Investing in Local Currency Bond Markets

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June 17, 2010

Abstract

We assess the extent to which emerging markets have been able to attract global investors to their local currency bond markets. To do so, we first provide a sense of the playing field by examining the surge in the development of local currency bond markets over the past decade, as well as the historical returns characteristics faced by global investors. We then present a model in which investors care about barriers to investment as well as the mean, variance, and skewness of expected returns. Empirical tests suggest that the dominant factor is a new measure of investability; cross-border participation in local currency bonds is highest in countries where investor-friendly institutions and policies have been established. Finally, we discuss the link between our findings and global financial stability. In particular, both increased bond market development and greater foreign participation are paths toward ameliorating imbalances associated with financial crises in the 1990s and more recently.

1. Introduction

Local currency emerging market bonds were not a serious asset class for global investors a decade ago. Were emerging market countries to borrow internationally at a reasonably long maturity, about the only way to do so was to issue foreign-currency-denominated bonds. This strategy led to an overreliance on foreign currency debt and severe currency mismatches between assets and liabilities. Typically, currency mismatches survive during periods of fixed or stable exchange rates, but when the local currency depreciates, foreign currency borrowers face a dramatically increased debt burden and possible defaults and bankruptcy. Such episodes include Mexico (1994), Thailand (1997), Argentina (2002) and Iceland (2008).

At the core of currency mismatches and the associated currency crises is an inability to attract global investors to invest in the local currency bond markets. Indeed, in the 1990s local bond markets in many countries were so underdeveloped that many doubted they would ever truly materialize.

In this paper we take a fresh look at how local currency bond markets have developed and the extent to which countries have been able to attract foreign investors—specifically, due to data limitations discussed below, U.S. investors—to participate in their local bond markets. We find that while emerging bond markets are still small relative to those in advanced economies, there has been significant progress with a recent surge in local currency bond issuance and reduced reliance on foreign currency debt. We follow work by Kraus and Litzenberger (1976), de Athayde and Flores (2004), Harvey, Liechty, Liechty, and Muller (2003), and Burger and Warnock (2007), and sketch a model in which investors care about the mean, variance, and skewness of returns. In an

international setting such as ours, two other factors might also be important: barriers to international investment (see, for example, Black (1974), Stulz (1981), and Cooper and Kaplanis (1986)) and potential diversification benefits. We find some evidence that U.S. investors' bond portfolios are tilted toward markets that provide more potential diversification benefits, by far our strongest and most robust result is related to (the lack of) direct barriers to international investment: Countries with investor-friendly institutions and policies—specifically, fewer capital controls, greater market liquidity and efficiency, stronger regulatory quality and creditor rights, better market infrastructure, lower taxation, and a larger local institutional investor base—attract more U.S. investment. To the extent countries want to be able to borrow internationally in their currencies, these results point to concrete measures to be addressed in future financial sector development.

A study of international investment is worthy in its own right, but in this case a bigger issue lurks in the background. It can be argued that the ability of emerging market countries to develop their local currency bond markets and, relatedly, to attract investors (be they domestic or international) can make a vital contribution to global financial stability. That bond market development can improve stability *within* an emerging market country is obvious. By reducing reliance on foreign currency debt—and its concomitant currency mismatches—emerging economies would be less likely to experience a repeat of the Asian financial crisis (Goldstein and Turner 2004; Eichengreen and Hausmann 2005; Burger and Warnock 2006). Moreover, local bond markets play an important role in the broader goal of financial development, which in turn is linked to economic growth and poverty reduction (Levine 2005, 2008). Policymakers, academics, and market

participants now fully recognize the importance of a local currency bond market for a country's financial stability.[1]

Somewhat less recognized is the potential role of local currency bond markets in mitigating the global imbalances that many argue have contributed to the recent global financial crisis. Persistent global imbalances have attracted extensive analysis by academics and policymakers, and one school of thought emphasizes excessive borrowing by the U.S. economy in generating these imbalances. But an alternative hypothesis highlights the saving side of the equation and describes a global savings glut (Bernanke 2005). Continuing the focus on saving, Caballero, Farhi, and Gourinchas (2008a,b), henceforth CFG, suggest that the root cause of these imbalances is a shortage of sound and liquid financial instruments to act as a store of value for growing global wealth. In CFG's model the Asian financial crisis dealt a damaging blow to financial development in emerging economies around the globe. The resulting lack of reliable financial instruments in emerging economies channeled global saving toward industrial countries and in particular the U.S. One potential path toward global financial balance would involve improved financial market development in emerging economies that might attract cross-border investors from the developed and developing world alike. In Section 4 we develop this idea further and explore the implications of our work for global financial stability.

Relative to previous work and in addition to linking to global financial stability, our contributions are as follows. We present updated information on local currency bond

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[1] Global institutions, including the IMF, BIS, World Bank, and OECD, have highlighted the importance of local bond market development, and regional organizations such as the Asian Development Bank have championed the strategy. See, for example, BIS (2007), IMF (2006), Asian Bond Online (www.asianbondsonline.adb.org), and the World Bank Gemloc program (www.gemloc.org).

market development and returns in those markets; both of these are more important than one might think, as in almost all countries this is a relatively new asset class about which little is understood. Now that better bond returns data are available, we are able to extend (and update) the work of Burger and Warnock (2007) to take more seriously the roles of expected mean, variance, and skewness of returns in attracting (or deterring) global investors. Finally, we show, using an investability measure tailor made for international bond investment, the tangible steps countries could make in order to attract more global investment.

The paper proceeds as follows. In the next section we describe characteristics of local currency bond markets around the world, focusing on their development and returns characteristics. In Section 3 we analyze U.S. participation in local bond markets. Section 4 considers the implications of our results for *global* financial stability and Section 5 concludes.

2. Characteristics of Local Currency Bond Markets

In this section we assess two aspects of local currency bonds that are important to global investors: the returns they have offered and their supply.

2.1. Returns Characteristics of Local Currency Bonds

Burger and Warnock (2007) studied returns characteristics from 1998 to 2001. Two features stood out. First, over that sample period, for developed country bonds, hedged returns were much less volatile than unhedged returns, but unhedged bonds provided a more attractive skewness profile. Second, compared to developed bond

markets, emerging economy bond markets were much more volatile and exhibited significantly more negative skewness. We next extend these observations by analyzing more recent data for 2002-2006 and 2007-2009 (Table 1). Note that all returns used in this paper are of local currency bonds and are from the perspective of a U.S. investor (i.e., are translated back into U.S. dollars).

2.1.1 Developed Countries: Characteristics of Hedged and Unhedged Returns

Table 1 shows that in developed countries, from a U.S. investor's perspective, mean unhedged returns are greater or less than mean hedged returns depending on whether the dollar is depreciating or appreciating. During the dollar depreciation of 2002-2006, mean unhedged developed country bond returns were, at least ex post, very attractive. Unhedged foreign currency bonds will, however, deliver much greater volatility, and this 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, is notoriously volatile.[2] Indeed for the 2007-2009 period US dollar exchange rates were particularly volatile and this translated into elevated variance for unhedged foreign bond returns. Finally, for developed country bonds, the third moment (skewness) is typically more attractive for unhedged bonds; it is so in our sample (+0.79 v. -0.29 in the 2002-2006 period) and was also in the earlier Burger and Warnock (2007) sample. A plausible explanation of this relationship is that in months when developed countries experience a surge in domestic interest rates and thus large negative bond returns, the currency appreciates and eliminates the infrequent bad outcome for a U.S.-based investor. In developed country

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[2] Were there a negative covariance between currency and bond returns the variance of unhedged foreign currency positions would be reduced (Levich, 2001).

bond 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 usually associated with currency depreciations, recent events in the euro area notwithstanding.

