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THE DETERMINANTS OF CORPORATE RISK IN EMERGING MARKETS: AN OPTION-ADJUSTED SPREAD ANALYSIS

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ABSTRACT

This study explores the determinants of corporate bond spreads in emerging markets economies. Using a largely unexploited data set, the paper finds that corporate bond spreads are determined by firm-specific variables, bond characteristics, macroeconomic conditions, country-specific sovereign risk, and global factors. A variance decomposition analysis shows that firm-level performance indicators account for the larger share of the variance. In addition, the paper finds that corporate spreads respond more acutely to sovereign and global risk increases rather than to decreases. This suggests two asymmetries prevalent in the data. The first is in line with the sovereign ceiling 'lite' hypothesis, which states that it appears from spreads data that sovereign risk remains a significant determinant of corporate risk although credit rating agencies have gradually moved away from a policy of never rating a corporate above the sovereign. The second is consistent with the popular notion that panics are common in emerging markets where investors are less informed and more prone to herding. Copyright © 2009 John Wiley & Sons, Ltd.

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1. INTRODUCTION

Corporate bond spreads over riskless debt are a manifestation of the cost of financing for private firms. Higher spreads signal that the cost of capital is higher. Given that investment in physical capital is a key motor of economic growth,[1] it is very important to find out what are the drivers of the cost of financing for private firms in order to identify the determinants of productive investment.

We focus on the determinants of the corporate spreads for 139 bonds issued by 65 corporations in 10 emerging market economies (EMEs), six in Latin America and four in the East Asian region, with available data in Bloomberg. Our main finding is that firm-specific variables, bond characteristics, macroeconomic conditions, sovereign risk, and global factors are all determinants of corporate risk. Furthermore, a variance decomposition analysis indicates that firm-level characteristics account for the largest share of the variance. The factors that are outside the direct control of the firm management, such as sovereign risk, also matter, but these effects are relatively less important. All in all, these results underscore the importance of performance and other firm-specific characteristics as the main determinants corporate risks in EMEs.

This is an interesting result especially for a sample of EMEs.[2] A defining characteristic of this group of countries is that they have sought, particularly since the 1990s, to tap international capital markets in order

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to expand financing opportunities and bring down the domestic cost of capital. But experience suggests that when these new opportunities arise, the private sector is not the only one eager to tap them. Governments themselves have also increased foreign borrowing to finance their own investment and spending needs (IDB, 2006). This borrowing creates, among other things, sovereign default risk, or 'country risk,' which could increase the cost of borrowing faced by domestic firms.[3] It is precisely this presumed linkage between sovereign and corporate risk that has provided the rationale for all major rating agencies to justify the application of the so-called 'sovereign ceiling policy,' which means that the debt of a company in a given country cannot be rated higher than the debt of its government. While the policy was amended and relaxed in 1997 by Standard & Poor's and in 2001 by Moody's, the question still remains open as to whether the market has de-linked the two. One contribution of this paper is to provide an estimate for the impact of sovereign risk on the borrowing costs of firms using spreads data. We show that the effect is large and significant, although it is not the main determinant of corporate risk in EMEs.

To the best of our knowledge, we are among the first to perform empirical analysis using a large panel data set with comparable corporate bond spreads across several industries and countries. One limitation in previous studies has been data availability. For example, in related studies, the corporate bond spreads are computed by comparing the 'yield to maturity' of a corporate bond to that of a government bond of similar maturity, and a value assessment of the incremental risk is made based upon the yield spread. The limitations of this approach are twofold. On the one hand, it is typically very difficult to find pairs of bonds that match well on all dimensions, thereby limiting sample size of studies that are based on that approach.[4] On the other hand, for many corporate bonds issued in EMEs, determining a definite maturity date for a corporate bond oftentimes becomes impossible as the bond structure typically incorporates option-like features.[5]

To circumvent these problems, we use option-adjusted spread (OAS) analysis from Bloomberg. Basically, the OAS is the spread over an issuer's spot rate curve (i.e. the theoretical yield on a zero-coupon Treasury security). This method allows us to compare bonds with different cash flow characteristics on a more equal basis. It simultaneously considers credit risk and contingent cash flow risk, and it is a useful tool for determining an investor's compensation conditional on the structure of the bond. One of the positive aspects of this method is that Bloomberg Professional Analysis computes OAS for a variety of corporate bonds in EMEs, for example, bonds with and without embedded options. This increases sample size considerably *vis-à-vis* other methods as these spreads are comparable despite the differences in the underlying bonds. At the same time, these adjusted corporate bond spreads are also comparable with the country-specific Emerging Markets Bond Index (EMBI) spread, the benchmark measure of sovereign risk in EMEs. The EMBI plus is the most liquid US-dollar emerging market debt standard, and it tracks total returns for actively traded external instruments in EMEs. Included in the EMBI plus are US-dollar-denominated Brady bonds, Eurobonds, and traded loans issued by sovereign entities.[6] JPMorgan computes an individual country's spreads as a weighted average of all spreads from bonds that meet certain size and liquidity requirements. These country-specific spreads are the proxy for sovereign risk that we use in the estimation.[7]

In addition to the main results on the determinants of corporate bond spreads in EMEs and on the impact of country risk on the cost of financing of corporate issuers, we find that corporate spreads respond more acutely to increases in sovereign and global risk. This suggests two asymmetries prevalent in the data. The first is in line with a sort of sovereign ceiling 'lite' in emerging markets bonds spreads (Borensztein *et al.*, 2006). It suggests that the so-called 'transfer risk' between sovereign spreads and corporate risk—that is, the risk that if the government encounters difficulties in servicing its debts, it will transfer those problems to the local private sector—is positive and significant. The second asymmetry is consistent with the notion that panics are common in emerging markets where investors are less informed and more prone to herding (Calvo, 1999; and Calvo and Mendoza, 2000).

We contribute to the existing literature in at least two fronts: we are, to the best of our knowledge, among the first to employ OAS to explore the determinants of corporate bond spreads in a large cross-country and multi-bond setting.[8] Second, we implement an empirical methodology based on panel data techniques aimed at disentangling the determinants of corporate risk while appropriately accounting for cross-country and cross-sector heterogeneity in the sample.

The rest of the paper is organized as follows. In the next section we present the empirical strategy and the choice of variables, and in Section 3 we discuss the OAS methodology. In Section 4 we present our

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regression results, along with a variance decomposition analysis to investigate the quantitative significance of each set of determinants in explaining the variance of corporate spreads. Also, we briefly discuss some of the robustness checks. The paper ends with conclusions.

