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INVESTING IN LOCAL CURRENCY BOND MARKETS

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ABSTRACT

We assess the extent to which emerging economies have been able to attract global investors to their local currency bond markets. To do so, we first provide a sense of the landscape by examining the development of local currency bond markets over the past decade, as well as the historical returns characteristics faced by global investors. We then assess how barriers to investment, potential diversification benefits, and the expected mean, variance, and skewness of returns help explain international investment. Our empirical tests suggest that cross-border participation in local currency bonds is highest in countries in which 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 1990s and more recent financial crises.

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1. Introduction

Local currency bonds in emerging market economies (EMEs) were not a serious asset class for global investors a decade ago. If EMEs were 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, for many countries, severe currency mismatches between assets and liabilities. Such currency mismatches were benign during periods of fixed or stable exchange rates, but when the local currency depreciated, foreign currency borrowers often faced a dramatically increased debt burden, defaults, and bankruptcy. Such episodes included Mexico (1994), Thailand (1997), Argentina (2002), and Iceland (2008).

At the core of such currency mismatches and the associated currency crises was 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.

This paper has two main parts. We first examine how local currency bond markets have developed, the returns they have produced for U.S.-based investors, 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 then assess various factors associated with foreign participation in local currency bond markets. Following work by Kraus and Litzenberger (1976), de Athayde and Flores (2004), Harvey, Liechty, Liechty, and Muller (2003), and Burger and Warnock (2007), we assume investors care about the expected mean, variance, and skewness of returns. We also consider two other factors that might be important in an international setting:

barriers to international investment (see, for example, Black (1974), Stulz (1981), and Cooper and Kaplanis (1986)) and potential international diversification benefits.

We find that while bond markets in emerging market economies are still small relative to those in advanced economies (AEs), progress has been significant with a recent surge in local currency bond issuance and reduced reliance on foreign currency debt.¹ We find some evidence that U.S. investors' bond portfolios are tilted toward markets that provide more potential diversification benefits and in which the expected mean and skewness of returns are more positive, and that 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 emerging market economies would like to borrow internationally in their own currencies, our results point to concrete measures to be addressed in further financial sector development.

A study of international fixed income 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 economies 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 economy 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

¹ We note that foreign currency debt is not problematic for those EMEs who earn substantial USD-based export revenue (e.g., commodity producers), because their assets and income streams are in dollars. For many other countries, however, dollar liabilities unmatched by dollar assets are problematic.

and Hausmann 2005; Burger and Warnock 2006) and could actually benefit from a currency depreciation, thus allowing for greater policy flexibility.² 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.³

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 advanced economies 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

² We focus on one aspect of currency mismatches, the extent of local versus foreign-currency-denominated bond markets. There are, of course, other aspects. See, for example, Ranciere, Tornell, and Vamvakidis (2010) on the banking sector and currency mismatches.

³ 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).

cross-border investors from the developed and developing markets alike. In Section 4 we develop this idea further and explore the implications of this study for global financial stability.

Relative to previous work and in addition to linking to global financial stability, our contributions are as follows. We present recent information on local currency bond market development and returns in those markets; both of these are more important than one might think, as in almost all EMEs this is a relatively new asset class about which little is understood. Now that longer time series of local currency bond returns data are available, we are able to extend and update the work of Burger and Warnock (2007) to dig more deeply into the roles of expected mean, variance, and skewness of returns in attracting (or deterring) global investors.⁴ Finally, we show, using an investability measure tailor-made for international bond investment, the tangible steps economies 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. All data are described in some detail in the Data Appendix.

⁴ Analyses of cross-border bond investment also appear in Lane (2006) and Fidora, Fratzscher, and Thimann (2007), although their datasets cannot identify the currency denomination of the bonds. Burger and Warnock (2007) did not have access to true local currency bond returns for many EMEs and instead relied on estimates from USD-denominated bonds combined with currency movements.

