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The Role of Global Risk Aversion in Explaining Sovereign Spreads

Sovereign spreads are key for emerging countries for many reasons. Perhaps the most important is that they constitute the floor for the cost of external capital. Emerging economies have used external bond financing extensively in the last few decades. Latin American countries, in particular, currently account for over 60 percent of the outstanding bonds in the Emerging Market Bond Index (EMBI) constructed by J. P. Morgan. The region's economic growth appears to be closely associated with the amount of net capital inflows received.[1]

Given the importance of external financing and the volatility of Latin American sovereign spreads, the region's economic authorities need to identify the main driving forces of sovereign spreads. No consensus has yet emerged, despite much debate. One strand of the literature argues that domestic factors—namely, economic fundamentals—are particularly relevant in determining sovereign spreads. Another strand emphasizes external factors, such as international interest rates, global economic growth, and contagion. In this study, we focus on one external factor, namely global investors' attitude toward risk, which we refer to as global risk aversion. This factor has recently received much attention from practitioners and policymakers, though it has not yet come under much scrutiny by academics.

The traditional literature identifies the U.S. risk-free interest rates as the main external factor affecting sovereign spreads. While this is clearly relevant, investors' attitude toward risk should also have a bearing on high-risk markets,

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1. Calvo, Leiderman, and Reinhart (2003).

including emerging countries' sovereign bond markets. Risk issues are becoming increasingly relevant owing to the sophistication of financial markets, and the impact on emerging markets of international investors' appetite for risk is clearly recognized today.[2]

Our paper contributes to this literature by analyzing how investors' attitude toward risks affects Latin American sovereign spreads. An important issue in this endeavor is how to measure the degree of global risk aversion. The measure chosen should be unrelated to default risk, while reflecting investors' pure risk appetite. A broader definition may include the financial position of international investors, which basically depends on the economic cycle and the cost of capital in the investors' country of origin. When the economy is booming and liquidity is ample and cheap, global risk aversion should, in principle, be low. This is exactly what has happened in the past few years. On this basis, this paper not only studies the impact of global risk aversion on Latin American sovereign spreads, but also that of its main driving forces, such as U.S. economic growth and the U.S. risk-free rate. The paper thus contributes more generally to the literature on the external determinants of sovereign spreads.

The rest of the paper is divided into six sections. We start by reviewing the existing literature and setting out the paper's objective. The subsequent section describes our empirical strategy. We then report on the variables and data used. The following two sections offer some stylized fact and present our empirical results. The final section concludes.

Literature Review and Paper Objective

Empirical work on the determinants of emerging countries' sovereign risk has grown markedly in the last few years. This has triggered a lively debate on whether external or domestic factors are most relevant in explaining sovereign spreads. Our literature review focuses on external factors, in particular the cost of capital in the United States.

Calvo, Leiderman, and Reinhart were probably the first authors to point out the importance of external factors, although they concentrate on capital inflows to Latin American countries rather than on sovereign spreads.[3] They find evidence that increases in U.S. short-term interest rates are responsible for the

2. J. P. Morgan (1999); IMF (2002, 2003a, 2003b); Calvo (2003); Broner, Gelos, and Reinhart (2004).

3. Calvo, Leiderman, and Reinhart (1993).

reduction in capital inflows to the region, based on a sample of ten Latin American countries. In turn, Min and Kamin and von Kleist report that the relation between the two variables is statistically insignificant for a group of emerging countries.[4] For a longer timeframe, Arora and Cerisola present evidence that U.S. monetary policy has a positive and significant effect, with higher elasticities for some countries (Brazil and Mexico) and lower elasticities for others (Argentina).[5] Herrera and Perry assess the importance of U.S. monetary policy and investors' risk aversion, allowing for different short- and long-run effects.[6] They obtain a negative short-run impact of the federal funds rate on Latin American sovereign spreads and a positive one in the long run. The relation between global risk aversion and sovereign spreads is positive in both the short and long run.

Fernández-Arias explores the channels through which lower long-term risk-free rates in the United States affect the cost of capital in emerging countries, using a model of international portfolio allocation.[7] He shows that low bond yields reduce sovereign spreads and that the impact is generally larger than that of domestic factors. Cline and Barnes, in turn, do not find any significant role of the U.S. government bond yield in a sample of twelve emerging market countries and six industrial ones.[8] Finally, Eichengreen and Mody explore the determinants of the issuance of sovereign spreads for a number of emerging regions.[9] A reduction in the U.S. government bond yield appears to increase the supply of emerging countries' sovereign bonds, thereby raising sovereign spreads.

Apart from the Herrera and Perry paper cited above, very few studies assess the importance of investors' risk appetite for sovereign spreads. García and Didier confirm empirically that the U.S. high-yield spread raises Brazil's cost of capital.[10] McGuire and Schrijvers undertake a principal factor analysis and find a single common factor explaining one-third of the total variation in emerging countries' sovereign bond spreads.[11] The authors argue that this common factor is probably related to investors' risk tolerance. Dungey and others explore the impact of investors' risk appetite on emerging market debt in several crisis events, using a sample of nine emerging economies; they conclude that the

4. Min (1998); Kamin and von Kleist (1999).
5. Arora and Cerisola (2001).
6. Herrera and Perry (2002).
7. Fernández-Arias (1996).
8. Cline and Barnes (1997).
9. Eichengreen and Mody (1998).
10. García and Didier (2003).
11. McGuire and Schrijvers (2003).

Russian default is characterized by a sharp increase in risk aversion, while the evidence is mixed for the Brazilian crisis.[12] Dailami, Masson, and Padou report that investors' risk aversion positively affects emerging market spreads.[13] U.S. long-term rates raise the spreads of highly indebted countries, but the effect is not significant for the whole sample. Finally, González Rozada and Levy Yeyati show a positive long-run relation between global risk aversion and emerging countries spreads; the same is true for U.S. short-term interest rates.[14]

We build on the existing literature in two ways. First, we move away from a purely statistical technique, such as that used by McGuire and Schrijvers, and estimate a structural model.[15] Second, we endogenize our variable of interest: that is, the risk appetite of global investors. We make the latter depend on pure risk aversion and on financial conditions in the investors' country of origin, which are mainly determined by the U.S. risk-free rate and economic growth. Since these two factors have also been found to directly affect Latin American sovereign spreads, we are able to explore the two major channels through which the U.S. risk-free rate and growth may affect sovereign spreads. All in all, by endogenizing global risk aversion, we obtain a broader understanding of how external factors affect sovereign spreads.

Empirical Strategy

As a first approximation, we make the sovereign spread depend on two regressors: global risk aversion and the probability of default stemming from each country's fundamentals.[16] We treat global risk aversion as exogenous, but we endogenize it in a second step.

$$s_t = b\theta_t^* + dP_t + \varepsilon_t, \tag{1}$$

where s is the semi-log of the spread between foreign-currency-denominated sovereign bonds in a given Latin American country and the U.S. risk-free

12. Dungey and others (2003).
13. Dailami, Masson, and Padou (2005).
14. González Rozada and Levy Yeyati (2006).
15. See McGuire and Schrijvers (2003).
16. This decomposition is based on a model developed by Blanchard (2004). Although Blanchard's objective is rather different (namely, showing that monetary policy suffers from fiscal dominance), the decomposition of spreads is useful as a first approximation of the issue we want to tackle.

bond at the same maturity; θ* is global risk aversion; *P* stands for the probability of default related to the fundamentals; and ε_t is the error term. How much global risk aversion influences each country's sovereign spreads is determined by the coefficient *b*.