2. METHODOLOGY AND DATA

The central question of this study is to understand the determinants of corporate risk using OAS for corporate bonds issued in EMEs. We use a panel data set containing quarterly data from 139 publicly traded bonds listed in Bloomberg issued by 65 corporations over 10 EMEs between 1999 and 2006. The countries are split between Latin America (six): Argentina, Brazil, Chile, Colombia, Mexico, and Panama; and Asia (four): Indonesia, Malaysia, Philippines, and Thailand. The firms cover seven industrial sectors: manufacturing, mining, utilities, agriculture, construction, tourism, and telecommunications. Our constraint for sample selection is data availability for corporate bond spreads and firm-level performance indicators.[9]

We propose that the natural logarithm of the spread (S_{it}) of a bond i during quarter t is given by

$$S_{it} = \beta_0 P_C + \beta_1 D_s + \beta_2 F_{it} + \beta_3 B_{it} + \beta_4 CR_{ct} + \beta_5 C_{ct} + \beta_6 G_t + \mu_{it} \quad (1)$$

where P_C are country fixed effects, D_s are industry dummies, F_{it} are firm-level determinants of idiosyncratic corporate risk, B_{it} are bond-structure characteristics, CR_{ct} is the sovereign risk, C_{ct} are country-level time-varying variables (i.e. macroeconomic variables), G_t are the global factors, and μ_{it} is the error term.

The choice of the frequency hinges on the availability of firm-specific variables, which are reported in Bloomberg on a quarterly basis. Instead, bond spreads and the country-specific EMBI spreads are reported daily. Thus, they are transformed into quarterly frequency by computing the corresponding period average. The resulting sample comprises an unbalanced panel over 29 consecutive quarters.

The dependent variable is the OAS (in natural logarithm). As described in Huang and Kong (2003), this credit spread on corporate bonds is the extra yield offered to compensate investors for a variety of risks, such as: (1) expected default loss, (2) credit risk premium due to the uncertainty of default losses, and (3) liquidity and tax premiums. It is precisely the origin of this extra yield that we seek to investigate in this paper using a new panel data set.[10]

Our explanatory variables are split into six groups. These are: (1) industry-specific effects, (2) firm-specific variables, (3) bond characteristics, (4) sovereign risk, (5) country-specific effects, and (6) global factors. All the data are derived from Bloomberg, except for countries' macroeconomic variables, which are taken from the World Bank's World Development Indicators. A list of all variables, definitions, and sources is included in the Appendix (Table A1). In addition, Table A2 provides descriptive statistics for the main variables.

The industry fixed effects control for the unobservable heterogeneity in industry risk. The country fixed effects control for unobservable effects, for example some possible heterogeneity in the local bond markets (i.e. in terms of size, liquidity and financial development).

The firm level determinants of idiosyncratic corporate risk (mainly, financial risk factors) are primarily those derived from the model of Altman (2000). These are: return on assets (EBIT/Assets),[11] stability of earnings, cumulative profitability (Retained earnings before interest and taxes/Assets), liquidity (Working Capital/Assets), capitalization (Equity/Capital), leverage (Debt/Assets), and size (Total Assets). For concreteness, in the reported regressions we focus only on EBIT/Assets, Equity/Assets, Debt/Assets, and size, but the reader should rest assured that our results are robust to the inclusion of the full set of determinants.[12] We also expand the set of firm-level variables to include 'volatility of equity'[13] because in the framework of Merton (1974) a firm with more volatile equity is more likely to reach the boundary condition for default. Thus, investors should require additional compensation in the form of higher spreads. In fact, Campbell and Taksler (2003), in a study of US corporations, find that equity volatility explain about a third of the variation in corporate bond yield spreads.[14]

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The main bond structure characteristic included in the analysis is the time-to-maturity (in natural logarithm). Presumably, at least for corporations with low overall levels of debt, the longer the time for maturity, the greater is the uncertainty about the future, so the higher is the associated risk of holding that debt. On the other hand, for corporations with high levels of debt, having a debt structure with longer time to maturity might reduce liquidity risk. Therefore, the term structure of credit spreads could vary with the leverage of the firm (Merton, 1974). To account for this possible non-linearity, we also include the interaction term between time-to-maturity and Debt/Assets.[15]

As discussed in the introduction, our measure of country-specific risk is the widely used JPMorgan EMBI spread for each of the 10 countries in our sample. The other country-level variables included are those related to the macroeconomic environment, which conceivably has an incidence on corporate risk. We experimented with several macroeconomic variables, including inflation, external balance, and the volatility of economic growth. The drawback is that some of these are not available for all countries on a quarterly frequency. For concreteness, in our preferred specification, we report results for only two such variables: GDP growth and the level of GDP per capita. The other control variables are not statistically significant and their inclusion does not change the results.

The global factors accounted for in our regressions include 'High Yield,' which measures the yield of US low-rated (i.e. 'junk') bonds. The inclusion of this variable is motivated by the fact that if, for example, investors consider EMEs' corporate bonds to be part of the same risky assets class as US high-yield bonds, then an increase in the yield of the latter could have an effect on the spread of the former. Another global factor accounted for is the yield on 10-year US treasury bonds. An increase in the spreads of these essentially risk-free bonds could have an effect on corporate bond spreads in EMEs if, for example, that increase reflects an increase in investors' appetite for riskier assets in general. Finally, we also account for 'VIX,' which is constructed using the implied volatilities of a wide range of S&P 500 index options. This volatility is meant to be forward-looking and is calculated from both calls and puts. The VIX is a widely used measure of market risk.[16] Table A3 in the Appendix shows the correlation matrix of all these variables and also the OAS corporate spreads.[17]

The proposed empirical specification has the advantage of enabling us to exploit both the cross-section and time-series variation of our data set, while reducing the risk of omitted variable bias through the inclusion of country and industry level fixed effects. In our preferred specification, we do not include time-specific effects because they are perfectly collinear with the measures of global factors that vary only over time. Nevertheless, quite reassuringly, our results are also robust to the inclusion of time-dummies in lieu of these measures of global factors.

Another concern with our baseline specification is the possible presence of endogeneity, which may be relevant for the firm-specific variables. In order to address this problem, we do a robustness check using a two-step efficient generalized method of moments (GMM) estimator, where we instrument firm-specific variables with the 1- and 2-year lags.[18] The baseline results are robust to this change, suggesting that our results do not appear to be driven by potential endogeneity of firm-specific variables.

Following Petersen (2009), all standard errors are clustered by 'country $\times$ time.' We perform a variance decomposition analysis to quantify the importance of each set of determinants in explaining the variation in OAS. We also perform a battery of sensitivity tests, including running the model in differences and allowing for additional interaction effects.

