

## Foreign Participation in Local-Currency Bond Markets

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**Abstract:** We analyze the development of, and foreign participation in, 49 local bond markets. Countries with stable inflation rates and strong creditor rights have more developed local bond markets and rely less on foreign-currency-denominated bonds. Less developed bond markets have returns characterized by high variance and negative skewness, factors eschewed by U.S. investors. Results based on a three-moment CAPM indicate, however, that it is diversifiable idiosyncratic risk that U.S. investors appear to shun. Taken as a whole our results hint at a virtuous cycle of bond market development. Creditor friendly policies and laws can spark local bond market development and result in lower variance and more right-skewed returns, characteristics that attract foreign participation. In turn, the ability to borrow internationally in the local currency helps avoid the pitfalls of a currency mismatch and thus may further stabilize macroeconomic performance.

**Keywords:** bond market development, home bias, emerging market debt, original sin  
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## **1. Introduction**

The analysis of local-currency bond market development is of particular interest to both policymakers and investors. Countries that have less developed local-currency bond markets and rely heavily on foreign-currency bonds are more likely to suffer from a currency mismatch and are hence more susceptible to currency crises [Krugman (1999), Jeanne and Zettelmeyer (2002), Schneider and Tornell (2004), Aghion, Bacchetta and Banerjee (2004), Goldstein and Turner (2004)].<sup>1</sup> Deeper local bond markets can also provide a redundancy of funding sources, something that may well ameliorate financial crises [Greenspan (1999)]. An understanding of the factors associated with less developed bond markets could provide policymakers with a prescription for avoiding the financial fragility inherent in a currency mismatch.

Data limitations have, however, hampered empirical research on bonds. Unlike equities, information on bonds is not readily available across a wide range of countries, in part because bonds do not typically trade on standardized exchanges. Perhaps because of the relative paucity of bond market data, the literatures on financial development and international portfolio analysis have largely focused on equities. In the financial development literature, for example, the debate on the relative merits of bank-based and market-based financial systems typically excludes bonds; because of data limitations, in that literature market-based refers to equity market development only (Levine, 2002; Ergungor, 2004). In the international portfolio literature, a limited discussion of international bond

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<sup>1</sup> By extension, this literature, and our work, also has a link to the vast literature on dollarization. For example, Goldstein and Turner (2004) note that a currency mismatch could ultimately force an emerging economy to dollarize.

returns and the home bias is provided by Bekaert and Harvey (2003) and Tesar and Werner (1995).<sup>2</sup>

In this paper we aim to enhance our understanding of local bond markets around the world. Compiling data from a number of sources, we present information on the size and currency composition of bond markets in 49 countries and analyze factors associated with local bond market development. We then investigate the ability of countries to attract foreign investment by analyzing the determinants of U.S. investors' portfolios.

We first explore the factors that are associated with deeper local-currency bond markets. Extant empirical evidence is conflicting. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (henceforth LLSV) (1997) find that debt markets (bank debt plus nonfinancial bonds) are larger in countries with better rule of law and creditor rights, whereas Eichengreen, Hausmann, and Panizza (2002), henceforth EHP, find that the ability to issue local currency bonds is exogenous to such factors. Our analysis, performed with more complete data than LLSV or EHP, reveals roles for both creditor-friendly policies and creditor-friendly laws. Countries with better historical inflation performance (an outcome of creditor-friendly policies) have more developed local bond markets, both private and government, and rely less on foreign-currency-denominated bonds. Creditor-friendly laws matter, too; strong rule of law is associated with deeper local bond markets, while countries with better creditor rights are able to issue a higher share of bonds in their local currency.

While our bond market analysis provides insights into a country's ability to issue local-currency-denominated debt, it does not address whether these local-currency bonds will be attractive to international investors. This question is of particular interest for

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<sup>2</sup> While equities have been the main focus of the literature on international portfolio allocation, recent work by Buch, Driscoll, and Ostergaard (2004) examines the international diversification of banks' portfolios.

emerging markets. Were emerging economies able to borrow from abroad in local currency, they may also be able to avoid the pitfalls of a currency mismatch.<sup>3</sup>

We do not have data on all foreigners' investment in local bond markets, but rely instead on high-quality data on the international bond positions of one of the largest groups of international bond investors, U.S. investors. The data reveal very limited participation by U.S. investors in local currency bond markets overall, and especially limited in emerging markets. But there is significant cross-country variation, which leads us to investigate the returns characteristics influencing U.S. investor portfolio decisions. We follow work by Kraus and Litzenberger (1976), Athayde and Flores (2004), and Harvey, Liechty, Liechty, and Muller (2003) and sketch a model in which investors care about the mean, variance, and skewness of returns. The model predicts that if these characteristics are priced with respect to the U.S. investor, country weights in U.S. investors' international bond portfolios should be a function of bond market capitalizations and direct barriers to international investment. To the contrary, we find evidence that U.S. investors avoid local-currency bonds that have returns with historically high variance and negative skewness. Decomposing these risks, we find that U.S. investors are avoiding diversifiable idiosyncratic risk, yet another indication of the home bias in portfolios.

The paper is organized as follows. Section 2 presents data on the size and currency composition of 49 bond markets and analyzes the determinants of local-currency bond market development. We then turn to our analysis of foreign participation by first presenting (in Section 3) the risk and return characteristics of local-currency bonds from the perspective of a U.S. investor. We then utilize the risk and return characteristics in the

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<sup>3</sup> There are other ways to avoid the problems associated with currency mismatches; see, for example, Jeanne and Wyplosz (2001).

analysis of foreign participation provided in Section 4. Concluding comments are found in Section 5.

## **2. The World Bond Market Portfolio**

In this section we first present salient features of the world bond market portfolio and then analyze determinants of countries' local-currency bond market development.

### *2.1 The Size and Geography of the World Bond Market*

Unlike equity markets, about which information is readily available, comprehensive information on the size of the global bond market is not available from any one source. LLSV (1997) present data on debt finance, but their measure is of private bank debt and nonfinancial bonds. In this section we present information on the size and currency composition of bond markets in 49 countries.<sup>4</sup>

Our estimates of the size of each country's bond market are derived primarily from unpublished data from the Bank for International Settlements (BIS). For *international bonds* (i.e., those in foreign currencies or placed abroad), we use the security-level data underlying *BIS Quarterly Review* Table 14B. To form the security-level international bonds database, the BIS combines information from Capital DATA (Bondware), Thomson Financial Securities Data (Platinum), and Euroclear; identifies and removes duplicates; corrects mistakes; ensures a consistent classification of issuers across the different sources; and performs general quality control. The BIS data on international bonds are likely the most comprehensive available, but they do not include information on Brady bonds, which

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<sup>4</sup> Another source of information on the size of bond markets across countries had been Merrill Lynch's *Size & Structure of the World Bond Market*, but it was recently discontinued. Other recent discussions of bond market development include IMF (2002) and Mihaljek, Scatigna, and Villar (2002).

we obtain from Merrill Lynch (2002). For *domestic bonds*, we rely again on unpublished data from the BIS, but here we must augment BIS data with data retrieved from Bloomberg. *BIS Quarterly Review* Table 16A publishes data on outstanding domestic debt securities, but combines both short- and long-term securities. In our study we focus on long-term debt securities—those with an original maturity of more than one year—and so utilize instead the unpublished long-term component of the domestic debt data. Augmentation is necessary, because for seven countries in our study—Brazil, India, Ireland, New Zealand, Poland, Russia, and Turkey—BIS data indicate no domestic long-term debt issued by private entities. However, a Bloomberg search uncovered private bonds outstanding as of end-2001 for all but Turkey; amounts, which are not large, were added to our data after a cross-check that ensured the bonds were not placed abroad (which would be double counting because such bonds are in our international debt data).

The global bond market totaled \$31.2 trillion in 2001 (Table 1). The bulk of outstanding bonds were issued by developed countries (93%), in particular the United States (46%), euro area (22%), and Japan (16%). Emerging market issuance comprised the other 7% of the global bond market, with issuance much greater in emerging Asia (3.6% of the global market) than in Latin America (1.9%). Developed country bond markets not only comprised a large portion of the global bond market, but they were also large relative to the size of their economies: most developed countries have outstanding bonds that are about equal in magnitude to the size of annual GDP (third column). For example, the bonds-to-GDP ratio is 105% for Germany, 116% in Japan, and 141% in the United States. Emerging bond markets are much smaller, averaging just 38% of annual GDP.

In this paper we focus on local-currency bonds issued by residents of a particular country (for example, Chile) in that country's currency (Chilean pesos), regardless of whether it was placed in the domestic market or offshore. Local-currency bond markets make up the bulk of the global bond market (right panel of Table 1), totaling \$28.7 trillion, or 92% of all bonds; the other 8% of outstanding bonds were issued in foreign currencies, primarily the dollar, euro, and sterling.

## *2.2 The Determinants of Local Bond Market Development*

Table 1 reveals quite a bit of variation in the size of local-currency bond markets. Variation is evident both among developed countries (Denmark's local bond market is 151% of its GDP, whereas Finland's is only 48%) and within regions (Chile's local bond market is 52% of GDP, whereas Mexico's is only 16%). And the variation is not just a developing versus emerging market split; were Malaysia considered a developed country, its bond market would be at the median.

We examine the determinants of two general measures of local bond market development: the ratio of the size of the local bond market to GDP (Local Bond Market Development) and the share of a country's outstanding bonds that are denominated in the local currency (Local Currency Share). In addition, to ascertain whether private and government bond markets differ materially, we separate our Local Bond Market Development variable into its private and government components.

