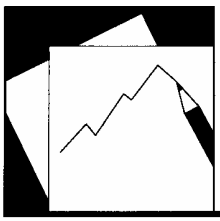
WP/04/70



IMF Working Paper

Credit Rationing in Emerging Economies' Access to Global Capital Markets

Edda Zoli

INTERNATIONAL MONETARY FUND

 WP/04/70

IMF Working Paper

IMF Institute

Credit Rationing in Emerging Economies' Access to Global Capital Markets

Prepared by Edda Zoli[1]

Authorized for distribution by Sunil Sharma

April 2004

Abstract

This paper tests empirically the theoretical prediction that the country premium paid by emerging economies on sovereign debt increases with the amount of debt up to a certain critical level, above which the supply of foreign funds becomes fixed. The results confirm this theoretical prediction. The approach developed in the paper is also used to test for the presence of moral hazard in international lending. The results indicate significant changes in the supply of funds curve consistent with the presence of moral hazard in the period immediately following the Mexican rescue operation, but not after the Russian non-bailout.

JEL Classification Numbers: C23; E44; F34

Keywords: sovereign debt; international lending; moral hazard; financial crises

Author's E-Mail Address: ezoli@imf.org

---

[1] The author was with the IMF Institute when this paper was written. This paper was presented at the Workshop on Transition Economics organized by the Bank of Finland Institute for Economies in Transition (BOFIT), April 2003, and at the 18th Annual Congress of the European Economic Association, August 2003. The author would like to thank Anne Epaulard, Andrew Feltenstein, Miguel Messmacher, Jacques Miniane, Sunil Sharma, Taner Yigit, and all the participants of the mentioned conferences for helpful comments and suggestions.

Contents Page

I. INTRODUCTION

Different theoretical models have shown how the cost of funds to risky borrowers is upward sloping in the amount of debt, and may become infinite beyond a maximum debt level. In Stiglitz and Weiss (1981), credit rationing is the consequence of asymmetric information. In the literature on sovereign borrowing (Eaton and Gersovitz, 1981; Sachs 1982, 1984; Sachs and Cohen, 1982), credit ceilings are set by international lenders who are aware that above a certain debt level it is more convenient for sovereigns to default than to repay, given that creditors' capabilities for retaliation in the event of default are limited.

These models suggest that the spread paid by developing and emerging economies over a risk-free rate is increasing in the amount of external debt up to a certain critical debt level, above which no premium can compensate investors for the default risk, and credit rationing occurs. Surprisingly, little empirical work has been done to test these theoretical predictions.[2] In fact, most of the empirical studies on the determinants of emerging market spreads have estimated linear models that do not allow tests of whether sovereigns are subject to credit rationing.[3]

This paper aims at filling this existing gap in the literature by estimating a nonlinear supply of foreign funds curve allowing the possibility of testing for the existence of a maximum ceiling on foreign lending to sovereigns. A new database on quarterly Eurobond spreads for 32 emerging market countries between 1993 and 2000 was developed for this purpose. The results indicate that the null hypothesis of linearity is rejected under different model specifications, and controlling for several explanatory variables, and that the supply of funds curve tends to become vertical beyond a maximum critical debt level. These findings provide empirical validation to the theoretical predictions summarized above.

Additionally, the approach developed in this paper may be used to test the claim that international official rescues encourage excessive risk-taking by investors, thus advancing

---

[2] To my knowledge, the only empirical work that attempts to ascertain the existence of a credit ceiling on the supply of funds to emerging markets is by Eaton and Gersovitz (1981), who find that most countries in their sample are indeed credit constrained. In a totally different context, Bayoumi, Goldstein, and Woglom (1992, 1995) test whether the supply curve for debt faced by the U.S. states is nonlinear, and becomes vertical above a critical level of debt.

[3] Recent studies on the determinants of emerging markets spreads include Edwards (1986); Eichengreen and Portes (1989); Cline (1995); Cantor and Packer (1996); Cline and Barnes (1997); Eichengreen and Mody (1998); Min (1998); Kamin and Kleist (1999), Arora and Cerisola (2001), Ferrucci (2003), IMF (2004). All these recent works analyze bond spreads, while the earlier literature, surveyed in Hajivassiliou (1989) and Huizinga (1989) focused on bank loan spreads.

the public policy debate on the moral hazard consequences of international bailouts in the wake of the Mexican and Asian crises.[4] By showing that the credit supply curve to emerging markets is nonlinear, and that it tends to become vertical above a critical external debt level, this paper suggests that moral hazard effects in international lending are somewhat limited. Indeed, one may argue that the supply of funds to emerging markets could be unlimited only if investors ruled out the possibility of losses because of sovereign defaults in the expectation of international bailouts.

In this regard, this paper tests whether the rescue operations, or their absence thereof, during the recent financial crises, modified the supply of funds curve. In particular, this paper's basic model is reestimated allowing for different coefficients for the pre- and post-crisis periods, and a test is performed for changes in the supply of funds curve's functional form (from linear to nonlinear, or vice-versa) as well as changes in the size of the credit ceiling for the pre- and post-crisis periods. The results indicate significant changes in the supply of funds curve consistent with the presence of moral hazard in the period immediately following the Mexican rescue operation. However, no such changes are found to occur in the wake of the Russian crisis, where no rescue operation took place.

The paper is organized as follows. Section II presents the model and the basic estimating equation. Section III illustrates the data and explanatory variables. Section IV discusses the econometric issues, and the results obtained estimating a nonlinear supply of funds curve over the period 1993Q1–2000Q4. Section V tests whether the bailouts, or non-bailouts, associated with the recent crises, have produced significant changes in the supply of funds curve. Section VI concludes.

II. THE MODEL

The theoretical model underlying the empirical analysis is based on Edwards (1986), and Bayoumi, Goldstein, and Woglom (1995). For a country, that cannot influence the world rate of interest, the cost of foreign borrowing is determined by the exogenous risk-free world interest rate and the country premium, which depends on the probability of default. Assuming investors' risk neutrality, in equilibrium the expected interest rate on a one-period bond with default risk will be equal to the risk-free rate. In the simplifying case that the lender will completely lose both the interest and the principal in the event of default, in equilibrium

$$1+i^*= [1+(i^*+s)] \cdot P(Y), \tag{1}$$

[4] Several analysts have argued that the large-scale international rescue operations of the 1990s induced excessive lending to emerging markets by creating expectations of bailouts in the event of other financial crises. See, for instance, Calomiris (1998), Meltzer (1998).

where s is the premium paid by the country over the risk free rate i^*, and $P(Y)$ is the probability of no default, as perceived by the lender. Y is the vector of variables affecting the probability of default, which include the debt to output ratio (D), and a set of nondebt variables $X=(x_1,...x_i,...x_n)$, with $P'(D)<0$, and $P'(X)<0$.

Rearranging (1), the country's risk premium can be written as:

$$s = [(1-P(\cdot))/P(\cdot)] \cdot (1+i^*). \tag{2}$$

Given that $P'(D)<0$, it is easy to see that $\partial s/\partial D=-(1+i^*)\cdot(1/P^2)\cdot\partial P/\partial D>0$, that, is the country in question faces an upward-sloping supply curve for foreign funds. Furthermore, when the probability of default gets close to unity (P approaches zero), the risk premium s approaches infinity. In other words, the supply curve is upward sloping up to a certain point, and when the probability of default approaches unity, a credit ceiling is achieved, at which the country is excluded from the world's credit market.