3. OAS ANALYSIS COMPUTATION[19]

In contrast to conventional bond price calculations that utilize a constant 'yield to maturity' rate to discount all future coupon and principal cash flows to their respective present values, the OAS is the spread over an issuer's spot rate curve (i.e. the theoretical yield on a zero-coupon Treasury security). In this 'benchmark spot curve' short maturity cash flows are discounted differently than long maturity flows using the appropriate discount rate for each cash flow. Bloomberg Professional Analysis generates a 'benchmark spot curve' in the following steps: (1) the six-month spot rate is defined as being equivalent to the

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benchmark six-month rate; (2) a 1-year benchmark bond containing a 6-month coupon payment and a 1-year coupon and principal payment is considered; (3) the 6-month coupon payment of the 1-year benchmark issue is discounted to present value using the 6-month spot rate from (1); (4) the present value of the 6-month coupon payment in (3) is then subtracted from the market price of the 1-year cash flow to solve for the appropriate discount rate, which becomes the 1-year spot rate; and (5) spot rates for successive terms are solved for in a similar way, generating a spot curve based on the underlying benchmark yield curve. The result of these successive calculations is a series of discount factors unique to each term of a bond's cash flows.

The OAS analysis for non-callable bonds (i.e. bonds without embedded options) utilizes the 'benchmark spot curve' to value a bond by breaking up its component cash flows and valuing them using the appropriate discount factor for each cash flow term. Once the spot rates for the benchmark curve are established, the OAS of a given bond is determined. Thus, rather than simply comparing a bond's yield to maturity with a benchmark issue, OAS measures the constant spread that must be added to the spot interest rate to make the price of the risk-free bond, as calculated by the pricing model, identical to the observed market price of the corporate bond. This procedure makes it feasible to compare spreads across corporate bonds with different maturity profiles and cash-flow structures. In practical terms, this enables us to expand the sample size beyond a few bonds that match among all the dimensions.

In addition, many corporate bonds—in our sample, almost half—contain contingent cash flows due to call, put, or sink features, sometimes referred to as embedded options. As such, the standard 'yield to maturity' spreads on these bonds are meaningless because the exact maturity date of the bond is unknown. The OAS spread analysis for callable bonds—with cash flows contingent upon the future level of interest rates—is somewhat more complex. Specifically, the Bloomberg OAS model uses a one-factor, arbitrage-free binomial tree of normally distributed short-rates in order to establish a distribution of millions of different interest rate scenarios that are driven by the volatility input for the interest rate. OAS then examines the bond's call schedule to establish the evolution of rates over time. Once these cash flows are modelled, the present value of the callable bond is determined by using the discount rates found in the tree, together with an OAS, which is in the same manner as with non-callable bonds. The end product is once again the same: OAS for callable bonds is also the spread over an issuer's spot rate curve.

4. BASELINE RESULTS

Table 1 reports the main results from the sequential estimation of different variants of Equation (1). Column (1) includes only firm-level financial variables, along with (unreported) country fixed effects and industry (sector) dummies. The coefficients on the proxies for firm profitability (EBIT/Assets), capitalization (Equity/Capital), and asset size are negative and, with the exception of capitalization, statistically significant. In addition, the coefficient on the proxy for firm leverage (Debt/Assets) is positive and statistically significant. The results are intuitive: on the one hand, firms with higher profitability, higher ratios of equity over capital, and more assets, are (all else equal) less risky. On the other hand, firms with high levels of debt are more risky. Also, in line with the findings of Campbell and Taksler (2003), the point estimate for the 'volatility of the equity' is positive and statistically significant, suggesting that higher levels of volatility (a proxy for idiosyncratic risk) increase corporate bond spreads.[20]

Column (2) includes the 'years to maturity' and 'years to maturity $\times$ debt to assets' in order to account for the term structure of corporate bonds, as well as for the possible non-linear incidence of the term structure at different levels of leverage. Both coefficients enter the regression with the expected sign. On the one hand, longer time to maturity is associated with more risk, but this effect is somewhat mitigated at higher levels of debt, where more time to pay reduces the risk of facing liquidity problems. Note that while there are small quantitative changes in the point estimates of the other variables as we augment the regressions, there are no changes in either the signs or the statistical significance of the coefficients.

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Table 1. Determinants of Corporate OAS

	(1) OAS	(2) OAS	(3) OAS	(4) OAS	(5) OAS	(6) OAS	(7) OAS	(8) OAS	(9) OAS
Firm specific									
EBIT/Assets	−0.047***	−0.050***	−0.052***	−0.053***	−0.053***	−0.045***	−0.043***	−0.043***	−0.048***
	(0.015)	(0.014)	(0.013)	(0.013)	(0.013)	(0.012)	(0.011)	(0.011)	(0.012)
Equity/Capital	−0.003	−0.005	−0.009***	−0.009***	−0.009**	−0.010***	−0.009***	−0.009***	−0.010***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Debt/Assets	0.012***	0.018***	0.012***	0.014***	0.013***	0.015***	0.014***	0.014***	0.012***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Size	−0.158***	−0.182***	−0.181***	−0.181***	−0.189***	−0.187***	−0.180***	−0.180***	−0.168***
	(0.025)	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.024)
Volatility Equity	0.028***	0.023***	0.015***	0.015***	0.014***	0.013***	0.016***	0.016***	0.017***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Bond Charcteristic									
Years to Maturity		0.439***	0.397***	0.449***	0.444***	0.490***	0.472***	0.473***	0.482***
		(0.055)	(0.055)	(0.059)	(0.061)	(0.054)	(0.053)	(0.053)	(0.054)
Years to Maturity × Debt/Assets		−0.004***	−0.004***	−0.005***	−0.005***	−0.006***	−0.005***	−0.005***	−0.006***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sovereign Risk									
EMBI			0.382***	0.492***	0.469***	0.329***	0.326***	0.308***	0.212**
			(0.075)	(0.148)	(0.159)	(0.101)	(0.113)	(0.111)	(0.086)
EMBI x Years to Maturity				−0.054	−0.058*	−0.096***	−0.082***	−0.084***	−0.077***
				(0.037)	(0.033)	(0.024)	(0.023)	(0.022)	(0.020)
Macro factors									
GDP Growth					−0.020**	−0.015**	−0.016***	−0.014**	−0.009*
					(0.008)	(0.006)	(0.005)	(0.005)	(0.005)
GDP per capita					−0.132	0.157	0.305	0.317	0.143
					(0.578)	(0.419)	(0.455)	(0.444)	(0.463)
External factors									
High Yield						0.491***	0.469***	0.386***	
						(0.073)	(0.078)	(0.080)	
Treasury 10 years							−0.452***	−0.418***	
							(0.097)	(0.104)	
VIX								0.006*	
								(0.004)	
Observations	1520	1503	1503	1503	1503	1503	1503	1503	1503
R-squared	0.585	0.671	0.716	0.718	0.722	0.743	0.749	0.750	0.769
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	No	No	No	No	Yes
Cluster (Country x Time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses.
*significant at 10%; ** significant at 5%; *** significant at 1%.