In our regressions (Table 2), we examine the influence of Rule of Law, Creditor Rights, fiscal balance (calculated as a percent of GDP and averaged over a 20-year period), country size (as measured by the log of GDP), and growth rates (annual GDP growth over

the preceding ten years).<sup>5</sup> Creditor Rights measures whether the *laws* of a country are creditor friendly; we also include another variable, Inflation Variance (the variance of the inflation rate over the past ten years), as a measure of whether *policies* have been creditor-friendly. Odd-numbered columns present results from parsimonious regressions of at most 49 countries; even-numbered columns include other variables that have less coverage and reduce the sample to 41 countries (and 37 countries for the government/private split).<sup>6</sup>

All regressions in Table 2 provide strong evidence that countries with better inflation performance (the result, perhaps, of more stable monetary and fiscal policies) have larger local-currency bond markets and rely less on foreign currency bonds.<sup>7</sup> Countries with stronger institutions (high score on Rule of Law) have broader local-currency bond markets, and those with stronger Creditor Rights rely less on foreign currency bonds. The tendency to run fiscal deficits influences only the size of government bond markets, where much of the deficit financing occurs.

Overall, our results emphasize the importance of the institutional (rule of law/creditor rights) and policy (inflation) settings for countries that wish to develop local currency bond markets. Our results suggest that countries such as Australia (with a low score on creditor rights), Indonesia (poor inflation performance), or Peru (poor rule of law) might increase the breadth of their local-currency bond market and rely less on foreign

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<sup>5</sup> The Rule of Law variable is, as reported in LLSV (1997), an average over 1982-1995 of the International Country Risk Guide assessment of law and order tradition. We supplement this source with 2000 data from Gwartney et al. (2003) for five other countries: China, Czech Republic, Hungary, Poland, and Iceland. Fiscal balance data are from the World Bank's World Development Indicators database, with data from Hong Kong and Taiwan obtained from OECD data and the IMF's International Financial Statistics.

<sup>6</sup> In even-numbered columns we lose one country that does not have ten years of historical GDP (Czech Republic) and seven that do not have data on Creditor Rights (China, Hungary, Iceland, Luxembourg, Morocco, Poland, and Venezuela). In columns (3) – (6) we lose at most another seven countries for which the government/private split is not available.

<sup>7</sup> Omitting the four countries with greatest inflation variance leads to similar results with the exception that inflation variance becomes statistically insignificant in the private bond market regressions.



currency borrowing if they address their deficient creditor laws and policies. They are also consistent with the model of Jeanne (2003), which shows an important role for monetary policy credibility in explaining the currency composition of a country's debt. To gauge the importance of various factors, our estimates in column (1) imply that (ceteris paribus) if Brazil had Denmark's rule of law, its bond market as a share of GDP would be 43 percentage points higher. If Brazil had Denmark's inflation history, its bond market would be 42 percentage points (of GDP) larger. These amounts are both economically significant—Brazil's local-currency bond market is currently only 22 percent of GDP—and suggest an important role for creditor-friendly policies in emerging markets.

We note that there may also be virtuous interactions between the development of the bond market and future inflation performance; for example, Eichengreen and Hausmann (1999) suggest that a well-developed domestic bond market may generate a political constituency opposed to inflationary policies. In general, a historically more developed bond market may lead to a more creditor-friendly macroeconomic and contractual environment that in turn may lead to a further deepening of capital markets.<sup>8</sup>

Finally, we also note our results are intuitive and largely consistent with those of LLSV (1997) but contrast sharply with those of EHP, who find that only country size matters.<sup>9</sup> The similarity of our results to LLSV (1997), who include bank debt in their analysis, leads us to investigate the relationship between bond market and banking sector development. Column (1) of Table 3 reveals that the conditions necessary for bond market

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<sup>8</sup> This, of course, raises the specter of endogeneity or reverse causality. Bond data limitations preclude an econometrically rigorous analysis of which comes first, bond market development or creditor-friendly policies and laws. For example, the preferred econometric method in the finance and growth literature [see Levine, Loayza, and Beck (2000)] utilizes long spans of data that are not available for bond markets.

<sup>9</sup> One possible reason our results contrast with EHP is that their study includes only bonds that were initially placed abroad or denominated in a foreign currency; such bonds comprise just one-fifth of the global bond market. Our results are also consistent with the contemporaneous Claessens, Klingebiel, and Schmukler (2003) study of 36 government bond markets.

development, such as creditor-friendly policies and laws, are similar to those that foster development of the banking system [as measured by the private bank credit to GDP ratio of Beck, Demigurcic-Kunt, and Levine (1999)]. Countries in which people are not willing to become creditors—at one extreme this is an unwillingness to deposit money in banks—will have undeveloped banking systems and underdeveloped bond markets. Following this line of analysis, when the literature on the relative merits of bank-based versus market-based financial systems includes bonds, it could be that bonds and banks should be combined. Indeed, column (2) shows that countries with larger bond markets tend to have larger banking systems, but not larger equity markets. Because bond market and banking system development appear to be so closely related, the focus of the financial development literature might benefit from a shift in focus to debt versus equity rather than the current focus on bank-based versus market-based systems.<sup>10</sup>

### **3. Risk and Return Characteristics of International Bond Portfolios**

Having described and analyzed the breadth of bond markets in a wide range of countries, we now analyze factors that attract foreign participation. We do not have data on all foreigners' investment in bond markets, so we rely instead on data on the largest group of international investors in the world, U.S. investors. Before turning to the analysis of international portfolio allocations, in this section we present the (ex post) risk and return characteristics of international bond markets from the perspective of a U.S.-based investor.

Not knowing the extent to which international bond positions are hedged, we form two sets of returns. The first, Unhedged, is comprised of unhedged local-currency bonds for

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<sup>10</sup> To be sure, the debate is moving in various directions. Levine (2002) discusses the financial services view that stresses not bank-based versus market-based systems, but the financial arrangements that arise in the economy, and a special case, the law and finance view of LLSV (1998).

developed countries. For emerging markets, where local-currency bond indices are generally not available, Unhedged is the sum of currency returns and bond returns from the EMBI (which is composed of dollar-denominated bonds). Our second set of returns, Hedged, are comprised of hedged bonds for developed countries and returns on dollar-denominated bonds for emerging markets.<sup>11</sup> For the rest of the paper, because returns data are generally not available for both private and government bonds across a wide range of countries, we examine local currency bond markets at the country level and omit the private/government split.

Table 4 presents statistics on the mean, variance, and skewness of hedged and unhedged historical returns. Three features of returns stand out. First, for developed country bonds, a comparison of hedged and unhedged returns indicates that hedged returns were much higher (7% per year vs. 0.7%) and much less volatile (0.017 vs. 0.140). The mean-variance dominance of hedged bonds is also illustrated in Figure 1, which depicts the risk-return profiles of hedged (dashed line) and unhedged (solid line) bond portfolios for the period from January 1994 to December 2001.<sup>12</sup> The higher return that hedged foreign bonds provided U.S. investors is clearly sample-dependent; December 2001 coincided with the apex of the dollar's six-year appreciation. But the fact that unhedged returns are much more volatile than hedged returns, on average by a factor of eight, is not sample-dependent. From the perspective of a U.S.-based investor, unhedged returns are comprised of returns on the underlying bond and on the foreign currency; the latter component, foreign currency returns,

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<sup>11</sup> The reader should note that our Hedged series for emerging markets does not include hedging costs, which may be prohibitively high.

<sup>12</sup> On each line in Figure 1, portfolios vary from 100 percent U.S. bonds (at the end labeled 'US') to 100 percent foreign bonds (at the end labeled 'ROW'). The mean-variance tradeoffs for various holding periods starting from 1988 and ending in 2001 (not shown) are very similar. For 1977-1990, Levich and Thomas (1993) find that currency volatility more than outweighed the increased returns and the optimal (ex post) unhedged bond portfolio would have been composed mainly of U.S. bonds. Recent papers on exchange rate volatility include Bayoumi and Eichengreen (1998) and Devereux and Lane (2003).

is notoriously volatile. As pointed out in Levich (2001), a negative covariance between currency and bond returns—caused perhaps by tight monetary policy that results in bond losses but capital inflows that appreciate the currency—would reduce the variance of unhedged foreign currency positions somewhat, but the reduction is likely orders of magnitude smaller than the variance of currency returns.

Second, although hedged bonds dominated unhedged bonds in a mean-variance sense during this period, unhedged bonds provided a more attractive skewness profile. The unhedged returns of every developed country bond market (except for Sweden's) exhibited positive skewness, while for most countries hedged returns were negatively skewed. A plausible explanation of this relationship is that in months when developed country bonds experience a large negative return, the currency appreciates and eliminates the infrequent bad outcome for a U.S.-based investor. The case of Japan, with the largest negative skewness among hedged returns for developed countries, is instructive. In December 1998, long-term interest rates in Japan surged following the announcement of various fiscal stimulus measures. U.S. investors holding a hedged portfolio of Japanese bonds experienced a substantial 5% loss during the month; hence, the negative skewness. But a simultaneous appreciation of the yen generated by capital inflows enabled U.S. investors holding unhedged Japanese bonds to earn a positive return in dollar terms. More generally, this relationship is evidence that we do not see “flight-from-quality” in developed country capital markets. Bond returns might at times be negative, and sometimes severely so, but this does not tend to coincide with broad-based capital outflows and, hence, is not associated with currency depreciations.

The third regularity is that returns on emerging market bonds—indeed, less developed bond markets in general, regardless of the level of economic development—were much more volatile and exhibited significantly more negative skewness than developed country bonds. The average variance for emerging market bond returns was 0.8, nearly six times greater than the unhedged developed country bond returns, and the average skewness was negative (-0.95). Returns on dollar-denominated emerging market bonds (bottom right) were also very volatile and negatively skewed. Figure 2 shows that less developed bond markets are characterized by higher variance and more negative skewness, whether returns are assumed to be hedged or not. This highlights a distinct difference between emerging market and developed country bonds (or less developed and more developed bond markets): Periods of negative bond returns for emerging markets do not coincide with currency appreciations. To the contrary, periods of rising interest rates often occur during an episode of financial flight and currency depreciation—the makings of a currency crisis.