To convert the supply curve (2) into a nonlinear curve that can be estimated, following Bayoumi, Goldstein, and Woglom (1995), it is assumed that $P(Y)=exp(-Y)$. Such specification for the probability of default function is chosen only for convenience, as it consents to derive a simple nonlinear supply of funds curve, that allows testing for the existence of a maximum ceiling on foreign lending to sovereigns.
It is also assumed that

$$Y=aD+b(i^*+s)D+\Sigma c_i x_i \tag{3}$$

Where a, b, and c_i are parameters. The first two terms in (3) reflect the idea that the probability of default depends on the principal value of outstanding debt (D), as well as the interest payments on the debt. Substituting (3) into (1), and using the approximation that, in general, given any small z, $\log(1+z)\approx z$, yields

$$s=[aD+bDi^*+\Sigma c_i x_i]/(1-bD), \tag{4}$$

which suggests the following estimating equation:

$$s_t=[\alpha D_t+\beta D_t i_t^*+\Sigma\gamma_i x_{it}]/(1-\delta D_t)+\varepsilon_t\,, \tag{5}$$

where ε_t is the error term. This specification allows testing for the presence of nonlinearities in the supply of funds curve. If the estimated coefficient δ is not significantly different from zero, then the supply curve is linear. If, instead, this coefficient is positive, the function is non-linear, and tends to become vertical as D_t gets close to a critical level equal to $1/\delta$.

Although equation (5) is the basic estimating equation of this paper, an alternative ad hoc nonlinear model is also estimated, to test the robustness of the results. Specifically, the alternative model is a simple quadratic equation, that takes the following form:

$$s_t = \lambda D_t + \pi D_t^2 + \Sigma \theta_i x_{it} + \nu_t \,, \tag{6}$$

where λ, π, and θ are parameters, and ν_t is the error term. Also in this formulation the relationship between the spread and external debt in nonlinear, but the slope of the supply curve is always finite.[5]

III. Data and Explanatory Variables

The empirical analysis is conducted on an unbalanced panel of 44 sovereign Eurobonds, denominated in foreign currency, issued by 32 emerging markets.[6] The dependent variable is the quarterly average difference between the yield on an emerging market sovereign bond, and the yield on a treasury bill, denominated in the same currency, and of similar maturity, issued by an industrialized country.[7] The sample period is 1993Q1–2000Q4.

The determinants of the probability of default include, first of all, the debt to output ratio. Unlike most previous studies, the data for this variable include public and publicly guaranteed external debt only, rather than total external debt. This choice seems more appropriate, since the intent of the paper is to estimate the supply of funds to *sovereign* borrowers. The results are not very different, though, if the latter variable is considered, as the correlation between public and publicly guaranteed external debt and total external debt is very high (the correlation coefficient is 0.8).

Regarding the other determinants of the probability of default, four groups of variables are considered, namely, macroeconomic fundamentals; variables measuring a country's solvency and liquidity position; factors affecting the attractiveness of investment for foreign lenders; and external shocks. The first group includes domestic factors (real GDP growth, inflation, fiscal balance) as well as external sector variables (current account balance, and real exchange rate). It is expected that low growth, high inflation rates, high fiscal and current

[5] A similar quadratic model has been estimated for the U.S. states in Goldstein and Woglom (1992).

[6] The country list is presented in Appendix I. Before proceeding with the panel estimation, one should test whether data can be pooled, in order to check whether the supply of funds curves to different emerging market countries can be meaningfully aggregated. Due to lack of data, though, this cannot be done. Pooling data on different countries, however, has a long tradition in the literature on pricing of emerging markets debt (Edwards, 1986; Eichengreen and Portes,1989; Cline,1995; Cantor and Packer, 1996; Cline and Barnes, 1997; Eichengreen and Mody, 1998; Min, 1998; and Kamin and Kleist, 1999).

[7] Basic descriptive statistics for the dependent variable are reported in Appendix 1.

account deficits, and appreciated real exchange rates increase the probability of default, and then the yield spread.[8]

The second group of explanatory variables comprises alternative measures of international reserves (the ratio of international reserves to GDP, international reserves in months of imports, the ratio of reserves to broad money), an indicator of the country's ability to generate reserves (the growth rate of exports and export volatility), several indicators of the country's need to use international reserves (the growth rate of imports, the ratio of imports to GDP, the ratio of short-tem external debt to GDP, the ratio of short-term debt to reserves, and the share of short-term debt in total external debt). Low international reserves, high import ratios or import growth rates, low export growth, high export volatility, and high shares of short-term debt are expected to weaken country liquidity and solvency, and, therefore, are supposed to be associated with a higher premium.

The set of variables assessing a country's attractiveness to foreign investors includes political factors (government instability and corruption), indicators of the amount of investment being already undertaken in the country (the ratio of investment to GDP, the ratio of foreign direct investment to GDP), and an index measuring the risk of investment, compiled by the International Country Risk Guide.[9] More government instability, high corruption, low investment or foreign direct investment, and high investment risk are supposed to increase the probability of default and the country premium.[10]

The fourth group of variables includes oil price changes, as an indicator of external shocks, as well as the Libor rate or the U.S. treasury bills rate, as a measure of international interest rates. Increases in oil prices are supposed to raise the probability of default, and the country premium.[11] High international interest rates, which raise the cost of new borrowing, and

---

[8] Several analysts maintain that inappropriate exchange rate policies, in particular sustained real appreciations, have been among the main causes of debt crises in developing countries in the last decades. On this point, see, for instance, Cline (1983).

[9] The Index of Investment Risk is a measure of the governments' attitude to inward investment, as determined by the assessment of four aspects, namely, the risk of operations, taxation, repatriation, and labor costs.

[10] The amount of investment, as an indicator of the country's perspectives for future growth, should be negatively related to yield spread (Sachs and Cohen, 1982; Sachs, 1982, 1984). However, Gersovitz (1985), suggests that if borrowers use foreign funds to undertake risk-reducing investment, they will lower the cost of the penalty in case of default. Therefore, higher investment ratios will reduce creditworthiness, and increase the yield spread.

[11] However, since the sample includes few oil-exporting countries (e.g., Mexico, and Venezuela), it is also possible that increases in oil price will improve creditworthiness.

reduce the amount of capital flows to emerging markets, are expected to be associated with a higher default premium.[12] In addition, the model includes a dummy variable for the recent financial crises (Mexican, Asian, Russian, and Ecuadorian), with the intent to capture the contagion effects of crises on emerging market spreads, as well as country-specific fixed effects[13]

IV. Econometric Issues and Results

Before proceeding with the estimation, the correlation among the regressors was checked and, as a result, some variables were included in the model alternatively. Also, a series of unit root panel data tests was performed on the variables that were suspected to be non-stationary. The results, reported in Appendix II, indicate that both the dependent and the explanatory variables are stationary.

Another issue that needs to be addressed before proceeding with the estimation is the simultaneity problem that would arise if a country's demand for foreign funds were sensitive to the interest rate spread. In fact, if this were the case, the interest spread and the amount of external borrowing would be simultaneously determined by the demand and supply curve. But, is the demand for external funds sensitive to the spread between the cost of foreign borrowing, and the risk-free world interest rate? The theoretical models of sovereign borrowing indicate that countries borrow for consumption smoothing purposes (Eaton and Gersovitz, 1981), and for political economy considerations (Ozler and Tabellini, 1991), suggesting that the demand for foreign funds depends on variables like output volatility, or external shocks, as well as political factors. Hence, there is no indication in the existing literature that the demand for foreign funds is affected by the country premium.

