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Diversification, Original Sin, and International Bond Portfolios

John D. Burger and Francis E. Warnock*

Abstract: This paper has two main goals: to analyze country allocations in international bond portfolios and to describe the development of bond markets around the world. In the primary analysis, we find that country weights in U.S. investors' foreign bond portfolios are determined by the openness of capital accounts and potential diversification benefits. Positions in local-currency-denominated bonds are particularly sensitive to past and prospective volatility of returns. Analysis of reallocations in bond portfolios from 1997 to 2001 reveals a flight to quality from countries with low and declining credit ratings; reallocations in U.S. investors' equity portfolios also reveal a discriminating flight from higher credit risks. In the secondary analysis, we present measures of the size and currency composition of bond markets and analyze the development of local currency bond markets. We find that while country size and the level of economic development influence the level of bond market development, past policies—as evidenced in the level and volatility of historical inflation—play an important role. An implication for developing countries is that creditor friendly policies, such as vigilance on the inflation front, can enable local bond market development and in turn attract global investors, in part by promoting the development of derivative instruments that allow the decoupling of bond and currency investments.

Keywords: portfolio choice, bond market development, flight to quality, home bias, emerging market debt
JEL Classification: F30, G11, G15, O16

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1. Introduction

The presumption that investors can and do take positions in international bonds is central to many models in economics and finance. International macroeconomic models—from Mundell-Fleming to portfolio balance to new open economy macroeconomic models—typically assume that representative agents can engage in cross-border trading of bonds.¹ Central to models of consumption smoothing or risk sharing is the presumption of internationally tradable bonds.² And cross-border bond positions are, of course, prevalent in portfolio diversification models.

Comparatively little empirical work, however, has been conducted on the extent and determinants of investors' *positions* in international bonds. In the Bekaert and Harvey (2003) survey on emerging market finance, the literature on international bonds is presented in just one short subsection and is limited to a discussion of returns. In the Karolyi and Stulz (2002) survey on international asset pricing and home bias, empirical research on international bonds is mentioned only in passing. In the Lewis (1999) survey on home bias, discussion of bonds is limited to noting the Tesar and Werner (1995) evidence that cross-border bond positions are relatively small.

We aim to fill this gap by analyzing U.S. investors' international bond portfolios across 50 countries. Empirical work on international bond portfolios has been impeded by the (lack of) availability of three vital types of data. First, to analyze bond portfolios, scaling factors—the size of countries' bond markets—are needed. One contribution of this paper is the presentation and analysis of the size of 50 countries' total, local-currency-denominated, and dollar-denominated bond markets.³ Second, until recently accurate estimates of cross-border bond positions did not exist. We use high quality data on

¹ See Fleming (1962); Mundell (1963, 1968); Branson and Henderson (1985); Obstfeld and Rogoff (1995); and Lane (2001).

² See, for example, Obstfeld (1994) and Lewis (1996).

³ One source of information on the size of bond markets across countries is Merrill Lynch's annual *Size & Structure of the World Bond Market*. Merrill's data, however, are delineated by currency (i.e., the U.S. dollar bond market, the sterling market, etc.). For our analysis, we require bond data categorized by the residence of the issuer. Other recent discussions of bond market development include IMF (2002) and Mihaljek, Scatigna, and Villar (2002).

international bond positions from recent benchmark surveys of U.S. investors' holdings.⁴ Third, until recently historical returns data were available for only a few large countries. With the development of emerging market bond indices, many of which begin in the early 1990s, we now have sufficient historical time series of bond returns.

Our analysis is relevant for the literatures on portfolio choice, finance and growth, and financial crises. Research on international portfolio choice has focused to date on equity portfolios. What do we learn from analyzing another asset class? Are there interactions between allocations in equity and bond portfolios? Past work suggests that foreign equity investors tend to be momentum traders (Bohn and Tesar (1996); Bekaert, Harvey, and Lumsdaine (2002); Froot, O'Connell, and Seasholes (2001)). Do investors in foreign bonds exhibit similar tendencies? Research on finance and growth has focused on equity markets and banking sector development (Levine (1997), Levine and Zervos (1998)). What contribution does an analysis of bond market development offer? Although bonds play an important role in capital inflows, research on financial crises has yet to focus on local bond markets. The burgeoning literature on 'original sin', for example, has focused exclusively on external bond markets (Eichengreen, Hausmann, and Panizza (2002)). What are the implications for original sin when data on local bond market development are included in the analysis? Our study addresses each of these questions.

We begin in Section 2 by presenting the ex post diversification gains associated with adding foreign bonds to a domestic bond portfolio. This highlights two aspects of international bonds that will influence our analysis of portfolios. First, currency denomination matters. The optimal portfolio rarely includes substantial unhedged positions in local-currency foreign bonds. That is, over most horizons from one to fifteen years, autarky dominates unhedged positions in a reward-to-risk sense. Not knowing the extent to which investors hedged international bond positions, in our quantitative analysis we use both

⁴ Tesar and Werner (1995) estimate aggregate bond positions for three countries and the U.S. Bureau of Economic Analysis (BEA) presents aggregate U.S. positions annually. It is well known, however, that estimates of aggregate and, especially, bilateral positions from financial flow data can be extremely inaccurate (Warnock and Cleaver (forthcoming)). See Grier, Lee, and Warnock (2001) for a primer on the benchmark surveys.

hedged and unhedged returns and differentiate between holdings in the issuer's currency (i.e., local-currency denominated) and holdings in the investor's currency (in this case, dollar denominated).

We provide a formal statistical analysis of the country distribution of U.S. investors' international bond portfolios in Section 3. We find that country weights in U.S. investors' foreign bond portfolios are related to the openness of capital accounts and potential diversification benefits as given by historical correlations. Separating positions by currency, similar factors influence portfolio weights in dollar-denominated bonds, but for local-currency-denominated bonds we find a noteworthy aversion to countries with higher past and prospective returns volatility. In Section 4 our analysis of portfolio reallocations between 1997 and 2001 reveals evidence of a discriminating flight to quality: U.S. investors pulled back from countries with low or declining credit ratings. We analyze reallocations in equity portfolios, too, and find a similar flight to quality.

Finally, in Section 5 we focus on the implications of our work for emerging markets. We show in our sample of 50 countries—half of which are emerging markets—that countries with more stable policies (as evidenced by more stable inflation and exchange rates) have greater bond market development and higher foreign participation. U.S. investors' aversion to returns volatility in local currency bond markets suggests that local currency bonds do not sufficiently compensate foreign investors for exchange rate risk. The key, therefore, to attracting global investors may be the development of both local bond markets and the concomitant development of derivative instruments.⁵ Well-functioning derivatives markets would enable investors to transfer currency risk to those more willing to bear it. Moreover, shifting the focus toward local bond market development has the added advantage that deeper local bond markets would help provide a redundancy of funding sources, something that may well ameliorate financial crises (Greenspan (1999)).

⁵ Many others promote local bond market development. For example, it figures prominently in the plan put forward in Goldstein (2002).

2. Risk and Return Characteristics of International Bond Portfolios

It is well known that whereas portfolio theory predicts internationally diversified portfolios, investors tend to exhibit a bias towards local or domestic securities. Much of the home bias literature has focused on international equities (see the surveys by Karolyi and Stulz (2002) and Lewis (1999)). But there is also a literature on the potential diversification gains from holding international bonds. The benefits of including foreign bonds in a portfolio has been documented by Levy and Lerman (1988), Jorion, (1991), and Levich and Thomas (1993), among others.