We need to make a number of assumptions, some of which are relaxed at a later stage. First, the model is supposed to be linear. Second, θ* must be uncorrelated with the residual (ε_t) for *b* to be unbiased. This implies that global investors' risk aversion should not influence the probability of default related to fundamentals. This is a strong hypothesis insofar as some of the main drivers of global risk aversion, such as U.S. economic growth and the cost of capital in the United States, may also influence the fundamentals of Latin American countries. We take two different approaches to tackle this problem: the simplest is to estimate the above equation with two-stage least squares (2SLS) with the first two lags of global risk aversion as instrumental variables; the second is to endogenize global investors' risk aversion. To that end, we move to an SVAR model that spells out the factors that may affect both global risk aversion and the probability of default stemming from the quality of fundamentals. Following the literature on the external finance premium, the degree of risk aversion (θ*) is inversely proportional to the balance sheet strength of companies' net wealth (*n*), minus the gross value of capital ($q + k$), *q* being the price per unit of capital and *k* the quantity of capital:[17]

$$\theta^* = -\Psi\left[n_t - \left(q_t + k_t\right)\right]. \tag{2}$$

The net wealth of companies is considered to be a linear function of the aggregate level of real activity (*y*):

$$n_t = b_1 y_t. \tag{3}$$

The gross value of capital is positively related to the aggregate level of activity and negatively to the risk-free interest rate (*i**):

$$q_t + k_t = b_2 y_t - b_3 i_t^*. \tag{4}$$

We substitute equations 3 and 4 into equation 2. We then add an idiosyncratic part to the determinants of the external risk premium, which captures changes

17. On the external finance premium, see Bernanke and Blinder (1992); Bernanke, Gertler, and Gilchrist (1998).

in pure risk aversion (that is, not related to economic conditions). This is modeled as a stochastic term (u^{θ}). We thus obtain

$$\theta^* = -\Psi\left(b_1 - b_2\right)y_t - \Psi b_3 i_t^* + u_t^{\theta}. \tag{5}$$

The relation between global risk aversion and U.S. economic growth and the U.S. risk-free rate depends on four factors: idiosyncratic changes in risk aversion; the elasticity of global risk aversion to the net wealth of enterprises minus the value of their capital (Ψ); the relevance of U.S. growth for the net wealth of enterprises (b_1), as compared with its importance for the value of their capital (b_2); and the degree to which the U.S. risk-free rate affects the value of capital (b_3) and Ψ. The empirical literature displays ample consensus that the risk-free rate negatively affects the external risk premium.[18] The same is true for economic growth.[19]

We then set out a five-equation SVAR to consider the impact of global risk aversion and its main drivers, as well as that of fundamentals and its determinants, on Latin American sovereign spreads. We consider the following general structure, where **A** and **B** are matrices, $\mathbf{e}_t$ is the vector of innovations, and $\mathbf{u}_t$ is the vector of structural orthogonal shocks:

$$\mathbf{A}\mathbf{e}_t = \mathbf{B}\mathbf{u}_t. \tag{6}$$

We take the matrix **A** to be diagonal and restrict the **B** matrix as shown in the system of equations below. The system is overidentified.

$$\begin{aligned}
e_t^y &= c_1 u_t^y; \\
e_t^i &= c_2 e_t^y + c_3 u_t^i; \\
e_t^{\theta} &= c_4 e_t^y + c_5 e_t^i + c_6 u_t^{\theta}; \\
e_t^P &= c_7 e_t^y + c_8 e_t^i + c_9 u_t^P; \\
e_t^s &= c_{10} e_t^{\theta} + c_{11} e_t^P + c_{12} u_t^s.
\end{aligned} \tag{7}$$

In the first equation of the SVAR, U.S. economic growth is exogenously determined.[20] The second equation models the reaction function of U.S. monetary policy as dependent on domestic economic growth and the level of the

18. Duffee (1996); Gertler and Lown (2000); Huang and Kong (2003).
19. Mody and Taylor (2003); Huang and Kong (2003).
20. We conduct a robustness test in which the U.S. interest rate, rather than U.S. growth, is to be determined exogenously. The results do not change.

risk-free rate.[21] The third equation models the behavior of global risk aversion, based on equation 5 above. Global risk aversion is, thus, a function of U.S. growth (c_4), the U.S. risk-free rate (c_5), and the pure component of risk aversion (c_6). In the fourth equation, we open the possibility for U.S. economic growth and the U.S. risk-free rate to affect Latin American countries' fundamentals (c_7 and c_8, respectively). We also include a stochastic term that is not affected by external factors, reflecting the idiosyncratic component of fundamentals (c_9). The fifth equation of the SVAR incorporates the two main determinants of sovereign spreads, as outlined in equation 1 above: namely, global risk aversion and the probability of default determined by fundamentals (with coefficients c_{10} and c_{11}, respectively).[22] In sum, U.S. growth and the risk-free rate may influence the sovereign spread not only directly, through their impact on fundamentals (as measured by c_7 and c_8, respectively), but also indirectly, through their influence on global risk aversion (as measured by c_4 and c_5, respectively).[23]

Data

Comparable data on emerging countries' sovereign spreads are generally scarce. The most widely used are drawn from J. P. Morgan Securities, which offers relatively long time series of different daily indexes. We chose the EMBI+ because it summarizes the returns of foreign currency instruments issued externally, starting in May 1994. Such instruments include dollar-denominated Brady bonds and other foreign local-currency-denominated bonds (such as euro-bonds), and loans. This is preferable to the EMBI Global—J. P. Morgan's other foreign currency index—because the latter has a much shorter time span and is more heterogeneous. In fact, the EMBI Global includes all foreign-currency-denominated debt instruments, even those held by residents. The EMBI+ is also preferable to J. P. Morgan's Emerging Local Markets Index, which includes domestic-currency bonds, since credit risk and local exchange rate risk are often closely intertwined.

21. For simplicity, we do not include inflation.

22. Even if it is hard to justify in economic terms, we test for a different specification of the fifth equation of the SVAR, namely, one that also includes U.S. economic growth and the U.S. risk-free rate. After comparing the two models on the basis of the Akaike information criterion, we decide to disregard this additional direct channel of influence of U.S. growth and interest rates on Latin American spreads.

23. Other SVAR (structural vector autoregression) specifications have been conducted as robustness tests. Some are available in García-Herrero and Ortíz (2005).

The EMBI+ is available for eight Latin American countries: Argentina, Brazil, Colombia, Ecuador, Mexico, Panama, Peru, and Venezuela. These countries account for the bulk of bonds held by nonresidents, with the exception of Chile. The only available data for Chile are from the EMBI Global.

