7.124 [13.699]	-64.725* [35.991]	-7.124 [13.699]	-1,155.58 [2,038.226]	-441.749*** [144.804]	-10.715 [14.199]	6.499** [3.121]	
2-Year rolling yield volatility of the 3-month US T-bond (USTB-yield volatility)	73.758 [127.677]	70.167 [131.924]	73.758 [127.677]	7.92 [95.273]	3.513 [101.510]	-16.248 [107.560]	25.841 [27.627]	
2-Year rolling firm value volatility	-252.972 [534.130]	-79.699 [571.684]	-252.972 [534.130]	341.223 [368.741]	161.506 [410.613]	115.549 [379.962]	85.928 [94.792]	
Interaction 1: Quasi-debt to firm value – Year s to maturity	-3.967*** [0.929]	-8.340*** [1.231]	-3.967*** [0.929]	-0.133 [0.867]	-0.92 [1.138]	-1.658** [0.797]	-1.501*** [0.378]	
Interaction 2: Quasi-debt to firm value - USTB-yield volatility	19.046* [9.976]	16.418* [9.958]	19.046* [9.976]	10.966* [6.372]	15.055** [7.095]	10.479 [7.119]	2.545 [2.865]	
Constant	682.568*** [224.571]	836.002** [354.898]	682.568*** [224.571]	-234.011 [507.506]	2,507.221*** [50.226]	723.585*** [206.911]	145.309*** [46.552]	
Observations	667	667	667	574	591	667	662	662
Number of bonds	76	76	76	71	71	76	71	71
R-squared	0.525	0.383	0.53	0.08	0.11	0.3		
Log likelihood							-4175.76	-80382.1
Prob > F [GLOBAL SIGNIFICANCE]	0.00							
Prob > chi2 - [EQUAL SLOPES FOR SOV. SPREAD]	0.00							
Prob > F [POOLED SERIAL CORRELATION]	0.00							
Prob > F - [POOLED OLS VS. FIXED EFFECTS]		0.00						
Prob > chi2 - [HETEROSKEDASTICITY]							0.00	
Prob > F - [PANEL SERIAL CORRELATION]					0.00			
Prob > chi2 - [FIXED VS. RANDOM EFFECTS]			0.00					

Note: The dependent variable is the corporate bond spread. Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. OLS, RE, FE, FD, FE-AR, RE-AR, GLS-RE and GLS-FE stand for ordinary least squares, random effects, fixed effects, first differences, fixed effects with serial correlation corrections, random effects with serial correlation corrections, generalized least squares with random effects, and generalized least squares with fixed effects estimators, respectively.

Exhibit 9: Sovereign spread specific slopes distribution. Kernel density estimates for the whole sample

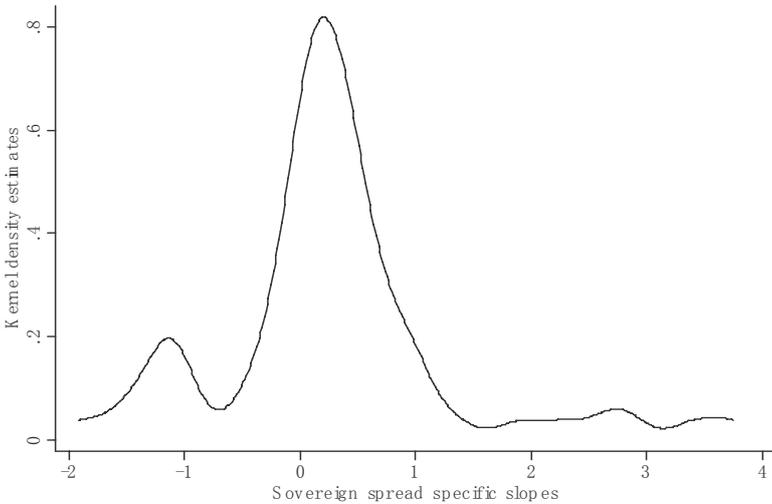


Exhibit 10: Sovereign ceiling probability distribution. Whole sample kernel density estimates for the probability of specific sovereign spread coefficients being equal to