2.1.2 Returns Characteristics of Less Developed Bond Markets

An interesting fact jumps out from Table 1: Over the 5-year period from 2002 to 2006, emerging market bonds dominated developed country bonds along a number of dimensions. They provided higher monthly mean returns, whether the currency risk was unhedged (1.22%) or hedged (0.61%). The volatility was comparable if not less than that in developed countries, the skewness was generally small in magnitude, and the low correlation with US bond returns offered significant diversification benefits. Even through the crisis (evident in the 2007-2009 sample) emerging market bond returns had favorable characteristics.

The recent returns characteristics for emerging market bonds are far more favorable than those for previous periods. As Burger and Warnock (2007) showed, in the period ending 2001 emerging market bonds were much more volatile and exhibited significantly more negative skewness than developed country bonds, whether returns were assumed to be hedged or not. At that time Burger and Warnock opined that the fact that less developed bond markets were characterized by higher variance and more negative skewness highlighted a distinct difference between emerging market and developed country bonds: Periods of negative bond returns for emerging markets did not coincide with currency appreciations. To the contrary, periods of rising interest rates often occurred during an episode of financial flight and currency depreciation—the makings of a currency crisis. In contrast, in the Naughties, as more and more emerging

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markets have achieved improved policy stability, emerging markets have been successful in eliminating the joint bad outcomes (from the perspective of a global bond investor) of losses on bonds and a depreciating currency.

2.1.3 Lessons from Returns Data

Lessons from returns data can be summarized with the help of efficient frontiers. In Figure 1 we generate three efficient frontiers to illustrate the risk-return tradeoffs facing a U.S.-based fixed income investor. Each frontier includes a range of portfolios varying from 100% U.S. bonds to 100% foreign bonds (labeled 'ROW'). The figure includes three measures of the rest-of-world (ROW) portfolio: (1) an *unhedged* portfolio of 80% industrial and 20% emerging market bonds, (2) a *hedged* portfolio of 80% industrial and 20% emerging market bonds, and (3) a 50-50 combination of (1) and (2).

For the purpose of analyzing foreign participation in local currency bond markets, there are a few important lessons from the frontiers. First, attracting cross-border investment in local currency bonds can be impeded by the significant currency risk facing foreign investors. From the perspective of a U.S. investor, adding unhedged foreign bonds significantly increases portfolio risk. In this period (2002-2006), the added risk happened to be compensated by strong returns (because of the falling U.S. dollar), but in the earlier period the additional risk was rewarded with substantially lower returns (because the dollar was appreciating).[3] The figure also indicates the gains to diversification from adding hedged foreign bonds, which over this period (and earlier

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[3] Figure 1 depicts the risk-return profiles of hedged (dashed line) and unhedged (solid line) bond portfolios for the period from January 2002 to November 2006. On each line, portfolios vary from 100 percent U.S. bonds (at the end labeled 'US') to 100 percent foreign bonds (at the end labeled 'ROW'). The hedged frontier in the figure is very similar to the hedged frontier in Burger and Warnock for periods ending in 2001, but the unhedged frontier from that earlier period was downward sloping (ROW bonds brought with them increased risk and *less* reward). In an even earlier period (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.

periods) reduced portfolio risk without deteriorating returns. A mix of hedged and unhedged bonds provided a particularly attractive risk-return tradeoff over this period, suggesting that global investors will likely prefer bonds in countries where the currency risk can be hedged. Otherwise a cross-border investment is largely a currency play (with some yield) in an instrument that might not be as liquid as desired.

2.2. The Supply of Local Currency Bonds

A decade ago many doubted if bond markets in emerging economies would ever develop. One aspect of this thinking was the "original sin" hypothesis, which, in its strongest form, suggested that emerging markets were forever doomed to have small, inconsequential bond markets.[4] It proposed that small countries were born with a condition that precluded the development of a local bond market, no matter how hard they tried, no matter which policies they put in place, and no matter which institutions they developed.

Were original sin to hold, essentially nothing—other than country size—should correlate with bond market development. But one reason to reassess the original sin hypothesis is that study after study has documented various factors that are associated with and influence local currency bond market development. That countries can (and have) put in place institutions and policies that foster the development of debt markets has been documented by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997); Burger and Warnock (2006); Claessens, Klingebiel, and Schmukler (2007); Jeanne and Guscina (2006); Eichengreen and Luengnaruemitchai (2006); and Mehl and Reynaud (2005).

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[4] On the original sin hypothesis, see Eichengreen and Hausmann (1999, 2005), among others. The view has since evolved to the extent that it is now focused on its much narrower form, the unlikelihood of emerging market currencies becoming truly international.

To evaluate the current state of bond market development we gathered data for 52 countries (Table 2). Not surprisingly, most bonds—almost 94% of the $67 trillion global bond market—are issued by developed countries. In some developed countries—the United States, Japan, Denmark, and euro area (except Finland)—the size of local currency bond markets exceeds annual GDP, while other developed countries tend to have somewhat smaller local bond markets. Bonds issued by entities from developed countries are also almost exclusively in the local currency, although there are some exceptions (see last column of Table 2).

In contrast, local currency bond markets in emerging economies tend to be smaller (on average, less than one-third of annual GDP) and make up a slightly smaller portion of their overall bond markets. The relatively small size of bond markets in these countries can be taken as evidence of financial underdevelopment. Moreover, currency mismatches persist. While we do not have information on the currency composition of these countries' assets, for most (except, perhaps, major commodities producers) it can be assumed that assets and income flows are primarily denominated in the local currency. Compare that to the currency composition of bond liabilities (last column of Table 2). For developed countries, most bonds (90%, on average) are denominated in the local currency. But for emerging economies, especially those in Latin America, the share of local currency bonds is lower.

Table 3 shows the evolution of the size of local currency bond markets and their share of all bonds outstanding, both of which point to the progress in emerging economies. Local currency bond markets have grown in size relative to GDP and

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emerging economies have become much less reliant on foreign-currency-denominated bonds.

Importantly, the data in Table 3 suggest that emerging economies are not predestined to rely on foreign currency borrowing and do in fact have the capacity to develop local currency bond markets. Currency mismatches have also improved. For example, whereas in 2001 Latin American bonds were about half in the local currency and half in foreign currencies, by 2008 over 70 percent of their outstanding bonds were local-currency denominated.[5]

3. Foreign Participation in Local Bond Markets

In this section we present data on the extent of cross-border investment and analyze the factors that attract foreign participation. Ideally, we would study all foreign investors' positions in local currency bonds, but unfortunately such a study is not currently possible. Although one broad multilateral database does exist—namely the IMF's Coordinated Portfolio Investment Survey (CPIS) data—it does not include vital information about the *currency denomination* of bond holdings.[6] What we can do is provide a formal analysis of the 2006 and 2008 benchmark surveys of one large set of international investors—U.S. cross-border investors. The surveys provide reliable evidence on the change in U.S. positions in local currency bonds since the previous (2001) benchmark survey.