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In column (3), we include the country-specific EMBI spread to account for sovereign risk. The point estimate is positive and statistically significant at standard confidence levels, suggesting that sovereign risk increases corporate risk. Given that this effect has been the subject of considerable interest in the related literature and policy circles, we explore the significance of our results in detail.

Until 2001 it was the common practice of risk credit agencies not to rate the debt of private corporations higher than the corresponding sovereign debt. The main reason was the so-called 'transfer risk,' that is, the risk that if the government encounters difficulties in servicing its debts, it will transfer those problems to the domestic private sector. In other words, credit agencies used to impose a 'sovereign ceiling' on corporate ratings. While rating agencies have moved away from the policy, an open question remains as to whether there is still a ceiling observable in spread data. We find that sovereign risk increases corporate risk, but we find no evidence of a hard ceiling.[21] In particular, the point estimate that measures the elasticity of sovereign risk to corporate spreads is 0.382, suggesting that the pass-through from the latter to the former is less than complete. This is consistent with the sovereign ceiling 'lite' hypothesis of Borensztein *et al*. (2006), which states that it appears that sovereign risk remain a significant determinant of corporate risk even after controlling for country-specific macroeconomic conditions and firm-level performance indicators.

In column (4) we include an interaction term between country-specific EMBI and 'years to maturity' of the corporate bond. The intuition is that this proxy of sovereign risk could have different effects on corporate spreads at different levels of maturity.[22] The results suggest that while the overall effect of country-specific EMBI on corporate spreads persists, the impact of the former on the latter is higher when the maturity of the bond is shorter. In other words, while sovereign risk increases corporate spreads for all bonds, it has an even stronger effect on the spreads of corporate bonds with shorter maturities.

In column (5) we incorporate two macroeconomic variables: GDP growth and GDP per capita to account for the time-variant, country-specific effects. Both coefficients have the expected negative sign, but only the first one is significant at standard confidence levels.[23] This suggests that in countries with higher GDP growth, the private sector benefits from lower spreads.

Finally, in columns (6), (7), and (8) we included the US High Yield, the 10-year US Treasury rate, the VIX and index in order to account for global factors that might affect all spreads. We find that an increase in US High Yield increases corporate spreads in EMEs. This is consistent with the view that investors consider these bonds to be part of the same assets class, so that when the perceived risk of one increases, so does the other. On the other hand, we find that an increase in the yield of US risk-free bonds is a corresponding decrease in EMEs' corporate spreads. This could be signalling a substitution effect between the risk-less bonds and the risky asset class. The coefficient of VIX, a widely used measure of market risk is positive (i.e. higher market volatility is associated with higher corporate bond spreads) but is only marginally statistically significant. When these additional explanatory variables are included in the regression, the point estimate of the effect of sovereign risk, while still statistically significant, drops in size. This is likely to be the result of high correlation between the country-specific EMBI spreads and the other global factor variables. Indeed, Table A3 in the Appendix shows that some of these variables are highly correlated. In column (9), we replace all the global factors (which vary only over time) with time dummies. The results for all the explanatory variables are robust to this change.

In summary, the evidence presented in Table 1 suggests that firm-specific variables, bond characteristics, sovereign risk, macroeconomic conditions, and global factors are all determinants of corporate risk. The next step is to quantify the relative contribution of each of them, along with unobserved country and industry fixed effects, in explaining the variance of corporate spreads. To do so, we perform a variance decomposition exercise based on the regression reported in column (8) of Table 1 (without the interaction terms).[24] The results are reported in Figure 1. They indicate that firm-specific factors account for the greatest share of corporate risk (i.e. approximately 33% of the total variance). Among these, volatility of equity (firm's idiosyncratic risk measure) and asset size account for the bulk of the variation (approximately 20% altogether) The second most important factor is fixed effects, both industry-level and country-level.

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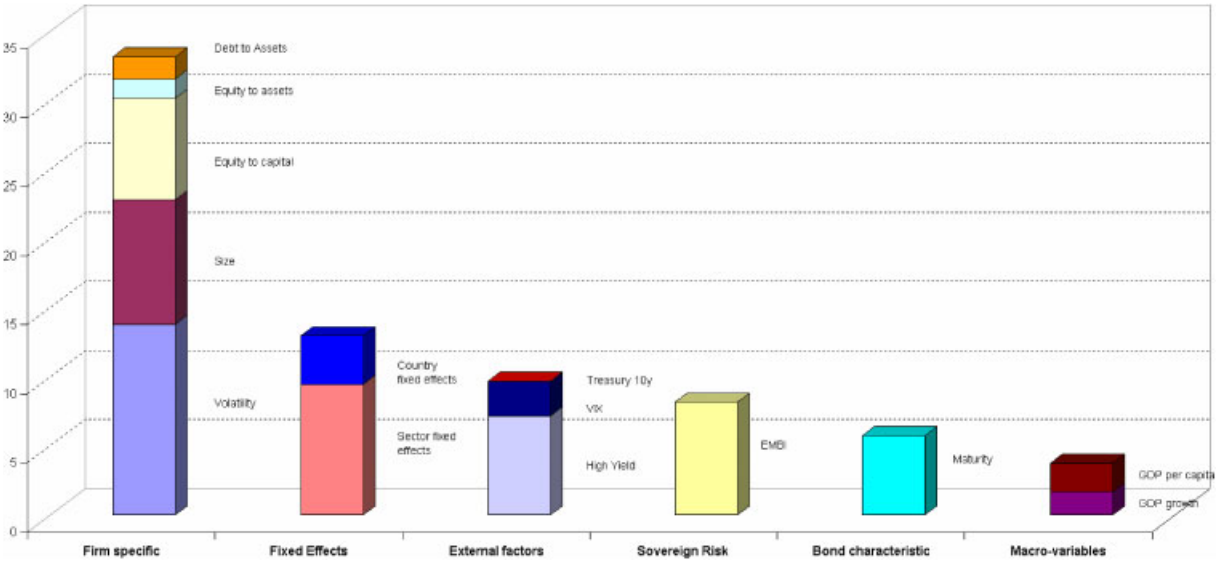

Figure 1. Variance decomposition: corporate OAS.

These unobserved time-invariant effects account for approximately 12% of total variance. Global factors and sovereign risk are the next most important determinants, each accounting for approximately 9% of variance each. Bond characteristics and macro-factors are relatively less important determinants, explaining 6% and 4% of variance, respectively.

All in all, these results underscore the importance of firm-level performance indicators as the main drivers of corporate risk in EMEs. While sovereign risk and global factors—which are outside the control of firm management—also play a role, these effects are quantitatively less important.