1

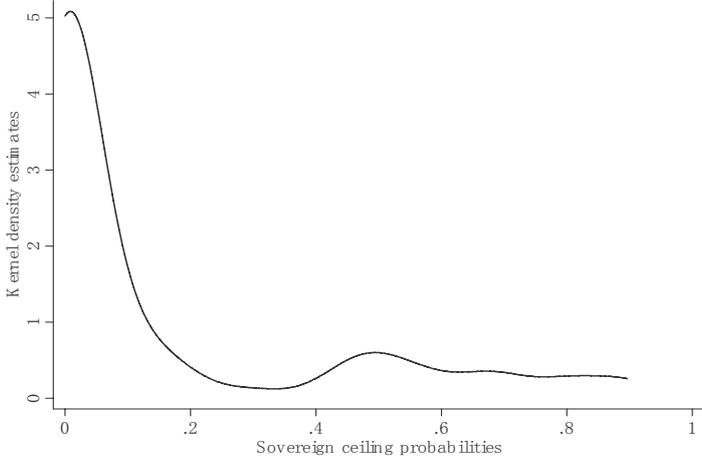


Exhibit 11: Rejection rates of the sovereign ceiling hypothesis

	Sov. Ceiling (a)	Sov. Ceiling (b)
Whole sample	0.83	0.62
Argentina	0.90	0.80
Brazil	0.79	0.64
Chile	0.77	0.38
Mexico	0.85	0.65

Note: Rejection rates in Column "Sov. Ceiling (a)" have been calculated assuming that the sovereign ceiling hypothesis cannot be rejected when the corporate spread coefficient (β_1) is positive and Prob. ($\beta_1=0$) <0.05 and Prob. ($\beta_1=1$) >0.05 or Prob. ($\beta_1=1$) <0.05 & $\beta_1>1$. Rejection rates in column "Sov. Ceiling (b)" are calculated as in "Sov. Ceiling (a)" but without introducing the Prob. ($\beta_1=0$) <0.05 constraint.

**Exhibit 12: Economic significance of corporate spread structural determinants.
Different approaches to variance decomposition**

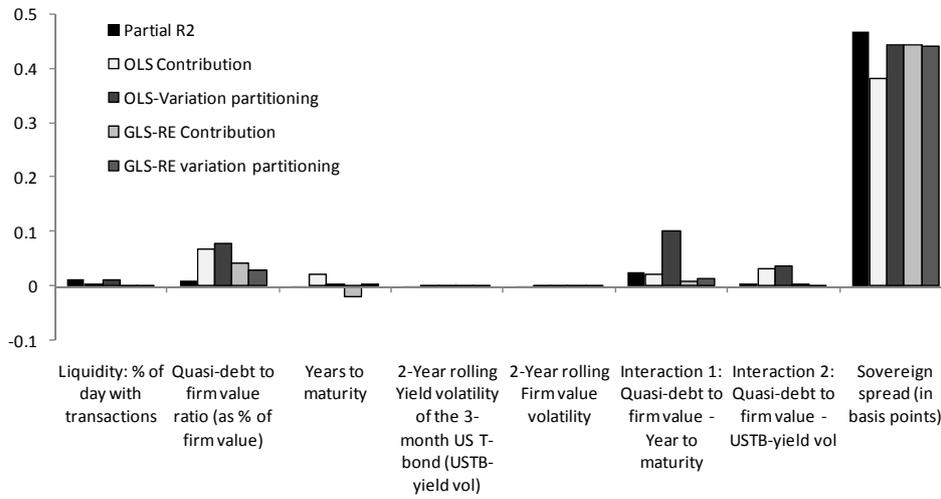


Exhibit 13: Sovereign spread specific slopes and sovereign ceiling test results for the GLS-RE estimator