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[5] One stark counter example in Table 3 is Iceland. In 2006 it had the largest (as a share of GDP) bond market of all countries in our sample, with bonds totaling 396% of GDP, as well as a severe currency mismatch with 40% of its bonds being denominated in foreign currency. After its depreciation and crisis, its bond market has shrunk to 104% of GDP, but the currency mismatch remains.

[6] Papers on cross-border bond investment that utilize CPIS data include Lane (2006) and Fidora, Fratzscher, and Thimann (2007). With our focus on local currency bonds, we cannot use CPIS data.

3.1 The Extent of U.S. Holdings of Local Currency Bonds

Earlier benchmark surveys of U.S. investors reveal an overwhelming preference for bonds denominated in U.S. dollars. Burger and Warnock (2007), who analyze U.S. investors' end-2001 holdings of the local currency bonds of 41 countries, report nearly zero participation in local-currency bond markets in emerging economies and find a particular aversion to the most volatile markets. But, as highlighted in Section 2, since 2001 there have been dramatic changes to local currency bond markets. Emerging economies have greatly reduced their reliance on foreign currency debt and focused efforts on developing local currency bond markets. We turn to evidence from the 2006 and 2008 benchmark surveys of U.S. investment abroad to analyze how U.S. investors have responded to these developments.

Table 4 shows U.S. investor participation in local currency bonds as of the end of 2001, 2006, and 2008. Participation is measured as a percentage of local currency bonds outstanding. Participation in emerging local currency bond markets has increased sharply since 2001. Participation is still very limited in Emerging Asia, at 0.23 percent (on average), but is up from near zero in 2001 and is reasonably large in some countries such as Indonesia and Malaysia. In local-currency Latin American bonds U.S. participation has increased dramatically to a level of 2.6 percent by end-2008, triple the share U.S. investors held of developed markets. In fact, for developed markets as a whole U.S. investors have steadily *reduced* their holdings as a percentage of outstanding bonds. The data therefore convey a shift in U.S. investor portfolio weights away from developed countries, and toward emerging economies.

3.2 Returns Characteristics, Investability, and U.S. Participation

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 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), de Athayde and Flores (2004), Harvey, Liechty, Liechty, and Muller (2003), and Burger and Warnock (2007) 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.[7] Specifically, we assume that investors choose a vector of portfolio weights, ω, to maximize utility that is a function of (expected) returns x, variance V_x, and skewness S_x:

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

where $\quad V_x = (x - \overline{m})(x - \overline{m})' \qquad (2)$

$$S_x = V_x \otimes (x - \overline{m})' \qquad (3)$$

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

and λ and γ are the relative utility weights on variance and skewness, respectively. Alternatively, investors can determine the optimal portfolio by minimizing variance

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[7] 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.

subject to expected returns (net of costs) and skewness. Analytical solutions to this

optimization problem are rather complicated—see Harvey et al. (2003) and de Athayde

and Flores (2004), who note that feasible solutions can be calculated in most cases—but

take the general form:

$$\omega = f(\overset{+}{x}, \overset{-}{V}_x, \overset{+}{S_x}) \tag{5}$$

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 should also control for barriers to international

investment and potential diversification benefits. 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.[8] As a proxy for potential diversification benefits, we include

the correlation of each country's bond returns with U.S. bond returns ($corr_i$), calculated

over a 36-month period.

Thus, our empirical exercise in this section assesses the extent to which barriers to

international investment, potential diversification benefits, and expected mean, variance,

and skewness of returns affect U.S. portfolio allocations. Specifically, we are interested

in relationships of the following form:

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[8] For portfolio allocation models with barriers to international investment, see Black (1974), Stulz (1981), and Cooper and Kaplanis (1986).

$$\omega = f(\overset{+}{x}, \overset{-}{V}_x, \overset{+}{S}_x, \overset{-}{Barriers}, \overset{-}{Corr}) \tag{6}$$

Empirical implementation of this model requires two things: measures of the expected mean, variance, and skewness of returns and a measure of barriers to international investment. We discuss these next.

To compute expected mean, variance, and skewness of returns, we assume cross-border investors have a one-year horizon; thus, we estimate one-year ahead expectations. Because lagged realizations of mean, variance, and skewness will likely inform expectations (at least to some extent), to form expectations we use the dynamic panel-data model of Blundell and Bond (1998).

$$y_{it} = \sum_{j=1}^{p} \alpha_j y_{i,t-j} + x_{it}\beta_1 + w_{it}\beta_2 + v_i + \varepsilon_{ti} \tag{7}$$

for $i=\{1,\ldots,N\}$ and $t=\{1,\ldots,T_i\}$, where y_{it} is one-year ahead mean, variance, or skewness of country i's USD returns, x_{it} are strictly exogenous explanatory variables, w_{it} are predetermined explanatory variables, and v_i are country-level panel effects. Using annual data, we include in these first stage regressions two lags of the dependent variables as well as exogenous or predetermined variables such as exchange rate movements, bond yields, inflation, and current account balances. Regression results are shown in Table 5. Expected mean returns are higher in countries with higher lagged mean returns, higher yields, lower inflation, more currency depreciation, and better current account balances. All of the signs are as expected except that on the currency change. Expected skewness

and expected volatility are best estimated with own lags. Importantly, the correlations between predicted mean, variance, and skewness and their realized values are reasonably high and statistically significant, suggesting that our regressions provide reasonable estimates of the expected mean, variance, and skewness of international bond returns.

For barriers to international investment, we use the inverse, an openness measure called *Investability*, which was custom-made for cross-border investment in local currency bonds. CRISIL (2008, 2009) provides the bulk of data for *Investability*. Somewhat similar to the country-level investability measures for equities devised in Edison and Warnock (2003), CRISIL (in cooperation with the World Bank) created investability scores for a range of emerging economy local currency bond markets. In the CRISIL data, there are six broad components to investability: capital controls, market liquidity and efficiency, regulatory quality and creditor rights, market infrastructure, taxation on bonds, and the size of the local institutional investor base. Capital controls data are from AREAER (2007) and countries are scored on three indicators that are particularly relevant from the perspective of investment in local currency bond market: access to securities market, access to domestic money market, and access to the derivatives market. The market liquidity and efficiency measure is formed by combining four variables: secondary market turnover ratio, bid-ask spread, existence of a yield curve, and existence of centralized bond price data. Regulatory quality and creditor rights are taken from the World Bank's Regulatory Quality Index (Worldwide Governance Indicators) and Creditor Rights Index (Doing Business). Market infrastructure indicators cover efficiency of clearing and settlement systems, safety and soundness of safekeeping arrangements, and efficiency of asset servicing. Effective tax rates are from the

perspective of a Luxembourg-based institutional investor. Finally, investor base is the size of institutional investor base (pension and mutual funds) as a share of GDP. For complete details, see CRISIL (2008, 2009).