5. EXTENSIONS AND ROBUSTNESS CHECKS

First, we perform a sensitivity test to check that our results are not driven by bias arising from the potential endogeneity of the firm-specific variables. Since these are entered contemporaneously to corporate spreads in the baseline regressions, this possibility cannot be ruled out without further testing. In Table 2 we present the results for the same set of regressions reported in Table 1, using a two-step efficient GMM estimator, where we instrument firm-specific variables with the 1- and 2-year lags.[25] The efficiency gains of this estimator relative to the traditional IV/2SLS estimator derive from the use of the optimal weighting matrix, the over-identification restrictions of the model, and the relaxation of the identical and independently distributed? assumption.[26] The results reported in Table 2 remain largely unchanged. The table also presents the result from the Sargan test of over-identifying restrictions. The joint null hypothesis of the Sargan test is that the instruments are uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. As shown, we do not reject the null hypothesis at standard confidence levels in any of these regressions. All in all, this suggests that the baseline results do not appear to be driven by endogeneity bias.

In Table 3 we incorporate some additional non-linearities to test the robustness of our results and to explore some interesting hypotheses. In column (1) we expand the regression in column (8) of Table 1 (regression with the full set of controls) to include an interaction term between sovereign risk and a dummy for industries in the tradable sector.[27] Firms that operate in the tradable sector generate their own foreign exchange and are presumably less exposed to the 'transfer risk.' For concreteness, we do not report all the coefficients again, but instead focus on sovereign risk and on the new interaction effect. We find a negative coefficient for the interaction term, which is consistent with the aforementioned hypothesis that operating

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Table 2. Determinants of Corporate OAS (GMM estimation, Instrumental Variables 2SLS)

	(1) OAS	(2) OAS	(3) OAS	(4) OAS	(5) OAS	(6) OAS	(7) OAS	(8) OAS	(9) OAS
Firm specific									
EBIT/Assets	−0.089**	−0.114***	−0.083***	−0.066**	−0.090***	−0.096***	−0.102***	−0.114***	−0.121***
	(0.044)	(0.038)	(0.031)	(0.031)	(0.029)	(0.028)	(0.027)	(0.029)	(0.029)
Equity/Capital	−0.012	−0.008	0.006	0.002	0.001	0.000	0.000	−0.000	−0.002
	(0.015)	(0.014)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.013)
Debt/As sets	0.007	0.037*	0.052***	0.050***	0.050***	0.047***	0.047***	0.046***	0.044**
	(0.020)	(0.021)	(0.018)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.019)
Size	−0.079	−0.054	−0.118*	−0.079	−0.110*	−0.122*	−0.130**	−0.131**	−0.120**
	(0.063)	(0.066)	(0.064)	(0.063)	(0.062)	(0.063)	(0.062)	(0.062)	(0.056)
Volatility Equity	0.051***	0.040***	0.023***	0.028***	0.023***	0.021***	0.021***	0.021***	0.021***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Bond Charcteristic									
Years to Maturity		0.696***	0.647***	0.749***	0.766***	0.736***	0.729***	0.751***	0.806***
		(0.156)	(0.150)	(0.163)	(0.160)	(0.154)	(0.152)	(0.150)	(0.145)
Years to Maturity x Debt/Assets		−0.011***	−0.010***	−0.011***	−0.012***	−0.011***	−0.011***	−0.012***	−0.013***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Sovereign Risk									
EMBI			0.293***	0.630***	0.594***	0.375**	0.383***	0.296**	0.269*
			(0.055)	(0.080)	(0.088)	(0.093)	(0.095)	(0.118)	(0.157)
EMBI x Years to Maturity				−0.160***	−0.154***	−0.145***	−0.143***	−0.142***	−0.133***
				(0.037)	(0.034)	(0.032)	(0.032)	(0.030)	(0.030)
Macro factors									
GDP Growth					−0.046***	−0.050***	−0.050***	−0.047***	−0.036**
					(0.014)	(0.015)	(0.015)	(0.014)	(0.014)
GDP per capita					0.521	0.637	0.939	0.972	−1.502
					(0.585)	(0.617)	(0.636)	(0.654)	(1.320)
External factors									
High Yield						0.314***	0.316***	0.208*	
						(0.100)	(0.102)	(0.106)	
Treasury 10 years							−0.272*	−0.176	
							(0.149)	(0.172)	
VIX								0.012*	
								(0.007)	
Observations	595	595	595	595	595	595	595	594	595
R-squared	0.556	0.667	0.729	0.74	0.734	0.747	0.746	0.744	0.766
Hansen J statistic (Over. Test of all instr.)	7.904	7.685	7.570	7.860	4.730	6.895	7.495	7.403	3.746
p-value	0.162	0.175	0.182	0.164	0.450	0.229	0.186	0.192	0.586
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	No	No	No	No	Yes
Cluster (Country x Time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses Instrumented: EBIT/Assets, Equity /Capital, Debt/Assets, Size and Volatility Equity. Excluded instruments: 4 and 8 lags of EBIT/Assets, Equity/Capital, Debt/Assets, Size and Volatility Equity.
*significant at 10%; **significant at 5%; ***significant at 1%.

Table 3. Country risk by sector

	(1) OAS	(2) OAS[a]
EMBI	0.196**	0.168**
	(0.090)	(0.081)
EMBI × 1(Tradable)	−0.024	
	(0.038)	
EMBI × 1 (Mining)		0.060
		(0.087)
EMBI × 1 (Utilities)		0.026
		(0.078)
EMBI × 1 (Agriculture)		−0.043
		(0.088)
EMBI × 1 (Construction)		−0.290*
		(0.164)
EMBI × 1 (Tourism)		−0.285***
		(0.079)
EMBI × 1 (Telecommunication)		−0.473***
		(0.117)
Observations	1503	1503
R-squared	0.703	0.755
Dummies sector	Yes	Yes
Dummies country	Yes	Yes
Control variables	Yes	Yes
Cluster (Country × Time)	Yes	Yes

[a]The omitted sector is manufacturing robust standard errors in parentheses.
*significant at 10%; **significant at 5%; ***significant at 1%.

in the tradable sector mitigates the effects of sovereign risk on corporate spreads, but the coefficient is not statistically significant. In order to explore whether there are other industry characteristics that determine a differential impact of sovereign risk on corporate spreads, we compute sector-level interaction effects (the omitted industry is Manufacturing). The results are reported in column (2) of Table 3. There are no noticeable differences across sectors except for Tourism (a very 'tradable' activity) and Telecommunications (a sector with a great deal of foreign ownership in EMEs), where the negative and statistically significant coefficients for the corresponding interaction terms indicate that operating in these sectors mitigates the effect of sovereign risk on corporate spreads.[28]

Table 4 reports the results from the estimation of our baseline specification (i.e. column (8) in Table 1)[29] for the model in first-differences. Two sets of regressions are reported: columns (1)–(4) in Table 4 do not include either industry or country fixed effects, while columns (5)–(8) include all dummies (for compactness, we omit reporting all the coefficients and concentrate on a subset of particularly interesting ones).[30] The specification in first differences serves two purposes: on the one hand it constitutes a robustness check for our main results, but on the other hand it allows us to explore whether there is a differential impact of certain variables as they increase compared with when they decrease. This helps to shed light on some interesting hypotheses.