#### **4. Foreign Participation in Local Bond Markets**

In this section we analyze the extent and determinants of foreign participation in local bond markets. We first present the country allocation of U.S. investors' international bond portfolios, and compare that allocation with the composition of the world bond market portfolio. This shows that U.S. investors severely underweight foreign bonds overall—and the bonds of some countries more than others. We then present a simplified mean-variance-skewness model that informs our regressions on deviations from world portfolio weights.

#### *4.1 Comparison of U.S. Investors' Foreign Bond Portfolio and the World Market Portfolio*

Table 5 presents data on U.S. investors' foreign bond portfolios.<sup>13</sup> The first column shows two facts that are not terribly surprising. Compared to their weight in the world bond market portfolio ( $\omega_m = 46.89\%$ ), local-currency bonds have only a very small weight in U.S. investors' bond portfolios ( $\omega_{us} = 1.22\%$ ). And the vast majority (\$150 billion) of U.S. holdings of local-currency foreign bonds was issued by developed countries, compared to only \$3 billion of emerging market bonds.

The underweighting is best illustrated in the final column, which shows the ratio of weights in U.S. portfolios to weights in the world market portfolio. If allocations in U.S. investors' bond portfolios were in line with the world bond market portfolio, this ratio would equal one, but it is much less than one for every country. The underweighting is severe in developed countries' bonds ( $\omega_{us} / \omega_m = 0.029$ ) and even more so in emerging markets ( $\omega_{us} / \omega_m = 0.004$ ). But there are exceptions. For example, the relative weight on South African bonds ( $\omega_{us} / \omega_m = 0.029$ ) is greater than the weight on many developed country bonds. In the next subsection, we analyze the variation in relative portfolio weights.

#### *4.2 Historical Returns Characteristics, Capital Account Restrictions, and U.S. Participation*

Table 5 establishes that U.S. investors' foreign bond portfolios deviate substantially from the world market portfolio. In this section we sketch a simple model of portfolio allocation that encompasses two features of international bond markets—barriers to international investment and returns that exhibit higher moments—and use the model to

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<sup>13</sup> The positions data, which include holdings of both corporate and sovereign bonds and come from the comprehensive benchmark survey of U.S. investment abroad as of December 2001, are analogous to the 1997 data on equity positions used in Ahearne, Grier, and Warnock (2004) and Dahlquist, Pinkowitz, Stulz, and Williamson (2003). For a primer on the benchmark surveys, see Grier, Lee, and Warnock (2001).

inform cross-sectional regressions of the extent to which U.S. investors' portfolio weights deviate from benchmark (market) weights.

We follow the work of Kraus and Litzenberger (1976), Athayde and Flores (2004), and Harvey, Liechty, Liechty, and Muller (2003) and allow for the fact that asset returns exhibit higher moments and that investors with nonincreasing absolute risk aversion should care about skewness, in particular, in addition to mean and variance.<sup>14</sup> Specifically, we assume that investors choose a vector of portfolio weights,  $\omega$ , to maximize utility that is a function of (expected) returns  $x$ , variance  $V_x$ , and skewness  $S_x$ :

$$U(\omega, x, V_x, S_x) = \omega'x - \lambda\omega'V_x\omega + \gamma\omega'S_x\omega \otimes \omega \quad (1)$$

$$\text{where } V_x = (x - \bar{m})(x - \bar{m})' \quad (2)$$

$$S_x = V_x \otimes (x - \bar{m})' \quad (3)$$

$$\bar{m} = \sum_{i=1}^N x_i / N \quad (4)$$

and  $\lambda$  and  $\gamma$  are the relative utility weights on variance and skewness, respectively.

Alternatively, investors can determine the optimal portfolio by minimizing variance subject to expected returns (net of costs) and skewness. Analytical solutions to this optimization problem are rather complicated—see Harvey et al. (2003) and Athayde and Flores (2004), who note that feasible solutions can be calculated in most cases—but take the general form:

$$\omega = f(x, \bar{V}_x, \bar{S}_x) \quad (5)$$

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<sup>14</sup> As Kraus and Litzenberger (1976) note, while one could include fourth and higher moments, we lack compelling behavioristic arguments for investor attitudes for those moments.

where the signs above the arguments indicate that weights should be higher on countries that add to the portfolio's expected returns and skewness and reduce the portfolio's variance.

In an international setting, we must also control for barriers to international investment. For example, we analyze U.S. positions in local-currency bonds, but some countries have capital controls such as restrictions on the repatriation of investment income. Direct barriers to international investment can be modeled by assuming that they impose a cost,  $C$ , that varies across countries and reduces investors' expected returns.<sup>15</sup> If, in addition, a separation theorem is invoked [see, for example, Cass and Stiglitz (1970)] and variance and skewness are fully priced, a U.S. investor's optimal allocation can be represented by a vector of portfolio weights,  $\omega_{us}$ , that depends on the vector of world market portfolio weights,  $\omega_m$ , and the vector of costs from barriers to investment,  $C$ :

$$\omega_{us} = f(\omega_m^+, C^-) \quad (6)$$

Our empirical exercise in this section controls for world market portfolio weights and barriers to international investment and tests whether the expected mean, variance, and skewness of returns affect U.S. portfolio allocations. Specifically, we estimate OLS regressions of the following type:

$$\frac{\omega_{i,us}}{\omega_{i,m}} = \alpha_0 + \alpha_1 Openness_i + \alpha_2 x_i + \alpha_3 V_i + \alpha_4 S_i + \varepsilon_i \quad (7)$$

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<sup>15</sup> For portfolio allocation models with barriers to international investment, see Black (1974), Stulz (1981), and Cooper and Kaplanis (1986).



where  $\omega_{i,us}/\omega_{i,m}$  is the weight of country  $i$  in the U.S. bond portfolio ( $\omega_{i,us}$ ) relative to its weight in the world bond market portfolio ( $\omega_{i,m}$ );  $Openness_i$  is an average of the 2000 and 2001 measures of capital account openness from Gwartney et al. (2003), ranging from zero (completely closed) to ten (completely open); and  $x_i$ ,  $V_i$ , and  $S_i$  are the expected mean, variance, and skewness of returns.

Empirical implementation of this model requires measures of the expected mean, variance, and skewness of returns. For expected mean returns, we allow for the possibility that investors use past returns to forecast future returns, but we also rely on past work indicating that business cycle variables have predictive power for bond returns [Keim and Stambaugh (1986); Chen (1991); and Ilmanen (1995)]. We construct a de-trended real stock market variable, *Cycle*, equal to one if the country's stock market index is at the long-run trend, greater than one if the stock market is above historical trend, and less than one if it is below trend.<sup>16</sup> Expected bond returns should be high at a cyclical peak; when stock prices are high relative to trend, an economic slowdown might be in the offing, which would allow interest rates to fall and produce higher bond returns. For variance and skewness, evidence suggests that historical averages have sufficient predictive power, at least in the cross-

section. Erb, Harvey, and Viskanta (1999) suggest as much by noting the constancy of skewness in emerging market bonds. To confirm that historical averages of variance and skewness are reasonable proxies for expected future values, we calculate rank correlations of historical averages (computed over the 1993–1997 period) with future values (1998).

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<sup>16</sup> *Cycle*, which is defined as  $\frac{P_t}{(P_{t-1} + 0.9 * P_{t-2} + 0.9^2 * P_{t-3} + \dots) * 0.1}$ , where  $P_t$  is the real value of a country's equity index at time  $t$ , is the inverse of a measure used by Ilmanen (1995) to forecast one-month ahead bond returns. We assume bond investors have a longer time horizon and therefore offer an alternative interpretation.

skewness, indicating that historical values are reasonable proxies for expected values. Not surprisingly, the rank correlation for historical and future mean is somewhat lower at 0.31.

With these observations in mind, our working model is the following cross-sectional regression (with country  $i$  subscripts omitted):

$$\frac{\omega_{us}}{\omega_m} = \alpha_0 + \alpha_1 Openness + \alpha_2 x_0 + \alpha_3 V_0 + \alpha_4 S_0 + \alpha_5 Cycle + \varepsilon \quad (8)$$

where  $\omega_{us}/\omega_m$  is based on end-2001 values, *Openness* is an average of 2000 and 2001 values, the 0 subscript denotes historical values calculated from monthly excess returns over the 48 month period preceding December 2001, and *Cycle* is the detrended stock market value as of December 2001.<sup>17</sup>

The empirical results are presented in Table 6. Because New Zealand is an outlier—U.S. investors hold an exceptionally large percentage of the local-currency New Zealand bond market—we report results both with New Zealand [columns (1), (3), and (5)] and without [columns (2), (4), and (6)]. The left panel, which assumes that returns are unhedged, indicates an aversion to volatile bond markets. To investigate whether this aversion to volatility carries over in the absence of exchange rate risk, we repeat the exercise using hedged returns in the right panel. Due to a high degree of collinearity between the variance and skewness of hedged returns ( $\rho = -0.60$ ), we do not include these risk measures together in the same regression. Columns (3) and (4) report a highly significant coefficient

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<sup>17</sup> Excess returns are calculated by subtracting the 1-month U.S. T-bill rate. Expanding the historical sample to begin in January 1997, and thus fully including the Asian financial crises, does not substantively change the results that follow. We exclude 7 countries for which returns data are unavailable (see Table 3). We include six countries with less than 48 months of returns data (start date in parentheses): Indonesia, India, and Hong Kong (Jan. 1999); Hungary (Feb. 1999); Chile (June 1999); and Singapore (January 2000).

on the variance of hedged returns, evidence that exchange rate volatility is not the whole story. Columns (5) and (6) display a positive and statistically significant coefficient for skewness. Evidence of returns-chasing behavior—of either past or prospective returns—is absent; historical returns and *Cycle* are insignificant in most specifications.