To address the possible simultaneity problem, the model should be estimated both with Least Squares and with an instrumental variable technique, and the results should be compared. The difficulty, however, is to find valid instruments, that is, variables that affect only the demand for external funds, but not the supply. Determinants of the demand for foreign funds, like output volatility, and political variables are likely to influence also the supply of credit and, therefore, cannot be used as instruments. While it seems impossible to find good instruments, to try to account for simultaneity anyway, total population, population growth, as well as per capita GDP at the beginning of the estimating period were tentatively used as instrumental variables. Demographic variables have been included in previous empirical studies as a determinant of the demand for foreign borrowing (Eaton and Gersovitz, 1981).

---

[12] Calvo, Leiderman, and Reinhart (1993), for instance, argue that changes in international interest rates have played a key role in affecting capital flows to developing countries during the 1990s.

[13] The complete variable list and definitions, as well as the data source, are reported in Appendix I.

Per capita GDP is used as a proxy for economic development, with the expectation that a country with higher per capita GDP has a more developed financial sector and is therefore more likely to issue Eurobonds. It can be argued, however, that this variable might also reflect a country's quality of institutions, and that this factor might affect the supply of funds, as well. Hence, in some regressions only the demographic variables were used as instruments.[14]

The basic estimating equation (5), as well as the alternative model (6), were estimated both with Least Squares and Two Stage Least Squares (2SLS). The two techniques produce fairly similar estimates, suggesting that simultaneity is not a major issue (Tables 1 and 2). A Hausman test for exogeneity of the debt variable was also performed, and confirmed that the Least Squares estimates are consistent.[15]

Results from the Main Estimates

The regression results from the estimates of equation (5) show that debt as a percentage of GDP affects country premiums significantly and positively, as indicated by the joint significance of the estimated parameters α and δ, and by the sign of the slope of the estimated curve (Table 1). This confirms the findings previously obtained by Edwards (1984, 1986), Eichengreen and Mody (1998), Min (1998), and Zhang (1999) in linear models.[16] At the mean values of the sample, each percentage point increase in debt raises the country premium by 4 to 7 basis points. Also, and very importantly, the statistical significance of the coefficient on debt in the denominator (δ) implies a rejection of the linear specification. Furthermore, it indicates that when the debt level gets close to a critical value, equal to $1/\delta$, the denominator in (5) approaches zero, and the curve tends to become vertical. These results corroborate the theoretical prediction that the supply of foreign funds to emerging markets is upwards sloping in the amount of external debt, and becomes vertical beyond a maximum debt ceiling.

---

[14] To test for the adequacy of the instruments, the debt variable was regressed on the instrument set. The F-test of the hypothesis that the instruments were jointly insignificant was rejected, suggesting that the instruments have adequate explanatory power for the potentially endogenous variable.

[15] The Hausman test compares the estimated coefficients obtained using 2SLS, which are consistent, but not necessarily efficient, to the coefficient estimates using Least Squares, which are more efficient, but inconsistent if the debt variable is endogenous. To perform the test, equation (5) and (6) were estimated (including a constant) using both Least Squares, and 2SLS. In all cases, the test failed to reject the null hypothesis of consistency of the Least Squares estimates at the conventional significance levels.

[16] In contrast, in Feder and Just (1977), Sachs (1981), and Burton and Inonue (1985), the coefficient of the debt-output ratio was insignificant.

Equation (5) includes among the explanatory variables the interaction term between external debt and the risk-free world interest rate, reflecting the idea that increases in the safe rate raise the debt service burden for borrowing countries, thus reducing their creditworthiness. In the regressions, the risk-free rate is measured by Libor. The Libor rate is entered into the model also as a separate regressor, to account for the fact that changes in the world interest rates might affect not only borrowers' interest payments on outstanding debt, but also lenders' "appetite for risk." Indeed, according to some analysts, given that investors tend to increase their risk exposure in a low interest rate environment to boost portfolio returns, spreads on risky assets in general, and on emerging market bonds in particular, are positively related to interest rates in industrial countries (Kamin and Von Kleist, 1999). The empirical results on the impact of Libor and the interaction term on the interest spread are somewhat mixed (Table 1). First, for these two variables the estimates from Non-Linear Least Squares (NLS) and 2SLS are different. Indeed, only in the NLS estimates, the coefficients for these variables are significant. Second, the coefficient of the Libor rate variable has an unexpected negative sign. Nevertheless, taking into account the impact of the interaction term, and of the Libor rate variable together, the derivative of the country premium respect to the risk-free rate is positive.[17]

As per the significance of the other explanatory variables, the coefficients of the index measuring the investment risk, reserves in months of imports, or in percent of GDP, the index of corruption and the dummies for crises periods are significant at conventional levels, and with the expected sign. Also the country-specific fixed effects are significant. The other regressors discussed in the previous section do not exhibit significant coefficients, and, therefore, have been dropped from the selected models shown in Table 1.[18]

Results from the Alternative Model Estimation

Although the alternative quadratic model (6) does not allow to test whether the supply curve becomes vertical beyond some critical value of debt, the estimates of equation (6) confirm the previous finding that the supply of funds to emerging markets countries is nonlinear. Indeed, the coefficient on the squared debt-to-GDP ratio is highly significant, and has the expected positive sign (Table 2). Interestingly, when evaluated at the mean and median values, the slope of the quadratic curve is similar to the estimated slope of equation (5). Indeed, in the quadratic model, at the mean and median value of the sample, a percentage point increase in debt raises the yield spread by 4 to 6 basis points and 3 to 5 basis points, respectively.

---

[17] The main results do not change when either the interaction term or the Libor rate or both, are excluded from the model. Also, similar results are obtained when the U.S. treasury bill rate is used instead of the Libor rate.

[18] Other regression results are presented in Appendix III.

Table 1. Main Regression Results

	NLS (a)	NLS (b)	2SLS (c)	2SLS (d)
Debt/GDP in numerator (α)	-0.05	-0.07	0.03	0.06
	(0.89)	(1.09)	(0.08)	(0.22)
Debt/GDP in denominator (δ)	0.001	0.001	0.002	0.002
	(3.48)	(3.84)	(5.37)	(3.09)
Investment risk index	0.56	0.82	1.25	1.07
	(2.16)	(2.92)	(4.85)	(5.18)
Reserves in months of imports	-	-0.58	-0.50	-
		(2.94)	(8.55)	
Reserves/GDP	-0.08	-	-	-0.07
	(2.54)			(6.57)
Libor	-1.65	-1.98	1.15	1.93
	(1.76)	(2.02)	(0.14)	(0.29)
(Debt/GDP)×Libor	0.02	0.02	-0.004	-0.007
	(1.90)	(1.97)	(0.05)	(0.11)
Dummy for crisis periods	1.08	1.10	1.27	1.43
	(3.39)	(3.27)	(1.82)	(2.36)
Corruption index	-	0.59	0.43	-
		(2.99)	(2.71)	
Adjusted R-squared	0.71	0.71	0.43	0.51
Number of obs.	747	747	747	747
Wald test for α =δ=0				
F-statistic (p-value)	0.00	0.00	0.00	0.00
Chi-square (p-value)	0.00	0.00	0.00	0.00
Wald test for joint significance of fixed effects (F-statistic)	15.17	14.55		
ds/dDebt at the point of means	0.06	0.04	0.04	0.07
ds/dDebt at the point of medians	0.06	0.05	0.04	0.06
Debt ceiling=1/δ	853.24	766.87	568.50	655.31

Source: Author's calculations.