We incorporate the largest time span possible for each country. For Argentina, Brazil, Mexico, and Venezuela, data exist from May 1994 onward. Panama and Peru's indexes start in 1996; those for Chile and Colombia in 1999; and Ecuador in February 2005. We exclude observations for countries in default (namely, Argentina since late 2001 and Ecuador in 2000) because their spreads are very much affected by the sovereign debt restructuring. The remaining time span is so short for Ecuador that we have to exclude it from the sample. We thus have a total of eight countries with a variable time span. The maximum length is from May 1994 to June 2006. Data have monthly frequency, which is the highest possible since country fundamentals, as well as the drivers of global risk aversion, cannot be found at a higher frequency. This implies transforming the J. P. Morgan daily indexes into monthly averages. Finally, we test for the stationarity of Latin American sovereign spreads. While these are generally found to be nonstationary, Johansen tests conducted for each country dispel the possibility of cointegration among the three variables of interest.[24]

The degree of risk aversion by global investors is not observable. The most obvious proxy is the spread between the U.S. corporate bond yield and government bond yield, for two main reasons. First, most of the movements in corporate bonds with a high enough credit rating are not related to the probability of default of that asset class, but rather to changes in investors' attitude toward risk. Second, in a financially integrated world, the pricing of debt from emerging markets should be close to the pricing of other securities with the same credit rating. This is because, apart from sharing a similar default risk, they should also be affected by the price of risk.

For our proxy, we chose the Baa corporate bond rating because it is not too close to the risk-free rate (as is the Aaa), but the rating is still investment grade. Consequently, it is not much affected by credit risk. Other studies also use this proxy, which is drawn from Moodys.[25]

24. Colombia is the only case in which it is accepted.

25. Bernanke and Blinder (1992); Herrera and Perry (2002); González Rozada and Levy Yeyati (2006).

We check the robustness of our results to different proxies of global risk aversion. First, to explore whether credit risk affects our results, we measure global risk aversion with the volatility of the stock exchange. We chose the VIX volatility index of the Chicago Board Options Exchange (CBOE) as the most general measure that is readily available.[26] Second, given that a number of Latin American countries are not investment grade (that is, their credit rating is worse than that of Baa corporate bonds), we take the spread of non-investment-grade U.S. corporate bonds (or junk bonds) for those countries' equations, instead of the Baa spread. Data are from Lehman Brothers. Third, we control for supply factors affecting U.S. government bonds, such as prepayment premiums and tax issues, by using the difference between the Baa and Aaa corporate bonds as a measure of global risk aversion.[27] Finally, we test for the relevance of other potential sources of risk aversion, such as oil prices, housing prices, terrorism, and corporate scandals. Of these, oil and housing prices could be treated as proxies of global risk aversion, whereas terrorism and corporate scandals should be reflected in a sharp increase in pure risk aversion. The source for oil prices is the North Sea Brent crude oil price from the London Market; for U.S. housing prices, we use the U.S. National Association of Realtors. For swings in pure risk aversion, we look at the largest jump in the corporate Baa spread, which is associated with the Enron scandal.

As for the main drivers of global investors' risk aversion, we use a leading indicator of U.S. economic activity, calculated by the Organization for Economic Cooperation and Development (OECD). A forward-looking variable is the most meaningful measure of the impact on financial variables, such as sovereign spreads. Furthermore, this indicator has a monthly frequency, as needed. We conducted robustness tests using the Conference Board consumer confidence index. For the U.S. risk-free rate, we use the ten-year U.S. Treasury bond yield. Data are from the Federal Reserve Board.

To control for the quality of fundamentals in each Latin American country, we use principal components to obtain a summary measure of several variables:

26. This is calculated by taking a weighted average of the implied volatility from eight calls and puts on the S&P 100 index.

27. Duca (1999) states that one component of the Baa-Treasury spread is the prepayment premium to investors for the risk that if interest rates fall in the future, borrowers might retire old debt with new debt at lower rates. With regard to taxes, Elton and others (2001) hold that taxes explain a substantial portion of the spread between corporate and government bonds, because they are paid on the entire coupon of corporate bonds, not only on the spread.

the average rating of the three major rating agencies (Moody's, Standard and Poor's, and Fitch IBCA), the level of exports, the level of international reserves, the ratio of reserves to imports, and the ratio of external debt to exports.[28] All variables have monthly frequency, except for external debt, which needs to be interpolated from quarterly data.[29] All variables are taken from *International Financial Statistics* (IFS) published by the International Monetary Fund (IMF), except for external debt, which is drawn from the Joint BIS-IMF-OECD-World Bank Statistics.

Finally, we analyze the impact of global risk aversion on portfolio flows, as a quantitative reflection of developments in sovereign spreads. We chose countries for which we have a sufficient sample period, namely, Argentina, Brazil, Chile, and Mexico. As for the sovereign spreads, the data only start in 1994. As we only have quarterly data for portfolio flows, we can introduce some new fundamental-related variables in the summary measure obtained with principal components. These are the annual change in real GDP (drawn from the IFS), the level of the real exchange rate (from J. P. Morgan), the level of international reserves, the ratio of short-term debt to reserves, and nonfuel commodity prices (from the IMF database on primary commodity prices).

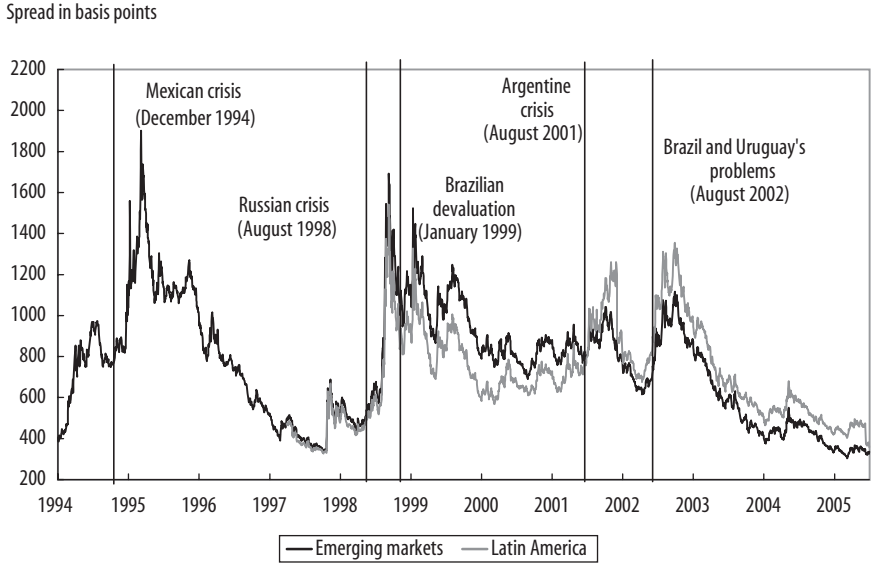
Some Stylized Facts

Latin America saw a strong revival of capital inflows starting in 1990, following a long period of external financing constraints during the debt crisis of the 1980s. This resurgence was briefly interrupted during the Mexican crisis in 1994–95 and then continued until the Russian crisis erupted in 1998, when sovereign spreads skyrocketed. The spreads quickly narrowed, recovering most of their losses by the end of 1998, only three months after the Russian default. The Brazilian devaluation of January 1999 represented no more than a brief interruption of this recovery, which was again under way as early as March 1999. The Argentine crisis, which started in 2001, led to a sharp increase in spreads, particularly in Latin America. This peak started to revert in October 2002, after Luiz Inácio Lula da Silva won the Brazilian presidential elections, the U.S. economy showed its first signs of recovery, and