Unlike foreign equities, foreign bonds may be denominated in various currencies and the holder must decide whether to take on the currency risk or hedge against it. Levich and Thomas (1993) show that the optimal *unhedged* bond portfolio over the 1977 to 1990 period for a U.S. investor would have been composed (ex post) mainly of U.S. bonds, because the substantial currency volatility more than outweighed the increased returns provided by foreign bonds. In sharp contrast, however, is the optimal *hedged* portfolio, which would have had a zero weight on U.S. bonds.

The concern with any ex post analysis is that the results are sample specific. While we do not eliminate this concern, we show in Figure 1 evidence that the risk-reward tradeoffs for portfolios of U.S. and foreign bonds that were documented in earlier work—work that used returns data from the 1970s and 1980s—are qualitatively similar when data through 2001 are used. We plot risk-return profiles for both hedged and unhedged portfolios for four-, nine-, and fourteen-year holding periods ending in December 2001.⁶

Focusing first on historical returns, the figure indicates that over longer horizons returns on foreign industrial-country bonds, whether hedged or unhedged, are similar to returns on U.S. bonds. See, for example, the solid line labeled ‘1988’, which represents unhedged portfolios held from 1988 to 2001. An all-U.S. portfolio (the leftmost point) would have earned on average about 0.65 percent per month (7.8

⁶ The foreign portfolio is a value-weighted composition of bonds from Japan, Canada, United Kingdom, and Euroland, where the weights are given by the size of the individual markets as of end-1997. The hedged portfolio assumes a passive all-hedged strategy; active hedging strategies are analyzed in Levich and Thomas (1993).

percent per year). Not too far behind is an unhedged all-foreign portfolio (rightmost point) at 0.50 percent per month (6 percent per year).⁷ Hedged all-foreign portfolios for the 1993-2001 and 1998-2001 periods provided somewhat higher monthly returns of 0.68 and 0.60 percent, respectively. In all, the difference in average monthly returns on all-U.S. and all-foreign portfolios, whether hedged for currency risk or not, is at most 20 basis points.

Over the periods presented in Figure 1, returns on unhedged foreign bond portfolios were not only lower than on a portfolio of U.S. bonds, but they were also extremely volatile. The difference in historical volatility is so large that even during periods when unhedged foreign bonds earn a higher return than U.S. bonds, one's tolerance for risk would have to be substantial for the higher returns to sufficiently compensate for the increased risk. The rather extreme risk is, of course, due mainly to the high volatility of exchange rates.⁸ If we rule out the option of currency hedging, the optimal portfolio is comprised almost exclusively of U.S. bonds. In fact, regardless of risk tolerance and sample period, a portfolio with greater than ten percent dedicated to unhedged foreign bonds is inefficient.

By eliminating currency risk, hedged foreign bonds dominated unhedged ones in this sample. Moreover, over these horizons hedged positions dominated a portfolio of only U.S. bonds. This is due to slightly higher historical returns on foreign bonds, but more importantly to the reduction in risk associated with greater diversification.⁹ Indeed, if we assume currency risk is completely hedged, the optimal allocation is reversed: The optimal portfolio is comprised almost entirely of non-U.S. bonds.¹⁰

⁷ That dollar returns on U.S. and foreign bond portfolios over a long period are broadly similar is evidence in support of uncovered interest parity (UIP). For a formal empirical test of UIP, see Cumby and Obstfeld (1981).

⁸ 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. However, this covariance term is likely orders of magnitude smaller than the variance of the change in the exchange rate. Recent papers on exchange rate volatility include Bayoumi and Eichengreen (1998) and Devereux and Lane (forthcoming).

⁹ The domination of hedged over unhedged bond international portfolios was also evident in earlier decades and spawned a series of 'free lunch' papers. For opposing views on the apparent free lunch in hedged international bond portfolios, see Rosenberg (1990) and Perold and Shulman (1988).

¹⁰ Foreign portfolios that also include emerging market debt result in broadly similar efficient frontiers (bottom half of Figure 1), because even though returns on emerging market and industrial country debt are less correlated, emerging market debt is only a small fraction of the global bond market.

The risk-return tradeoff for unhedged positions indicates that global fixed income investors are not sufficiently compensated for the currency risk inherent in local bond markets. This suggests that to attract global investors a country must either have a well developed derivatives market in its currency (so global bond investors can shed the currency risk) or issue in foreign currency (so currency risk, from the perspective of the investor, is eliminated).

What is the actual allocation between U.S. and foreign bonds in U.S. investors' bond portfolios? As of the end of 2001, U.S. positions in the bonds of the 50 foreign countries in our sample amounted to \$457 billion dollars (Table 2); including countries, mainly Caribbean financial centers, that we have omitted from our analysis puts the amount at \$508 billion. Although not part of the survey, U.S. investors' end-2001 positions in U.S. bonds are estimated to be about \$12,020 billion (Thomas and Warnock (2003)). Thus, foreign bonds comprise about 4 percent of the U.S. investors' bond portfolios, down from 6 percent in 1997 and well below the approximately 50 percent share of foreign bonds in the global bond market. In terms of the efficient frontiers of Figure 1, this approaches the all U.S. allocation.

Relative to the size of foreign bond markets—which comprise about half the global bond market—U.S. positions in foreign bonds are quite small. This represents a large departure from the predicted allocations of the ICAPM and is still more evidence of the home bias in asset positions. In our analysis of U.S. bond portfolios, we will not attempt to model this home bias at the aggregate level. Rather, we aim to explain the country weights in U.S. bond portfolios. We turn to this exercise next.

3. Country Weights in International Bond Portfolios

The framework underlying our empirical investigation of international bond portfolios is the traditional portfolio theory developed by Sharpe (1964) and Lintner (1965). In particular, we model deviations from portfolio weights predicted by the international version of the classical capital asset pricing model (ICAPM). The ICAPM predicts that portfolio weights are given by market weights; we effectively model the weight in U.S. portfolios relative to the market weight in the world market portfolio.

As explanatory variables we use candidate causes for deviations from ICAPM weights, such as direct and indirect barriers to international investment. For example, investors might deviate from ICAPM allocations because of direct barriers, such as capital controls or high transaction costs, or indirect barriers, such as information asymmetries. Information asymmetries could, for example, prompt returns-chasing behavior; to allow for such behavior, we examine the extent to which the mean (and volatility) of past returns affects asset allocations.

3.1 The Dependent Variable

We aim to explain the country allocation in U.S. investors' foreign bond portfolios. Analogous to the measure of equity home bias used in Dahlquist, Pinkowitz, Stulz, and Williamson (forthcoming) and Ahearne, Grier, and Warnock (forthcoming), the deviation of country i 's weight in U.S. investors' portfolios from its ICAPM weight is given by the following:

$$DevICAPM_i = (USHoldings_i / US Bond Portfolio) / (Bond Market_i / World Bond Market) \quad (1)$$

In cross-sectional work, the size of the U.S. bond portfolio relative to the world bond market is a constant equal to about one-half in 2001. Thus, for ease of interpretation we analyze the following measure that is observationally equivalent to equation (1):

$$ShareUS_i^T = USHoldings_i^T / Bond Market_i^T \quad (2)$$

where i denotes the country, T (T = total, dollar-denominated, or local-currency-denominated) is the type of bonds analyzed, and the holdings data are from the 1997 and 2001 comprehensive benchmark surveys of U.S. investors' positions in foreign securities. $ShareUS_i$ is the relative importance of U.S. investors in bond market of country i , which is observationally equivalent to a home bias or deviation from ICAPM measure and identical to measures used in Falkenstein (1996) and Gompers and Metrick (2001).