Note: NLS means Nonlinear Least Squares, and 2STS means Two Stage Least Squares. The numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors. Country-specific fixed effects were included in the estimation of equations (a) and (b). A constant was included in the estimates of equations (c) and (d).

Table 2. Results from the Alternative Model Estimation

	OLS (a)	OLS (b)	OLS (c)	2SLS (d)	2SLS (e)
Debt/GDP	-0.03	-	-	-	-
	(0.83)				
$(Debt/GDP)^2$	0.0004	0.0003	0.0003	0.0002	0.0003
	(3.26)	(5.41)	(5.80)	(3.99)	(7.00)
Investment risk index	0.74	0.75	0.56	1.76	1.51
	(2.84)	(2.33)	(1.84)	(5.63)	(7.59)
Reserves in months of imports	-	-0.59	-	-0.62	-
		(3.54)		(5.18)	
Reserves/GDP	-0.08	-	-0.07	-	-0.07
	(2.55)		(3.36)		(7.23)
Libor	0.90	0.68	0.99	1.24	1.57
	(2.04)	(1.74)	(2.17)	(2.33)	(3.30)
Dummy for crisis periods	1.19	1.21	1.23	2.07	2.05
	(3.43)	(3.60)	(3.77)	(4.26)	(3.90)
Corruption index	0.56	0.49	-	0.48	-
	(2.87)	(2.66)		(3.89)	
Adjusted R-squared	0.70	0.70	0.70	0.52	0.52
Number of obs.	747	747	747	747	747
Wald test for joint significance of fixed effects (F-statistic)	22.52	23.51	22.01		
ds/dDebt at the point of means	0.04	0.06	0.06	0.05	0.05
ds/dDebt at the point of medians	0.03	0.05	0.05	0.04	0.04

Source: Author's calculations.
Note: OLS means Ordinary Least Squares, and 2STS means Two Stage Least Squares. The numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors. Country-specific fixed effects were included in the estimation of equations (a), (b), and (c). A constant was included in the estimates of equations (d) and (e).

Model (5) and (6) perform similarly with regard to the significance of the other explanatory variables. Also, in the quadratic regressions, the coefficients of the investment risk index, reserves in months of imports or in percent of GDP, the index of corruption, the dummies for crises periods, and country-fixed effects are significant, and with the expected sign. Different from the estimates of equation (5), though, in the quadratic model, the coefficient of the Libor rate variable is always positive, and significant.[19]

Compared to existing studies on the determinants of country premiums, these results are in line with those obtained by Edwards (1984) and Min (1998), who find that variables reflecting a country's solvency and liquidity position, like the ratio of reserves to GDP, significantly affect emerging market bond spreads. The finding that the Libor rate (or the U.S. treasury bill rate) significantly affects country premiums is in contrast with the results of other recent studies that fail to identify a positive and significant linkage between industrial countries' interest rates and emerging market spreads (Cline and Barnes, 1997; Eichengreen and Mody, 1998; Min, 1998; Kamin and Kleist, 1999). Finally, the significance of the coefficient associated with the dummy for periods of crises shows evidence of the spillover effects of financial turmoil on emerging market spreads. This result is consistent with the finding by Zhang (1999) that during the Mexican crisis the spreads on bonds issued by emerging market economies were substantially above the levels otherwise explainable.

V. Moral Hazard and International Bailouts

Since the 1995 Mexican bailout, and especially after the Asian crisis, the public policy debate has focused on the problem of moral hazard produced, or aggravated, by international financial rescue operations. Any lending-borrowing relationship has to deal with moral hazard issues, but in the case of emerging market finance, the perception that credits might be somehow guaranteed by a third party (for instance, the IMF) creates further distortions of incentives for borrowers and lenders alike. Investors may take undue risks in their lending decisions, or reduce their monitoring efforts, while debtor countries may adopt imprudent policies, thus raising the probability of new financial crises. This section tries to assess whether the large rescue operations of the 1990s have indeed exacerbated investor moral hazard.

It is not easy to devise a test of creditor moral hazard. In principle, that would require knowing how much investors would have lent, and at what terms, in the absence of bailouts. Since this cannot be determined, one way of evaluating the practical relevance of moral hazard is to analyze how indicators of market expectations, such as interest rate spreads, have reacted to international bailouts. A number of studies have used this approach, and found little support for the proposition that these rescue programs resulted in investor moral hazard. Lane and Phillips (1999), examining the response of an emerging market bond index to

[19] In the quadratic model, the interaction term between the Libor and the debt-to-GDP ratio was initially included among the regressors, but it was then dropped, as the estimated coefficient turned out to be insignificant.

events, such as announcements of new IMF-supported programs, which might have affected investor expectations about future availability of IMF financial support, do not detect evidence consistent with the presence of moral hazard. Zhang (1999), comparing the spreads of emerging market bonds before and after the Mexican bailout, finds that a dummy variable for the post-Mexican-crisis period is insignificant. Dell'Ariccia, Schnabel, and Zettelmeyer (2002), testing whether the absence of support during the Russian crisis led to changes in the level of spreads, in the sensitivity with which spreads respond to fundamentals, and in the cross-country variance of spreads, detect some evidence of investor moral hazard. Kamin (2002), examining whether the access of emerging markets to international lending has been easier after 1995, and for economically or geopolitically important countries—which some consider to be the beneficiaries of IMF-led packages—concludes that there is little support for the view that moral hazard is significantly distorting international capital markets.[20]

Following the above-mentioned approach of using market data to infer about investor expectations, this section looks for evidence of moral hazard in international lending in the context of the model presented in Section II. The supply of funds to emerging markets would be unlimited only if investors ruled out the possibility of suffering losses resulting from a country default. Therefore, to evaluate whether the rescue operations associated with the recent financial crises have affected investor perceived probability of future bailouts, equation (5) is reestimated, allowing for different coefficients for pre- and post-crisis periods.[21] A significant change in the supply of funds functional form (from linear to nonlinear, or vice-versa), or in the size of the credit limit from one period to the other, is interpreted as an indication that lenders have reassessed their expectations of bailouts after observing the extent of financial support extended by international organizations during the crises. While the Mexican and Asian crises, which involved large rescue packages, are supposed to have exacerbated investor moral hazard, the Russian crisis, which did not entail bailout and resulted in the country default, is expected to have reduced the perceived likelihood of future rescues.[22]

To assess the impact of the Mexican bailout on the supply of funds to emerging markets, regression (b) from Table 1 is reestimated on a pool sample over the interval 1993Q1–1997Q2 (which covers the period around the Mexican crisis, but excludes the turmoil due to the Asian crisis), allowing for different coefficients for the period before the crisis (1993Q1–

[20] Although they do not test for moral hazard, other papers related to the topic are Nunnekamp (1999), Jeanne and Zettelmeyer (2001), Eichengreen and Mody (2001), and Brealey and Kaplanis (2004).