Bond Id	Firm	Sector	Available obs.	% of Days with Transactions	Mean Corp. Spread	Mean Corresponding Corp. Spread	Sov. Spread coeff. (β_1)	Prob. $\beta_1=0$	Prob. $\beta_1=1$	Sov. Ceiling (a)	Sov. Ceiling (b)
ARGENTINA											
101	Alpargatas	Textile	1996q3-1996q4	2.20	3423.50	446.51	6.03	0.211	0.297	0	1
105	Comercial del Plata	Others	1996q3-1998q3	14.03	349.28	284.04	0.09	0.803	0.01	0	0
106			1996q3-1998q1	9.47	274.75	313.21	-0.28	0.293	0	0	0
107	YFF	Oil & Gas	1996q3-2000q1	20.55	922.00	289.60	10.37	0.024	0.041	1	1
108			2001q2-2002q1	8.69	438.70	511.20	0.18	0.114	0	0	0
109			2001q4-2002q1	5.77	147.69	511.20	0.13	0.653	0.002	0	0
110			1997q4-2004q3	52.18	256.73	1800.52	0.09	0	0	0	0
111			2000q2-2004q3	44.10	394.66	4107.73	0.09	0	0	0	0
112			1999q1-2003q3	43.87	304.29	697.01	0.06	0.333	0	0	0
113			1998q2-2002q1	28.65	330.64	512.40	0.46	0.044	0.02	0	0
BRAZIL											
202	Braskem	Chemical products	2004q1-2004q3	15.76	654.01	627.91	0.97	0	0.896	1	1
205	Gerdau Met	Steel & Metals	1996q4-2001q2	30.52	951.37	287.81	0.72	0.283	0.671	0	1
206			2001q2-2003q4	45.46	691.77	621.45	0.07	0.641	0	0	0
207	Tele Norte Celular	Telecommunication	2003q4-2004q3	16.26	449.77	483.61	0.45	0.139	0.067	0	1

Note. In Column "Sov. Ceiling (a)", the sovereign ceiling hypothesis cannot be rejected (1; while 0 stands for rejection) when $\beta_1 > 0$ & Prob. ($\beta_1 = 0$) < 0.05 & (Prob. ($\beta_1 = 1$) > 0.05 or (Prob. ($\beta_1 = 1$) < 0.05 but $\beta_1 > 1$)). In Column "Sov. Ceiling (b)", the Prob. $\beta_1 = 0 < 0.05$ constraint is no longer introduced. Detailed characteristics for each bond can be obtained from Exhibit 13.

Exhibit 14: Sovereign spread specific slopes and sovereign ceiling test results for the GLS-RE estimator (cont.)

Bond Id	Firm	Sector	Available obs.	% of Days with Transactions	Mean Corp. Spread	Mean Corresponding Corp. Spread	Sov. Spread coeff. (β_1)	Prob. $\beta_1=0$	Prob. $\beta_1=1$	Sov. Ceiling (a)	Sov. Ceiling (b)
BRAZIL (cont.)											
212			1999q3-2000q3	16.73	430.26	304.37	-1.1	0.187	0.011	0	0
213			2000q3-2001q4	11.52	228.68	284.97	-1.08	0.162	0.007	0	0
214			2000q2-2001q4	11.78	222.69	286.29	-1.4	0.041	0	0	0
215			2000q3-2001q4	8.57	164.42	287.48	-1.09	0.116	0.003	0	0
216	Unibanco	Finance & Insurance	2001q2-2001q4	8.47	234.14	284.54	-1.22	0.249	0.036	0	0
217			2002q2-2004q3	25.77	647.09	363.03	0.91	0	0.67	1	1
219			2003q1-2004q3	23.57	618.04	363.03	0.95	0	0.8	1	1
220			2004q1-2004q3	15.54	457.84	483.60	0.3	0.299	0.013	0	0
221			2004q1-2004q3	8.66	50.52	725.43	-1.02	0.002	0	0	0
222	Usiminas	Steel & Metals	2003q4-2004q3	8.51	39.56	427.76	-1.16	0.332	0.071	0	0
CHILE											
301			2002q3-2002q4	44.44	327.84	203.37	-1.92	0.052	0.003	0	0
302			2003q1-2004q3	32.01	639.78	97.93	3.41	0	0.003	1	1
303	Enerjis	Electricity	2003q1-2004q3	24.86	132.72	-40.79	-1.55	0.732	0.573	0	0
304			2003q4-2004q3	16.67	304.43	136.78	0.32	0.793	0.579	0	1
305			2003q4-2004q3	16.81	323.19	136.78	0.42	0.634	0.515	0	1
307	Embotor	Food & Beverages	2002q3-2004q3	29.82	379.15	127.85	0.17	0.733	0.089	0	1