Overall the results in Table 6 suggest that U.S. investors avoid bond markets that exhibit high historical variance and/or negative skewness. The coefficients in column (4) indicate that if a country were able to lower the variance of its hedged bond returns from the emerging market average to the industrial country average, U.S. investors would increase their holdings by 1.3% of bonds outstanding. Likewise, column (6) indicates improving skewness from the emerging market average to the industrial country average would attract an increase in holdings of 1.1% of bonds outstanding. These figures are economically significant; as of end-2001, U.S. investors held on average only 0.4% of local-currency emerging market debt and 2.9% of developed country bonds.

By avoiding bonds with highly volatile and negatively skewed returns, U.S. investors are demonstrating an aversion to two measures of risk. But the measures of returns volatility and skewness in Table 6 fail to separate systematic and idiosyncratic sources of these risks. To disentangle the two, we follow Kraus and Litzenberger's (1976) two-stage approach.<sup>18</sup> First, a three-moment CAPM is estimated for each country's bond returns. Specifically, let  $r_i$  be country  $i$ 's bond returns,  $r_f$  the risk-free rate, and  $r_m$  returns on the world bond market. For each country  $i$  we estimate the following three-moment CAPM using (at most) 48 months of returns data:

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<sup>18</sup> Harvey and Siddique (2000) estimate a conditional version of the three-moment CAPM. With relatively short time series, we opt for the simpler approach of Kraus and Litzenberger (1976).

$$r_i - r_f = \alpha_i + \beta_i(r_m - r_f) + \gamma_i(r_m - \bar{r}_m)^2 + \varepsilon_i \quad (9)$$

The estimated  $\beta$  and  $\gamma$  coefficients provide measures of systematic variance and skewness, respectively, while the variance of the residual,  $\varepsilon_i$ , proxies for idiosyncratic risk. We use these in a second-stage regression to investigate whether the degree of U.S. investors' under- or over-weighting in a market depends on systematic or idiosyncratic risk:<sup>19</sup>

$$\frac{\omega_{i,us}}{\omega_{i,m}} = \theta_1 + \theta_2 Openness_i + \theta_3 \hat{\beta}_i + \theta_4 \hat{\gamma}_i + \theta_5 \text{var}(\hat{\varepsilon}_i) + \mu_i \quad (10)$$

Under the null hypothesis, systematic variance and skewness of returns are priced and so should not affect (relative) portfolio weights (i.e.,  $\theta_3 = \theta_4 = 0$ ). Optimal allocations will not be as easily calculated as in the traditional two-moment CAPM—Athaydes and Flores (2004) and Harvey et al. (2003) show just how complicated they can be—but if expected returns adjust, we should not see a relationship between  $\omega_{us}/\omega_m$  and systematic risk. Similarly, idiosyncratic risk should not matter because it is diversifiable, although the severe home bias depicted in Table 5 suggests that U.S. investors do not fully diversify.

Results from the second stage regressions are presented in Table 7. Once again, unhedged returns are used in the left panel and hedged returns on the right. The coefficients on the measures of systematic variance and skewness are statistically insignificant throughout Table 7. The finding that portfolio weights are not impacted by measures of

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<sup>19</sup> This regression includes generated regressors, which will cause OLS standard errors to be understated and bias our results toward rejection of the null hypothesis. However, the variance of these generated regressors across countries likely far exceeds the noise in an individual country's estimate, so the estimated  $\theta_i$  will be consistent and unbiased. Put another way, there is enough variation between countries that it should not materially affect cross-sectional regressions if we estimate country  $i$ 's  $\beta$  to be 1.2 when it is truly 1.4.

systematic risk is consistent with the notion that U.S. investors expect to be rewarded with higher returns for holding higher levels of systematic risk. The coefficient on our measure of idiosyncratic risk, however, is negative and statistically significant throughout Table 7. In theory, idiosyncratic risk does not require a return, therefore this result does not suggest a market failure but rather a failure of U.S. investors to sufficiently diversify.<sup>20</sup>

## 5. Conclusion

This paper presents data on the characteristics of the world bond market portfolio, analyzes factors associated with local-currency bond market development, and investigates the ability of countries to attract foreign participation in local bond markets. We find that countries with better historical inflation performance and stronger legal institutions have more developed local bond markets and rely less on foreign-currency-denominated bonds. In our analysis of foreign participation we find evidence that U.S. investors avoid local-currency bonds that have returns with historically high variance and negative skewness.

Given that the variance of local bond returns is dominated by exchange rate volatility, our results suggest an important role for currency hedges. By enabling investors to transfer currency risk to those more willing to bear it, the existence of derivatives markets in a country's currency should make its local bond market more attractive to foreign investors. Active derivatives markets do not exist in every currency; the ability to hedge currency risk is intimately related to bond market development, because without a liquid bond market and an established yield curve, derivative securities cannot be priced, and a

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<sup>20</sup> One possibility is that U.S. investors are eliminating country-specific idiosyncratic risk through holdings of other types of assets, such as equities. However, regression results (not shown) indicate this is not the case; the more underweight is a country's bonds in U.S. investors portfolios, the more underweight are its equities.

well-functioning derivatives market will not develop.<sup>21</sup> Future work should investigate the relationship between the existence of derivatives markets and foreign participation in local bond markets.

Our results suggest a possible virtuous cycle in local bond market development. Countries that pursue responsible policies (low, stable inflation and strong institutions) are better able to develop local-currency bond markets. Countries with these policies also have lower variance and more right-skewed bond returns, factors that should attract international investors. If emerging economies are able to borrow internationally in their local currency, they can better avoid the pitfalls of a currency mismatch and thus further stabilize their macroeconomic performance.

In addition, our results indicate that the necessary conditions for bond market development are very similar to those that foster development of the banking system. This, in turn, has implications for the literature on financial development and growth [see, for example, Levine (2002) and Beck and Levine (2004)]; when that literature brings bonds into the analysis, the debate may well shift from the relative merits of bank-based and (equity) market-based financial systems to debt (i.e., banking and bonds) versus equity.

Finally, some limitations of our study should be noted. Some of the bonds included in our analysis may be indexed to inflation or an exchange rate and thus behave a lot like foreign-currency securities. Also, we have said nothing about the quality of bond market development. Historically, an important impetus for financial market development has been exceptional government financing needs, for example, to finance large budget deficits that were often incurred to fund a war effort [Rousseau and Sylla (2003)]. We showed that fiscal

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<sup>21</sup> See Carlton (1984) for a discussion of an existing deep market for the underlying asset as a necessary precondition for successful derivative market development.

deficits are related to the development of government bond markets, and, indeed, some of the recent bond market development may be financing large budget deficits. Impavido et al. (2002) examine a more benign driver of financial market development, the growth of local contractual savings institutions such as pension funds and life insurance companies. We leave for further work an analysis of the quality of bond market development.