The CRISIL investability data for 2006 are available for the 20 Gemloc countries; coverage was expanded to 34 countries in 2008.[9] In addition, we added roughly 20 developed countries by creating similar indices. We started with the assumption that developed countries obtain the maximum score for each component and then adjusted those scores as we gathered information. For readily available data, such as capital controls and the components of regulatory quality and creditor rights, this task is straightforward. For an item such as market infrastructure we were not able to gather data, but here assuming the maximum score for developed markets seems particularly plausible.[10]

Armed with an openness measure and measures of the expected mean, variance, and skewness of returns, we are interested in Tobit regressions of the following type:

$$\frac{\omega_{i,us}}{\omega_{i,m}} = \alpha_0 + \alpha_1 Investability_i + \alpha_2 x_i + \alpha_3 V_i + \alpha_4 S_i + corr_i + \varepsilon_i \qquad (8)$$

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 ($\omega_{i,m}$); $Investability_i$ is a measure of investability; x_i, V_i, and S_i are the expected mean, variance, and skewness of returns as of

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[9] The World Bank's Global Emerging Markets Local Currency Bond (Gemloc) Program supports the development of local currency bond markets in developing countries.
[10] We deviated from this in creating investability data for four additional countries: Greece (which we assumed scored slightly better than Turkey), Portugal (average of Greece and Spain), Czech Republic (average of Poland and Slovakia), and Korea (assumed to score similar to Chile). If we omit these four observations, results are nearly identical to our reported results.

the end of the year; and $corr_i$ is the 3-year correlation of the bond returns of country i with U.S. bond returns.

We make one minor transformation before estimation. Note that $\omega_{i,us}/\omega_{i,m}$ is a constant times the percentage of a country's bond market held by U.S. investors. Let $\sum_{i=1}^{N} H_i^{US}$ be total U.S. holdings of all countries' bonds and $\sum_{i=1}^{N} MCap_i$ be the size of all countries' bond markets. At a point in time the expression $\sum_{i=1}^{N} H_i^{US} / \sum_{i=1}^{N} MCap_i$ is a constant (call it X) equal to the relative size of U.S. investors (i.e., the share of U.S. holdings relative to the world market). Then $\omega_{i,us}/\omega_{i,m}$ can be written as

$$\frac{\omega_{i,US}}{\omega_{i.m}} = \frac{H_i^{US}/MCap_i}{X} \tag{9}$$

In a cross-sectional regression, X will become part of the constant term. Variation in $\omega_{i,us}/\omega_{i,m}$ will be given by variation in the percentage of a country's bond market held by U.S. investors j, which we denote by v_i^{US}. Define v_i^{US} as

$$v_i^{US} = H_i^{US} / MCap_i \tag{10}$$

For purely expositional reasons, in our regressions we will use v_i^{US} (as displayed in Table 4), which at a point in time is observationally equivalent to $\omega_{i,us}/\omega_{i,m}$. Our baseline specification is

$$v_i^{US} = \alpha_0 + \alpha_1 Investability_i + \alpha_2 x_i + \alpha_3 V_i + \alpha_4 S_i + corr_i + \varepsilon_i \qquad (11)$$

Empirical results are presented in Table 6. The dependent variable in each

regression is v_i^{US} as of end-2006 or end-2008.[11] The results indicate that countries with

higher scores on the aggregate investability index and, separately, most of the individual

subindices are able to attract significantly more U.S. investment into local currency bond

markets. The expected mean, variance, and skewness of returns are generally not

significant, although expected mean is marginally significant in some of the end-2006

regressions. There is also some evidence that U.S. investment is greater in countries that

offer more potential diversification benefits.

One might be concerned that the significance of the investability indicators in

Table 6 is driven by the inclusion of both developed and emerging markets. As a

robustness check, we estimate and plot the relationship between CRISIL's investability

index and U.S. investor positions as of end-2006 for the twenty emerging markets

included in the Gemloc program (Figure 2). Even when restricting the analysis to

emerging markets the relationship is positive and statistically significant.[12]

With data for two points in time, it is reasonable to ask what drove portfolio

reallocations over this period. However, with so few countries, a formal analysis of that

quickly runs into problems with degrees of freedom. Cursory analysis of the changes in

portfolio weights from 2006 to 2008 (not shown) suggests that U.S. investors moved

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[11] Colombia is excluded from this analysis (and hereafter) because, as displayed in Table 4, it represents an outlier in terms of the extremely large percentage of Colombian peso-denominated bonds held by U.S. investors.

[12] While all of the underlying subcomponents are positively related to U.S. investment in the Gemloc subsample, only a few—namely taxation and liquidity and efficiency—are significant. The lack of statistical significance for some indicators could, of course, be due to the limited number of observations in the Gemloc subsample.

toward markets in which they had smaller initial (2006) positions and that had higher expected returns as of end-2006. As Table 4 indicated, many of the increases in U.S. investment occurred in emerging markets.

Overall, the analysis in this section suggests growing participation by U.S. investors in emerging local currency bonds. Our empirical results firmly establish a concrete set of policy settings and institutional factors that are linked to higher cross-border participation. Moreover, improving the investability of local currency bond markets in emerging economies would not only attract foreign investors but would likely reduce the flight of domestic saving to rich world instruments and therefore play a role in reducing global imbalances, a point we turn to next.

4. Global Financial Stability through Investability

Our analysis, which is useful from an investments perspective, also plays an important role in identifying changes that could mitigate the persistent global imbalances that some think are at the heart of the current crisis. For example, Caballero, Farhi, and Gourinchas (2008a,b) suggest that the root cause of global imbalances is a shortage of sound and liquid financial instruments to act as a store of value for growing global wealth. The Asian financial crisis dealt a damaging blow to financial development in emerging economies around the globe. The resulting lack of reliable financial instruments in emerging economies channeled global saving toward industrial countries and in particular the U.S.[13] As highlighted in Warnock and Warnock (2009), the resulting flows (mostly from emerging markets) into U.S. bond markets was an important factor behind

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[13] This is consistent with the Forbes (2009) evidence that countries with less developed domestic financial markets hold more U.S. assets.

the low long-term interest rates that, some have argued, stoked the subsequent global crisis.

Along this line of thinking, one potential path toward global financial stability would involve improved financial development in emerging markets that might attract cross-border investors from the developed and developing economies alike. With more prospects at home, wealth in emerging economies might be less likely to flow to developed economies.

Local bond markets in some countries have made significant strides as indicators of bond market growth attest (presented in Section 2). This is not surprising, as many countries have made progress on the institutional and macroeconomic preconditions for bond market development. The academic literature has shown that countries with better historical inflation performance (an outcome of creditor-friendly policies) and stronger rule of law have more developed local bond markets, both sovereign and corporate (Burger and Warnock 2006). Moreover, the necessary conditions for bond market development are very similar to those that foster development of the banking system. Countries in which people are not willing to become creditors—at one extreme this is an unwillingness to deposit money in banks—tend to have undeveloped banking systems and underdeveloped bond markets. After the East Asian financial crisis, and especially since 2001, many emerging markets have made important progress on the institutional and macroeconomic fronts.