2. Characteristics of Local Currency Bond Markets

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

2.1. Returns Characteristics of Local Currency Bonds

We analyze returns characteristics of local currency bond markets for the January 2002 to May 2011 period (Table 1).⁵ We also show data for the crisis period from August 2007 to May 2011, as that presumably encompassed a difficult period for EMEs. All returns data we use are of local currency bonds and are from the perspective of a U.S.-resident investor (i.e., translated back into U.S. dollars). (See Data Appendix for more information.)

2.1.1 Advanced Economies: Characteristics of Hedged and Unhedged Returns

We focus first on the full sample data from January 2002 to May 2011 (top half of Table 1). From a U.S. investor's perspective, three regularities on bond returns are evident. First, *hedged* AE bond returns are usually similar to U.S. bond returns (averaging 0.4 to 0.5 percent per month). Second, returns on unhedged foreign currency bonds are highly volatile (although, as data shows, less volatile than equity returns). From the perspective of a U.S. investor, unhedged foreign currency bond returns are comprised of returns on the underlying bond and returns on the foreign currency; the latter

⁵ Burger and Warnock (2007) studied returns characteristics from 1998 to 2001. Two features stood out. First, over that sample period, for AE bonds, hedged returns were much less volatile than unhedged returns, but unhedged bonds provided a more attractive skewness profile. Second, compared to AE bond markets, emerging economy bond markets were much more volatile and exhibited significantly more negative skewness. Note that for local currency emerging market bond returns, off-the-shelf indices did not exist, so they constructed EME returns using EMBI/JACI and currency returns. In contrast, in this paper we can rely on time series of local currency EME bonds that are now available.

component, foreign currency returns, is notoriously volatile.⁶ Third, the skewness on AE bonds tends to be very close to zero.

A fourth apparent regularity concerns the relationship between mean returns on hedged and unhedged AE bonds (or between returns on U.S. government bonds and unhedged AE bonds). But this relationship changes depending on whether the dollar is depreciating or appreciating. Over the past decade, with the dollar depreciating against many currencies, mean returns were, at least ex post, quite attractive for unhedged AE bonds, returning 0.81 percent per month (compared to 0.39 percent for hedged bonds and 0.46 percent for U.S. government bonds). However, in times of sustained dollar appreciation, (for example, the period from 1994 to 2001, not reported in the table), returns on unhedged AE bonds are much lower than those on hedged AE bonds (or on US bonds).

2.1.2 Emerging Market Economies: Characteristics of Returns

Another interesting fact jumps out from Table 1. Over the January 2002 to May 2011 period, local currency EME bonds dominated AE bonds along a number of dimensions. Local currency EME bonds provided strong monthly mean returns, whether the currency risk was unhedged (1.01%) or hedged (0.46%), with volatility that was comparable if not less than that in AEs, skewness that was moderate (and even positive for hedged returns), and a low correlation with U.S. bond returns that offered significant diversification benefits. Even during the crisis (evident in the August 2007 to May 2011 sample) local currency EME bond returns exhibited favorable characteristics. We note that EMBI returns (i.e., those on dollar-denominated EME bonds) have also been high on

⁶ Were there a negative covariance between currency and bond returns the variance of unhedged foreign currency positions would be slightly reduced (Levich, 2001).

average, but with high volatility and very negative skewness (indicating a few too many really bad outcomes).