The denominator of $ShareUS_i$ requires data on the size and currency composition of foreign bond markets, a summary of which is provided in Table 1. Our primary source for calculating the size of bond markets is unpublished data from the Bank for International Settlements (BIS). For local-currency bonds that are placed in the domestic market, we use the unpublished data on long-term debt underlying *BIS Quarterly Review* Table 16A on domestic debt outstanding. For international bonds (i.e., those in foreign currencies or placed abroad), we use the security-level data behind *BIS Quarterly Review* Table 14B. The security-level nature of these data allow us to break out issuance by country and by currency, which is essential to our calculation of the size of dollar-denominated debt outstanding by country, but also to capture the local-currency-denominated debt issued abroad.¹¹

In theory, we would like to measure not the size of the entire bond market, but the float, or tradable portion. In the literature on equity portfolios, the size of the tradable market is calculated by excluding shares held by insiders; see, for example, Dahlquist et al. (forthcoming). To calculate the float for bonds we should subtract from the size of a bond market all government agencies' (including pension funds) holdings of their own government's bonds. In practice, such information is not available across a wide range of countries, although we are able to exclude a subset of government holdings—central bank holdings of their own government's bonds—which is presented for most countries in the IMF's *International Financial Statistics* (line 12a). Note that this 'float' adjustment affects only local currency issuance; we assume governments do not hold their own foreign-currency-denominated debt.

Summary data for our dependent variable is displayed in Table 2. The top rows show 1997 U.S. positions as a share of the total bond market in selected countries. Perhaps surprisingly, U.S. holdings are quite similar across industrial and emerging market countries. In the industrial countries listed, U.S. investors' positions, as a share of the market, range from one percent in Japan to 16 percent in Canada.

¹¹ The BIS security-level *international bond* data combines information from Capital DATA (Bondware), Thomson Financial Securities Data (Platinum), and Euroclear. BIS then identifies and removes duplicates, corrects mistakes, ensures a consistent classification of issuers across the different sources, and performs general quality control. Thus, it appears to be the most comprehensive data set on international bonds. It does not, however, include information on Brady bonds, which we obtained from Merrill Lynch (2002). BIS data on *domestic debt* is not collected at the

U.S. investors hold similar shares of emerging market debt. Among emerging markets, U.S. positions are substantial in Latin America (20 percent) but more limited in emerging Asia (five percent).

This similarity of U.S. holdings across industrial and emerging markets is also evident when we examine holdings of local-currency- and dollar-denominated bonds. U.S. positions in local-currency bonds (as a share of total local-currency bonds outstanding) are quite small across the board. As of December 1997, holdings in emerging Asia, Japan, and the euro area were in the 0-1% range, while U.S. investors held 3 and 10 percent of local-currency bonds in Latin America and Canada. Importantly, these shares do not appear to vary systematically across types of countries. We see little evidence that emerging markets are strikingly *less* able to market their local-currency bonds to U.S. investors—this is true across all countries. Finally, of the dollar-denominated issuance by the countries listed, U.S. investors held 28 percent of the amount outstanding in 1997. Again, the shares do not differ much across emerging markets and industrial countries.¹²

3.2 Explanatory Variables

Table 2 demonstrates that the nature of U.S. positions is somewhat similar across different types of countries. This broad similarity does not preclude important differences across individual countries. To analyze the cross-sectional variation in U.S. bond positions, we first need to identify candidate causes for deviations from the ICAPM allocation. These include:

Historical Performance. Historical risk-return tradeoffs are sample dependent. Nonetheless, the story from the efficient frontiers of Figure 1 is striking. If global bond investors are momentum traders who use past performance as some indication of future performance, historical risk-return tradeoffs could lead to deviations from ICAPM allocations. We construct historical risk and return measures using monthly observations of JPMorgan country-level bond indices. For emerging markets, we use JPMorgan Emerging Market Bond Index (EMBI) Global, which consists of dollar-denominated bonds. For

security level but should by definition contain only local-currency-denominated bonds placed locally; for Argentina and Peru, however, it contains some foreign currency issues, which we have recategorized.

industrial countries we rely on the JPMorgan Government Bond Index (GBI), which consists of government bonds denominated in local currency. Because we are interested in returns to U.S. investors, we utilize GBI returns expressed in dollars. In all, the JPMorgan indices provide coverage for 45 countries in our sample. For each country we calculate the average return (MEAN), variance of return (VAR), Sharpe ratio (SHARPE), and correlation with U.S. bond returns (CORR) over a four-year period ending December 2001.¹³ Because it is an open issue as to what extent global investors hedge foreign bond positions, we generate these variables using both hedged (H) and unhedged (U) returns.¹⁴

Some studies have found that business cycle variables have predictive power for returns (Keim and Stambaugh (1986), Chen (1991), and Ilmanen (1995)). Following these studies, we form detrended GDP and stock market variables, but these have no explanatory power for holdings across countries and are not reported in what follows.

Liquidity. Investors who value liquidity may be willing to deviate from ICAPM allocations. Measuring the liquidity of individual debt securities can be nontrivial; measures of liquidity across our sample of fifty markets are nonexistent. An indication of trading volume would serve as a good proxy for liquidity, but because bond trading is not conducted on organized exchanges, such a measure does not exist at the country level across many countries. Instead we rely on McCauley and Remolona (2000), who show that size is a reasonable but imperfect proxy for liquidity, and construct a variable, BDDEV, defined as the size of the bond market normalized by GDP. This measure of bond market development is akin to measures of stock or financial market development found in Levine and Zervos (1998), and will capture any preference U.S. investors might have for large or small bond markets.¹⁵

¹² Table 2 will be updated with complete data for 2001 after the official data release (expected March 2003).

¹³ The Sharpe ratio is calculated as $(R_i - R_F) / \sigma(R_i)$. One-month U.S. Treasury bill returns from CRSP are used as the risk-free return series.

¹⁴ For industrial countries, the GBI has both hedged and unhedged dollar returns. For emerging markets, we form unhedged returns on local currency bonds by adding currency returns to EMBI bond returns.

¹⁵ Ahearne et al (forthcoming) find that small stock markets have greater relative weights in U.S. investors' foreign equity portfolios.

Credit Ratings. Country credit ratings (CR) might have predictive power for risk and thus influence portfolio allocations. We translate Standard & Poor's ratings on long-term foreign-currency denominated debt into a numeric score ranging from one (AAA) to 21 (C).¹⁶

Direct Barriers to International Investment. While direct barriers to international investment have fallen greatly over the past few decades, some restrictions still exist. There is no numeric indicator of bond market openness, so we rely on the more general Quinn (1997) measure of capital account openness (CA97), which is used in Quinn, Inclan, and Toyoda (2001) and ranges from 0 (completely closed) to 4 (completely open). The measure is available only through 1997; if sustained and credible changes in capital account openness are infrequent, this historical measure should be satisfactory.

Real Linkages. The extent of real linkages could affect deviations from ICAPM allocations. As in Ahearne et al (forthcoming) we use as a measure of real linkages TRADE, the importance of trade with the United States (bilateral exports plus imports over GDP).

Summary statistics for the explanatory variables are provided in Table 3a – 3c.

3.3 *The Determinants of Country Weights*

The results of bivariate regressions of the percentage of a country's overall bond market held by U.S. investors as of end-2001 are presented in the 't-stat' column of Table 3(a). The bivariate results show that countries with greater bilateral trade linkages (TRADE) and more open capital accounts (CA97) have greater weights in U.S. portfolios. Since we do not know the extent to which bond positions in industrial countries are hedged against currency risk, Table 3(a) includes variables based on both hedged (prefix H) and unhedged (prefix U) returns. The t-stat of -1.714 on UCORR suggests that U.S. investors' international bond portfolios are more heavily weighted towards countries whose returns are less correlated with U.S. returns, consistent with the theory of portfolio diversification.¹⁷

¹⁶ See Cantor and Packer (1996) and Ammer (1998) for analysis of the determinants and information content of credit ratings.