Consider, for example, the aforementioned sovereign ceiling hypothesis that suggests that there is an impact of sovereign risk on corporate spreads. We have already shown some evidence consistent with the 'lite' version of this supposition (the transfer is not complete). With the model in differences we can provide complementary evidence as, if there is a sovereign ceiling (even in a 'lite' version), then there should be a differential impact as EMBI spreads increase compared with when they decrease. The reason is that a sovereign 'ceiling' by definition implies that when sovereign risk goes up, corporate risk should also increase, but the reverse is not necessarily true.[31] Columns (2) and (6) in Table 4 provide evidence of a differential effect: the interaction term of changes in the EMBI spread with a dummy that take a value of 1 when those changes are positive appears in the regressions with a positive sign and is statistically significant. This is also consistent with another interesting hypothesis advanced in the work of Calvo (1999) and Calvo and Mendoza (2000), that episodes of panic are more common in EMEs, where investors are less informed and more prone

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Table 4. Asymmetries, EMBI, and High Yield

In differences	(1) OAS	(2) OAS	(3) OAS	(4) **OAS**	(5) OAS	(6) OAS	(7) OAS	(8) OAS
dEMBI	0.167**	0.135**	0.171*	0.149*	0.184***	0.134**	0.179***	0.147***
	(0.071)	(0.059)	(0.063)	(0.062)	(0.060)	(0.053)	(0.053)	(0.052)
dHigh Yield	0.457***	0.421***	0.369***	0.379***	0.413***	0.392***	0.323***	0.332***
	(0.097)	(0.090)	(0.092)	(0.091)	(0.095)	(0.091)	(0.092)	(0.092)
dEMBI × 1(dEMBI > 0)		0.046***		0.029		0.054***		0.036**
		(0.017)		(0.019)		(0.020)		(0.018)
dHigh Yield × 1(dHigh Yield > 0)			0.049**	0.031			0.061***	0.046**
			(0.020)	(0.022)			(0.020)	(0.019)
Observations	1292	1292	1292	1292	1292	1292	1292	1292
R-squared	0.196	0.205	0.205	0.207	0.211	0.219	0.22	0.223
Dummies sector	No	No	No	No	Yes	Yes	Yes	Yes
Dummies country	No	No	No	No	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (country × time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses.
*significant at 10%; **significant at 5%; ***significant at 1%.

Table 5. Determinants of Corporate OAS

	Without Argentina					
	(1) OAS	(2) OAS	(3) OAS	(4) OAS	(5) OAS	(6) OAS
Firm specific						
EBIT/Assets	−0.051***	−0.051***	−0.053***	−0.047***	−0.044***	−0.044***
	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)	(0.013)
Equity/Capital	−0.009**	−0.009**	−0.008**	−0.009**	−0.008**	−0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Debt/As sets	0.013***	0.016***	0.016***	0.017***	0.016***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Size	−0.214***	−0.208***	−0.207***	−0.212***	−0.204***	−0.204***
	(0.024)	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)
Volatility Equity	0.013***	0.013***	0.013***	0.014***	0.016***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Bond Charcteristic						
Years to Maturity	0.389***	0.467***	0.462***	0.492***	0.470***	0.471***
	(0.068)	(0.067)	(0.068)	(0.067)	(0.066)	(0.066)
Years to Maturity x Debt/Assets	−0.004**	−0.005***	−0.005***	−0.006***	−0.005***	−0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sovereign Risk						
EMBI	0.452***	0.685***	0.706***	0.455***	0.495***	0.468***
	(0.036)	(0.050)	(0.059)	(0.065)	(0.064)	(0.071)
EMBI x Years to Maturity		−0.105***	−0.105***	−0.117***	−0.105***	−0.105***
		(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Macro factors						
GDP Growth			−0.013	−0.016**	−0.013*	−0.011
			(0.009)	(0.008)	(0.007)	(0.007)
GDP per capita			0.577	0.662	0.634	0.637
			(0.502)	(0.418)	(0.435)	(0.434)
External factors						
High Yield				0.427***	0.356***	0.309***
				(0.072)	(0.066)	(0.076)
Treasury 10 years					−0.498***	−0.467***
					(0.095)	(0.106)
VIX						0.005
						(0.004)
Observations	1424	1424	1424	1424	1424	1424
R-squared	0.732	0.736	0.737	0.748	0.755	0.755

Robust standard errors in parentheses.
*significant at 10%; ** significant at 5%; *** significant at 1%.

to herding. As panics are usually triggered when risks increase rather than decrease, the existence of a differential effect of the EMBI when it increases provides empirical evidence consistent with herding behaviour. In order to probe this hypothesis further, we test whether we obtain similar results when we use a dummy that marks increases in the yield of US junk bonds. The results reported in columns (3) and (7) of Table 4 are also in line with this hypothesis: the interaction term of changes in US High Yield with a dummy that takes a value of 1 when those changes denote an increase and are positive and statistically significant. Finally, columns (4) and (8) of Table 4 include the two previous non-linearities together, and the results do not change.[32] All in all, we find that these relationships are non-linear. These results are consistent with certain features of EMEs that have been previously identified in the cited literature.