Emerging bond market development and cross-border participation can help mitigate global imbalances. As such, it is worthwhile to focus in on four countries— Brazil, Russia, India, and China (or the BRICs)—that represent the bulk of economic

power among emerging economies. Table 7 displays the end-2008 size of local currency bond markets along with CRISIL's investability scores for the BRICs. For comparison purposes the top investability score and top scorer for each category are also reported. In line with the shortage of financial instruments theory, the BRICs have small local bond markets (outstandings as a percentage of GDP). Looking at the investability indicators, which we have shown are related to outsider participation, we see there is plenty of room for improvement. China, for example, has the second lowest score among the 34 Gemloc countries in the category of capital account openness (only Venezuela scores worse). All of the BRICs score relatively poorly on the regulatory quality and creditor rights indicator but each has improved its score in this important category since 2006. Creditor rights have been linked empirically to the ability to both develop local currency bond markets *and* attract cross-border participation.

The summary measures in Table 7 suggest that there is significant potential for further development of local currency bond markets in the largest emerging economies. Clearly, institutional upgrades will be necessary to improve the environment for bond issuers and investors, but there are plenty of successful examples to follow among emerging economies. Further development of local bond markets in these large and rapidly growing economies has the potential to reduce the global assent shortage and could therefore enhance financial stability.

5. Conclusion

The recovery of emerging economies from the string of crises in the late 1990s was remarkable in many ways, not the least of which has been the development of local

currency bond markets. After suffering the consequences of currency mismatches, many emerging economies have established the necessary institutional framework and pursued creditor-friendly policies in an effort to develop local bond markets. These efforts have borne fruit. In the period between 2001 and 2008 we document a substantial increase in local currency bond market development and a reduced reliance on foreign currency bonds. In fact, the most vulnerable area in 2001, Latin America, has made the most dramatic progress.

This study looks into the response by cross-border investors to these developments in local currency bond markets. We focus on U.S. investors due to a lack of reliable international source for cross-border investment in local currency bonds. The most frequently referred source, the IMF's CPIS database, unfortunately, is inadequate because it does not contain information on the currency denomination of bond holdings. We use instead 2006 and 2008 benchmark surveys, which provide details on U.S. investment relevant to the study.

The survey data reveals a shift by U.S. investors into local currency emerging market bonds. Our empirical analysis indicates that cross-border participation in local currency bonds is highest in countries where investor-friendly institutions and policies have been established. For emerging economies seeking to broaden their investor base by appealing to international investors, our results are potentially good news. Many of the investability factors that appeal to cross-border investors can improve and are within the control of the host country. It is not surprising that capital controls and taxation impede cross-border investment, but potential host countries should also think carefully about regulatory quality and creditor rights.

There is cause for both optimism and caution when assessing the potential role of emerging local currency bond markets in mitigating the global asset shortage. On a promising note the 2001-2008 period witnessed a surge in local currency issuance by emerging economies *and* increased participation by cross-border investors. Our empirical results identify the importance of specific factors that international investors consider before taking a position in local currency bonds. These investability factors could form a blueprint for further development of local bond markets in emerging economies.

We must also be cautious in our assessment of emerging local bond markets. First, we seek to emphasize that local currency borrowing in emerging economies is possible and that under certain conditions has been demonstrated to be attractive to cross-border investors. We are not suggesting, however, that larger bond markets (and more borrowing) in emerging economies should necessarily be encouraged, although all else equal borrowing by issuing local currency bonds should dominate foreign-currency borrowing. Second, we emphasize that while much of the 2000s were remarkably stable for emerging economies, that period of tranquility has clearly come to an end. The global financial crisis has generated significant stress in emerging economies and local currency bond markets have not been spared. During the recent crisis many emerging economies suffered significant (albeit, for most, short-lived) currency depreciations, but thanks to reduced reliance on foreign-currency-denominated bonds there were few instances of exploding foreign currency debt burdens. Also, although there were some reports of flight from local currency assets, our data indicate that, on average, US investors maintained their positions in emerging local bond markets as of end-2008.

References

AREAER, 2007. Annual Report on Exchange Arrangements and Exchange Restrictions (Washington, DC: IMF).

Bank for International Settlements, 2007. Financial stability and local currency bond markets. CGFS Papers No. 28.

Bernanke, B. 2005. The Global Saving Glut and the U.S. Current Account Deficit. Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, Federal Reserve Board.

Black, F., 1974. International Capital Market Equilibrium with Investment Barriers. *Journal of Financial Economics* 1(4): 337-352.

Blundell, R., and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115–143.

Burger, J., and F. Warnock, 2006. Local Currency Bond Markets. *IMF Staff Papers* 53: 115-132.

Burger, J., and F. Warnock, 2007. Foreign Participation in Local Currency Bond Markets. *Review of Financial Economics* 16(3): 291-304.

Caballero, Farhi, and Gourinchas 2008a. An Equilibrium of "Global Imbalances" and Low Interest Rates. *American Economic Review* 98(1): 358-393.

Caballero, Farhi, and Gourinchas 2008b. Financial Crash, Commodity Prices and Global Imbalances. Forthcoming *Brookings Papers on Economic Activity*.

Claessens, S., D. Klingebiel, and S. Schmukler, 2007. Government Bonds in Domestic and Foreign Currency: The Role of Macroeconomic and Institutional Factors. *Review of International Economics* 15(2), 370-413.

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.

CRISIL, 2008. Gemloc Investabilty Indicators. Manuscript.

CRISIL, 2009. GEMLOC Investibility Indicators – Phase 2 extension. International Finance Corporation.

de Athayde, G., 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.

Edison, H. and F. Warnock, 2003. A simple measure of the intensity of capital controls. *Journal of Empirical Finance*. 10(1): 2003 pp. 81-103.

Eichengreen, B., and R. Hausmann, 1999. Exchange rates and financial fragility. Proceedings, Federal Reserve Bank of Kansas City, pages 329-368.

Eichengreen, B., and R. Hausmann, 2005. *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*. Chicago: University of Chicago Press.

Eichengreen, B., and P. Luengnaruemitchai, 2006. Why Doesn't Asia Have Bigger Bond Markets? in *Asian Bond Markets: Issues and Prospects* (BIS Paper No. 30).

Fidora, M., M. Fratzscher, and C. Thimann, 2007. Home Bias in Global Bond and Equity Markets: The Role of Real Exchange Rate Volatility. *Journal of International Money and Finance* 26: 631-655.

Forbes, K. 2009. Why do foreigners invest in the United States? *Journal of International Economics*, forthcoming.

Goldstein and Turner, 2004. *Controlling Currency Mismatches in Emerging Economies*. Institute for International Economics, Washington, D.C.

Harvey, C., J. Liechty, M. Liechty, and P. Muller, 2003. Portfolio Selection with Higher Moments. Mimeo, Drexel University (Philadelphia).

International Monetary Fund, 2006. Assessing Global Financial Risks, *Global Financial Report*, p. 1-44.

Jeanne, O., and A. Guscina, 2006. Government Debt in Emerging Market Countries: A New Data Set. IMF Working Paper 06/98.

Kraus, A., and R. Litzenberger, 1976. Skewness Preferences and the Valuation of Risk Assets. *Journal of Finance* 31(4): 1085-1100.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, R. Vishny, 1997. Legal Determinants of External Finance. *Journal of Finance* 52(3): 1131-1150.