¹⁷ This result, however, is not very robust, disappearing when holdings are broken out by currency denomination.

Multivariate results, reported in Table 4(a), indicate that trade, capital account openness, and correlation are again statistically significant. These variables combine to explain 25 to 30 percent of the variation in U.S. investors' bond holdings. In addition, the estimated coefficients are economically significant. The estimated coefficient for CA97 suggests that U.S. investors' holdings of the Chinese bond market would increase from 0.2% to 7.7% if China opened its market (from current level of CA97 of 1.5 to max of 4.0).¹⁸ The estimated coefficient for HCORR indicates that if a market highly correlated with the U.S. (e.g., Germany) had instead only an average correlation, U.S. investors would have had significantly higher holdings (for Germany, holdings would have doubled from 2.3% to 4.6%). Finally, the coefficient on TRADE is somewhat less powerful, indicating that a sizable 10% increase in bilateral trade as a share of GDP would increase holdings by less than 1.5 percentage points.¹⁹

These results notwithstanding, there is one variable that is an even more important determinant of U.S. holdings, the percentage of a country's outstanding debt that is dollar denominated (DOLISS). This variable alone explains 55% of the cross-country variation in U.S. holdings and its inclusion in multivariate regressions renders other variables insignificant. We do not, however, view this as a satisfactory explanation of U.S. holdings. Instead, we take this as evidence that it is important to analyze U.S. holdings of dollar- and local-currency-denominated bonds separately.

3.4 Positions in Dollar- and Local-Currency-Denominated Bonds

The bivariate results in Table 3(b) show that dollar-denominated bonds issued by countries with deeper bond markets (BDDEV) and higher historical returns (HMEAN) have greater weights in U.S. portfolios.²⁰ The multivariate results, reported in column (1) of Table 4(b), indicate that only historical returns retain statistical significance.

¹⁸ We recognize that in a general equilibrium world this and other such statements that follow require the ceteris paribus assumption.

¹⁹ The statistical significance of TRADE in Tables 3a and 4a is tenuous. Dropping one outlier (Canada) greatly diminishes the significance of its coefficient.

²⁰ For industrial countries, returns series on dollar denominated bonds are not available. We utilize hedged returns on local currency denominated debt, a reasonable substitute given low hedging costs for these industrial countries.

Turning back to the bivariate results reported in Table 3(c), we find that the determinants of holdings of local-currency-denominated bonds differ. For local-currency holdings, the most important variables are those associated with risk and volatility: credit rating and variance of past returns.²¹ In multivariate regressions (Table 4b, column 3), the credit rating seems to be the dominant factor.

The contrasting results for the determinants of local-currency and dollar-denominated bond holdings are consistent with the distinction between hedged and unhedged bond portfolios made in Section 2. Given the risk associated with unhedged positions in foreign bonds (illustrated in Figure 1), it is not surprising that measures of risk and volatility are particularly important in explaining holdings of local-currency denominated debt. Furthermore, for dollar-denominated bonds the primary source of volatility has been eliminated, justifying a greater emphasis by U.S. investors on the level of returns.

4. Reallocations in International Bond and Equity Portfolios

We have shown that at a point in time (end-2001) U.S. positions in foreign bonds are driven mainly by the openness of capital accounts and measures of past and prospective volatility. In this section, we investigate the determinants of changes in U.S. portfolio weights from 1997 to 2001 as defined by:

$$Dhold_i = \left(\frac{USHoldings_i^{2001}}{MarketSize_i^{2001}} \right) - \left(\frac{USHoldings_i^{1997}}{MarketSize_i^{1997}} \right) \quad (3)$$

For completeness, after analyzing the reallocations in international bond portfolios, we update the Ahearne et al (forthcoming) analysis of changes in equity portfolios.

²¹ Correlation is significant (and positive) in bivariate but not multivariate regressions. In this sample, the effect of correlation is indistinguishable from credit risk given their correlation of -0.83 .

4.1 Bond Portfolio Reallocations

Table 5 displays regression results for the change in bond holdings on various factors. Since our holdings data are at current value but the issuance data are valued at face, we deflate 2001 holdings by the price change from 1997 to 2001.²² We include in the first regression the initial 1997 levels and changes from 1997 to 2001 of BDDEV and CR. The results indicate that U.S. investors moved into more developed bond markets and away from smaller ones. There is also strong evidence that investors moved away from countries with poor 1997 credit ratings, and more so from those whose credit rating was subsequently downgraded. For example, our coefficients indicate that Malaysia, with its 1997 credit rating of A, would have seen more U.S. disinvestment than a more highly rated country—2.5 percentage points more than a country with a 5-step higher credit rating of AAA. More important, however, was its 3-step downgrade to BBB, accounting for a 3.3 percentage point decrease (of 8.4% total).

Over this period, poor and declining credit ratings were highly correlated with greater returns volatility; column (2) shows that U.S. investors fled volatile returns. The regressions in columns (1) and (2) each explain more than 40 percent of the variation in the change in holdings. Our finding that investors sought out more developed bond markets while avoiding credit risks and volatile returns appears to indicate a flight to quality from 1997 to 2001.

That U.S. investors shifted out of the bonds of countries with small markets, lower credit ratings, and more volatile returns raises the question of whether this was simply an exodus from emerging markets. Indeed, the most striking change in U.S. investors' bond positions between 1997 and 2001 is a retrenchment from emerging market debt. In 1997, U.S. investors' held twenty and five percent, respectively, of Latin American and emerging Asian debt, but by 2001 those shares had fallen to nine and one percent. Moreover, the eight largest declines in U.S. positions (as a share of the market) occurred in emerging markets.

²² We use total returns indexes to deflate holdings. Straight price indexes would be preferable, but they are not available for all countries.

To investigate whether investors blindly dumped emerging market debt or were more discriminating in their portfolio adjustments, we introduce a binary dummy variable for LDCs. In column (3) of Table 5 we find that the LDC dummy variable is negative and highly statistically significant in a bivariate regression: investors did reduce their allocations to emerging markets. However, even in the presence of a LDC dummy, our other explanatory variables retain statistical significance (columns (4) and (5)). These results suggest that within the category of LDC debt, U.S. investors considered characteristics such as credit risk when adjusting their portfolios.

Finally, in columns (6)-(8) we investigate whether U.S. investors' bond reallocations followed the pattern of equity reallocations (DEQHOLD).²³ Column (6) indicates that bond and equity portfolio shifts did indeed have much in common—US investors tended to move out of particular countries' bond and equity markets. But columns (7) and (8) demonstrate that underlying factors such as credit ratings and the variance of past returns drove the reallocations, not just flight from certain countries.

4.2 Equity Portfolio Reallocations

Our analysis of the change in U.S. investors' international bond portfolios from 1997 to 2001 reveals a flight to quality. The statistical evidence rejects the hypothesis that this was a blind flight from emerging markets and instead supports the notion that U.S. investors considered a number of risk factors when adjusting their portfolios. We now turn to an investigation of the change in U.S. equity holdings over the same period to see if a similar pattern emerges.

Column (1) of Table 6 displays bivariate regression results for the change in equity holdings on various factors.²⁴ Some of the results match those for bond portfolios; for example, U.S. investors moved into more developed equity markets and decreased holdings in countries with poor or declining credit ratings. In contrast to the findings for bond holdings, equity investors seem to be primarily driven by the

²³ The patterns of equity and bond *positions* at a point time are not significantly related.

²⁴ The exception is the coefficient for DCR which is generated in a multivariate regression including the initial value (CR97).

mean rather than the variance of past returns; the Sharpe ratio is a significant predictor of the change in equity holdings, but the explanatory power is in the numerator rather than the denominator.