We caution that the returns characteristics for EME bonds portrayed in Table 1 are likely far more favorable than those for previous periods. In the 1990s, although systematic local currency EME bond returns were not available, returns were highly volatile (as inflation and exchange rates were volatile) and negatively skewed (as spikes in bond yields and, hence, negative returns on the underlying bonds, coincided with financial flight that depreciated the currency). In AEs periods of negative bond returns tend to coincide with currency appreciations, eliminating the occasional extremely bad outcome for international investors. In an emerging economy, the bad outcome of negative bond returns is commonly exacerbated by a plummeting currency. Contrast this with the past decade, in which a greater number of EMEs have achieved improved policy stability (more on this below) which has been helpful 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 Local Currency Bond Returns Data

Lessons from returns data can be summarized with the help of efficient frontiers. In Figure 1 we generate three all-bonds efficient frontiers to illustrate the risk-return tradeoffs facing a U.S.-resident fixed income investor. Each frontier includes a range of bond 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 percent AE and 20 percent EME bonds, (2) a *hedged* portfolio of 80 percent AE and 20% percent bonds, and (3) a 50-50 combination of (1) and (2).

For the purpose of analyzing foreign participation in local currency bond markets, we draw 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 the January 2002 to May 2011 period, the added risk happened to be compensated by strong returns (because of the falling U.S. dollar), but in earlier periods the additional risk was rewarded with substantially lower returns (because the dollar was appreciating).⁷ The figure also indicates the gains to diversification from adding hedged foreign bonds, which over this period (and earlier periods) reduced portfolio risk without much deterioration of 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.

We note that, following Levich and Thomas (1993) and Burger and Warnock (2007), Figure 1 only includes bonds. Figure 2 broadens the set of assets to all included in Table 1. We select weights for each asset class from 2006, roughly the midpoint of the January 2002 to May 2011 period. Weights for the U.S. portion are based on 2006 estimates from the Federal Reserve's Flow of Funds accounts: 62% equities, 38% bonds, of which 43% government and 57% corporate. For the rest-of-world (ROW) portion, weights, which come from Treasury Department surveys as described later in Table 5 and

⁷ The hedged frontier in Figure 1 is very similar to the hedged frontier in Burger and Warnock (2007) 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.

also in the Data Appendix, are 77% equity (of which 79% AE and 21% EME) and 23% bond (89% AE, 9% USD-denominated EME, 2% local currency EME). As in Figure 1, we allow for bond portfolios to be unhedged or hedged against currency fluctuations. Over this period, efficient frontiers for the broader portfolio are upward sloping; more return required more risk.

In the bottom graph of Figure 2 we ramp up the local currency EME bond weight by increasing the overall bond weight in the ROW portfolio to 59.4% (from 23%) and the local currency EME portion of that to 20% (from 2%).⁸ The efficient frontiers of this portfolio with much greater weight on local currency EME bonds represent superior opportunities relative to those with actual portfolio weights. The ramped up EME bond portfolios generate higher returns for any given level of risk.

2.2. The Supply of Local Currency Bonds

A decade ago many doubted if bond markets in EMEs would ever develop. One aspect of this thinking is the “original sin” hypothesis, which, in its strongest form, suggests that EMEs are forever doomed to have small, inconsequential bond markets.⁹ The proposition is that small countries have an innate condition that precludes the development of a local bond market, no matter how hard they try, no matter which policies they put in place, and no matter which institutions they develop.

Were original sin to hold, essentially nothing—other than country size—should correlate with bond market development. Nothing, other than sheer country size, would

⁸ The 59.4% was not pulled from thin air. It is the actual bond weight on foreigners’ U.S. portfolios (see Curcuru, Dvorak, and Warnock 2010).

⁹ 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.

distinguish one economy from another, and all small economies would be forever doomed to have small bond markets.

But the original sin hypothesis is not borne out in the real world. Burger and Warnock (2006) showed that countries can (and have) put in place institutions and policies that foster the development of debt markets. Countries with better historical inflation performance (an outcome of creditor-friendly policies) have more developed local bond markets, both private and government, and rely less on foreign-currency-denominated bonds. Moreover, creditor-friendly laws matter; stronger rule of law is associated with deeper local bond markets, while countries with better creditor rights are able to issue a higher share of bonds in their local currency.¹⁰

In two steps, we next update the Burger and Warnock (2006) study, which was conducted using data for 2001. First we describe the size and composition of local currency bond markets. Second, we perform analysis of factors behind local currency bond market development using new and updated data.