[21] This approach has been previously used by Dell'Ariccia, Schnabel, and Zettlemeyer (2000), who, however, conduct a test for moral hazard that is different from that carried out here.

[22] For a discussion of the Mexican, Asian, and Russian crisis as valid events to test for moral hazard, see Dell'Ariccia, Schnabel, and Zettelmeyer (2002).

1994Q4), and after the crisis (1995Q4–1997Q2). To avoid the results being affected by the instability of the crisis period, the first three quarters of 1995 are also excluded from the sample. This period subdivision is consistent with those adopted in Zhang (1995), so that the results are comparable.[23] The estimates seem to support the hypothesis that the Mexican bailout has exacerbated investor moral hazard (Table 3). First, the test for equality of the δ coefficients before and after the crisis indicates a structural break between the two periods. Second, while the null hypothesis of linearity is rejected for the period prior to the crisis, it cannot be rejected after the crisis, implying that in the latter period investors were not imposing a credit limit on emerging market countries. Furthermore, in the after-crisis period, spreads were not significantly affected by the debt-to-GDP ratio, as the null hypothesis that $\alpha=\delta=0$ cannot be rejected.[24] These results are in contrast with those found in Zhang (1995) and Dell'Ariccia, Schnabel, and Zettelmeyer (2002), who failed to detect evidence of moral hazard in the wake of the Mexican bailout.

To ascertain whether the absence of international support during the Russian turmoil produced a significant change in investor willingness to lend to emerging markets, consistent with the presence of lender moral hazard before the crisis, the model above is estimated again, allowing for different coefficients for the periods before and after the crisis (Table 4). To check the robustness of the results, and to facilitate a comparison with the existing literature, two different sample periods are considered. In regression (I), the pre-crisis period includes the quarters following the Mexican crisis and prior to the Russian crisis (1995Q4–1998Q2), while in regression (II) it includes only the quarters between the end of the Asian crisis and before the Russian crisis (1998Q1–1998Q2).[25] The crisis period (1998Q3–1999Q1) is again excluded from the sample. The empirical findings do not support the moral hazard hypothesis. Indeed, in the estimated equations, the null hypothesis of linearity is rejected both prior to and following the crisis. Also, the equality of the δ coefficients before and after the crisis suggests that the credit limit imposed by international lenders to emerging markets did not significantly change after the Russian non-bailout. The only effect, consistent with the presence of investor moral hazard before the crisis, is the increase in the responsiveness of spreads to changes in country indebtedness, as indicated by the rise in the slope of the supply of funds.[26]

---

[23] In Dell'Ariccia, Schnabel, and Zettelmeyer (2002) the after-crisis period starts one quarter earlier, in 1995Q3. Adopting this slightly different period subdivision does not affect the results reported below.

[24] These findings are confirmed also when Mexico, the crisis country, is excluded from the sample.

[25] The latter period subdivision is the same as that adopted by Dell'Ariccia, Schnabel, and Zettelmeyer (2002). Descriptive statistics for the dependent variable over the different sub-periods are reported in Appendix I.

[26] These results hold also when Russia is excluded from the sample.

Table 3. Estimation of the Basic Model Before and After the Mexican Crisis

	Before Mexican crisis (1993Q1–1994Q4)	After Mexican crisis, and before Asian Crisis (1995Q4–1997Q2)
Intercept	-3.47	-0.68
	(1.84)	(0.10)
Debt/GDP in numerator (α)	-0.02	0.16
	(2.87)	(1.03)
Debt/GDP in denominator (δ)	0.004	-0.01
	(6.05)	(1.29)
Investment risk index	0.59	1.26
	(2.48)	(2.71)
Reserves in months of imports	0.05	-0.43
	(0.75)	(3.60)
Libor	0.14	-0.63
	(0.59)	(0.59)
(Debt/GDP)×Libor	-0.00	-0.02
	(0.63)	(1.08)
Corruption index	0.48	0.48
	(2.42)	(3.54)
Wald test for $\alpha=\delta=0$		
F-statistic (p-value)	0.00	0.39
ds/dDebt at the point of means	0.013	0.005
ds/dDebt at the point of medians	0.012	0.004
Wald test for equality of δ coefficient before and after the crisis (p-value)	0.04	
Adjusted R-squared	0.41	
Number of observations	170	

Source: Author's calculations.
Note: Estimates obtained using Nonlinear Least Squares. The numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors.

Table 4. Estimation of the Basic Model Before and After the Russian Crisis

	(I)		(II)	
	After Mexican Crisis and Before Russian Crisis (1995Q4–1998Q2)	After Russian Crisis (1999Q2–2000Q4)	After Asian Crisis and Before Russian Crisis (1998Q1–1998Q2)	After Russian Crisis (1999Q2–2000Q4)
Intercept	-0.31	9.77	-4.88	9.77
	(0.06)	(1.16)	(0.36)	(1.15)
Debt/GDP in numerator (α)	0.03	-0.09	0.01	-0.09
	(1.07)	(1.07)	(0.16)	(1.07)
Debt/GDP in denominator (δ)	0.002	0.001	0.002	0.001
	(4.44)	(4.33)	(3.10)	(4.62)
Investment risk index	0.26	2.35	0.48	2.35
	(2.97)	(6.49)	(4.80)	(6.44)
Reserves in months of imports	-0.13	-0.80	-0.12	-0.80
	(3.28)	(5.79)	(2.42)	(5.75)
Libor	0.17	-2.20	1.07	-2.20
	(0.19)	(1.60)	(0.45)	(1.59)
(Debt/GDP)×Libor	-0.005	0.02	-0.003	0.02
	(0.87)	(1.59)	(0.23)	(1.58)
Corruption index	0.24	-0.34	0.06	-0.34
	(6.20)	(1.14)	(0.94)	(1.13)
Wald test for $\alpha=\delta=0$				
F-statistic (p-value)	0.00	0.00	0.01	0.00
ds/dDebt at the point of means	0.03	0.10	0.03	0.10
ds/dDebt at the point of medians	0.03	0.09	0.03	0.09
Wald test for equality of δ coefficient before and after the Russian crisis (p-value)	0.17		0.53	
Adjusted R-squared	0.65		0.64	
Number of obs.	557		366	

Source: Author's calculations.
Note: Estimates obtained using Nonlinear Least Squares. The numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors.

Taken together, the results of the experiments above might indicate that investor moral hazard worsened in the period immediately following the Mexican crisis, but that this effect was only temporary. Indeed, only in the interval between the Mexican and the Asian crisis can evidence of moral hazard be detected, whereas this disappears after the Asian crisis.[27]

VI. CONCLUSIONS

This paper has tested empirically the theoretical predictions that the country premium paid by emerging economies on sovereign debt is upward sloping in the amount of debt, and that these economies may be able to borrow abroad only up to a certain maximum ceiling, above which they experience credit rationing. For that purpose, using a newly created database on Eurobond spreads for 32 emerging market countries, this paper has estimated a nonlinear supply of foreign funds curve, allowing the possibility to test for the existence of a maximum ceiling on foreign lending to sovereigns. The results indicate that the null hypothesis of linearity is rejected, under different model specifications and controlling for several explanatory variables, and that the supply of funds curve tends to become vertical beyond a maximum critical debt level.