We also carried out some additional robustness checks. We replicate the results of Table 1 (columns 3–8) using two new specifications. First, we excluded Argentina from the sample to ensure that the Argentine sovereign default episode (2002–2005) does bias the results. These regressions are reported in Table 5. The results remain largely unchanged, with the main difference being a slight increase in the impact of the country-specific EMBI on corporate spreads, from 0.382 to 0.452.[33] Second, in Table 6, we replace the

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Table 6. Determinants of Corporate OAS, Robustness Checks

	Sovereign Rating as Sovereign Risk					
	(1) OAS	(2) OAS	(3) OAS	(4) OAS	(5) OAS	(6) OAS
Firm specific						
EBIT/Assets	−0.050***	−0.049***	−0.049***	−0.043***	−0.041***	−0.041***
	(0.015)	(0.015)	(0.013)	(0.012)	(0.012)	(0.012)
Equity /Capital	−0.007**	−0.007**	−0.009***	−0.010***	−0.010***	−0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Debt/Assets	0.016***	0.015***	0.013***	0.013***	0.012***	0.012***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Size	−0.172***	−0.173***	−0.187***	−0.186***	−0.179***	−0.179***
	(0.025)	(0.026)	(0.025)	(0.023)	(0.022)	(0.022)
Volatility Equity	0.022***	0.022***	0.017***	0.014***	0.016***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Bond Charcteristic						
Years to Maturity	0.446***	0.500***	0.448***	0.371***	0.375***	0.365***
	(0.057)	(0.074)	(0.074)	(0.071)	(0.069)	(0.068)
Years to Maturity x Debt/Assets	−0.005***	−0.004**	−0.004***	−0.005***	−0.005***	−0.005***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Sovereign Risk						
Rating	−0.064**	−0.054*	−0.031	−0.030	−0.026	−0.024
	(0.029)	(0.032)	(0.030)	(0.024)	(0.023)	(0.023)
Rating x Years to Maturity		−0.005	−0.003	0.004	0.003	0.004
		(0.006)	(0.005)	(0.006)	(0.006)	(0.005)
Macro factors						
GDP Growth			−0.022**	−0.017**	−0.017**	−0.013**
			(0.011)	(0.007)	(0.006)	(0.006)
GDP per capita			−1.841***	−0.122	−0.108	−0.005
			(0.608)	(0.473)	(0.506)	(0.486)
External factors						
High Yield				0.555***	0.554***	0.415***
				(0.048)	(0.045)	(0.073)
Tresury 10 years					−0.445***	−0.406***
					(0.098)	(0.103)
VIX						0.009***
						(0.003)
Observations	1503	1503	1503	1503	1503	1503
$R-$squared	0.677	0.677	0.698	0.736	0.742	0.744

Robust standard errors in parentheses.
*significant at 10%; ** significant at 5%; *** significant at 1%.

country-specific EMBI with sovereign credit ratings as an alternative measure of country risk (higher rating implies lower risk). The results are qualitatively similar, but credit ratings are less informative than spreads.[34]

6. CONCLUSIONS

What are the main determinants of corporate bonds spreads in emerging market economies (EMEs)? We have presented evidence that suggests that firm-specific variables (profitability, size, etc.), country and industry fixed effects, sovereign risk, bond characteristics, and global factors all account for a share of those spreads.

Our proposed empirical methodology, based on OAS analysis from Bloomberg, enables us to deal with spread comparability issues that are pervasive in this literature. Panel data techniques allow us to take full advantage of the cross-sectional and time-series dimensions of our data set while reducing the risk of bias arising from omitted variables or unobserved fixed effects.

A variance decomposition analysis indicates that firm-level characteristics account for the largest share of variance. All in all, these results underscore the importance of firm-level performance indicators as the

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main determinant of corporate risk in EMEs. While sovereign risk and global factors, which are outside the control of the firm management, also play a role, these effects appear to be relatively less important. In addition, we find two asymmetries. The first is consistent with a sort of sovereign ceiling 'lite' in emerging bond spreads (Borensztein *et al*., 2006). The second is consistent with the notion that panics are common in emerging markets, where investors are less informed and more prone to herding (Calvo, 1999; and Calvo and Mendoza, 2000).

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APPENDIX A

The description of variables, descriptive statistics and correlation matrix are given in Tables A1–A3, respectively.

Table A1. Description of variables

Variable	Definition	Unit of measurement	Data source
OAS spread	Option adjusted spread	Percent (in natural logarithms)	Bloomberg
EBIT/Assets	EBIT to assets	Percent	Bloomberg
Equity/Capital	Equity to capital	Percent	Bloomberg
Debt/Assets	Debt to assets	Percent	Bloomberg
Size	Assets	Millions of US$ (in natural logarithms)	Bloomberg
Volatility equity	Standard deviation of day-to-day logarithmic price changes. A previous 360-day price volatility equals the annualized standard deviation of relative price change of the 360 most recent trading day's closing price	Percent	Bloomberg
Years to maturity	Years to Maturity	Years (in natural logarithms)	Bloomberg
GDP growth	Annual real GDP growth	Percent	WDI
GDP per capita	GDP per capita	US$ thousands (in natural logarithms)	WDI
Country-specific EMBI	Emerging Markets Bond Index Spread	Percent (in natural logarithms)	Bloomberg
Rating	Sovereign rating	(1 = Default,…,21 = AAA)	S&P
High Yield	US High Yield Master II	Percent (in natural logarithms)	Bloomberg
Treasury 10 years	Treasury 10 years	Percent (in natural logarithms)	Bloomberg
VIX	CBOE Volatility Index	Percent	Bloomberg

Table A2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.
OAS spread	1529	2.85	2.48
EBIT to assets	1529	2.28	1.40
Equity to capital	1529	48.58	18.47
Debt to assets	1529	37.22	12.32
Assets	1529	10 508	9953
Volatility equity	1529	30.98	11.41
Years to maturity	1529	9.68	18.22
GDP growth	1529	4.01	2.62
GDP per capita	1529	4733	1408
Country-specific EMBI	1529	2.65	4.53
High Yield	1529	9.50	2.06
Treasury 10 years	1529	4.54	0.62
VIX	1529	17.55	6.76

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Table A3. Correlation matrix

	OAS	EMBI	High Yield	Treasury 10 years	VIX
OAS	1.00				
EMBI	0.46	1.00			
High Yield	0.43	0.36	1.00		
Treasury 10 years	0.06	0.16	0.15	1.00	
VIX	0.43	0.37	0.87	0.09	1.00