In columns (2)-(4) we test whether the explanatory variables are simply capturing a flight from emerging market equities. Columns (3) and (4) indicate that, even in the presence of a LDC dummy, the other explanatory variables retain statistical significance. Consistent with our earlier findings for bonds, these results suggest that within the category of emerging market equities, U.S. investors considered risk and return proxies when adjusting their portfolios. Finally, the results in columns (5) and (6) confirm that bond and equity portfolio reallocations are not significantly linked once we control for risk and return.

5. Implications for Emerging Markets

Issues facing emerging markets have spawned a growing literature that is of particular interest after the series of financial crises that began in the mid-1990s. Our analysis of U.S. investors' international bond portfolios has a number of important implications for emerging markets. In this section we discuss the implications of our results for bond market development, original sin, and foreign participation in emerging local bond markets.

5.1 Bond Market Development and Original Sin

The (in)ability of emerging markets to issue bonds in local currency that are attractive to international investors has received considerable attention in the currency crisis literature. A new and growing literature on the "original sin hypothesis" attributes much of the financial instability in emerging economies to incomplete financial markets. Eichengreen and Hausmann (1999) describe original sin as, "... a situation in which the domestic currency cannot be used to borrow abroad or to borrow long term, even domestically." Countries suffering from this affliction have, among other things, less flexibility in economic policy. For example, if a large portion of a country's debt is denominated in foreign currency, a depreciation immediately increases the pain of debt service payments.

The Eichengreen and Hausmann (1999) definition suggests that a country free from original sin is one that has developed a mature local-currency bond market. Recent work, however, has focused on a more narrow measure of original sin, namely the fraction of a country's *external* bonds denominated in foreign currency (Eichengreen, Hausmann, and Panizza (2002) – henceforth EHP). The exclusion of local bond markets has been influential. Indeed, the stylized facts of external bond markets (bonds placed abroad) figure prominently in many theoretical papers; see, for example, Caballero and Krishnamurthy (forthcoming). The exclusion, though, is defensible only if global investors do not participate in local bond markets. However, the 1997 U.S. holdings data in Table 2, discussed above and addressed again in the next subsection, suggests that U.S. investors do indeed hold local emerging market bonds, and to a similar extent that they hold local bonds of industrial countries.

In column 4 of Table 1 we present the share of outstanding bonds that is denominated in the local currency. This is similar to an original sin measure used in EHP, but it is more encompassing as it includes local bond markets. The data indicate that the contrast between industrial countries and emerging markets is not as stark as one might have imagined. For emerging Asia the fraction of the total bond market denominated in local currency exceeds that of the UK and Canada, although Latin America's local currency issuance is below that of other regions.

More informative than the local currency *share* of a country's bond market is the actual development of the local currency bond market. Consider, for example, a country with an underdeveloped bond market—say 10% of GDP—wholly comprised of local-currency-denominated securities. Is this country free from original sin? A measure focused strictly on the local currency share would indicate that it is. However, such a country has only a limited ability “to borrow long term, even domestically.” We therefore construct a measure of local-currency bond market development defined as the size of a nation's local-currency-denominated bond market (excluding central bank holdings) divided by GDP. The regressions reported in Table 7a seek to explain the cross-country variation in local-currency bond market development. The results suggest a prominent role for past policy. In our sample, countries with lower or less volatile inflation (and thus likely more stable monetary and fiscal policies)

have better developed bond markets. In addition, the level of economic development, as measured by GDP per capita, is significantly related to bond market development, but country size (GDP) is not.²⁵

For completeness, we also analyze the share of outstanding bonds denominated in the local currency (Table 7b), the measure most closely related to one employed by EHP (2002). We find, as they do, that country size is highly significant but that the level of economic development is not. Contrary to their findings, however, is the importance of past inflation. Countries that have had higher or more variable historic inflation tend to issue more foreign-currency-denominated debt. This suggests, as in the model of Jeanne (2002), an important role for monetary policy credibility in explaining the currency composition of a country's debt.

The regressions reported in Tables 7a and 7b include some outliers. For example, Brazil, Russia, and Turkey had extremely high inflation during our sample period. And Luxembourg's bond market development (which is, recall, expressed as a percent of GDP) is more than three times greater than the country with next most developed market. In Tables 8a and 8b we rerun the regressions without the outliers. The results are broadly similar. Variables that are significant in Table 7 tend to be so in Table 8.

In summary, the results in Tables 7 and 8 indicate an important role for past policies in the current state of both the development and currency composition of countries' bond markets. Moreover, the fact that per capita GDP is significant in regressions of bond market development but not in regressions of the currency composition of outstanding bonds is telling. It suggests that the primary distinction between emerging markets and industrial countries is the level of overall bond market development, not the currency denomination of outstanding debt.

5.2 Foreign Participation in Emerging Local Bond Markets

As we noted, the literature's focus on external bond markets is defensible if foreigners do not participate in emerging local bond markets. To the contrary, the data indicate that as of end-1997, U.S.

²⁵ Results for overall bond market development – that is, the amount of outstanding bonds denominated in both local and foreign currencies – are qualitatively identical to those presented in Table 7a.

investors held a non-trivial amount of local-currency-denominated debt issued by emerging markets. Between 1997 and 2001, there was a clear flight to quality, although not a blind one: U.S. investors were discriminating in their flight, considering characteristics such as credit risk and returns volatility when adjusting their portfolios.

Our analysis suggests that emerging markets can attract global bond investors through enhanced development of the local market. Local bond market development is greater in countries with lower historic inflation, so a necessary step is improved performance on the inflation front. The development of the bond market may even protect against future inflationary episodes. As suggested in Eichengreen and Hausmann (1999), a well-developed domestic bond market may generate a political constituency opposed to inflationary policies.

Local bond market development will also lead to the creation of a yield curve, which will enable global investors to decouple the bond and currency investments. The importance of hedging instruments is evident in our results: Global bond investors flee volatility, suggesting that from the perspective of the foreign investor volatility is not properly priced. It is not surprising that local bond markets do not price bonds to compensate foreigners for exchange rate volatility (which itself may owe to policies in the investors' countries). It should be noted that the top half of Figure 1 indicates that the volatility facing foreign investors is not priced in industrial countries' local bond markets, either. The well-developed yield curves in these countries, however, enable the decoupling of bond and currency investments, which in turn allow industrial countries to attract and maintain some level of foreign participation.

The reader should note that our results indicate that foreigners do not flee volatility in emerging *equity* markets. There are at least two possible reasons for this. First, stock market volatility is by no means restricted to emerging economies. Also, the effect of exchange rate changes on the equity of a firm that may well derive a substantial portion of its income from abroad is ambiguous.

6. Conclusion

Our aim in this paper is to describe and understand country weights in U.S. investors' international bond portfolios. In doing so we find that important factors include the openness of capital accounts and potential diversification benefits as given by historical correlations. We fine-tune the analysis by separating dollar and local currency portfolios and find that for positions in local-currency-denominated bonds there is a noteworthy emphasis on measures of past and prospective volatility. Our analysis of portfolio reallocations from 1997 to 2001 reveals a flight to quality—not a blind one, but a discriminating flight from those countries with poor or declining credit ratings.

To carry out the goal of this paper required measures of the size of bond markets across many countries. No such measures existed, so another contribution of this paper is our presentation of the size and currency composition of bond markets across 50 countries. This in itself has implications for a number of literatures. The empirical literature on finance and growth, which has hitherto excluded bond market development in its analysis, might begin to include debt markets. Perhaps more important is our potential contribution to the 'original sin' literature, which has focused on bonds placed abroad. Our analysis of emerging local bond markets suggests a refinement of the original sin hypothesis. The share of a country's overall bond issuance that is denominated in its local currency does not differ substantively between emerging and more developed markets. The legacy of original sin is, rather, that emerging bond markets are in general much less developed. We find, moreover, that the cause is not a mystery, but related to policies of the not-so-distant past.