Also, the approach developed in this paper has been used to contribute to the public policy debate on the moral hazard effects of international rescue operations. First, this paper has argued that the empirical evidence that the credit supply curve to emerging markets is non-linear, and tends to become vertical above a critical debt level, suggesting that the moral hazard effects in international lending are somewhat limited.

Moreover, this paper has specifically tested whether the rescue operations, or the absence of bailout, observed in connection with the recent financial crises, have modified the supply of funds curve. The paper's basic model has been reestimated allowing for different coefficients for the pre- and post-crisis periods, and a test for changes in the supply of funds curve's functional form (from linear to nonlinear, or vice-versa), as well as changes in the size of the credit ceiling for the pre- and post-crisis periods, has been carried out. The results indicate significant changes in the supply of funds curve consistent with the presence of moral hazard in the period immediately following the Mexican rescue operation, but not in the wake of the Russian non-bailout.

---

[27]One could argue that these findings could also be consistent with the view that lenders revised their assessment of emerging markets creditworthiness after Mexico received financial support from the IMF, and entered into a Fund program. According to this latter interpretation, the Mexican bailout did not result in investor moral hazard, but, instead, persuaded foreign lenders that other financial crises were less likely. However, this argument seems rather weak. In fact, to maintain such a view, one needs to assume that the confidence-boosting effect of the IMF program was extremely strong, to be able to remove the credit constraint imposed by international investors in the period before the Mexican crisis.

Country List

Argentina, Bolivia, Brazil, Chile, People's Republic of China, Colombia, Costa Rica, Croatia, Czech Republic, Ecuador, Guatemala, Hungary, Indonesia, Jamaica, Republic of Kazakhstan, Korea, Republic of Latvia, Republic of Lithuania, Mexico, Moldova, Morocco, Pakistan, Panama, Philippines, Poland, Russia, Slovak Republic, South Africa, Thailand, Trinidad and Tobago, Turkey, Uruguay, and Venezuela.

Variable Definitions and Data Sources
Dependent variable:
SPREAD: Quarterly average difference between the yield on an emerging market sovereign international bond, and the yield on a treasury bill, denominated in the same currency, and of similar maturity, issued by an industrialized country. Source: Datastream.

Explanatory variables:
ASIAN: Dummy for the period of the Asian crisis: 1997q3-1997q4.
CABGDP: Current account balance, percent of GDP. Source: IMF, International Financial Statistics.
CORRUPT: Index of corruption within the political system. The original index has been normalized, so it takes values between 0 (low corruption) and 10. Source: International Country Risk Guide.
CRISIS: Dummy for periods of crises (either Mexican or Asian, or Russian, or Ecuadorian).
DEBT/GDP: Public and publicly guaranteed external debt, percent of GDP. Source: World Bank, Global Development Finance.
ECUAD: Dummy for the period of the Ecuador crisis: 1999q1–2000q1.
EXPGRN: Rate of growth of exports in nominal terms (in U.S. dollars). Source: IMF, International Financial Statistics.
EXPGRR: Rate of growth of export volume index. Source: IMF, International Financial Statistics.
EXPVOL: Standard deviation of monthly growth rate of exports (over six months). Source: IMF, International Financial Statistics.
FABGDP: Fiscal account balance, percent of GDP. Source: IMF, International Financial Statistics.
FDI: Foreign direct investment (percent of GDP). Source: IMF, International Financial Statistics.
GROWTH: Real GDP growth. Source: IMF, International Financial Statistics.
IMPGDP: Imports, percent of GDP. Source: IMF, International Financial Statistics.
IMPGRN: Rate of growth of imports in nominal terms (in U.S. dollars). Source: IMF, International Financial Statistics.
IMPGRR: Rate of growth of import volume index. Source: IMF, International Financial Statistics.
INFAN: Annualized rate of growth of Consumer Price Index. Source: IMF, International Financial Statistics.
INFL: Quarterly rate of growth of Consumer Price Index. Source: IMF, International Financial Statistics.

INSTAB: Index of government instability. It is a measure both of the government's ability to carry out its declared programs and its ability to stay in office, which depends on the type of governance, the cohesion of the government, the closeness of the next election, popular approval of government policies, and so on. The original index has been normalized, so it takes values between 0 (low stability) and 10. Source: International Country Risk Guide.
INVGDP: Gross Fixed Capital Formation in percent of GDP. Source: IMF, International Financial Statistics.
INVRISK: Index of investment risk. It is a measure on the governments' attitude to inward investment, as determined by the assessment of four aspects, namely, the risk of operations; taxation; repatriation; and labor costs. The original index has been normalized, so it takes values between 0 (low stability) and 10. Source: International Country Risk Guide.
LIBOR: Six-month Libor rate. Source: International Country Risk Guide.
MEXICAN: Dummy for the period of the Mexican crisis: 1995q1-1995q3.
OIL: Crude oil price (U.S. dollars per barrel), percentage changes. Source: IMF, International Financial Statistics.
PERCAPITAGDP: GDP per capita PPP at the end of 1992 (current international U.S. dollars). Source: World Bank, World Development Indicators
POP: Total population. Source: World Bank, World Development Indicators
REER: Real Effective Exchange Rate, percentage changes. Source: IMF, International Financial Statistics.
RESGDP: Total reserves minus gold, percent of GDP. Source: IMF, International Financial Statistics.
RESIMP: Total reserves minus gold divided by good imports. Source: IMF, International Financial Statistics.
RESM2: Total reserves minus gold, percent of broad money. Source: IMF, International Financial Statistics.
RESMONTH: Total reserves minus gold divided by the average monthly bill. Source: IMF, International Financial Statistics.
RUSSIAN: Dummy for the period of Russian crisis: 1998q3–1999q1.
STDEBTGDP: Short-term debt outstanding at year-end in percent of GDP. Source: IMF, WEO and International Financial Statistics.
STDEBTRES: Short-term debt outstanding in percent of reserves minus gold. Source: IMF, WEO and International Financial Statistics.
STDEBTTOTAL: Short-term debt outstanding at year-end in percent of total external debt. Source: IMF, WEO and International Financial Statistics.
TBILL: U.S. treasury bill rate

Descriptive Statistics for the Dependent Variable SPREAD

	1993Q1–2000Q4	1993Q1–1994Q4	1995Q4–1997Q2
Mean	5.37	3.33	2.53 2.40*
Standard deviation	10.19	2.45	2.16 2.80*
No. of observations	805	42	129 118*

* Excluding Mexico

	1995Q4–1998Q2	1998Q1–1998Q2	1999Q2–2000Q4
Mean	2.75	3.32	7.21 6.68*
Standard deviation	1.88	1.70	14.4 14.4*
No. of observations	275	76	305 291*

* Excluding Russia

Unit Root Tests[28]

Variable: SPREAD

Im, Pesaran, and Shin (1997) Unit Root Test	
With Intercept and Without Time Trend (one lagged difference of the dep. Variable)	t statistic=-2.15***
With Intercept and Without Time Trend (two lagged differences of the dep. variable)	t statistic=-1.96***

Variable: Debt/GDP

Levin and Lin (1992) Unit Root Test[29]	
Without Intercept and Time Trend	t_rho statistic=-1.43747*
With Intercept and Without Time Trend	t_rho statistic=-3.21237***
With Intercept and Time Trend	t_rho statistic=-3.20036***
Without Intercept and Time Trend, With Time Specific Effect	t_rho statistic=-4.83571***
Without Intercept and Time Trend, With Individual Specific Effect	t_rho statistic=-0.91861
With Individual-Specific Effect and Individual Time Trend	t_rho statistic=0.54271
Without Intercept and Time Trend, Correlation Across Time Periods	t_rho statistic=-5175.05705***
Im, Pesaran, and Shin (1997) Unit Root Test	
With Intercept and Without Time Trend	t statistic= -1.54629
With Intercept and Time Trend	t statistic= -2.24031***

[28] *, **, *** indicate significance at 10, 5, and 1 percent significance level, respectively.