Note. In Column "Sov. Ceiling (a)", the sovereign ceiling hypothesis cannot be rejected (1; while 0 stands for rejection) when $\beta_1 > 0$ & Prob. $\beta_1 = 0 < 0.05$ & (Prob. $\beta_1 = 1 > 0.05$ or (Prob. $\beta_1 = 1 < 0.05$ but $\beta_1 > 1$)). In Column "Sov. Ceiling (b)", the Prob. $\beta_1 = 0 < 0.05$ constraint is no longer introduced. Detailed characteristics for each bond can be obtained from Exhibit 13.

Exhibit 14. Sovereign spread specific slopes and sovereign ceiling test results for the GLS-RE estimator (cont.)

Bond Id	Firm	Sector	Available obs.	% of Days with Transactions	Mean Corp. Spread	Mean Corresponding Corp. Spread	Sov. Spread coeff. (β_1)	Prob. $\beta_1=0$	Prob. $\beta_1=1$	Sov. Ceiling (a)	Sov. Ceiling (b)
CHILE (cont.)											
308	Andina	Food & Beverages	2002q3-2004q3	44.12	474.95	87.91	1.88	0	0.008	1	1
309			2003q1-2004q3	41.23	434.21	-56.29	-2.32	0.04	0.003	0	0
310			2003q1-2004q3	34.91	-381.20	-2828.01	1.02	0	0.801	1	1
311	Endesa	Electricity	2003q4-2004q3	17.44	275.86	116.03	0.83	0.502	0.891	0	1
312			2003q4-2004q3	17.57	264.16	142.89	0.65	0.491	0.707	0	1
314	CTC	Telecommunication	2002q3-2004q3	38.29	279.31	116.76	0.36	0.265	0.046	0	0
315			2002q3-2004q3	39.85	181.75	135.40	-0.37	0.66	0.104	0	0
MEXICO											
501	Comercial Mexicana	Wholesale & retail trade	1996q3-1997q2	10.29	271.25	152.43	0.59	0.314	0.486	0	1
502			1999q3-2004q3	36.38	1352.52	197.75	2.28	0.181	0.452	0	1
508	Posadas Gpo	Others	1997q1-2001q3	28.71	556.88	216.45	1.33	0.005	0.477	1	1
511	Televisa Gpo	Others	1996q3-1997q3	7.73	126.99	517.11	-0.22	0.045	0	0	0
512			2001q3-2004q3	25.53	84.86	190.72	0.67	0.192	0.511	0	1
513			2000q3-2004q2	28.68	256.84	190.72	0.59	0.244	0.425	0	1
514			2002q1-2004q3	28.11	321.16	243.25	0.46	0.006	0.001	0	0
515			2002q2-2004q3	25.93	297.69	243.25	0.49	0.009	0.007	0	0
518			1997q1-1998q1	9.02	167.22	178.89	-2.43	0.001	0	0	0
519	Hysamex	Steel & Metals	2003q2-2004q3	19.62	900.32	270.99	4.52	0	0	1	1
520			1999q1-2004q3	43.18	1933.98	312.19	3.75	0	0.001	1	1
522	Kimberly Clark Mex	Paper & pap. related prod.	2001q1-2004q3	33.35	283.60	595.53	0.1	0.268	0	0	0
523			1999q3-2004q3	41.39	422.58	595.53	0.28	0.014	0	0	0