## References

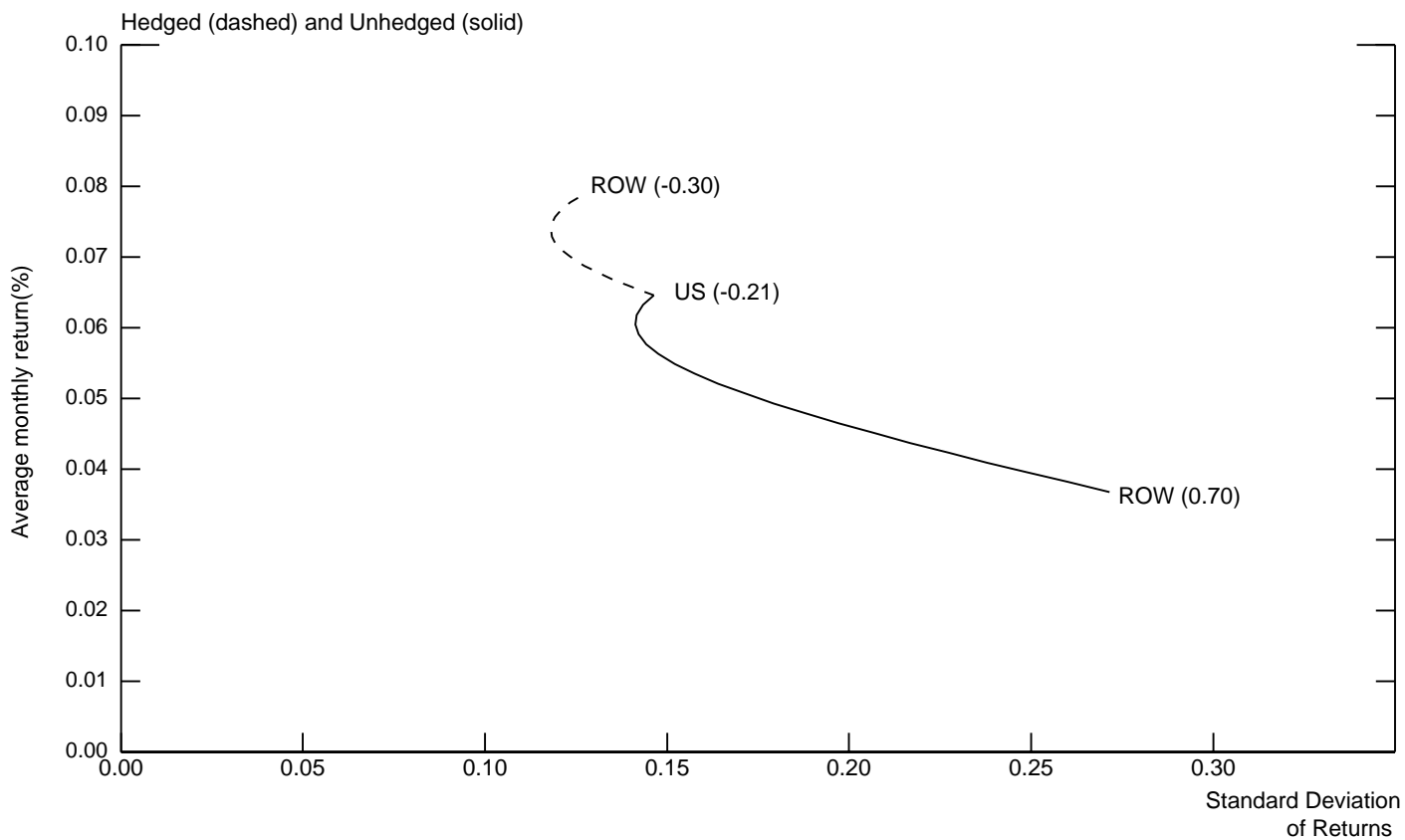
- Aghion, P., P. Bacchetta, and A. Banerjee, 2004. A Corporate Balance-Sheet Approach to Currency Crises. *Journal of Economic Theory* 119: 6-30.
- Ahearne, A., W. Grier, and F. Warnock, 2004. Information Costs and Home Bias: An Analysis of U.S. Holdings of Foreign Equities. *Journal of International Economics* 62: 313-336.
- Athayde, G. de, and R. Flores, 2004. Finding a Maximum Skewness Portfolio – A General Solution to Three-Moments Portfolio Choice. *Journal of Economic Dynamics and Control* 28(7): 1335-1352.
- Bayoumi, T., and B. Eichengreen, 1998. Exchange Rate Volatility and Intervention: Implications of the Theory of Optimum Currency Areas. *Journal of International Economics* 45: 191-209.
- Beck, T., A. Demirguc-Kunt, and R. Levine, 1999. A New Database on Financial Development and Structure. World Bank Working Paper 2146.
- Beck, T., and R. Levine, 2004. Stock Markets, Banks, and Growth: Panel Evidence. *Journal of Banking and Finance* 28: 423-442.
- Bekaert, G., and C. Harvey, 2003. Emerging Market Finance. *Journal of Empirical Finance* vol. 10(1/2): 3-56.
- Black, F., 1974. International Capital Market Equilibrium with Investment Barriers. *Journal of Financial Economics* 1(4): 337-352.
- Buch, C., J. Driscoll, and C. Ostergaard, 2004. Cross-Border Diversification in Bank Asset Portfolios. Finance and Economics Discussion Paper 2004-26, Board of Governors of the Federal Reserve System.
- Carlton, D., 1984. Future Markets: Their Purpose, Their History, Their Growth, and Their Successes and Failures. *Journal of Futures Markets* 4(3): 237-271.
- Cass, D., and J. Stiglitz, 1970. The Structure of Investor Preferences and Asset Returns, and Separability in Portfolio Allocations: A Contribution to the Pure Theory of Mutual Funds. *Journal of Economic Theory* 2(2): 122-160.
- Claessens, S., D. Klingebiel, and S. Schmukler, 2003. Government Bonds in Domestic and Foreign Currency: The Role of Macroeconomic and Institutional Factors. CEPR Discussion Paper 3789.
- Cooper, I., and E. Kaplanis, 1986. Costs to Cross-border Investment and International Equity Market Equilibrium. in J. Edwards, J. Franks, C. Mayer and S. Schaefer (eds.), *Recent Developments in Corporate Finance*. Cambridge: Cambridge University Press,.
- Dahlquist, M., L. Pinkowitz, R. Stulz, and R. Williamson, 2003. Corporate Governance and the Home Bias. *Journal of Financial and Quantitative Analysis* 38(1): 87-110.
- Devereux, M., and P. Lane, 2003. Understanding Bilateral Exchange Rate Variability. *Journal of International Economics* 60(1): 109-132.



- Eichengreen, B., and R. Hausmann, 1999. Exchange Rates and Financial Fragility. NBER WP#7418.
- Eichengreen, B., R. Hausmann, and U. Panizza, 2002. Original Sin: The Pain, the Mystery, and the Road to Redemption. Paper Presented at the IADB Conference “Currency and Maturity Matchmaking: Redeeming Debt from Original Sin.”
- Erb, C., C. Harvey, and T. Viskanta, 1999. New Perspectives on Emerging Market Bonds. *Journal of Portfolio Management* 25(2): 83-92.
- Ergungor, O., 2004. Market- vs. Bank-Based Financial Systems: Do Rights and Regulations Really Matter? *Journal of Banking and Finance* 28(12): 2869-3194.
- Goldstein, M., 2002. *Managed Floating Plus*. Washington, D.C.: Institute for International Economics.
- Greenspan, A., 1999. Lessons from the Global Crises. Remarks before the World Bank Group and International Monetary Fund, Annual Meetings Program of Seminars, Washington, D.C., September 27.
- Griever, W., G. Lee, and F. Warnock, 2001. The U.S. System for Measuring Cross-Border Investment in Securities: A Primer with a Discussion of Recent Developments. *Federal Reserve Bulletin* (October).
- Gwartney, J. and R. Lawson with N. Emerick, 2003. *Economic Freedom of the World: 2003 Annual Report*. Vancouver: The Fraser Institute. Data retrieved from [www.freetheworld.com](http://www.freetheworld.com).
- Harvey, C., J. Liechty, M. Liechty, and P. Muller, 2003. Portfolio Selection with Higher Moments. Mimeo, Drexel University (Philadelphia).
- Harvey, C., and A. Siddique, 2000. Conditional Skewness in Asset Pricing Tests. *Journal of Finance* 55(3): 1263-1295.
- Ilmanen, A., 1995. Time-varying Expected Returns in International Bond Markets. *Journal of Finance* 50: 481-506.
- Impavido, G., A. Musalem, and T. Tressel, 2002. The Impact of Contractual Savings Institutions on Securities Markets. Mimeo. Washington, D.C.: World Bank and International Monetary Fund.
- International Monetary Fund, 2002. Emerging Local Bond Markets. *Global Financial Stability Report*. Washington, D.C.: International Monetary Fund (September, Chapter 4).
- Jeanne, O., 2003. Why Do Emerging Economies Borrow in Foreign Currency? IMF Working Paper 03/177.
- Jeanne, O., and C. Wyplosz, 2001. The International Lender of Last Resort: How Large is Large Enough? NBER Working Paper 8381.
- Jeanne, O., and J. Zettelmeyer, 2002. “Original Sin,” Balance Sheet Crises, and the Roles of International Lending. IMF Working Paper 02/234.

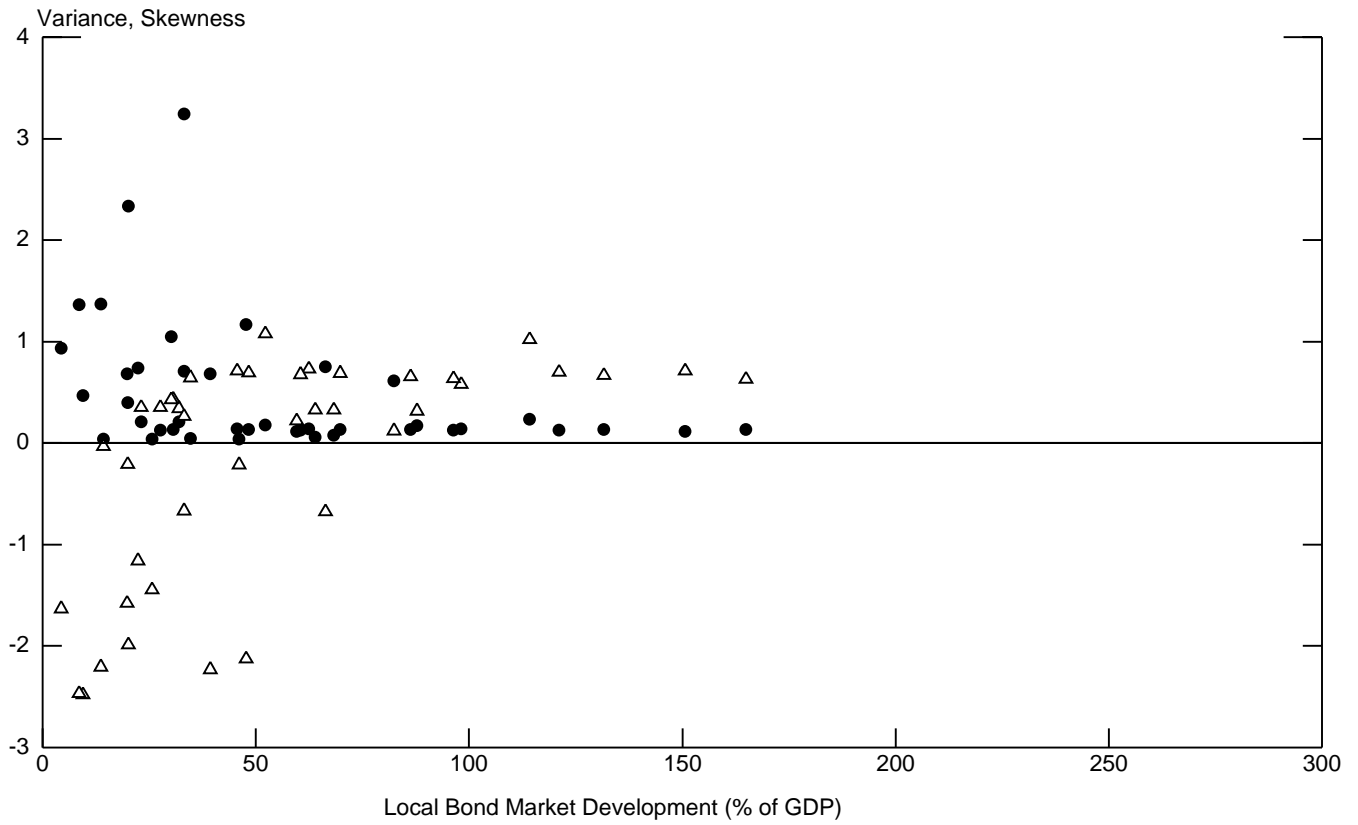
- Keim, D., and R. Stambaugh, 1986. Predicting Returns in the Stock and Bond Markets. *Journal of Financial Economics* 17: 357-390.
- Kraus, A., and R. Litzenberger, 1976. Skewness Preferences and the Valuation of Risk Assets. *Journal of Finance* 31(4): 1085-1100.
- Krugman, P., 1999. Balance Sheets, The Transfer Problem, and Financial Crises. in Isard, P., A. Razin, and A. Rose (eds.) *International Finance and Financial Crises: Essays in Honor of Robert P. Flood, Jr.* (Boston: Kluwer Academic; Washington: IMF).
- La Porta, R., F. Lopez-de-Silanes, A. Shleifer, R. Vishny, 1997. Legal Determinants of External Finance. *Journal of Finance* 52(3): 1131-1150.
- La Porta, R., F. Lopez-de-Silanes, A. Shleifer, R. Vishny, 1998. Law and Finance. *Journal of Political Economy* 102(6): 1113-1155.
- Levich, R., 2001. *International Financial Markets: Prices and Policies* (2nd edition). Boston: McGraw-Hill Irwin.
- Levich, R., and L. Thomas, 1993. The Merits of Active Currency Risk Management: Evidence from International Bond Portfolios. *Financial Analysts Journal* 49(5): 63-70.
- Levine, R., 2002. Bank-Based or Market-Based Financial Systems: Which Is Better? *Journal of Financial Intermediation* 11: 398-428.
- Levine, R., N. Loayza, and T. Beck, 2000. Financial Intermediation and Growth: Causality and Causes. *Journal of Monetary Economics* 46(1): 31-77.
- Merrill Lynch, 2002. The Size and Structure of the World Bond Market: 2001.
- Mihaljek, D., M. Scatigna, and A. Villar, 2002. Recent Trends in Bond Markets. *BIS Papers No 11*.
- Rousseau, P., and R. Sylla, 2003. Financial Systems, Economic Growth, and Globalization. in Bordo, M., A. Taylor, and J. Williamson (eds.) *Globalization in Historical Perspective* (Chicago: University of Chicago Press/NBER), 373-413.
- Schneider, M., and A. Tornell, 2004. Balance Sheet Effects, Bailout Guarantees, and Financial Crises. *Review of Economic Studies* 71(3): 883-913.
- Stulz, R., 1981. On the Effects of Barriers to International Investment. *Journal of Finance*, 36: 923-934.
- Tesar, L., and I. Werner, 1995. Home Bias and High Turnover. *Journal of International Money and Finance* 14, 467-493.
- Treasury Department, 1998. Report on Foreign Portfolio Investment in the United States as of December 31, 1997.