Lane, P., 2006. Global Bond Portfolios and EMU. *International Journal of Central Banking* 2(2): 1-23.

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. 2005. Finance and Growth: Theory and Evidence. *Handbook of Economic Growth* ed. Phillipe Aghion and Steven N. Durlauf, Amsterdam: Elsevier.

Levine, R. 2008. Finance and the Poor. *The Manchester School* 76(1): 1-13.

Mehl, A. and J. Reynaud, 2005. Domestic original sin in emerging market economies. ECB Working Paper No. 560.

Stulz, R., 1981. On the Effects of Barriers to International Investment. *Journal of Finance*, 36: 923-934.

Treasury Department, FRBNY, and Federal Reserve Board, 2002. Report on Foreign Portfolio Investment in the United States as of December 31, 2001.

Treasury Department, FRBNY, and Federal Reserve Board, 2007. Report on Foreign Portfolio Investment in the United States as of December 31, 2006.

Treasury Department, FRBNY, and Federal Reserve Board, 2009. Report on Foreign Portfolio Investment in the United States as of December 31, 2008.

Warnock, F., and V. Warnock, 2009. International capital flows and U.S. interest rates. *Journal of International Money and Finance* 28: 903-919.

Table 1. Monthly US$ Returns of Local Currency Bonds

The table shows returns characteristics of local currency bonds. Returns are monthly, reported in U.S. dollars, and for various periods. Industrial Countries refers to the JP Morgan GBI Global excluding U.S. Bond Index (Japan, Germany, France, Italy, UK, Spain, Belgium, Canada, Netherlands, Denmark, Sweden, Australia). Emerging Markets refers to the JP Morgan GBI-EM Broad Index (Brazil, Chile, Colombia, Czech Republic, Hungary, Indonesia, Malaysia, Mexico, Poland, Slovakia, South Africa, Thailand, Turkey, Russia, India, China). For the 1998-2001 period, local currency emerging market bond returns indices did not exist, so we calculated returns based on EMBI/JACI plus currency returns and averaged across 20 Emerging Market Economies.

	Mean Return (%)	Variance	Skewness	Correlation with U.S. returns
2007 to 2009				
U.S. Bonds	0.52	2.96	0.44	1.00
Unhedged Foreign Bonds				
Industrial Countries	0.60	9.72	-0.17	0.60
Emerging Markets	0.61	12.30	-0.75	0.09
Hedged Foreign Bonds				
Industrial Countries	0.43	0.77	0.03	0.82
Emerging Markets	0.31	1.80	1.91	0.44
2002 to 2006				
U.S. Bonds	0.40	2.34	-0.70	1.00
Unhedged Foreign Bonds				
Industrial Countries	1.04	6.60	0.79	0.42
Emerging Markets	1.22	4.21	-0.30	0.23
Hedged Foreign Bonds				
Industrial Countries	0.39	0.48	-0.29	0.79
Emerging Markets	0.61	0.97	0.62	0.35
1998 to 2001				
Unhedged Foreign Bonds				
U.S.	0.52	1.89	-0.21	1.00
Industrial Countries	0.11	6.10	0.08	0.49
Emerging Markets	-0.03	58.7	-0.94	0.12

Table 2. Bond Markets, 2008.

Data on international bonds are from security-level data underlying BIS Quarterly Review 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 Quarterly Review Table 16A - Domestic Debt Securities, and the local currency portion of Table 14B. The groupings of advanced and emerging economies follow IMF groupings as of April 2006. See http://www.imf.org/external/pubs/ft/weo/2006/01/data/groups.htm#1.

	Total	Local Currency Denominated		
	(billion US$)	(billion US$)	(% of GDP)	(% of total)
ADVANCED ECONOMIES	62,581	56,537	137	90
USA	24,363	23,399	162	96
Euro Area	20,306	18,673	140	92
Austria	677	573	138	85
Belgium	764	749	148	98
Finland	178	159	58	89
France	3,429	3,178	111	93
Germany	4,143	3,740	102	90
Greece	400	392	111	98
Ireland	1,150	899	336	78
Italy	4,030	3,957	171	98
Netherlands	2,419	1,994	227	82
Portugal	327	325	133	100
Spain	2,789	2,706	169	97
Other	17,912	14,466	106	81
Australia	683	342	32	50
Canada	1,198	902	60	75
Denmark	695	593	174	85
Hong Kong SAR	72	38	18	53
Iceland	66	17	104	27
Israel				
Japan	9,207	9,147	187	99
New Zealand	28	17	13	61
Norway	261	115	26	44
Singapore	123	82	44	67
South Korea	872	771	83	88
Sweden	508	301	63	59
Switzerland	274	261	52	95
United Kingdom	3,910	1,879	70	48

Table 2. Bond Markets, 2008 (continued)

	Total	Local Currency Denominated		
	(billion US$)	(billion US$)	(% of GDP)	(% of total)
EMERGING ECONOMIES	**4,026**	**3,420**	**23**	**85**
Europe	**691**	**487**	**14**	**70**
Croatia	13	7	10	54
Czech Republic	69	57	26	83
Hungary	97	59	38	61
Poland	170	127	24	75
Russia	102	42	3	41
Slovakia	29	23	25	82
Turkey	212	171	23	81
Latin America	**898**	**643**	**16**	**72**
Argentina	114	56	17	49
Brazil	324	256	16	79
Chile	52	39	23	75
Colombia	22	8	3	37
Mexico	321	260	24	81
Peru	24	16	13	67
Venezuela	41	8	2	19
Asia	**2,332**	**2,205**	**31**	**95**
China	1,468	1,451	32	99
India	388	358	30	92
Indonesia	67	53	10	80
Malaysia	172	148	67	86
Pakistan	20	17	11	86
Philippines	68	36	21	53
Thailand	150	142	52	95
Other	**104**	**84**	**11**	**80**
Egypt				
Morocco				
Nigeria				
South Africa	99	84	30	84

Table 3. The Evolution of Bond Market Development.
The table depicts data on local currency bond market development for 2001, 2006, and 2008. See
Table 2 for details.