2.2.1 Local Currency Bond Markets

We gather end-2008 data on the size of local currency bond markets in 48 countries (Table 2).¹¹ Not surprisingly, most bonds are issued by AEs —\$63 trillion of the \$67 trillion global bond market. In some countries—the United States, Japan,

¹⁰ See also Goldstein and Turner (2004) for a strong rebuttal of the original sin hypothesis. Other studies that corroborate the spirit of the Burger and Warnock (2006) results include La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997), Claessens, Klingebiel, and Schmukler (2007), Jeanne and Guscina (2006), Eichengreen and Luengnaruemitchai (2006), and Mehl and Reynaud (2005).

¹¹ As detailed in the Data Appendix, we include bonds by all domestic issuers, both government and private. Note that an important question is how much of the outstanding bonds in Table 2 is freely traded and available to investors. While data on float is now widely available for equity markets, we know of no such data for a broad range of bond markets. For some countries, such as Japan, estimates exist of “~~at~~” bonds outstanding, which excludes government agencies’ holdings of government bonds, but according to BIS such adjustments are not available for most countries. Indeed, JPMorgan’s GBI and GBI-EM indices are market capitalization weighted, not adjusted for float. So for now we can only say that float (or ~~net~~) as a percent of outstanding bonds likely varies greatly across countries.

Denmark, and euro area (except Finland)—the size of local currency bond markets exceeds annual GDP, while other AEs tend to have somewhat smaller local currency bond markets. Bonds issued by entities from AEs 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 EMEs tend to be smaller (on average, less than one-third of annual GDP) and make up a 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.¹² Compare that to the currency composition of bond liabilities (last column of Table 2). For AEs, most bonds (90 percent, on average) are largely denominated in the local currency. For EMEs, 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 progress in EMEs.¹³ Local currency bond markets have grown in size relative to GDP and EMEs have become much less reliant on foreign-currency-denominated bonds. The data in Table 3 suggest that EMEs are not predestined to rely on foreign currency borrowing and do in fact have the capacity

¹² It is true that some emerging markets are commodity producers who earn substantial USD-based export revenue. For them, dollar liabilities are not problematic, as they match the currency composition of assets. For many other countries, however, dollar liabilities are indeed a mismatch. For detail on this point, as well as measures of aggregate currency mismatches, see Goldstein and Turner (2004), and for an application to Jamaica and Trinidad and Tobago see Burger, Rebucci, Warnock, and Warnock (2010).

¹³ We note (but do not tabulate) that equity market capitalization as a percent of GDP has risen substantially in many EMEs. Based on World Bank's Financial Structures database, 1990s annual averages and 2008 values for selected countries are as follows: Argentina (13%, 30%), Brazil (20%, 113%), Chile (78%, 132%), Mexico (30%, 51%), India (32%, 173%), Indonesia (20%, 55%), Malaysia (185%, 180%), Philippines (53%, 76%), and Thailand (52%, 73%).

to develop local currency bond markets. 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.¹⁴

There is always a concern that while alleviating one mismatch (e.g., currency), another mismatch (e.g., maturity) is exacerbated. We find that the reduced reliance on foreign currency borrowing has *not* been replaced by a greater reliance on short-term borrowing (Table 4). Average local currency bond maturities have generally increased over the past decade, with impressive lengthening in Latin America. We find no evidence that currency mismatches have been replaced by maturity mismatches.

2.2.2 Determinants of Bond Market Development

As noted above, Burger and Warnock (2006) showed using 2001 data that countries with better historical inflation performance (an outcome of creditor-friendly policies) have more developed local bond markets, both private and government, and rely less on foreign-currency-denominated bonds. Moreover, they found that creditor-friendly laws matter; stronger rule of law is associated with deeper local bond markets, while countries with better creditor rights are able to issue a higher share of bonds in their local currency.