28. We take the first principal component for each country. This explains over 50 percent of the total variance.

29. Brazil is the only country with monthly external debt statistics.

FIGURE 1. Latin American and Emerging Market Sovereign Spreads[a]

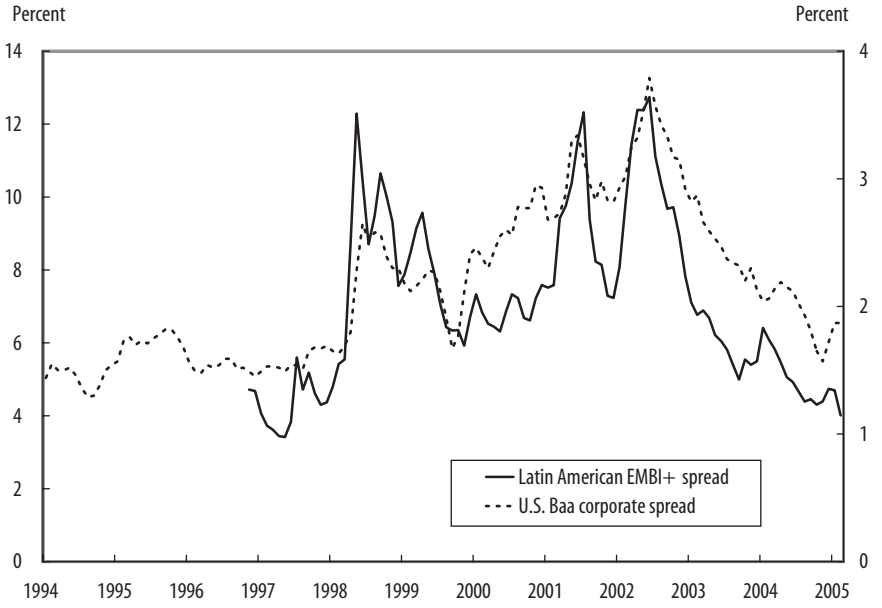


Source: J. P. Morgan EMBI+ for emerging markets and for Latin America.
a. Sovereign spreads are measured by the J. P. Morgan EMBI+ for emerging markets and for Latin America.

a number of massive corporate scandals in the United States started to recede. Since then, sovereign spreads have fallen to historically low levels (figure 1).

The risk appetite of global investors (measured by the most common proxy, namely, the U.S. Baa corporate spread) has moved closely with the evolution of sovereign spreads for quite some time (figure 2). The two yields moved in tandem in the period prior to the Russian crisis. After the Russian default, U.S. corporate spreads went clearly below Latin American sovereign spreads until the first quarter of 2000. Thereafter, corporate spreads closed the distance until mid-2001, when they reached the same level. The exception was the few months in late 2001 and early 2002 when U.S. corporate spreads fell less rapidly than Latin American sovereign spreads. This period coincides with the peak of the Argentine crisis, when other Latin American spreads diverged from that of Argentina. U.S. corporate spreads increased sharply again in the second quarter of 2002 as a consequence of several corporate scandals, beginning with Enron. Latin American spreads moved up very closely in this period, which coincided with Lula's campaign for the Brazilian elections. The

FIGURE 2. Latin American Sovereign Spreads and the U.S. Baa Corporate Spread[a]



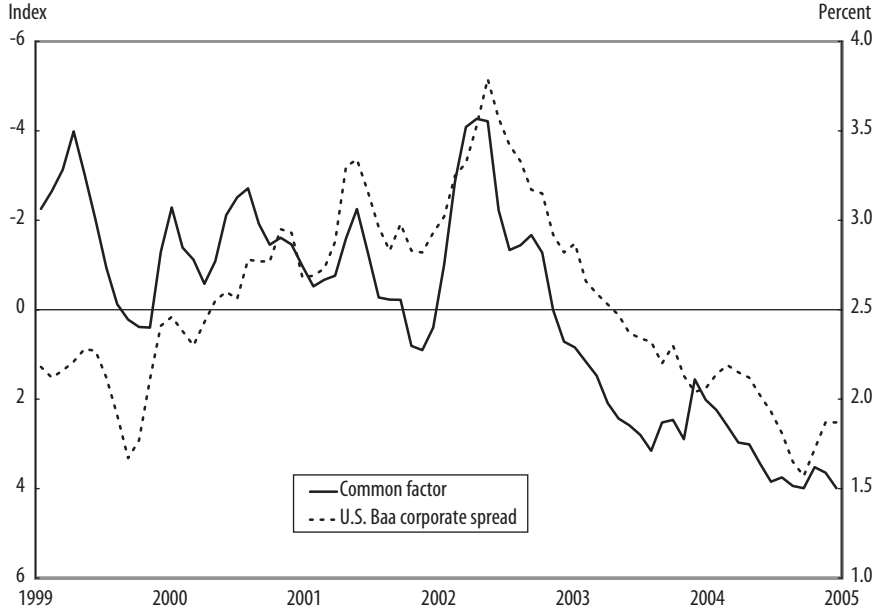
a. The Latin American EMBI+ spread is measured on the left axis; the Baa spread is on the right.

corporate scandals were clearing up by October 2002; they then receded, with U.S. corporate spreads reaching very low levels. Latin American spreads followed the same trend. The temporary surge in yield in mid-2004 also occurred for both types of assets.

We perform two exercises to confirm, to the extent possible, that the close comovement between Latin American sovereign spreads and global risk aversion does not hinge on the proxy chosen for the latter. First, we compare the evolution of the U.S. Baa corporate spread with the common global factor that can be extracted, using principal components, from Latin American sovereign spreads.[30] As figure 3 shows, the U.S. Baa corporate spread seems to explain most of the global common factor. Second, we explore the evolution of other proxies of global risk aversion, namely,

30. This is in line with McGuire and Schrijvers (2003).

FIGURE 3. Common Factor of Latin American Spreads and U.S. Baa Corporate Spread[a]