[29] The routine NPT 1.2, developed by Chiang and Kao (2000), was used to perform these tests. The panel was balanced by dropping some time periods.

Variable: RESMONTH

Levin and Lin (1992) Unit Root Test	
Without Intercept and Time Trend	t_rho statistic=-0.72
With Intercept and Without Time Trend	t_rho statistic=-5.11***
With Intercept and Time Trend	t_rho statistic=-5.02***
Without Intercept and Time Trend, With Time Specific Effect	t_rho statistic=-6.50***
Without Intercept and Time Trend, With Individual Specific Effect	t_rho statistic=-3.88***
With Individual Specific Effect and Individual Time Trend	t_rho statistic= -4.56***
Without Intercept and Time Trend, Correlation Across Time Periods	t_rho statistic= -132.5***
Im, Pesaran, and Shin (1997) Unit Root Test	
With Intercept and Without Time Trend	t statistic= -2.00**

Variable: RESGDP

Levin and Lin (1992) Unit Root Test	
Without Intercept and Time Trend	t_rho statistic=-12.00***
With Intercept and Without Time Trend	t_rho statistic=-33.00***
With Intercept and Time Trend	t_rho statistic=- 32.01***
Without Intercept and Time Trend, With Time Specific Effect	t_rho statistic=-31.18***
Without Intercept and Time Trend, With Individual-Specific Effect	t_rho statistic=-29.16***
With Individual-Specific Effect and Individual Time Trend	t_rho statistic= -29.98***
Without Intercept and Time Trend, Correlation Across Time Periods	t_rho statistic= -17756***
Im, Pesaran, and Shin (1997) Unit Root Test	
With Intercept and Without Time Trend	t statistic= -1.82**

Other Regression Results (Basic Model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Debt/GDP in numerator (α)	0.06	0.07	0.10	-0.06	-0.14	-0.05	-0.08
	(1.86)	(1.72)	(3.13)	(1.24)	(1.94)	(1.32)	(1.02)
Debt/GDP in denominator (δ	0.002	0.002	0.002	0.001	0.001	0.001	0.001
	(17.70)	(18.03)	(16.60)	(4.57)	(6.60)	(3.85)	(3.33)
CABGDP	-0.002	-0.007	0.41				
	(0.04)	(0.16)	(1.01)				
CORRUPT	0.34	0.34	0.36	0.58	0.76	0.34	0.67
	(2.37)	(2.40)	(2.49)	(2.12)	(2.11)	(1.90)	(3.02)
EXPGRN				-0.01			
				(0.61)			
EXPVOL			-0.01				
			(1.06)				
GROWTH					0.02		
					(0.96)		
IMPGDP							-0.07
							(1.25)
INFAN	-0.005	-0.005					
	(1.24)	(1.25)					
INVRISK	0.53	0.55	0.46	1.27	1.19	0.88	0.78
	(3.19)	(3.27)	(2.80)	(3.00)	(2.37)	(3.50)	(2.72)
(Debt/GDP)×Libor	-0.004	-0.06	-0.01	-0.02	0.03	0.02	0.03
	(0.46)	(0.82)	(2.66)	(2.10)	(2.06)	(2.77)	(1.78)
LIBOR	-0.001	0.29	1.95	-1.03	-1.21	-1.13	-2.18
	(1.00)	(0.55)	(2.15)	(2.86)	(2.16)	(2.97)	(1.90)
OIL	-0.01					0.01	
	(0.83)					(0.56)	
REER						0.04	
						(0.80)	
RESGDP						-0.08	
						(3.58)	
RESMONTH	-0.42	-0.40	-0.37	-0.42	-0.29		-0.67
	(3.32)	(3.39)	(3.25)	(2.13)	(1.05)		(3.02)
STDEBTRES	-0.002	-0.001	-0.001				
	(1.12)	(1.00)	(0.77)				
CRISIS	1.60	1.50	1.48	1.27	1.17	1.35	1.26
	(5.35)	(5.85)	(5.96)	(3.23)	(2.48)	(3.22)	(3.86)
Adjusted R-squared	0.81	0.81	0.76	0.69	0.62	0.70	0.70
No. of observations	677	677	680	568	395	747	704

Source: Author's calculations.
Note: Estimates obtained using Nonlinear Least Squares, and including country-fixed effects. Numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors.

Other Regression Results (Alternative Model)

	(1)	(2)	(3)	(4)	(5)	(6)
$(Debt/GDP)^2$	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004
	(7.22)	(7.43)	(7.11)	(5.37)	(7.26)	(7.34)
CABGDP	-0.03	-0.05	-0.02			
	(0.68)	(0.93)	(0.36)			
CORRUPT	0.24	0.26	0.27	0.14	1.04	-0.04
	(1.70)	(1.91)	(1.87)	(0.64)	(2.20)	(0.29)
EXPGRN				0.002		
				(0.08)		
EXPVOL			-0.01			
			(1.29)			
GROWTH					0.02	
					(1.21)	
IMPGDP						
INFAN	-0.007	-0.006				
	(1.46)	(1.39)				
INVRISK	0.48	0.45	0.42	0.85	0.53	0.54
	(2.90)	(2.78)	(2.73)	(2.72)	(0.95)	(2.71)
LIBOR	0.08	0.10	-0.02	-0.05	0.86	0.34
	(0.43)	(0.58)	(0.15)	(0.21)	(0.85)	(1.30)
OIL	-0.02					
	(1.57)					
REER						0.08
						(1.12)
RESGDP					-0.19	-0.09
					(3.18)	(3.32)
RESMONTH	-0.23	-0.22	-0.19	-0.52		
	(2.52)	(3.22)	(2.13)	(2.19)		
STDEBTRES	-0.001		-0.001			
	(0.91)		(0.45)			
STDEBTTOTAL		-0.034				
		(1.03)				
CRISIS	1.97	1.80	1.86	1.07	0.06	1.10
	(5.34)	(5.74)	(6.10)	(2.08)	(0.11)	(2.21)
Adjusted R-squared	0.80	0.80	0.72	0.67	0.58	0.56
No. of observations	677	677	670	568	395	747

Source: Author's calculations.

Note: Estimates obtained using Ordinary Least Squares, and including country-fixed effects. Numbers in parentheses are absolute values of t-statistics, obtained using White heteroskedasticity-consistent standard errors.

References

Arora, Vivek, and Martin Cerisola, 2001, "How Does U.S. Monetary Policy Influence Sovereign Spreads in Emerging Markets?" *Staff Papers*, Vol. 48, No. 3, pp. 474–98, International Monetary Fund.