**Figure 1**  
**Efficient Frontiers for International Bond Portfolios**

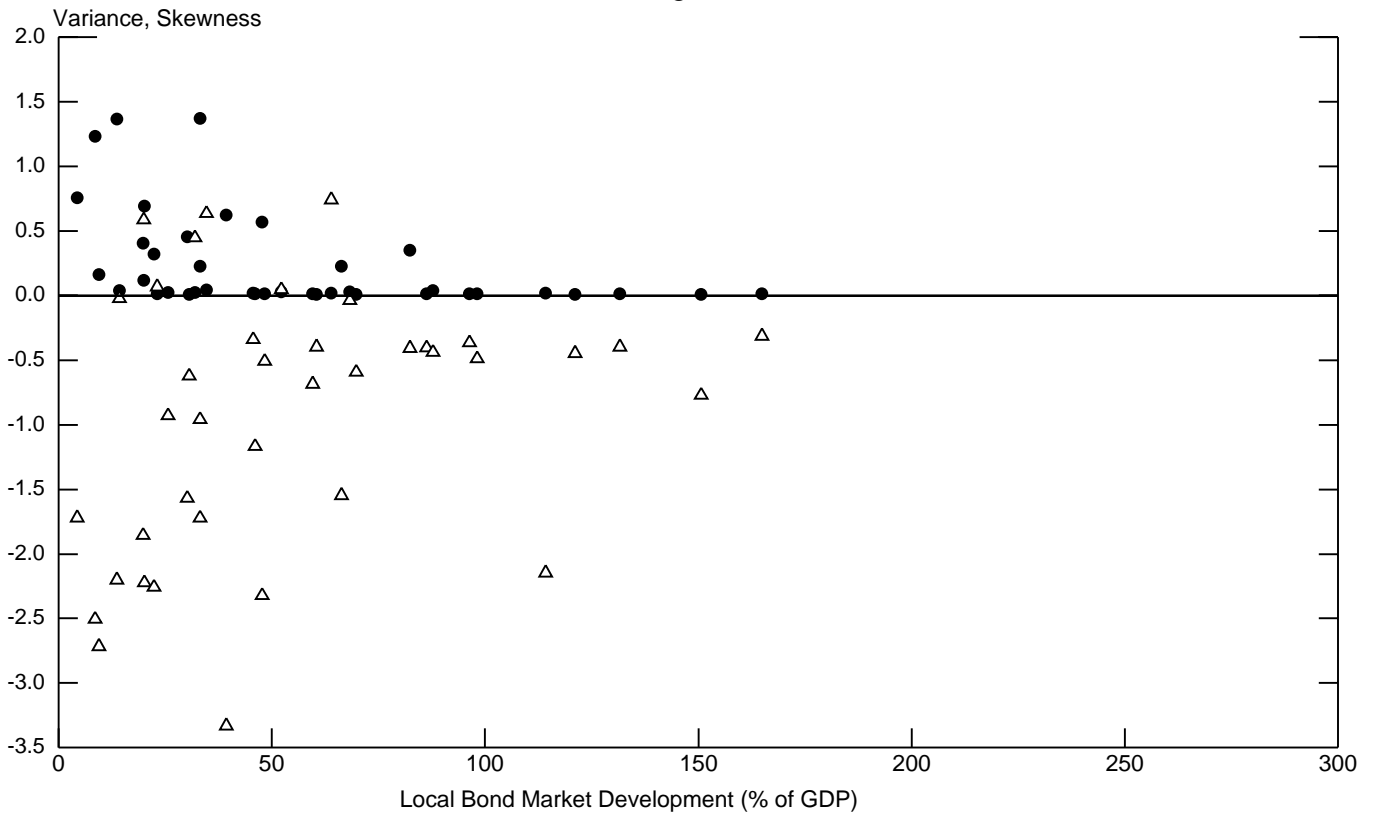


Note. Bond returns are monthly from 1994 to 2001. Skewness is given in parentheses.

**Figure 2**  
**The Relationship Between Variance, Skewness, and Bond Market Development**  
 Unhedged



**Hedged**



Note. Variance represented by circles, skewness represented by triangles.

**Table 1. The World Bond Market Portfolio**

All data are as of end-2001. Data on \$-denominated bonds and notes are from security-level data underlying BIS Table 14B (International Bonds and Notes by Country of Residence). Local-currency-denominated debt is the sum of the long-term debt component of BIS Table 16A (Domestic Debt Securities) and the local currency portion of Table 14B. Domestic long-term debt for countries not available on Table 16A and data for Brady bonds are from Merrill Lynch (2002). Included in the total is \$2.5 trillion of foreign currency bonds, denominated primarily in dollars, euros, and sterling.