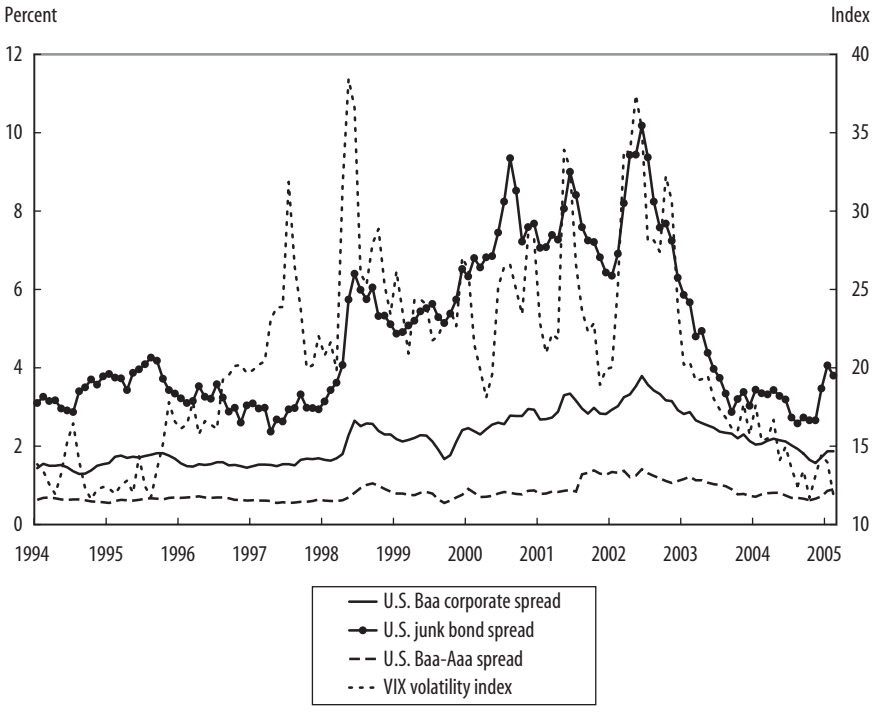


a. The common factor is the first common factor chosen, based on sovereign spreads of Brazil, Chile, Colombia, Mexico, Panama, Peru, and Venezuela. The common factor is measured on the left axis; the Baa spread is on the right.

the VIX volatility index, the U.S. junk bond spread, and the U.S. Baa-Aaa corporate spread (figure 4). The three move in line with the U.S. Baa corporate spread, although the varibility differs greatly.

With regard to the determinants of global risk aversion, panel A of figure 5 shows a negative comovement between the U.S. Baa corporate spread and the ten-year U.S. government bond yield throughout the sample. From 1994 to the summer of 1998, the bond yield was high and the Baa was low. This relation reverted with the Russian crisis until mid-1999, but the difference narrowed as U.S. long-term rates rose and Baa spreads dropped at the beginning of 1999. When the U.S. economy entered a recession in late 2000, the bond yield fell substantially, while the Baa spread increased sharply and peaked in the third quarter of 2002. The difference narrowed again thereafter, mostly because global risk aversion fell while the bond yield remained relatively unchanged. Panel B of figure 5 depicts the relation between the U.S.

FIGURE 4. Baa Corporate Spread Compared with Other Proxies of Global Risk Aversion[a]



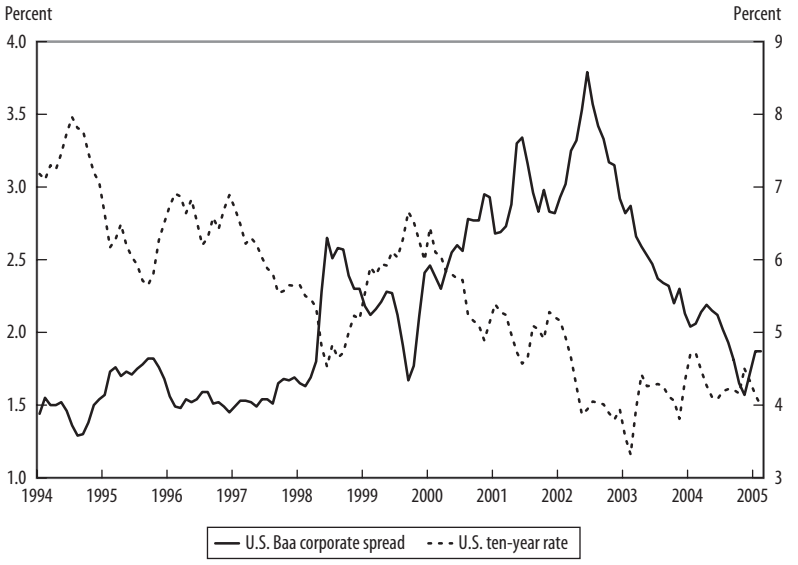
a. The U.S. Baa corporate spread, the U.S. junk bond spread, and the U.S. Baa-Aaa spread are measured on the left axis; the VIX volatility index is on the right.

Baa corporate spread and U.S. economic growth, proxied by the OECD leading indicator of U.S. economic activity. The relation is negative, as for the U.S. government bond rate.

Figure 6, 7, and 8 illustrate the comovement between Latin American sovereign spreads and two important drivers of global risk aversion: the U.S. long-run risk-free interest rate (figure 6) and a leading indicator of U.S. growth (figure 7). Figure 8 shows how sovereign spreads comove with a summary measure of fundamentals as described in the previous section (a higher value stands for better fundamentals). In figures 6 and 7, the relation seems to be negative, but it is less clear-cut than that for the Baa corporate spread. This makes the econometric exploration of the data all the more interesting. As one would expect, figure 8 displays a strong neg-

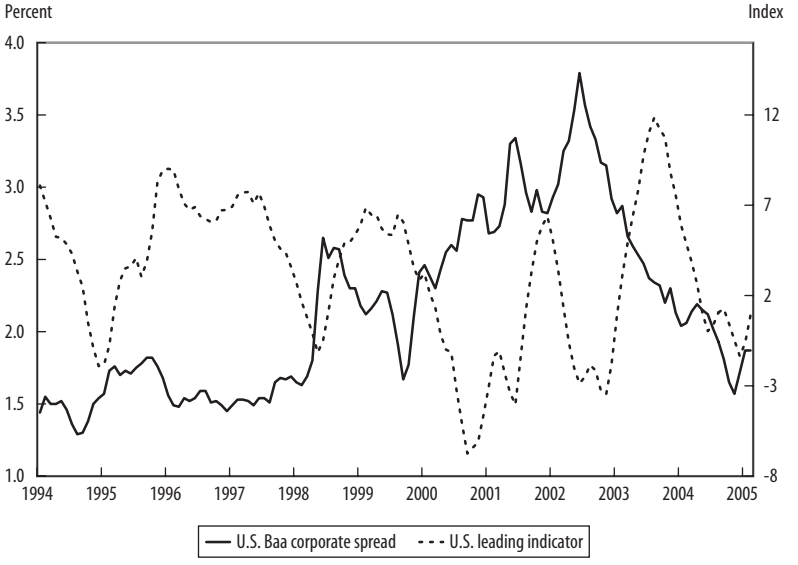
FIGURE 5. The Baa Corporate Spread, U.S. Ten-Year Government Yield, and U.S. Growth Leading Indicator[a]