Looking at the trends in the data, we find mixed evidence regarding the prospects for absolution of original sin. While local-currency-denominated debt in emerging markets, especially in Asia, grew substantially between 1997 and 2001, U.S. positions in such debt dropped precipitously. The question going forward is whether this represents a temporary flight to quality or a more permanent change in preferences. In either case, emerging economies can attract global investors through the development of

deeper local bond markets. Local bond market development can, in turn, lead to the creation of a yield curve and derivative instruments that enable the decoupling of the bond and currency investment.

Finally, some limitations of our study should be noted. In particular, we caution readers that our currency-specific results may not tell the complete story. For both issuance and portfolios, we know the currency denomination but not whether the bonds are indexed to inflation or an exchange rate. Thus, some of the bonds included in our local currency analysis, especially for Latin America, may behave a lot like foreign-currency securities. On the portfolio side, we do not want to imply that our study speaks to the currency exposure of U.S. investors. Not knowing the extent of derivatives positions, for example, makes our snapshot of currency exposure incomplete.

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Figure 1
Efficient Frontiers for International Bond Portfolios*

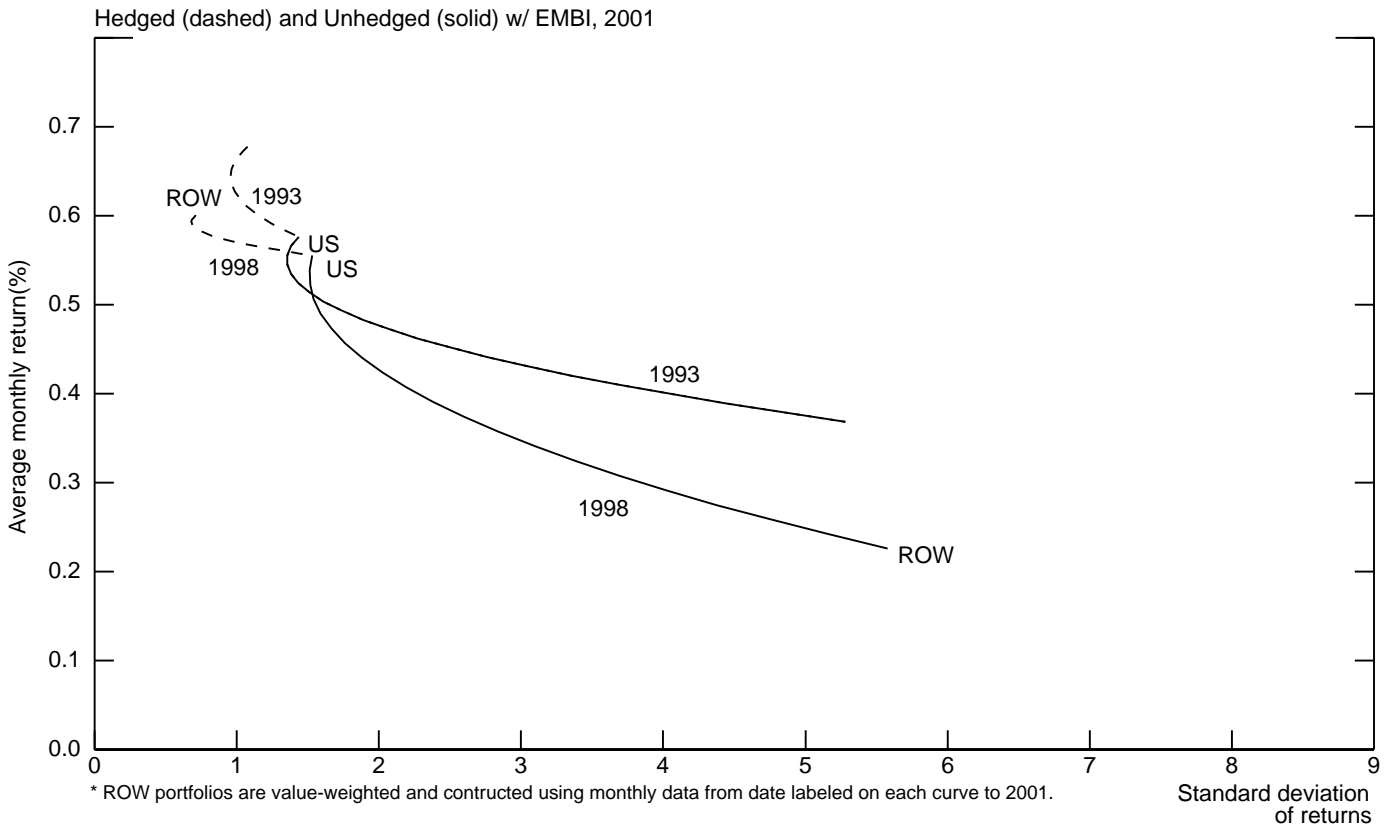
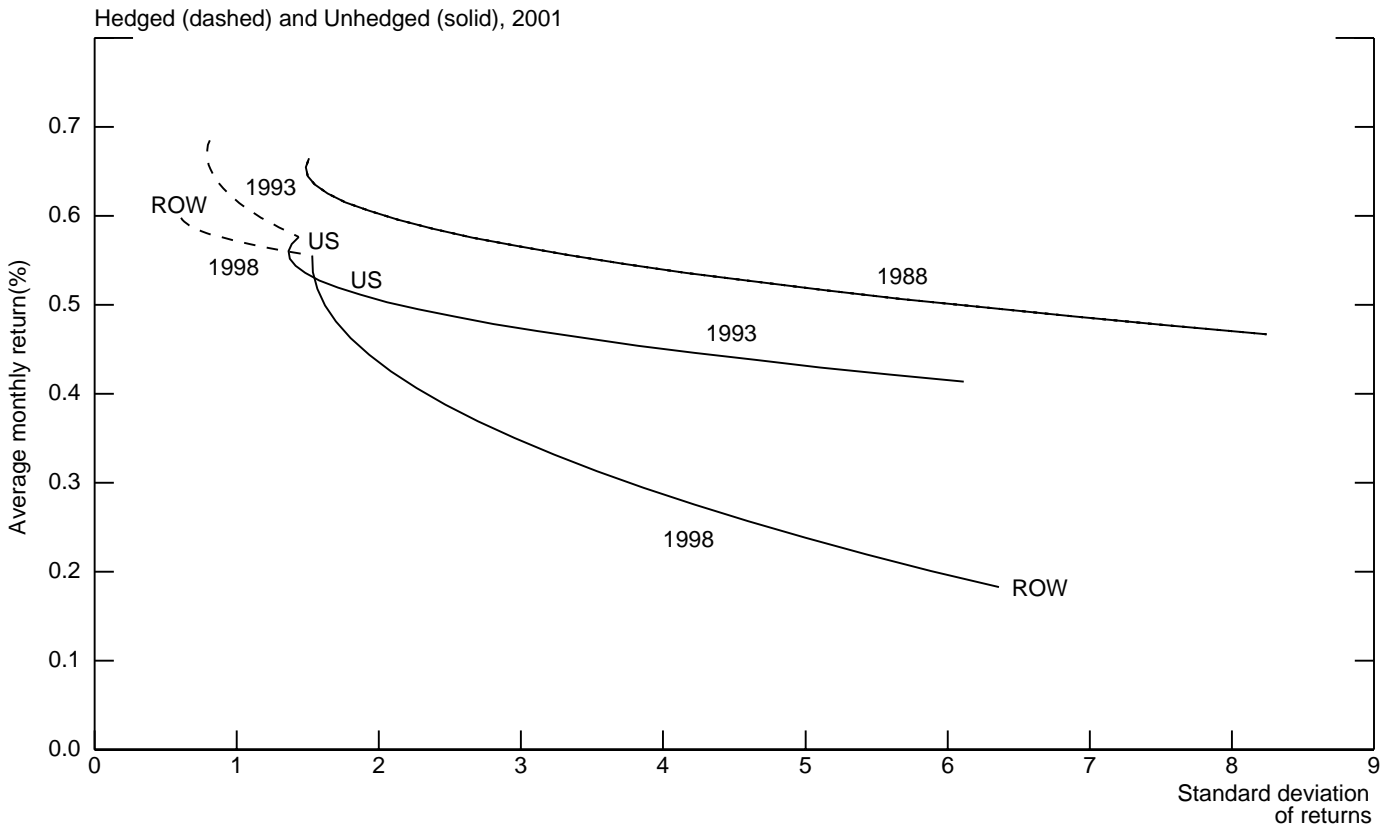