We update the 2001 analysis using 2008 data. As in the previous study, EMEs with lower inflation volatility and stronger legal rights have more developed local bond

¹⁴ Two stark counterexamples in Table 3 are Iceland and Ireland. In 2006, Iceland 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, crisis, and defaults, its bond market has shrunk to 104% of GDP (although the currency mismatch remains). It is not yet clear how the case in Ireland, its bond market having grown *tenfold* in just 7 years, will play out.

markets (Figure 3).¹⁵ The role of policy and institutions suggest important distinctions among the EMEs. Some countries with historically high and volatile inflation (e.g. Mexico, Brazil) have made the necessary macroeconomic policy adjustments to bring inflation under control. In general these countries have seen growth in local currency bond markets and/or reduced reliance on foreign currency debt. Improved macroeconomic policy also generally yields more favorable bond returns and, as we will see in the next section, has attracted increased participation by US investors. Other EMEs, including Russia, Argentina, and Pakistan, have had less success bringing inflation under control and as a result continue to have less developed and less attractive local currency bond markets.

While some countries have pursued the policies necessary to foster development of local currency bond markets, there remains plenty of room for improvement. It is noteworthy that some of the largest EMEs, the so-called BRICs, still have relatively small local bond markets and score relatively poorly on regulatory measures (including creditor rights). Going forward, improvements along that dimension would enable strong growth in those bond markets. Perhaps more pressing is to remain vigilant against inflation, which has been surging of late in many EMEs (and all of the BRICs). If this increase in inflation is not arrested, the development of local bond markets will likely be inhibited.

¹⁵ In the top graph of Figure 3 we omit three outliers, countries with exceedingly high inflation volatility (Pakistan, Venezuela, and Argentina). In an unreported, very small sample regression (with 20 EME observations), inflation volatility and legal rights are both significantly related to local currency bond market development.

3. U.S. Participation in Local Currency Bond Markets

In this section we present data on the extent of cross-border investment and analyze the factors that attract U.S. investor 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 set—it does not include vital information about the *currency denomination* of bond holdings.¹⁶ 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 2001 benchmark survey.

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 EMEs and find a particular aversion to the most volatile markets. But, as highlighted in Section 2, since 2001 there have been dramatic changes in local currency bond markets. EMEs have greatly reduced their reliance on foreign currency debt and focused efforts on building local currency bond markets. In addition, Section 2 revealed that local currency bonds had attractive returns characteristics for cross-border investors. We turn to evidence from the 2006 and 2008

¹⁶ 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.

benchmark surveys of U.S. investment abroad and compare to 2001 data to analyze how U.S. investors have responded to these developments.

The data in Table 5 show a striking shift in U.S. investor portfolio weights toward EMEs. While AEs have only increased slightly in U.S. investors' portfolios, increasing modestly from 1.23 percent in 2001 to 1.64 percent in 2006 before falling to 1.59 percent in 2008, the weights of EMEs in U.S. investors' local currency bond portfolio have steadily increased, from 0.01 percent of the portfolio (which includes the U.S. bond market) in 2001 to 0.13 percent in 2006 and 0.16 percent in 2008. U.S. participation increased somewhat in Emerging Asia and sharply in Latin America.¹⁷ The EME weights might seem small (because most bonds held by U.S. investors are U.S. bonds), but U.S. investors' EME holdings, only 1.1 percent of their AE holdings in 2001, rose to 10.3 percent of AE holdings by 2008.

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

Table 1 showed that returns characteristics differ across broad asset classes. In this section we allow for differences between countries by conducting analysis of returns at the country level. We begin by sketching a simple model of portfolio allocation that encompasses two features of international bond markets: barriers to international investment and returns that exhibit higher moments. We then use the model to inform cross-sectional regressions of the extent to which U.S. investors' portfolio weights deviate from benchmark (market) weights.