A. Global risk aversion and the U.S. ten-year rate



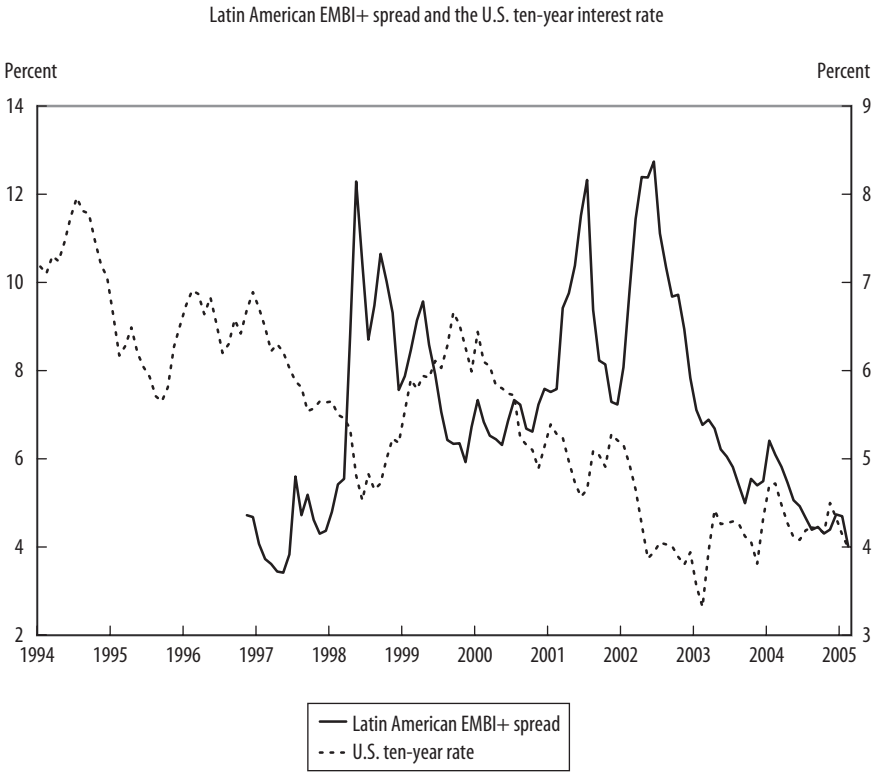
a. The U.S. Baa corporate spread is measured on the left axis; the U.S. ten-year government bond yield is on the right.

B. Global risk aversion and the U.S. leading indicator



a. The U.S. Baa corporate spread is measured on the left axis; the OECD's U.S. leading indicator is on the right.

FIGURE 6. Latin American Sovereign Spreads and the U.S. Ten-Year Government Yield[a]

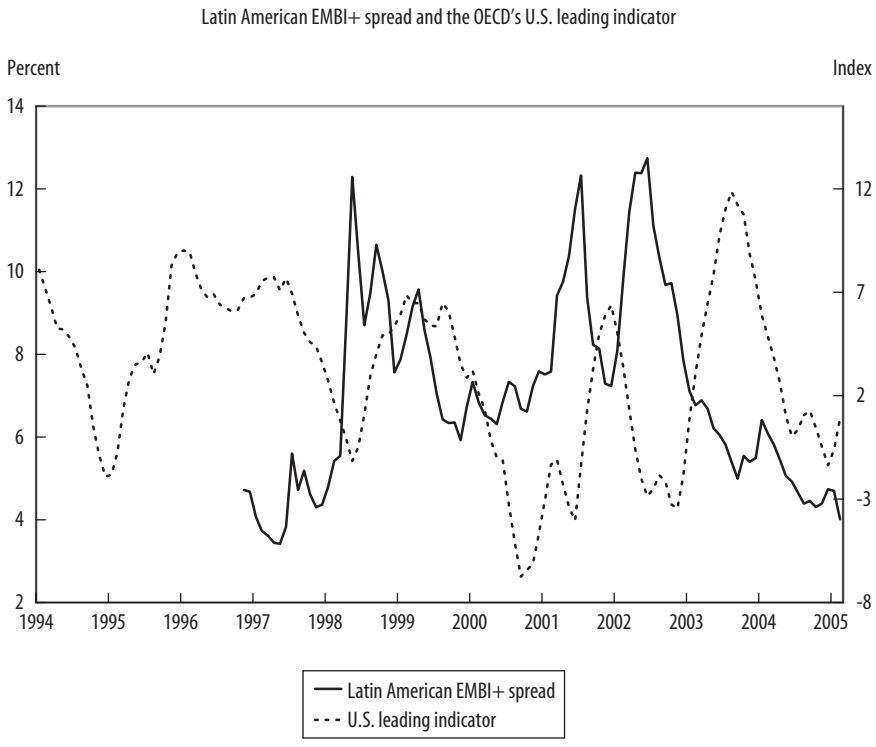


a. The Latin American EMBI+ spread is measured on the left axis; the U.S. ten-year rate is on the right.

ative relation between sovereign spreads and fundamentals, particularly since 2003.

Finally, Argentina, Ecuador, and Venezuela have the highest average sovereign spreads (measured by the mean and the median), while Chile has the lowest average spread. The bivariate correlation between global risk aversion and each country's sovereign spread is positive for all countries except Chile and Ecuador. The correlation between global risk aversion and the OECD leading indicator of U.S. economic activity is negative and relatively high. The same is true for the global risk aversion and the ten-year U.S. government bond yield. Finally, Granger causality tests between Latin American spreads

FIGURE 7. Latin American Sovereign Spreads and OECD's U.S. Leading Indicator[a]



a. The Latin American EMBI+ spread is measured on the left axis; the OECD's U.S. leading indicator is on the right.

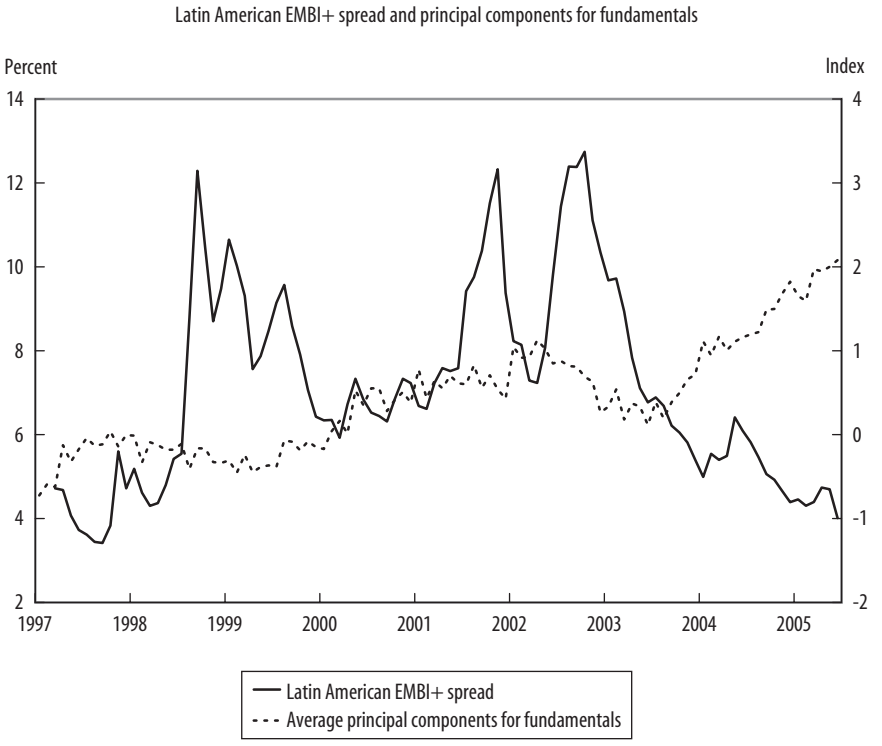
and U.S. Baa spreads indicate that our results are not affected by reversed causality.[31]

Results

In this section, we first present simple estimations of whether the degree of investors' risk aversion affects the sovereign spreads and whether the impact is different across countries. Second, by endogenizing global risk aversion, we assess how its main drivers—namely, U.S. economic growth

31. Summary statistics are available on request.

FIGURE 8. Latin American Sovereign Spreads and Principal Components for Fundamentals[a]



a. The Latin American EMBI+ spread is measured on the left axis; principal components are on the right.

and the U.S. risk-free rate—affect Latin American spreads. We also look into the changes in pure risk aversion derived from idiosyncratic events, such as the Enron scandal. Finally, we compare short- and medium-term effects.