NOTES

1. See discussion and citations in Bandeira *et al*. (2000).
2. To be deemed an emerging market by JPMorgan in its EMBI+Index, a country must have sovereign debt rated Baa1/BBB+or below by Moody's/S&P rating agencies.
3. The main reason is the so-called 'transfer risk.' See Durbin and Ng (2005).
4. See, for example, Peter and Grandes (2005).
5. For example, bonds with embedded options contain cash flows dependent upon the future level of interest rates. Therefore, determining a definite maturity date becomes impossible.
6. For our sample we use mostly country-specific EMBI plus. For those few cases when EMBI plus is not available, we use country-specific EMBI global. This does not affect the results as we checked that for those countries for which both measures exist, the differences are never statistically significant.
7. JP Morgan also computes the aggregate EMBI spread index of all emerging market countries with international bond debt, an index that is closely monitored by financial markets as a measure of overall EME risk.
8. In this respect, we improve upon earlier work by Huang and Kong (2003), Peter and Grandes (2005), and Durbin and Ng (2005).
9. In choosing the starting and end dates we are restricted by data availability. Although there are some corporate bonds issued prior to 1999, our data start in that year due to the availability of OAS analysis in Bloomberg.
10. Regarding our choice of dependent variable, we focus on the OAS of corporate bonds issued in foreign currencies only. This choice is driven by the availability of data. Nevertheless, the sample is representative of EME bond issues, as it is a well-established fact in the literature that most EMEs issue bonds only in foreign currencies (Eichengreen *et al*., 2003).
11. EBIT: Earnings before interest and taxes.
12. Although the other determinants are typically statistically insignificant. Details available from the authors upon request.
13. Volatility is the standard deviation of day-to-day logarithmic price changes. A 360-day price volatility equals the annualized standard deviation of relative price change of the 360 most recent trading days' closing price, expressed in a percentage for the day prior to the current.
14. In our study, one reason to use equity volatility over, for example, credit ratings or assets volatility as alternative measures of risk, is that equity markets reflect up-to-date information. Credit ratings and assets may be updated infrequently. According to Ederington *et al*. (1987) rating changes almost never affect bond returns because investors fully anticipate these changes based on the most recent information available.
15. There are also other bond characteristics that could have an incidence on the riskiness of the bond, such as whether the bond has embedded options or a state-contingent payment stream. But, as these are accounted for in the OAS reported by Bloomberg, we abstract from them in our empirical model.
16. See, example, *Financial Times*, November 30, 2006, Global Equity Valuations. Lex Column.
17. Note, in particular, the high correlation coefficient between 'high yield' and 'VIX.' This suggests that these measures capture related features of global risk aversion.
18. Since we use quarterly data, this implies that we instrument each variable 't' with lags 't-4' and 't-8'.
19. This section draws heavily on the Bloomberg Professional Analysis.
20. A concern with these results is the bias arising from potential endogeneity of the firm-specific variables. It is worth noting here that lagging the firm-specific variables to control for possible issues of endogeniety has a negligible effect on the estimated coefficients. Despite this, in the robustness check section we perform a sensitivity test using lag variables as instruments in a suitable instrumental variables framework. Quite reassuringly, the results remain robust.
21. See Durbin and Ng (2005) and Peter and Grandes (2005) for a discussion of testing for a sovereign ceiling using spreads data.
22. Ideally, one would want to match the 139 corporate bonds with the same number of sovereign bonds of identical maturities. While this is manageable for a small number of bonds (see Peter and Grandes, 2005), it becomes impractical for so many bonds across so many jurisdictions.
23. We also tried some additional macroeconomic controls variables, but the results do not change. Details are available from the authors upon request.
24. Where the variance decomposition of equation (1) is given by $1 = \frac{\mathrm{Cov}(S_{it}, \beta_0 P_C)}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_1 D_s)}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_2 F_{it})}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_3 B_{it})}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_4 CR_{ct})}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_5 C_{ct})}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it}, \beta_6 G_t)}{\mathrm{Var}(S_{it})} + \frac{\mathrm{Cov}(S_{it} \mu_{it})}{\mathrm{Var}(S_{it})}$
25. We use the Stata command 'ivreg2.'
26. See Baum *et al*. (2007) and Hayashi (2000).
27. Our industries considered as in the tradable sector are Agriculture, Mining, and Tourism.
28. We also find a negative coefficient for construction, although this is only weakly statistically significant.
29. For a better interpretation of the coefficients we exclude the non-linearities from this specification.
30. Full results are available from the authors upon request.
31. The concept of sovereign ceiling was developed in the context of credit ratings, not spreads. Thus, for bond spreads, the analog to the sovereign ceiling is the sovereign floor.
32. Although the statistical significance of one of the interaction terms in the regressions without fixed-effects disappears.
33. We find results in the same direction when we replicate Tables 2 and 3 excluding Argentina.

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34. Finally, we also estimate a model where we allow for a different point-estimate of the EMBI spread on each corporate bond. We find that in 73% of the cases the elasticities of OAS spread to EMBI spread are between 0 and 1. In addition, the mean and median of the distribution are 0.39 and 0.36, respectively, which are very close to the point estimate reported for the benchmark regression.

REFERENCES

Altman E. 2000. Predicting financial distress of companies: revisiting the Z-score and Zeta® models. Working Paper, New York, United States: New York University, Stern School of Business.

Bandeira O *et al*. 2000. Does financial reform raise or reduce savings? *Review of Economics and Statistics* **82**: 239–263.

Baum CF, Schaffer ME, Stillman S. 2007. ivreg2: stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML, and k-class regression. Boston College Department of Economics, Statistical Software Components S425401.

Borensztein E, Cowan K, Valenzuela P. 2006. Sovereign ceiling 'Lite'? The impact of sovereign ratings on corporate ratings in emerging market economies. IMF Working Paper 07/75, Washington, DC, United States.

Calvo G. 1999. *Contagion in Emerging Markets*: *When Wall Street is a Carrier*. University of Maryland: College Park, Maryland, United States.

Calvo G, Mendoza E. 2000. Capital markets crises and economic collapse in emerging markets: an informational frictions approach. *American Economic Review* **90**(2): 59–94.

Campbell J, Taksler G. 2003. Equity volatility and corporate bond yields. *Journal of Finance* **58**(6): 2321–2350.

Durbin E, Ng D. 2005. The sovereign ceiling and emerging market corporate bond spreads. *Journal of International Money and Finance* **24**: 631–649.

Ederington HL, Yawitz JB, Roberts BE. 1987. The information content of bond ratings. *Journal of Financial Research* **10**: 211–226.

Eichengreen B, Hausmann R, Panizza U. 2003. Currency mismatches, debt intolerance and original sin: why they are not the same and why it matters. NBER Working Paper 10036, Cambridge, National Bureau of Economic Research, United States.

Hayashi F. 2000. *Econometrics*. Princeton University Press: Princeton, NJ.

Huang J, Kong W. 2003. Explaining credit spread changes: new evidence from option-adjusted bond indexes. *Journal of Derivatives* **11**(1): 30–44.

IDB. 2006. Living with debt: how to limit the risk of sovereign finance. Economic and Social Progress in Latin America: 2007 Report. Washington, DC, United States: IDB.

Merton R. 1974. On the pricing of corporate debt: the risk structure of interest rates. *Journal of Finance* **29**(2): 449–470.

Peter M, Grandes M. 2005. How important is sovereign risk in determining corporate default premia? The Case of South Africa. IMF Working Paper 05/217.

Petersen M. 2009. Estimating standard errors in finance panel data sets: comparing approaches. *Review of Financial Studies* **22**(1): 435–480.

Standard and Poor's. 2001. Rating methodology: evaluating the issuer, corporate ratings criteria. September, Standard and Poor's, New York, United States.

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