Following the work of Kraus and Litzenberger (1976), de Athayde and Flores (2004), Harvey, Liechty, Liechty, and Muller (2003), and Burger and Warnock (2007),

¹⁷ The portfolio weight of U.S. bonds has fallen slightly from 98.76 to 98.25 percent from 2001 to 2008.

we allow for the fact that asset returns exhibit higher moments and that investors with nonincreasing absolute risk aversion should care about skewness in addition to mean and variance.¹⁸ The analytics 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:

$$\omega = f(x^+, V_x^-, S_x^+) \quad (1)$$

where the signs above the arguments indicate that portfolio weights (ω) should be higher on countries whose bonds add to the portfolio's expected returns (x) and expected skewness (S_x) and reduce the portfolio's variance (V_x). 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, *barriers*, can be modeled by assuming that they impose a cost that varies across countries and reduces investors' expected returns.¹⁹ 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,

¹⁸ 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.

¹⁹ For portfolio allocation models with barriers to international investment, see Black (1974), Stulz (1981), and Cooper and Kaplanis (1986).

and skewness of returns affect U.S. portfolio allocations. Specifically, we are interested in relationships of the following form:

$$\omega = f(x, \bar{V}_x^+, \bar{S}_x^+, \bar{barriers}^-, \bar{corr}^-) \quad (2)$$

Computing the last factor, *corr*, is straightforward. But measures of other variables (expected mean, variance, and skewness of returns and barriers to international investment) require some discussion.

3.2.1 Expected Mean, Variance, and Skewness of Returns

Off-the-shelf time series data of the *expected* mean, variance, and skewness of local currency bond returns do not exist, so we construct them. We assume cross-border investors have a one-year horizon and, thus, 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)

$$y_{it} = \sum_{j=1}^p \alpha_j y_{i,t-j} + x_{it} \beta_1 + w_{it} \beta_2 + v_i + \varepsilon_{it} \quad (3)$$

for $i=\{1, \dots, N\}$ and $t=\{1, \dots, T_i\}$, 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 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 6. We find that expected mean returns are higher in countries with higher lagged mean returns, higher yields, more currency depreciation, more positive current account balances, and lower real GDP growth. All of the signs are as expected except that on the exchange rate change.²⁰ For expected skewness and expected volatility, we find these are best estimated with their own lags. Importantly, the correlations between predicted mean, variance, and skewness and their realized values (shown in the last row of Table 6) are reasonably high and statistically significant, suggesting that our regressions provide reasonable estimates of the expected mean, variance, and skewness of international bond returns.

3.2.2 Barriers to International Investment in Bonds

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 local currency bond markets in a range of EMEs. 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

²⁰ For GDP growth a negative coefficient is intuitive given that a slowdown in current economic activity frequently generates falling interest rates and thus positive bond returns.

relevant from the perspective of investment in local currency bond market, namely, 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 database). 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 2008.²¹ In addition, we added roughly 20 AEs by creating similar indices. We started with the assumption that AEs 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 and we can confidently form scores. 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.²²

²¹ The World Bank's Global Emerging Markets Local Currency Bond (Gemloc) Program supports the development of local currency bond markets in EMEs.

²² 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.

3.2.3 Explaining U.S. Investment

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:

$$\frac{\omega_{i,us}}{\omega_{i,m}} = \alpha_0 + \alpha_1 Investability_i + \alpha_2 x_i + \alpha_3 V_i + \alpha_4 S_i + corr_i + \varepsilon_i \quad (4)$$

where $\omega_{i,us}/\omega_{i,m}$ is, as presented in Table 5, 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 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 multiplied by 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

$$\frac{\omega_{i,us}}{\omega_{i,m}} = \frac{H_i^{US} / MCap_i}{X} \quad (5)$$

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

$$\nu_i^{US} = H_i^{US} / MCap_i \quad (6)$$

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

$$\nu_i^{US} = \alpha_0 + \alpha_1 Investability_i + \alpha_2 x_i + \alpha_3 V_i + \alpha_4 S_i + corr_i + \varepsilon_i \quad (7)$$