A First Glance at the Influence of Global Risk Aversion on Spreads

We first take investors' risk aversion as an exogenous variable and separately estimate the semi-elasticity of the sovereign spread for the eight Latin American countries in our sample. Table 1 shows the results under two different estimation techniques: ordinary least squares (OLS) adjusted for autocorrelation of the error term and two-stage least squares (2SLS). The parameters

TABLE 1. Semi-Elasticities of Sovereign Spreads to Global Risk Aversion[a]

Country	*OLS*	*2SLS*
Argentina[b]	0.13	0.06
Brazil	0.21	0.21
Chile	0.40	0.29
Colombia	0.20	0.20
Mexico	0.20	0.19
Panama	0.15	0.15
Peru	0.24	0.23
Venezuela	0.16	0.17

a. Coefficients are statistically significant to the 95 percent level. The 2SLS regressions are estimated with two lags of global risk aversion.
b. We exclude observations for Argentina when the country was in default.

are always significant and have relatively high values. This confirms the relevance of global investor's risk aversion for the evolution of sovereign spreads.

As for country differences, Chile—with the lowest average sovereign spread—has the largest parameter for global risk aversion in both cases.[32] Those parameters are lowest for Argentina and Venezuela (the two countries with the highest average sovereign spread). This is in line with what we should expect: countries with worse fundamentals and, thus, with a higher probability of default should be the least affected by global risk aversion, at least in the short run. Their weak fundamentals basically explain most of the variability of their sovereign spreads.[33] Countries that perform well, like Chile, tend to be relatively more affected by external factors. The small impact of global risk aversion on Mexico might reflect the fact that Mexico has good fundamentals only recently in our sample.

These results, while interesting, should be treated with caution because each country's fundamentals could be correlated with global risk aversion, thereby biasing the coefficients. Both fundamentals and global risk aversion could be affected by external factors, such as U.S. economic growth and the cost of capital in the United States. To avoid this potential problem, we estimate a system of equations in which we endogenize global risk aver-

32. Given that Chile is the only country for which we use the EMBI Global to calculate the spread, instead of the EMBI+, we conduct a robustness exercise to confirm that Chile's higher elasticity is not the consequence of the proxy used. When we take the EMBI Global for all countries, Chile continues to have the highest elasticity. In addition, these elasticities are relatively similar to those estimated with EMBI + data.

33. It is also the result of the model developed by Blanchard (2004).

TABLE 2. Coefficients of the SVAR[a]

Variable	*Argentina*	*Brazil*	*Chile*	*Colombia*	*Mexico*	*Panama*	*Peru*	*Venezuela*
c_2	0.091*	0.085*	0.076*	0.088*	0.082*	0.089*	0.086*	0.088*
c_4	0.023*	0.000	–0.024	–0.012	0.004	–0.009	–0.008	0.001
c_5	–0.335*	–0.252*	–0.304*	–0.280*	–0.281*	–0.345*	–0.328*	–0.278*
c_7	0.058	–0.064	–0.123*	–0.161*	–0.004	–0.099	–0.038	0.033
c_8	–0.309*	–0.148	–0.111	–0.106	–0.184	0.236	0.297	0.185
c_{10}	0.188	0.356*	0.257*	0.203*	0.364*	0.210*	0.314*	0.120
c_{11}	0.090	–0.054*	–0.011	0.015	–0.146*	0.003	–0.043*	0.022

* Statistically significant at the 10 percent level.

a. The U.S. long-term government bond rate, the Baa corporate spread, and the OECD leading indicator of U.S. economic activity serve as a proxy for global risk aversion.

sion and include country fundamentals. We then compare short- and long-run effects.

Accounting for the Determinants of Risk Aversion

This section reports on the results of the five-equation SVAR described earlier. We are mainly interested in confirming that global investors' risk aversion is a relevant determinant of Latin American spreads, as found in the preliminary exercise above, and assessing the impact of U.S. growth and the U.S.risk-free rate on sovereign spreads, as both are important drivers of global risk aversion and Latin American countries' fundamentals. We prefer the U.S. long-term government bond rate to the short-term rate since it has a closer relation to the cost of capital for U.S. firms. Given the different evolution of the U.S. short- and long-run risk-free rates, we conducted robustness tests in which we included the short-term interest rate and the yield curve, respectively, as determinants of global risk aversion. The results can be found in García-Herrero and Ortíz (2005). Table 2 shows the relevant estimated coefficients of the five-equation SVAR when we take the U.S. long-term interest rate and the U.S. corporate Baa spread as the best proxy for global risk aversion. As found in the previous exercise, a high degree of risk aversion raises sovereign spreads in all countries analyzed (as shown by the positive coefficient of c_{10}) and is significant in all countries but Argentina and Venezuela. In this framework, where global risk aversion has been endogenized, the coefficients for global risk aversion are even larger than in the previous exercise, except for the case of Chile.

Another important finding is the persistence of investors' risk aversion, as evidenced in the results of the variance decomposition of the SVAR and the impulse response functions to a shock in pure risk aversion. Table 3 indicates

TABLE 3. Impact of Global Risk Aversion on Sovereign Spreads: Variance Decomposition[a]

	Period		
Country	*One month*	*Twelve months*	*Thirty-six months*
Argentina	1.0	2.0	11.0
Brazil	6.4	15.7	29.3
Chile	4.5	4.6	29.6
Colombia	4.9	19.6	14.4
Mexico	8.8	8.4	5.7
Panama	6.7	12.1	14.0
Peru	7.4	6.9	13.5
Venezuela	0.7	0.4	0.9

a. The Baa corporate spread serves as a proxy for global risk aversion.

that the share of the variance of sovereign spreads explained by global risk aversion generally increases over time. The exception is Mexico. In Venezuela, it remains relatively constant at low levels.[34]

A second result from the SVAR provides an indicator of how each country's fundamentals affect sovereign spreads (shown by c_{11} in table 2). We find that an improvement in fundamentals reduces spreads significantly in Brazil, Mexico, and Peru. The effect is most permanent in Mexico, followed by Peru and Brazil.[35]

Finally, we explore the impact of U.S. economic growth and the U.S. risk-free rate on sovereign spreads, through their influence on global risk aversion and on fundamentals. First, forward-looking measures of U.S. economic growth do not clearly affect global risk aversion or fundamentals, as indicated by the general lack of significance of c_4 or c_7, respectively.[36] Second, a rise in U.S. long-term rates reduces global risk aversion for all countries in the sample, as shown by the negative and significant sign of c_5. However, the impulse response functions show that this effect is short-lived and that global risk aversions and sovereign spreads actually rise only three months later in all countries analyzed.[37] Lastly, a surge in U.S. long-term government rates does not have a clear effect

34. The pattern of the impulse responses for the short-term interest rate and the yield curve can be found in García-Herrero and Ortíz (2005).