Note. In Column "Sov. Ceiling (a)", the sovereign ceiling hypothesis cannot be rejected (1; while 0 stands for rejection) when $\beta_1 > 0$ & Prob. $\beta_1 = 0 < 0.05$ & (Prob. $\beta_1 = 1 > 0.05$ or (Prob. $\beta_1 = 1 < 0.05$ but $\beta_1 > 1$)). In Column "Sov. Ceiling (b)", the Prob. $\beta_1 = 0 < 0.05$ constraint is no longer introduced. Detailed characteristics of each bond can be obtained from Exhibit 13.

Exhibit 14. Sovereign spread specific slopes and sovereign ceiling test results for the GLS-RE estimator (cont.)

Bond Id	Firm	Sector	Available obs.	% of Days with Transactions	Mean Corp. Spread	Mean Corresponding Srp. Spread	Sov. Spread coeff. (β_1)	Prob. $\beta_1=0$	Prob. $\beta_1=1$	Sov. Ceiling (a)	Sov. Ceiling (b)		
MEXICO (cont.)													
526	Vitro	Non-metallic minerals	2003q4-2004q3	17.25	893.63	180.69	2.67	0	0.001	1	1		
527			2003q4-2004q3	16.90	928.06	180.69	2.84	0	0	1	1		
532	America Movil	Telecommunications	2004q1-2004q3	14.55	184.88	177.66	0.01	0.994	0.126	0	1		
533			2004q2-2004q3	15.13	202.19	177.66	0.07	0.923	0.181	0	1		
539			2004q2-2004q3	13.00	-16.92	385.33	-0.56	0.184	0	0	0		
542	Coca Cola Femsa	Food & Beverages	1997q3-2004q3	54.46	263.88	390.19	0.05	0.705	0	0	0		
543			1996q3-1997q2	5.88	144.51	551.36	-0.09	0.457	0	0	0		
544			1996q3-1999q4	18.78	258.82	282.70	0.17	0.393	0	0	0		
545			1996q3-2000q3	23.41	259.41	236.48	0.27	0.282	0.003	0	0		
546			1996q3-1998q1	10.81	196.18	170.73	-0.06	0.834	0	0	0		
547			1996q3-2001q1	29.64	253.27	215.29	0.19	0.388	0	0	0		
548			1996q3-2000q2	22.95	257.99	244.72	0.28	0.236	0.002	0	0		
549			2001q2-2004q3	31.70	216.35	84.31	0.21	0.567	0.035	0	0		
550			Garex SA	Non-metallic minerals	2001q1-2004q3	57.14	344.34	84.31	0.41	0.273	0.11	0	1
551					1999q3-2002q2	17.42	185.70	210.79	-0.06	0.899	0.022	0	0
552	2000q3-2004q3	35.53			306.44	295.38	0.35	0.117	0.003	0	0		
553	2001q1-2004q3	32.14			347.09	295.38	0.4	0.021	0.001	0	0		
554	2000q1-2004q3	39.38			320.52	295.38	0.43	0.001	0	0	0		
555	2001q1-2002q3	14.62			181.69	187.38	-0.21	0.81	0.157	0	0		
556	2000q3-2002q3	17.30			192.74	187.38	-0.05	0.95	0.184	0	0		
557	1996q3-1997q3	7.69	265.86	519.95	0.17	0.414	0	0	0				

Note. In Column "Sov. Ceiling (a)", the sovereign ceiling hypothesis cannot be rejected (1; while 0 stands for rejection) when $\beta_1 > 0$ & Prob. $\beta_1 = 0 < 0.05$ & (Prob. $\beta_1 = 1 > 0.05$ or (Prob. $\beta_1 = 1 < 0.05$ but $\beta_1 > 1$)). In Column "Sov. Ceiling (b)", the Prob. $\beta_1 = 0 < 0.05$ constraint is no longer introduced. Detailed characteristics of each bond can be obtained from Exhibit 13.