Bayoumi, Tamin, Morris Goldstein, and Geoffrey Woglom, 1995, "Do Credit Markets Discipline Sovereign Borrowers? Evidence form the U.S. States," *Journal of Money, Credit, and Banking*, Vol. 27, No. 4, pp. 1,046–59.

Brealey, Richard, and E. Kaplanis, 2004, "The Impact of IMF Programs on Asset Values," *Journal of International Money and Finance*, Vol. 23, No. 2 (March), pp. 143–304.

Burton, F.N., and H. Inoue, 1985, "The Influence of Country Risk Factors on Interest Differentials on International Lending to Sovereign Borrowers," Applied Economics, Vol. 17, No. 3 (June), pp. 491–507.

Calomiris, Charles W., 1998, "The IMF's Imprudent Role as Lender of Last Resort," *The Cato Journal*, Vol. 17, No. 3, pp. 275–94.

Calvo, Guillemo A., L. Leiderman, and Carmen M. Reinhart, 1993, "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors," *Staff Papers*, International Monetary Fund, Vol. 40, No. 1, pp. 108–51.

Cantor, Richard, and Frank Packer, 1995, "Determinants and Impact of Sovereign Credit Ratings," *Federal Reserve Bank of New York Economic Policy Review*, Vol. 2 (October), pp. 37–53.

Chiang, Min-Hsien, and Chilhwa Kao, 2000, "Non-stationary Panel Time Series Using NPT 1.2—A User Guide," Center for Policy Research, Syracuse University.

Cline, William, 1983, "Interest and Debt: Systematic Risk and Policy Response" (Washington: Institute of International Finance).

———, 1995, "International Debt Reexamined" (Washington: Institute of International Finance).

Cline, William R., and Kevin J.S. Barnes, 1997, "Spread and Risk in Emerging Markets Lending," IIF Research Papers No. 97-1 (Washington: Institute of International Finance).

Dell'Ariccia, Giovanni, Isabel Schnabel, and Jeromin Zettelmeyer, 2000, "Moral Hazard and International Crisis Lending: A Test," IMF Working Paper 02/181 (Washington: International Monetary Fund) October.

Eaton, Jonathan, and Mark Gersovitz, 1981, "Debt with Potential Repudiation: Theoretical and Empirical Analysis," *Review of Economic Studies,* Vol. 48, pp. 289–309.

Edwards, Sebastian, 1984, "LDC Foreign Borrowing and Default Risk: An Empirical Investigation, 1976–80," *American Economic Review,* Vol. 74, No. 4, pp. 726–34.

———, 1986, "The Pricing of Bonds and Bank Loans in International Markets," *European Economic Review,* 30, pp. 565–89.

Eichengreen, Barry, and Ashoka Mody, 1998, "What Explains Changing Spreads on Emerging-Market Debt: Fundamentals or Market Sentiment?" NBER Working Paper No. 6408 (Cambridge, Massachusetts: MIT Press).

———, 2001, "Bail-Ins, Bailouts and Borrowing Costs," *Staff Papers*, International Monetary Fund, Vol. 47 (Annual Research Conference), pp. 155–87.

Eichengreen, Barry, and Richard Portes, 1989, "After the Deluge: Default, Negotiation, and Readjustment During the Interwar Years," in *The International Debt Crisis in Historical Perspective*, ed. by Barry Eichengreen and Peter Lindert (Cambridge, Massachusetts: MIT Press), pp. 12–47.

Feder, Gershon, and Richard E. Just, 1977, "An Analysis of Credit Terms in the Eurodollar Market," *European Economic Review*, 9, May, pp. 221–43.

Ferrucci, Gianluigi, 2003, "Empirical Determinants of Emerging Market Economies' Sovereign Bond Spreads," Bank of England Working Paper No. 205.

Gersovitz, Mark, 1985, "Banks' International Lending Decisions: What We Know and Implications for Future Research," in *International Debt and the Developing Countries*, ed. by G.W. Smith and J.T. Cuddington (Washington: World Bank).

Goldstein, Morris, and Geoffrey Woglom, 1992, "Market-Based Fiscal Discipline in Monetary Unions: Evidence from the US Municipal Bond Market," *Establishing a Central Bank: Issues in Europe and Lessons from the US*, ed. by M. Canzoneri and V. Grilli (Cambridge University Press), pp. 228–60.

Hajivassilious V., 1989, "Do Secondary Markets Believe in Life After Debt?" in *Dealing with the Debt Crisis*, ed. by H. Ishrat and I. Diwan (Washington: World Bank).

Huizinga, Harry, 1989, "Commercial Bank Claims on Developing Countries: How Have Banks Been Affected?" in *Dealing with the Debt Crisis*, ed. by H. Ishrat and I. Diwan (Washington: World Bank).

Im, Kyung, M. Hashem Pesaran, and Yongcheol Shin, 1997, "Testing for Unit Roots in Heterogeneous Panels," University of Cambridge.

IMF (2004): Global Financial Stability Report (Washington: International Monetary Fund), April.

Jeanne, Olivier, and Jernomin Zettelmeyer, 2001, "International Bailouts, Moral Hazard, and Conditionality," *Economic Policy*, Vol. 33 (October), pp. 409–32.

Kamin, Steven B., 2002, "Identifying the Role of Moral Hazard in International Financial Markets," International Financial Discussion Paper No. 736 (Washington: Board of Governors of the Federal Reserve System), September.

Kamin, Steven B., and Karsten von Kleist, 1999, "The Evolution and Determinants of Emerging Market Credit Spread in the 1990s," BIS Working Paper No. 68 (Basel: Bank for International Settlements), May.

Lane, Timothy, and Steven Phillips, 2000, "Does IMF Financing Result in Moral Hazard," IMF Working Paper 00/168 (Washington: International Monetary Fund).

Levin, Andrew, and Chien-Fu Lin, 1992, "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties," University of California, San Diego, Discussion Paper 92–23.

Meltzer, Allan H., 1998, "Asian Problems and the IMF," *The Cato Journal*, Vol. 17, No. 3, pp. 267–74.

Min, Hong G., 1998, "Determinants of Emerging Market Bond Spread: Do Economic Fundamentals Matter?" World Bank Policy Research Paper No. 1899.

Nunnenkamp, Peter, 1999, "The Moral Hazard of IMF Lending: Making a Fuss About a Minor Problem?" Kiel Discussion Paper 332, Kiel Institute of World Economics.

Ozler, Sule, and Guido Tabellini, 1991, "External Debt and Political Instability," NBER Working Paper No. 3772 (Cambridge, Massachusetts: MIT Press).

Sachs, Jeffrey D., 1981, "The Current Account and Macroeconomic Adjustment," Brooking Papers on Economic Activity 1, pp. 201–68.

———, 1982, "LDC Debt in the 1980s: Risk and Reform," NBER Working Paper No. 861 (Cambridge, Massachusetts: MIT Press).

———, 1984, "Theoretical Issues in International Borrowing," Princeton Studies in International Finance, No. 54, July.

Sachs, Jeffrey D., and Daniel Cohen, 1982, "LDC Borrowing with Default Risk," NBER Working Paper No. 925 (Cambridge, Massachusetts: MIT Press).

Stiglitz, Joseph. E., and Andrew Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71, pp. 343–410.

Zhang, Xiaoming Alan, 1999, "Testing for Moral Hazard in Emerging Markets Lending," IIF Research Papers No. 99-1 (Washington: Institute of International Finance).