35. See García-Herrero and Ortíz (2005) for more details.

36. Future U.S. economic growth actually worsens Chile's and Colombia's fundamentals. These counterintuitive results could be related to the focus on forward-looking measures of U.S. economic growth, which are more appropriate as determinants of global risk aversion than of Latin American fundamentals.

37. The impulse response functions are not included here for reasons of space, but they can be found in García-Herrero and Ortíz (2005).

TABLE 4. Variance Decomposition for the Pre-Enron Sample and the Full Sample

	One month		*Twelve months*		*Thirty-six months*	
Country	*Pre-Enron*	*Full*	*Pre-Enron*	*Full*	*Pre-Enron*	*Full*
Brazil	1.4	6.4	6.5	15.7	10.3	29.3
Chile	8.7	4.5	14.2	4.6	8.6	29.6
Colombia	8.6	4.9	10.6	19.6	9.8	14.4
Mexico	6.9	8.8	4.2	8.4	4.7	5.7
Panama	7.5	6.7	7.7	12.1	8.3	14.0
Peru	6.1	7.4	12.3	6.9	11.8	13.5
Venezuela	1.0	0.7	2.9	0.4	2.7	0.9

on Latin American fundamentals (as measured by c_8) except in Argentina, where it worsens them.[38]

Having explored the impact of the main drivers of global risk aversion, we now assess how changes in pure risk aversion may affect Latin American spreads. Our data sample provides an interesting example of a sharp increase in pure risk aversion—namely, Enron's default in May 2002.[39] This led to a sudden hike in U.S. corporate spreads and emerging countries' sovereign spreads. At the same time, the increasing probability of Lula's winning the elections in Brazil is thought to have affected Latin American sovereign spreads, particularly in the case of Brazil. To assess whether investors' attitude toward risks became more important as a consequence of Enron's default, we estimate the above SVAR model for two time spans: the period before Enron's scandal and the full sample. Table 4 compares the results from the variance decomposition in both cases.[40] In all countries but Venezuela, the long-term effect of global risk aversion on sovereign spreads is larger for the full sample than for the pre-Enron period, pointing to the relevance of sharp hikes in pure risk aversion for Latin American financing conditions. The results are mixed in the very short run.

Finally, we conduct robustness tests with different definitions of investors' risk aversion. As previously explained, we consider other relevant proxies,

38. We check the model using the short-term rate and the yield curve instead of the U.S. ten-year rate. Results do not change qualitatively and can be obtained upon request.

39. Another important event may have been the terrorist attack on September 11, 2001, but our proxies for global risk aversion hardly reflect it. We therefore concentrate on the Enron scandal as an example of a sharp increase in pure risk aversion.

40. Argentina is excluded from this exercise because it defaulted just before Enron's collaspe. As mentioned previously, all observations of countries under default have been excluded from our empirical analysis.

such as the junk bond spread, the VIX stock volatility index, and the Baa-Aaa spread. In all cases, an increase in global risk aversion tends to raise sovereign spreads.[41] We conduct two additional exercises on our proxies for U.S. economic growth and U.S. long-term interest rates. First, we use the Conference Board consumer confidence index as another forward-looking measure of economic activity and the results are maintained. Second, we consider that U.S. long-term rates of different maturities are the floor for the financing cost of Latin American countries and that the combination of maturities changes by country depending on the bonds issued. To control for different maturities, we use the difference between the EMBI spread and the EMBI yield for each country in the sample. The results are similar to those obtained when we use the U.S. ten-year bond rate.[42]

We also move from assessing whether global risk aversion affects the price of external capital for Latin American countries to exploring the impact on quantities—namely, portfolio flows.[43] This serves as additional robustness test on the fundamentals determining sovereign spreads. In line with the previous results, we find that a higher degree of risk aversion reduces portfolio flows to Latin American countries.

Conclusions

We have explored the role of global investors' risk aversion in explaining sovereign spreads for a number of Latin American countries for the period 1994 to 2005. We find that global risk aversion is positively and significantly related to movements in sovereign spreads in all countries analyzed: namely, Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, and Venezuela. This is true for many different measures of global risk aversion, such as the U.S. Baa corporate bond spread but also others. In addition, the effect is persistent and even increases over time in most countries.

Our results might be explained by the growing integration of Latin American sovereign bonds in global investors' portfolios.[44] In fact, the range of investors purchasing emerging market securities has broadened: only specialized investors, such as hedge funds and mutual funds, acquired these

41. Results for all robustness tests are available upon request.
42. Both sets of results are available upon request.
43. A similar idea can be found in Calvo, Leiderman, and Reinhart (1993).
44. Wooldridge, Domanski, and Cobau (2003).

securities in the early 1990s, but today large institutional investors also purchase this kind of paper. This trend cannot but strengthen the interrelation between U.S. corporate paper and emerging countries' sovereign bonds.

We examined the role of the main determinants of investors' risk appetite, namely, conditions in the U.S. economy (economic growth and the risk-free rate) and pure risk aversion stemming from idiosyncratic factors. Since conditions in the U.S. economy can also affect Latin American countries' fundamentals, we disentangle the two effects by estimating an SVAR model. The results indicate that an increase in U.S. long-term interest rates lowers global risk aversion, but only in the short-term. Three months later, investors' risk aversion increases, along with Latin American sovereign spreads. The impact of U.S. long-term government rates on countries' fundamentals is not significant. The same is true for U.S. growth on global risk aversion or fundamentals.

We also looked into the sharp changes in the idiosyncratic component of investors' risk appetite and their impact on Latin American spreads. The clearest case was the Enron scandal, after which the explanatory power of global risk aversion for sovereign spreads seems to have increased.

As an additional test, we analyzed the explanatory power of global risk aversion for portfolio flows instead of sovereign spreads. In line with the results for sovereign spreads, a rise in risk aversion reduces portfolio flows for all Latin American countries analyzed.

All in all, investors' attitude towards risk appears to be a key factor in explaining sovereign spreads and portfolio flows. The last few years of low risk aversion—which coincided with high growth and low long-term rates in the United States—can, in good part, explain the very low sovereign spreads in the Latin American region.

Latin American policymakers have expressed concerns about the possibility of a sharp increase in U.S. long-term interest rates if the U.S. economy grows at or above potential and inflation expectations come back to the forefront. Our results point to the idea that a rise in the U.S. long-term government yield might not constitute a large problem for Latin American sovereign spreads in the short run (particularly if strong growth is maintained). However, investors' risk aversion would rise only a few months after the hike in U.S. long-term rates, thereby triggering an increase in Latin American sovereign spreads.