	Total Bonds Outstanding			(\$ billions)	Local Currency Bonds Outstanding		
	(\$ billions)	(% in world bond portfolio)	(% of country's GDP)		(% in world bond portfolio)	(% of country's GDP)	(% of country's total bonds)
<b>Developed Countries</b>	<b>28,985</b>	<b>93.0</b>	<b>122</b>	<b>27,059</b>	<b>86.8</b>	<b>114</b>	<b>93</b>
<b>Euro Area</b>	<b>6,861</b>	<b>22.0</b>	<b>112</b>	<b>6,075</b>	<b>19.5</b>	<b>99</b>	<b>89</b>
Austria	252	0.8	133	190	0.6	100	75
Belgium	313	1.0	136	303	1.0	132	97
Finland	81	0.3	67	58	0.2	48	72
France	1,254	4.0	96	1,132	3.6	86	90
Germany	1,951	6.3	105	1,791	5.7	97	92
Greece	117	0.4	100	103	0.3	88	88
Ireland	83	0.3	81	54	0.2	53	65
Italy	1,379	4.4	127	1,317	4.2	121	95
Luxembourg	80	0.3	423	56	0.2	292	69
Netherlands	880	2.8	229	642	2.1	167	73
Portugal	85	0.3	78	77	0.2	70	90
Spain	385	1.2	66	355	1.1	61	92
<b>Other Europe</b>	<b>2,049</b>	<b>6.6</b>	<b>92</b>	<b>1,548</b>	<b>5.0</b>	<b>70</b>	<b>76</b>
Denmark	273	0.9	169	243	0.8	151	89
Iceland	11	0.0	141	7	0.0	94	66
Norway	86	0.3	51	47	0.1	28	54
Sweden	204	0.7	97	125	0.4	60	61
Switzerland	162	0.5	66	154	0.5	63	95
Great Britain	1,313	4.2	92	973	3.1	68	74
<b>Other Developed</b>	<b>20,075</b>	<b>64.4</b>	<b>130</b>	<b>19,435</b>	<b>62.4</b>	<b>126</b>	<b>97</b>
Australia	206	0.7	58	114	0.4	32	55
Canada	640	2.1	91	451	1.4	64	71
Japan	4,825	15.5	116	4,760	15.3	114	99
New Zealand	19	0.1	39	13	0.0	26	67
U.S.	14,385	46.2	141	14,096	45.2	138	98
<b>Emerging Markets</b>	<b>2,183</b>	<b>7.0</b>	<b>38</b>	<b>1,652</b>	<b>5.3</b>	<b>28</b>	<b>76</b>
<b>Latin America</b>	<b>596</b>	<b>1.9</b>	<b>34</b>	<b>314</b>	<b>1.0</b>	<b>18</b>	<b>53</b>
Argentina	130	0.4	48	37	0.1	14	28
Brazil	189	0.6	38	112	0.4	22	59
Chile	44	0.1	66	35	0.1	52	79
Colombia	28	0.1	34	16	0.1	20	58
Mexico	166	0.5	27	99	0.3	16	60
Peru	6	0.0	12	2	0.0	4	36
Venezuela	27	0.1	22	11	0.0	9	40
Uruguay	4	0.0	21	1	0.0	4	21
<b>Emerging Asia</b>	<b>1,124</b>	<b>3.6</b>	<b>40</b>	<b>1,013</b>	<b>3.3</b>	<b>36</b>	<b>90</b>
China	329	1.1	28	316	1.0	27	96
India	141	0.5	29	137	0.4	28	97
Indonesia	50	0.2	34	48	0.2	33	97
Korea	325	1.0	77	281	0.9	66	86
Malaysia	89	0.3	101	73	0.2	82	82
Pakistan	27	0.1	44	27	0.1	44	100
Philippines	32	0.1	45	16	0.1	22	50
Thailand	43	0.1	37	35	0.1	30	81
Taiwan	89	0.3	32	82	0.3	29	92
<b>Financial Centers</b>	<b>91</b>	<b>0.3</b>	<b>36</b>	<b>55</b>	<b>0.2</b>	<b>22</b>	<b>61</b>
Hong Kong	44	0.1	27	23	0.1	14	53
Singapore	46	0.1	54	32	0.1	37	69
<b>Emerging Europe</b>	<b>227</b>	<b>0.7</b>	<b>31</b>	<b>138</b>	<b>0.4</b>	<b>19</b>	<b>61</b>
Czech	11	0.0	20	10	0.0	17	86
Hungary	26	0.1	50	16	0.1	31	61
Poland	42	0.1	24	36	0.1	20	84
Russia	56	0.2	18	6	0.0	2	10
Turkey	91	0.3	61	71	0.2	48	78
<b>Other Emerging</b>	<b>146</b>	<b>0.5</b>	<b>56</b>	<b>132</b>	<b>0.4</b>	<b>51</b>	<b>90</b>
Israel	88	0.3	79	81	0.3	72	91
Morocco	14	0.0	40	13	0.0	39	98
South Africa	44	0.1	39	38	0.1	33	86
<b>World</b>	<b>31,168</b>	<b>100</b>	<b>105</b>	<b>28,711</b>	<b>92</b>	<b>97</b>	<b>92</b>

**Table 2**  
**Multivariate Tests of Bond Market Development**

OLS regression estimates of Local Bond Market Development (the size of the total, government, and private local-currency bond markets over GDP) and Local Share (the ratio of local currency bonds to total bonds). The explanatory variables include Inflation Variance (the variance of the past ten year's inflation), Rule of Law and Creditor Rights (from LLSV, 1997), Fiscal Balance (fiscal balance over GDP averaged over a twenty-year period), the log of GDP, and GDP Growth (the past ten year's average annual growth rate). The p-value, based on robust standard errors, of the two-tailed t-test of equality with zero is reported in parentheses.

	Local Bond Market Development						Local Share	
	Total	Government		Private				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation Variance	-3.485 (0.004)	-4.496 (0.000)	-2.743 (0.000)	-2.637 (0.000)	-1.596 (0.000)	-1.698 (0.000)	-1.859 (0.000)	-1.388 (0.000)
Rule of Law	0.116 (0.000)	0.074 (0.001)	0.036 (0.000)	0.041 (0.000)	0.066 (0.001)	0.050 (0.007)	0.004 (0.743)	0.000 (0.978)
Fiscal Balance	-0.028 (0.194)	-0.045 (0.000)	-0.047 (0.002)	-0.051 (0.000)	-0.001 (0.934)	0.003 (0.744)		
ln (GDP)	-0.007 (0.921)	0.102 (0.003)	0.027 (0.172)	0.017 (0.496)	0.037 (0.380)	0.078 (0.033)	0.054 (0.000)	0.070 (0.000)
GDP Growth		-2.929 (0.381)		-3.148 (0.073)		-0.177 (0.948)		2.642 (0.148)
Creditor Rights		0.059 (0.065)		0.030 (0.138)		0.020 (0.477)		0.049 (0.007)
N	49	41	42	37	42	37	49	41
Adj. R <sup>2</sup>	0.224	0.442	0.508	0.519	0.232	0.221	0.112	0.283

**Table 3**  
**The Relationship between Bonds, Equities, and Banks**

OLS regression estimates of Local Bond Market Development (the size of the local-currency bond market over GDP) and Banking System (the ratio of bank credit to the private sector to GDP). The explanatory variables include Equity Development (equity market capitalization to GDP) Inflation Variance (the variance of the past ten year's inflation), Rule of Law and Creditor Rights (from LLSV, 1997), the log of GDP, and GDP Growth (the past ten year's average annual growth rate). The p-value, based on robust standard errors, of the two-tailed t-test of equality with zero is reported in parentheses.

	Banking System	Local Bond Market Development
	(1)	(2)
Equity Development		-0.111 (0.489)
Banking System		0.699 (0.000)
Inflation Variance	-2.606 (0.000)	
Rule of Law	0.101 (0.000)	
ln (GDP)	-0.018 (0.579)	
GDP Growth	2.611 (0.491)	
Creditor Rights	0.076 (0.025)	
N	40	47
Adj. R <sup>2</sup>	0.472	0.218

**Table 4. The Mean, Variance, and Skewness of Historical Returns**

The underlying returns data, from JP Morgan's GBI, EMBI Global, and JACI, are monthly from January 1998 through December 2001 and are expressed per annum. For emerging markets, hedged returns are returns on dollar-denominated bonds and unhedged returns are constructed by combining these with exchange rate changes. Blank cells indicate that returns data are not available. Aggregates are equally-weighted averages.

	Unhedged US\$ Returns			Hedged US\$ Returns		
	Mean	Variance	Skewness	Mean	Variance	Skewness
<b>Developed Countries</b>	<b>0.007</b>	<b>0.140</b>	<b>0.58</b>	<b>0.069</b>	<b>0.017</b>	<b>-0.42</b>
<b>Euro Area</b>	<b>0.006</b>	<b>0.137</b>	<b>0.67</b>	<b>0.069</b>	<b>0.016</b>	<b>-0.44</b>
Austria	0.004	0.140	0.60	0.066	0.014	-0.47
Belgium	0.005	0.132	0.70	0.071	0.013	-0.42
Finland	0.003	0.134	0.73	0.070	0.012	-0.52
France	0.002	0.133	0.70	0.069	0.014	-0.42
Germany	0.001	0.130	0.68	0.068	0.013	-0.38
Greece	0.037	0.176	0.34	0.075	0.039	-0.42
Ireland	0.000	0.139	0.76	0.068	0.017	-0.35
Italy	0.004	0.130	0.74	0.068	0.012	-0.44
Luxembourg						
Netherlands	0.003	0.132	0.67	0.069	0.014	-0.33
Portugal	0.003	0.133	0.73	0.068	0.012	-0.61
Spain	0.004	0.131	0.72	0.069	0.012	-0.42
<b>Other Europe</b>	<b>0.005</b>	<b>0.115</b>	<b>0.42</b>	<b>0.067</b>	<b>0.018</b>	<b>-0.65</b>
Denmark	0.005	0.117	0.74	0.066	0.011	-0.74
Iceland						
Norway	-0.004	0.126	0.41			
Sweden	-0.014	0.116	-0.19	0.071	0.015	-1.15
Switzerland	-0.003	0.140	0.77			
Great Britain	0.041	0.077	0.37	0.065	0.028	-0.06
<b>Other Developed</b>	<b>0.012</b>	<b>0.180</b>	<b>0.54</b>	<b>0.067</b>	<b>0.021</b>	<b>-0.22</b>
Australia	-0.001	0.208	0.40	0.061	0.026	0.43
Canada	0.035	0.062	0.36	0.066	0.020	0.77
Japan	0.026	0.237	1.07	0.077	0.021	-2.17
New Zealand	-0.013	0.213	0.33	0.065	0.016	0.10
<b>Emerging Markets</b>	<b>-0.010</b>	<b>1.276</b>	<b>-1.09</b>	<b>0.076</b>	<b>0.711</b>	<b>-1.499</b>
<b>Latin America</b>	<b>-0.041</b>	<b>1.048</b>	<b>-1.62</b>	<b>0.049</b>	<b>0.665</b>	<b>-1.89</b>
Argentina	-0.218	1.369	-2.22	-0.218	1.369	-2.22
Brazil	-0.093	2.335	-2.00	0.090	0.695	-2.24
Chile	-0.011	0.176	1.10	0.099	0.029	0.06
Colombia	-0.052	0.683	-1.59	0.092	0.404	-1.86
Mexico	0.080	0.470	-2.49	0.110	0.164	-2.74
Peru	0.046	0.939	-1.64	0.104	0.759	-1.73
Venezuela	-0.038	1.362	-2.48	0.066	1.234	-2.53
Uruguay						
<b>Emerging Asia</b>	<b>0.073</b>	<b>0.926</b>	<b>-0.59</b>	<b>0.088</b>	<b>0.399</b>	<b>-1.00</b>
China	0.096	0.043	0.70	0.096	0.043	0.68
India	0.077	0.037	-1.43	0.119	0.024	-0.92
Indonesia	-0.168	3.245	0.28	-0.081	1.370	-0.94
Korea	0.208	0.753	-2.86	0.144	0.227	-1.76
Malaysia	0.104	0.615	0.13	0.098	0.352	-0.38
Pakistan						
Philippines	0.037	0.739	-1.05	0.100	0.321	-2.28
Thailand	0.160	1.048	0.07	0.143	0.454	-1.44
Taiwan						
<b>Financial Centers</b>	<b>0.052</b>	<b>0.041</b>	<b>0.12</b>	<b>0.092</b>	<b>0.027</b>	<b>-0.35</b>
Hong Kong	0.107	0.042	-0.02	0.109	0.041	-0.01
Singapore	-0.003	0.040	0.26	0.076	0.013	-0.69
<b>Emerging Europe</b>	<b>-0.137</b>	<b>3.193</b>	<b>-1.48</b>	<b>0.085</b>	<b>1.824</b>	<b>-1.72</b>
Czech						
Hungary	-0.015	0.133	0.45	0.068	0.011	-0.61
Poland	0.173	0.400	-0.19	0.084	0.117	0.60
Russia	-0.318	11.071	-4.05	0.087	6.595	-4.55
Turkey	-0.388	1.169	-2.12	0.100	0.571	-2.34
<b>Other Emerging</b>	<b>-0.007</b>	<b>0.696</b>	<b>-1.46</b>	<b>0.092</b>	<b>0.427</b>	<b>-2.55</b>
Israel						
Morocco	0.053	0.684	-2.24	0.096	0.624	-3.36
South Africa	-0.067	0.708	-0.68	0.088	0.230	-1.74
<b>World ex US</b>	<b>-0.002</b>	<b>0.735</b>	<b>-0.30</b>	<b>0.073</b>	<b>0.399</b>	<b>-1.01</b>