	Local Currency Denominated Bonds						
	% of GDP				% of Total		
	2001	2006	2008		2001	2006	2008
ADVANCED ECONOMIES	**105**	**130**	**137**		**93**	**91**	**90**
USA	**130**	**150**	**162**		**98**	**96**	**96**
Euro Area	**96**	**139**	**140**		**89**	**91**	**92**
Austria	91	133	138		74	82	85
Belgium	129	129	148		97	97	98
Finland	49	75	58		76	89	89
France	82	112	111		91	92	93
Germany	95	118	102		92	91	90
Greece	74	106	111		89	97	98
Ireland	46	235	336		65	74	78
Italy	119	162	171		96	97	98
Netherlands	164	241	227		74	81	82
Portugal	65	110	133		90	98	100
Spain	60	156	169		93	97	97
Other	**81**	**100**	**106**		**87**	**82**	**81**
Australia	30	41	32		56	52	50
Canada	69	65	60		72	77	75
Denmark	138	177	174		88	85	85
Hong Kong SAR	15	20	18		56	53	53
Iceland	91	396	104		66	60	27
Israel							
Japan	110	158	187		99	99	99
New Zealand	22	17	13		64	57	61
Norway	27	31	26		54	50	44
Singapore	37	40	44		69	61	67
South Korea	85	94	83		91	91	88
Sweden	56	72	63		62	65	59
Switzerland	60	57	52		97	95	95
United Kingdom	46	65	70		62	52	48

Table 3. The Evolution of Bond Market Development (continued)

	% of GDP				% of Total		
	2001	**2006**	**2008**		**2001**	**2006**	**2008**
EMERGING ECONOMIES	**19**	**24**	**23**		**70**	**81**	**85**
Europe	**17**	**20**	**14**		**64**	**72**	**70**
Croatia	9	13	10		33	49	54
Czech Republic	14	30	26		85	87	83
Hungary	28	46	38		60	66	61
Poland	20	33	24		86	76	75
Russia	2	3	3		13	41	41
Slovakia	26	28	25		68	81	82
Turkey	36	33	23		78	83	81
Latin America	**16**	**19**	**16**		**51**	**67**	**72**
Argentina	14	30	17		29	50	49
Brazil	20	15	16		59	69	79
Chile	45	24	23		77	71	75
Colombia	6	5	3		31	36	37
Mexico	16	26	24		59	79	81
Peru	12	12	13		60	54	67
Venezuela	5	3	2		25	19	19
Asia	**23**	**29**	**31**		**90**	**93**	**95**
China	18	28	32		95	98	99
India	26	32	30		97	95	92
Indonesia	27	15	10		96	87	80
Malaysia	57	61	67		77	79	86
Pakistan	22	15	11		96	90	86
Philippines	22	27	21		48	50	53
Thailand	30	51	52		81	92	95
Other	**13**	**23**	**11**		**80**	**88**	**80**
Egypt							
Morocco							
Nigeria							
South Africa	32		30		87		84

Table 4. U.S. Participation in Local Currency Bond Markets

The table shows the percent of each country's local currency bonds held by U.S. investors as of the end of 2001, 2006, and 2008. Data are from author's calculations using data on U.S. investment from Treasury Department et al. (2002, 2007, 2009) and the size of local currency bond markets (mostly from BIS; see Table 2 for details).

	2001	2006	2008		2001	2006	2008
EMERGING ECONOMIES	**0.17**	**0.81**	**0.81**	**ADVANCED ECONOMICS**	**1.17**	**0.93**	**0.81**
Europe	**0.51**	**1.08**	**0.96**	**Euro Area**	**1.37**	**0.72**	**0.65**
Croatia	0.00	0.00	0.00	Austria	0.43	0.28	0.14
Czech Republic	0.11	0.02	0.07	Belgium	0.92	0.65	0.61
Hungary	1.15	1.20	2.56	Finland	0.92	0.59	0.34
Poland	1.46	3.35	2.27	France	1.34	1.18	0.88
Russia	0.08	0.05	0.24	Germany	2.12	1.12	1.47
Slovakia	0.00	1.53	0.01	Greece	1.42	0.41	0.21
Turkey	0.00	0.01	0.06	Ireland	1.01	1.13	0.58
				Italy	0.72	0.20	0.22
Latin America	**0.15**	**2.03**	**2.60**	Netherlands	1.19	0.87	0.64
Argentina	0.20	3.73	0.61	Portugal	0.22	0.14	0.07
Brazil	0.07	2.93	3.32	Spain	1.56	0.19	0.14
Chile	0.04	0.00	0.04				
Colombia	0.00	17.63	40.53	**Other**	**1.00**	**1.20**	**1.02**
Mexico	0.27	0.85	1.53	Australia	2.84	1.95	2.26
Peru	0.00	0.54	2.01	Canada	4.38	4.79	4.91
Venezuela	0.26	0.89	2.71	Denmark	1.02	1.72	1.35
				Hong Kong SAR	0.29	0.65	0.67
Asia	**0.01**	**0.21**	**0.23**	Iceland	0.00	0.51	7.36
China	0.00	0.00	0.01	Israel			
India	0.00	0.00	0.00	Japan	0.48	0.57	0.54
Indonesia	0.01	2.01	3.47	New Zealand	11.20	9.37	7.65
Malaysia	0.03	1.10	1.75	Norway	0.90	1.97	1.28
Pakistan	0.00	0.00	0.00	Singapore	0.13	4.41	1.94
Philippines	0.05	0.14	0.13	South Korea	0.06	0.26	0.44
Thailand	0.08	0.54	0.34	Sweden	2.93	2.25	1.20
				Switzerland	0.07	0.11	0.39
Other	**1.17**	**1.06**	**1.37**	United Kingdom	2.01	1.90	1.25
Egypt							
Morocco							
Nigeria							
South Africa	1.17	1.03	1.09				

Table 5. Regressions for Expected Mean, Variance, and Skewness

The table shows dynamic panel regressions of one-year ahead mean, standard deviation, or skewness of local currency bond returns (in U.S. dollars). Regressions use annual end-of-year data. Yield is the yield on a country's JPMorgan GBI. Exchange Rate is the one-year change in the exchange rate quoted as domestic currency per USD, so that a positive amount depicts dollar appreciation. Inflation is year-over-year inflation in each country. Current account balance is as a percent of GDP. GDP growth is year-over-year real GDP growth. For information on the underlying returns data, see Table 1. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

DepVar:	Mean	Stdev	Skew
DepVar			
Lag1	0.346*	0.089*	-0.173**
Lag2	0.837***	0.030	0.211***
yield	0.007***		
Lag1	0.001		
Lag2	-0.000		
exchange rate	0.088***		
Lag1	0.114***		
Lag2	0.016**		
inflation	-0.001***		
Lag1	-0.000		
Lag2	-0.000		
current account balance	0.001**		0.027
Lag1	-0.000		0.045*
Lag2	0.001		-0.081***
GDP growth	-0.000		
Lag1	-0.000		
Lag2	0.001*		
#observations	210	479	244
#groups	39	39	39
Wald	130	3.17	29.85
correlation of predicted w/actual	0.38	0.47	0.25

Table 6. Regressions of U.S. Holdings of Local Currency Bonds

The table shows Tobit regressions of the share (from 0 to 1) of local currency bonds held by U.S. investors on various investability indicators. Investability ranges from 0 to 1, with a value of 1 indicating the market is completely open to foreign investment. The expected mean, standard deviation variance, and skewness are the predicted values (as of end-2006 or end-2008) from Table 5. Correlations are computed using 3 years of monthly data. For information on the underlying returns data, see Table 1. Regressions include all countries listed in Table 4 except those for which we do not have investability or returns data (Argentina, Croatia, Iceland, Israel, Pakistan, Taiwan, and Venezuela) and Colombia (an extreme outlier). Robust standard errors are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