Table 1. Bond Market Development (amount outstanding, end-2001)

	Total		Local-Currency-Denominated		Dollar-Denominated	
	\$bil	% of GDP	\$bil	% of total	\$bil	% of total
Euro Area	6,677	109%	5,892	88%	329	5%
Japan	4,825	116%	4,761	99%	44	1%
UK	1,313	92%	973	74%	195	15%
Canada	649	92%	460	71%	149	23%
Latin America	530 <i>(463)</i>	30% <i>(25%)</i>	248 <i>(221)</i>	47% <i>(48%)</i>	223 <i>(206)</i>	42% <i>(44%)</i>
Emerging Asia	1,245 <i>(639)</i>	41% <i>(22%)</i>	1,099 <i>(502)</i>	88% <i>(79%)</i>	125 <i>(108)</i>	10% <i>(17%)</i>
Other	1,301	59%	975	75%	169	13%
Total Foreign	16,541 <i>(13,605)</i>	85% <i>(68%)</i>	14,408 <i>(11,832)</i>	87% <i>(87%)</i>	1,235 <i>(930)</i>	7% <i>(7%)</i>
United States	14,430 <i>(10,364)</i>	142% <i>(125%)</i>	14,141 <i>(10,228)</i>	98% <i>(99%)</i>		

Notes. Data on \$-denominated bonds and notes are from security-level data underlying BIS Table 14B (Int'l 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 debt for countries not available on Table 16A is from the IMF's Government Finance Statistics Yearbook and Merrill Lynch (2002). Data in italics and parentheses are for 1997. Total Foreign includes only the 50 countries in our sample.

Table 2. U.S. Holdings of Foreign Bonds (end-1997, \$billions and % of outstanding)

	Total		Local-Currency Denominated		Dollar Denominated	
Euro Area	115	2%	71	1%	35	15%
Japan	30	1%	23	1%	4	6%
UK	54	6%	23	3%	26	29%
Canada	106	16%	42	10%	56	52%
Latin America	91	20%	6	3%	77	37%
	(47)	(9%)				
Emerging Asia	35	5%	2	0%	31	29%
	(14)	(1%)				
Other	63	5%	24	2%	32	25%
Total Foreign	494	4%	191	2%	261	28%
	(457)	(3%)				
<i>memo: US</i>	8,641	84%				
	(12,020)	83%				

Notes. Data for foreign bonds are from the 1997 benchmark survey of U.S. Holdings of Foreign Securities. Total Foreign includes only the 50 countries in our sample. Estimates of U.S. holdings of U.S. bonds are formed by subtracting foreign holdings of U.S. bonds, as estimated in Thomas and Warnock (2003), from the amount of U.S. bonds outstanding. Data in parentheses are from the preliminary release of the 2001 survey; complete data for 2001 are suppressed until the official data release, scheduled for March 2003.

Table 3. Summary Statistics
(a) Total Holdings

	Mean	Standard Error	Min	Max	Nobs	t-stat	Correlations						
							BdDev	Trade	CR	CA97	USharpe	UVar	UMean
BdDev	0.722	0.681	0.121	4.230	48	-0.317							
Trade	0.107	0.114	0.010	0.544	48	+2.266	-0.09						
CR	6.521	5.411	1	20	48	+0.912	-0.49	-0.01					
CA97	3.167	0.839	1.5	4	45	+1.776	0.38	0.03	-0.52				
USharpe	0.018	0.182	-0.238	0.505	43	+0.828	-0.49	0.01	0.51	-0.61			
UVar	0.002	0.002	0.000	0.010	43	+0.522	-0.35	-0.07	0.75	-0.17	-0.07		
UMean	0.004	0.007	-0.017	0.033	43	+0.627	-0.31	0.10	0.33	-0.61	0.86	-0.12	
UCorr	0.249	0.301	-0.333	0.578	43	-1.714	0.46	-0.13	-0.75	0.54	-0.34	-0.58	-0.48

											HSharpe	HVar	HMean
HSharpe	0.172	0.128	-0.218	0.505	41	-1.044	0.16	-0.07	-0.40	-0.06			
HVar	0.002	0.003	0.000	0.010	41	+0.675	-0.46	-0.04	0.84	-0.23	-0.68		
HMean	0.007	0.006	-0.017	0.033	41	+0.071	-0.08	0.06	-0.03	-0.42	0.69	-0.30	
HCorr	0.331	0.388	-0.333	0.778	41	-1.009	0.52	-0.06	-0.83	0.57	0.36	-0.65	-0.23

Notes: All variables are for 2001 unless noted. U(H) indicates industrial country returns are unhedged (hedged). Returns for emerging markets are based on dollar-denominated bonds comprising the EMBIG indexes. T-stat is the t-statistic from a regression of holdings on the characteristic (and a constant).

(b) Dollar Holdings

	Mean	Standard Error	Min	Max	Nobs	t-stat	Correlations						
							BdDev	Trade	CR	CA97	HSharpe	HVar	HMean
BdDev	0.737	0.700	0.121	4.230	45	+2.135							
Trade	0.109	0.116	0.010	0.544	45	+1.471	-0.11						
CR	6.178	5.331	1	20	45	-0.856	-0.48	0.02					
CA97	3.262	0.783	1.5	4	42	+1.332	0.38	0.00	-0.47				
HSharpe	0.166	0.119	-0.218	0.475	39	-0.044	-0.22	-0.06	-0.58	0.05			
HVar	0.002	0.003	0.000	0.010	39	-0.278	-0.44	-0.01	0.83	-0.17	-0.82		
HMean	0.006	0.005	-0.017	0.010	39	+1.831	0.01	0.17	-0.30	-0.28	0.63	-0.56	
HCorr	0.361	0.374	-0.256	0.778	39	-0.134	0.51	-0.12	-0.82	0.50	0.54	-0.63	-0.04

H (Hedged) returns are based on EMBI for emerging markets and hedged series for industrial countries. Israel, Pakistan, Russia, Morocco, and Ecuador are omitted because of lack of data. T-stat is the t-statistic from a regression of holdings on the characteristic (and a constant).

(c) Local Currency Holdings

	Mean	Standard Error	Min	Max	Nobs	t-stat	Correlations						
							BdDev	Trade	CR	CA97	IHSharpe	IHVar	IHMean
BdDev	0.722	0.681	0.121	4.230	48	+1.235							
Trade	0.107	0.114	0.010	0.544	48	+0.525	-0.09						
CR	6.521	5.411	1	20	48	-3.047	-0.49	-0.01					
CA97	3.167	0.839	1.5	4	45	+2.136	0.38	0.03	-0.52				
IHSharpe	0.089	0.195	-0.406	0.578	41	+1.843	0.40	0.02	-0.57	0.09			
IHVar	0.003	0.005	0.000	0.023	41	-2.584	-0.43	0.01	0.75	-0.37	-0.51		
IHMean	0.003	0.010	-0.032	0.042	41	+1.038	0.18	0.10	-0.36	-0.14	0.86	-0.43	
IHCorr	0.314	0.382	-0.302	0.778	41	+2.900	0.54	-0.09	-0.83	0.61	0.52	-0.65	0.20

IH (Incomplete Hedged) returns series consist of hedged returns for industrial countries and, for emerging markets, returns based on EMBI with exchange rate changes. Russia and Ecuador are omitted because of lack of data. T-stat is the t-statistic from a regression of holdings on the characteristic (and a constant).