**Table 5. U.S. Investors' Local Currency Foreign Bond Portfolio**

U.S. Holdings of local currency bonds are from the December 2001 benchmark survey of U.S. investment in foreign securities, available at [www.treas.gov/tic/fpis](http://www.treas.gov/tic/fpis). Totals include only the 50 countries listed. U.S. holdings of U.S. bonds are formed by subtracting foreigners' holdings of U.S. bonds, as estimated in Rogers and Warnock (2004), from the size of the U.S. bond market.  $w^{US}$  and  $w^M$  refer to the weight (in percent) in U.S. investors' bond portfolios and the world market portfolio, respectively. Not shown is the other 2.7% of U.S. investors' bond portfolio, which is comprised mainly of \$-denominated bonds.

	U.S. Holdings (\$ billions)	$w^{US}$	$w^M$	$w^{US}/w^M$
<b>Developed Countries</b>	<b>150.20</b>	<b>1.200</b>	<b>41.590</b>	<b>0.029</b>
<b>Euro Area</b>	<b>82.86</b>	<b>0.662</b>	<b>19.492</b>	<b>0.034</b>
Austria	0.75	0.006	0.608	0.010
Belgium	2.77	0.022	0.971	0.023
Finland	0.57	0.005	0.188	0.024
France	14.70	0.117	3.630	0.032
Germany	38.15	0.305	5.745	0.053
Greece	1.38	0.011	0.329	0.033
Ireland	0.49	0.004	0.174	0.023
Italy	9.55	0.076	4.225	0.018
Luxembourg	0.83	0.007	0.178	0.037
Netherlands	7.83	0.063	2.060	0.030
Portugal	0.16	0.001	0.246	0.005
Spain	5.69	0.045	1.138	0.040
<b>Other Europe</b>	<b>19.96</b>	<b>0.159</b>	<b>4.968</b>	<b>0.032</b>
Denmark	2.27	0.018	0.780	0.023
Iceland	0.00	0.000	0.023	0.000
Norway	0.41	0.003	0.149	0.022
Sweden	3.66	0.029	0.401	0.073
Switzerland	0.11	0.001	0.493	0.002
Great Britain	13.51	0.108	3.120	0.035
<b>Other Developed</b>	<b>47.38</b>	<b>0.378</b>	<b>62.356</b>	<b>0.006</b>
Australia	3.26	0.026	0.367	0.071
Canada	21.48	0.172	1.448	0.118
Japan	21.35	0.171	15.273	0.011
New Zealand	1.29	0.010	0.042	0.247
<b>Emerging Markets</b>	<b>2.68</b>	<b>0.021</b>	<b>5.300</b>	<b>0.004</b>
<b>Latin America</b>	<b>0.46</b>	<b>0.004</b>	<b>1.006</b>	<b>0.004</b>
Argentina	0.07	0.001	0.118	0.005
Brazil	0.08	0.001	0.360	0.002
Chile	0.01	0.000	0.111	0.001
Colombia	0.00	0.000	0.053	0.000
Mexico	0.29	0.002	0.319	0.007
Peru	0.00	0.000	0.008	0.000
Venezuela	0.02	0.000	0.035	0.003
Uruguay	0.00	0.000	0.003	0.000
<b>Emerging Asia</b>	<b>0.43</b>	<b>0.003</b>	<b>3.251</b>	<b>0.001</b>
China	0.00	0.000	1.012	0.000
India	0.00	0.000	0.438	0.000
Indonesia	0.01	0.000	0.155	0.000
Korea	0.25	0.002	0.900	0.002
Malaysia	0.02	0.000	0.233	0.001
Pakistan	0.00	0.000	0.086	0.000
Philippines	0.01	0.000	0.051	0.001
Thailand	0.03	0.000	0.112	0.002
Taiwan	0.11	0.001	0.263	0.003
<b>Financial Centers</b>	<b>0.11</b>	<b>0.001</b>	<b>0.178</b>	<b>0.005</b>
Hong Kong	0.07	0.001	0.075	0.007
Singapore	0.04	0.000	0.103	0.003
<b>Emerging Europe</b>	<b>0.74</b>	<b>0.006</b>	<b>0.442</b>	<b>0.013</b>
Czech	0.01	0.000	0.031	0.003
Hungary	0.17	0.001	0.051	0.027
Poland	0.55	0.004	0.114	0.039
Russia	0.00	0.000	0.018	0.002
Turkey	0.00	0.000	0.228	0.000
<b>Other Emerging</b>	<b>0.94</b>	<b>0.007</b>	<b>0.423</b>	<b>0.018</b>
Israel	0.49	0.004	0.259	0.015
Morocco	0.00	0.000	0.043	0.000
South Africa	0.45	0.004	0.121	0.029
<b>World ex US</b>	<b>152.9</b>	<b>1.22</b>	<b>46.89</b>	<b>0.026</b>
<b>memo: US bonds</b>	<b>12,020</b>	<b>96.01</b>	<b>45.23</b>	

**Table 6****Multivariate Tests of U.S. Investment Using Historical Returns**

OLS regression estimates of U.S. Investment in local-currency-denominated bonds on Openness, detrended stock index (Cycle), and the Mean, Variance, and Skewness of historical excess returns. For information on the underlying returns data, see Table 4. Openness is an average of the 2000 and 2001 values of the Freedom of the World measure of capital account openness, which ranges from 0 (closed) to 10 (open). Columns (2), (4), and (6) exclude New Zealand. Columns (3) - (6) exclude Switzerland and Norway, for which hedged returns are not available. The p-value, based on robust standard errors, of the two-tailed t-test of equality with zero is reported in parentheses. Results are similar if returns data back to January 1997 are used, with the exception that Skewness becomes significant ( $p=0.07$ ) in the unhedged regressions.

	Unhedged		Hedged			
	(1)	(2)	(3)	(4)	(5)	(6)
Mean	-0.0248 (0.502)	-0.0147 (0.901)	-0.1635 (0.025)	-0.1306 (0.000)	-0.0429 (0.262)	-0.0265 (0.356)
Variance	-0.0078 (0.048)	-0.0081 (0.015)	-0.0380 (0.000)	-0.0323 (0.000)		
Skewness	0.0043 (0.142)	0.0040 (0.074)			0.0151 (0.003)	0.0115 (0.005)
Openness	0.0040 (0.118)	0.0020 (0.186)	0.0040 (0.074)	0.0021 (0.082)	0.0036 (0.091)	0.0021 (0.116)
Cycle	0.0478 (0.212)	0.0164 (0.492)	0.0485 (0.164)	0.0197 (0.350)	0.0544 (0.128)	0.0263 (0.267)
N	41	40	39	38	39	38
Adj. R <sup>2</sup>	0.025	0.094	0.109	0.211	0.159	0.269

**Table 7**  
**The Roles of Systematic and Idiosyncratic Risk**

OLS regression estimates of U.S. Investment in local-currency-denominated bonds on Openness and, from a three moment CAPM (equation (9)), idiosyncratic risk, systematic variance and systematic skewness. For information on the underlying returns data, see Table 4. Systematic and Idiosyncratic risk measures are calculated using at most 48 months of returns data. Openness is an average of the 2000 and 2001 values of the Freedom of the World measure of capital account openness, which ranges from 0 (closed) to 10 (open). Columns (2) and (4) exclude New Zealand. Columns (3) and (4) exclude Switzerland and Norway, for which hedged returns are not available. The p-value, based on robust standard errors, of the two-tailed t-test of equality with zero is reported in parentheses.

	Unhedged		Hedged	
	(1)	(2)	(3)	(4)
Idiosyncratic Risk	-0.0103 (0.026)	-0.0086 (0.037)	-0.022 (0.001)	-0.0171 (0.000)
Systematic Variance	0.0106 (0.226)	0.0083 (0.308)	0.0033 (0.293)	0.0041 (0.144)
Systematic Skewness	0.0007 (0.723)	-0.0004 (0.789)	0.0004 (0.125)	0.0003 (0.138)
Openness	0.0034 (0.171)	0.0017 (0.370)	0.0046 (0.069)	0.0024 (0.080)
N	41	40	39	38
Adj. R <sup>2</sup>	0.050	0.123	0.075	0.168