2008 Regressions							
Investability Measure:	Aggregate	CA Open	Liq Eff	Reg_CR	Mkt St	Tax	DomInv
Investability	0.0518**	0.0994**	0.200**	0.280**	0.293***	0.0921	0.384**
	(0.0202)	(0.0463)	(0.0823)	(0.124)	(0.102)	(0.115)	(0.143)
exp_mean08	0.0353	0.0735	-0.0858	0.0923	-0.0562	0.00527	0.0223
	(0.165)	(0.190)	(0.183)	(0.185)	(0.136)	(0.211)	(0.128)
exp_sd08	1.159	0.441	2.140	1.058	1.741	0.850	1.473
	(1.155)	(1.061)	(1.271)	(1.253)	(1.131)	(1.044)	(1.251)
exp_skew08	0.0156	0.0150	0.0185	0.0140	0.0211	0.0181	0.0180
	(0.0129)	(0.0139)	(0.0135)	(0.0128)	(0.0124)	(0.0141)	(0.0123)
corr3yr08	-0.0312*	-0.0189	-0.0392*	-0.0217	-0.0369**	-0.0149	-0.0283**
	(0.0166)	(0.0146)	(0.0197)	(0.0137)	(0.0163)	(0.0136)	(0.0132)
Observations	36	36	36	36	36	36	36
2006 Regressions							
Investability Measure:	Aggregate	CA Open	Liq Eff	Reg_CR	Mkt St	Tax	DomInv
Investability	0.0586***	0.141***	0.230**	0.319**	0.213**	0.207**	0.258**
	(0.0190)	(0.0480)	(0.108)	(0.125)	(0.0810)	(0.0844)	(0.108)
exp_mean06	0.245*	0.325*	0.138	0.305*	0.109	0.215	0.123
	(0.140)	(0.168)	(0.130)	(0.164)	(0.126)	(0.158)	(0.142)
exp_sd06	4.207	3.057	5.541	3.409	4.777	3.298	4.119
	(2.987)	(2.826)	(3.631)	(2.933)	(3.130)	(3.131)	(3.037)
exp_skew06	0.0175	0.0166	0.0171	0.0121	0.0224*	0.0166	0.0232**
	(0.0107)	(0.0105)	(0.0117)	(0.0106)	(0.0119)	(0.0115)	(0.0113)
corr3yr06	0.0162	0.0270	0.0171	0.0207	0.0169	0.0287	0.0187
	(0.0262)	(0.0298)	(0.0248)	(0.0273)	(0.0255)	(0.0312)	(0.0283)
Observations	34	34	34	34	34	34	34

Table 7. BRICs and Investability

The table shows, for Brazil, Russia, India, China, and the emerging market at the top of the league table, the size of local bond market as well as six investability indicators: capital controls, market liquidity and efficiency, regulatory quality and creditor rights, market infrastructure, taxation on bonds, and the size of the local institutional investor base. Investability scores are out of 100, with higher numbers indicating that along that dimension the country's bond market is more open to international investment. For complete details on the investability indicators, see CRISIL (2009).

	Brazil	Russia	India	China	Top Score	
Local Currency Bonds (% GDP)	16	3	30	32	67	Malaysia
Investability Scores						
CA Openness	44	75	49	29	100	Hungary
Liquidity/Efficiency	66	63	64	69	75	Malaysia
Reg./Creditor Rights	46	50	57	50	84	Slovakia
Market Infrastructure	66	58	68	44	75	S. Africa
Taxation	55	100	31	83	100	Hungary
Dom Investor Base	80	40	50	60	90	South Africa

Figure 1. Efficient Frontiers
Each frontier includes a range of portfolios varying from 100% U.S. bonds to 100% foreign bonds (labeled 'ROW'). The figure includes three definitions for the rest-of-world (ROW) portfolio: (1) an *unhedged* portfolio of 80% industrial and 20% emerging market bonds (the upward-sloping line), (2) a *hedged* portfolio of 80% industrial and 20% emerging market bonds (the flat line), and (3) a 50-50 combination of (1) and (2) (the line in the middle). Returns data are from January 2002 to November 2006.
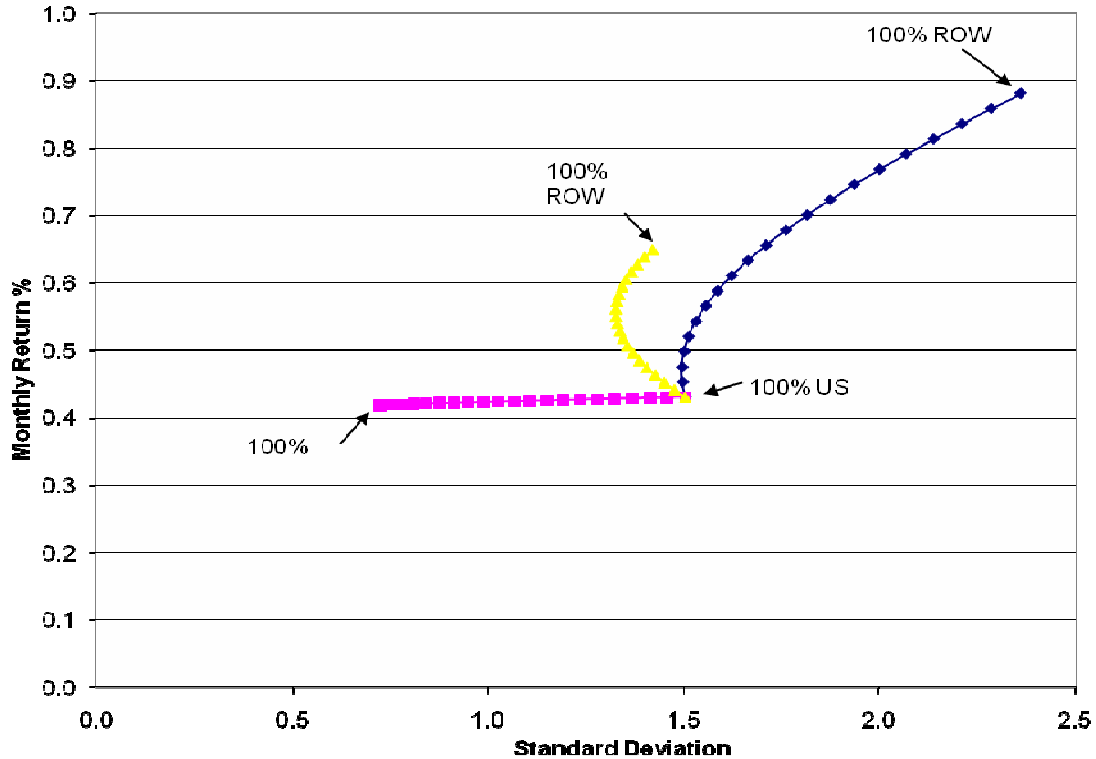

Figure 1: US - ROW Bond Portfolios
2002 - 2006

Figure 2. U.S. Investment and Investability Index, GEMX Countries
U.S. Holdings is the portion of the country's outstanding bonds that is held by U.S. investors; bond holdings data are as of end-2006 from Treasury Department et al. (2007). Investability for GEMX countries is from CRISIL (2008) and is comprised of the following six components: capital controls, market liquidity and efficiency, regulatory quality and creditor rights, market infrastructure, taxation on bonds, and the size of the local institutional investor base. The R^2 of the regression line is 0.24. A graph for 2008 (not shown) is similar if one extreme outlier (Venezuela) is omitted.