Table 4a. Regression Results: Total Holdings

	(1)	(2)	(3)	(4)	(5)
Trade	0.128* (0.071)	0.142* (0.074)		0.086 (0.071)	0.086 (0.072)
UCorr	-0.075** (0.031)				-0.009 (0.020)
HCorr		-0.053** (0.025)		0.007 (0.013)	
CA97	0.028*** (0.011)	0.029** (0.011)		0.004 (0.006)	0.007 (0.006)
Doliss			0.206*** (0.037)	0.194*** (0.039)	0.183*** (0.042)
Adj. R ²	0.283	0.257	0.549	0.595	0.603
Nobs	43	41	48	41	43

Dependent variable is the share of a nation's bond market held by US investors. Russia and Ecuador are omitted because of lack of data. Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

Table 4b. Regression Results: Dollar and Local Currency Holdings

	\$- denominated (1)	Local-Currency- Denominated (2) (3)	
Trade	0.323 (0.199)		
BdDev	-0.034 (0.032)		
Mean	3.995* (2.268)	0.129 (0.123)	
CA97	0.035 (0.022)	0.006* (0.003)	0.004 (0.003)
IHVar		-0.670** (0.284)	0.037 (0.210)
CR			-0.001*** (0.0004)
Nobs	39	41	41
Adj. R ²	0.144	0.063	0.102

Dependent variable is the share of a nation's dollar-denominated debt held by US investors. In columns (1) and (2), mean is HMean and IHMean, respectively. Israel, Pakistan, Russia, Morocco, and Ecuador are omitted because of lack of data. Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

Table 5. Regression Results: Bond Portfolio Reallocations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BdDev97	0.042* (0.021)	0.062*** (0.020)		0.040** (0.020)	0.049*** (0.019)		0.045** (0.020)	0.062*** (0.019)
DBdDev	-0.005 (0.011)	0.020 (0.032)		-0.004 (0.012)	0.020 (0.031)		-0.004 (0.011)	0.017 (0.032)
CR97	-0.005** (0.002)			-0.004 (0.004)			-0.005* (0.002)	
DCR	-0.011*** (0.004)			-0.011** (0.004)			-0.010** (0.004)	
HVar01		-14.36*** (3.82)			-12.86*** (4.89)			-12.86*** (4.46)
LDC			-0.082*** (0.019)	-0.010 (0.036)	-0.019 (0.024)			
Deqhold						0.515*** (0.167)	0.137 (0.156)	0.156 (0.138)
Nobs	43	39	43	43	39	43	43	39
Adj. R ²	0.419	0.454	0.314	0.404	0.446	0.111	0.411	0.449

Dependent variable is the change in share of a nation's bond market (net of price effects) held by U.S. investors. Russia, Ecuador, Venezuela, and Uruguay are omitted because of a lack of data. Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

Table 6. Regression Results: Equity Portfolio Reallocations

	Bivariate	Multivariate				
	(1)	(2)	(3)	(4)	(5)	(6)
EqDev97	0.032*** (0.012)	0.020* (0.012)	0.020* (0.011)	0.021* (0.011)	0.020* (0.011)	0.021* (0.011)
CR97	-0.004*** (0.001)	-0.002* (0.001)	-0.003 (0.002)	-0.004** (0.002)	-0.001 (0.001)	-0.002 (0.001)
DCR	-0.008* (0.004)			-0.008* (0.005)		-0.007* (0.004)
Sharpe01	0.204*** (0.059)	0.168** (0.077)	0.170** (0.079)		0.136* (0.078)	
Mean01	2.061*** (0.537)					
Var01	-0.613 (0.471)					
LDC	-0.033** (0.013)		0.004 (0.019)	0.021 (0.022)		
Dbondhold	0.262** (0.133)				0.142 (0.139)	0.043 (0.109)
Nobs	n.a.	49	49	49	45	45
Adj. R ²	n.a.	0.179	0.161	0.224	0.164	0.204

Dependent variable is the change in share of a nation's equity market held by US investors. Column (1) presents estimates from separate bivariate regressions, except for the DCR row, which also includes the initial value (CR97). Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

Table 7a. Local Currency Bond Market Development^a

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation – Variance	-2.441*** (0.471)				-1.280*** (0.380)	
Inflation – Mean		-2.476*** (0.717)				-1.078*** (0.320)
GDP Per Capita			0.446*** (0.114)		0.429*** (0.133)	0.410*** (0.134)
GDP				0.044 (0.077)	0.012 (0.067)	0.011 (0.066)
Trade Openness						
Adj. R ²	0.017	0.071	0.319	-0.008	0.299	0.305
Nobs	49	49	49	49	49	49

^a Dependent variable is the size a nation's local-currency-denominated bond market (excluding central bank holdings) divided by GDP.

Table 7b. Share of Outstanding Bonds Denominated in Local Currency

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation – Variance	-2.550*** (0.173)				-2.708*** (0.192)	
Inflation – Mean		-1.888*** (0.247)				-2.000*** (0.245)
GDP Per Capita			0.052 (0.052)		0.004 (0.040)	-0.027 (0.038)
GDP				0.057*** (0.020)	0.064*** (0.019)	0.060*** (0.017)
Trade Openness						
Adj. R ²	0.186	0.247	0.002	0.089	0.293	0.338
Nobs	49	49	49	49	49	49

Notes. In Tables 7a and 7b, Pakistan and Ecuador were dropped due to lack of data. Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.

Table 8a. Local Currency Bond Market Development^a (excluding outliers)

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation – Variance	-328 ^{***} (70)				-155 ^{***} (45.2)	
Inflation – Mean		-12.7 ^{***} (2.93)				-5.893 ^{***} (1.812)
GDP Per Capita			0.338 ^{***} (0.068)		0.229 ^{***} (0.062)	0.225 ^{***} (0.059)
GDP				0.121 ^{***} (0.042)	0.076 ^{**} (0.032)	0.072 ^{**} (0.033)
Trade Openness						
Adj. R ²	0.217	0.243	0.299	0.144	0.385	0.385
Nobs	45	45	45	45	45	45

^a Dependent variable is the size a nation's local-currency-denominated bond market (excluding central bank holdings) divided by GDP.

Table 8b. Share of Outstanding Bonds Denominated in Local Currency (excluding outliers)

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation – Variance	-152 ^{**} (75.4)				-160 ^{**} (72.8)	
Inflation – Mean		-6.33 ^{***} (1.84)				-6.856 ^{***} (1.922)
GDP Per Capita			0.033 (0.051)		-0.069 (0.045)	-0.083 [*] (0.045)
GDP				0.067 ^{***} (0.021)	0.058 ^{**} (0.015)	0.053 ^{***} (0.013)
Trade Openness						
Adj. R ²	0.155	0.203	-0.013	0.152	0.260	0.301
Nobs	45	45	45	45	45	45

Notes. In Tables 8a and 8b, in addition to Pakistan and Ecuador (lack of data), we drop three inflation outliers (Russia, Brazil, and Turkey) and one bond market development outlier (Luxembourg). Newey and West (1987) standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels respectively.