Empirical results are presented in Table 7. The dependent variable in each regression is ν_i^{US} as of end-2006 or end-2008.²³ The results for both years indicate that countries with higher scores on the aggregate investability index and, separately, most of the individual subindexes are able to attract significantly more U.S. investment into local currency bond markets. We note that even when restricting the analysis to EMEs the relationship between CRISIL's investability index and U.S. investor positions is positive and statistically significant; see Figure 4 for evidence as of end-2006. The expected mean and skewness of returns are borderline significant in some of the end-2006 regressions, which we interpret as modest evidence that U.S. investors had larger (relative) positions in countries in which they expected higher mean returns and more positive skewness. The

²³ Colombia is excluded from this analysis (and hereafter) because, as can be inferred from Table 5, it represents an outlier in terms of the extremely large percentage of Colombian peso-denominated bonds held by U.S. investors.

2008 regressions present some evidence that U.S. investment is greater in countries that offer more potential diversification benefits.

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 toward markets in which they had smaller initial (2006) positions and that had higher expected returns as of end-2006. As Table 5 suggests, many of the increases in U.S. investment occurred in EMEs.

Overall, the analysis in this section suggests growing participation by U.S. investors in local currency bonds in EMEs. The importance of the investability measure firmly establishes a concrete set of policy settings and institutional factors that are linked to higher cross-border participation.

4. Global Financial Stability through Investability

Our analysis, which is useful from an investments perspective, can also help identify 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 advanced economies and in particular the

U.S.²⁵ As highlighted in Warnock and Warnock (2009), the resulting flows (mostly from EMEs) into U.S. bond markets was an important factor behind 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 economies that might attract cross-border investors from the developed and developing economies alike. With more investment vehicles at home, wealth in emerging economies might be less likely to flow to advanced 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 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 EMEs have made important progress on the institutional and macroeconomic fronts.

²⁵ This is consistent with the model of Mendoza et al (2009) and the Forbes (2010) evidence that countries with less developed domestic financial markets hold more U.S. assets.

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 8 displays the end-2008 size of local currency bond markets along with CRISIL’s investability scores for the BRICs. For comparison, 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, ranging from only 3 percent of GDP in Russia to 16 percent in Brazil to about 30 percent in India and China. The investability indicators, which we have shown are related to outsider participation, show 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 (although each has improved its score in this important category since 2006). This is important, as 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 8 suggest a 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 even among EMEs there are plenty of successful examples to follow. Further development of local bond markets in these large and rapidly growing economies

has the potential to reduce the global asset shortage and could therefore enhance financial stability.²⁶

5. Conclusion

The recovery of EMEs 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 EMEs 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 improvement in local currency bond market development and a reduced reliance on foreign currency denominated 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 for which reliable international data for cross-border investment in local currency bonds exist. 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.

²⁶ An important aspect of bond market development, international investment, and financial stability is the availability of hedge instruments. By enabling investors to transfer risk to those more willing to bear it, the existence of derivatives markets to hedge currency and interest-rate exposure should make its local bond market more attractive to both foreign and local investors. Active derivatives markets do not exist in every country, although progress (more so with currency risk than interest-rate risk) has been made of late; see Saxena and Villar (2008). The ability to hedge currency risk is intimately related to bond market development, because without a liquid bond market and an established yield curve, derivative securities cannot be priced, and a well-functioning derivatives market will not develop (Carlton 1984). Future work should investigate the relationship between the existence of derivatives markets and foreign participation in local bond markets.

We use instead 2006 and 2008 comprehensive benchmark surveys that provide details on U.S. investment relevant to the study.

The survey data reveal a shift by U.S. investors into local currency bonds in EMEs. 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 EMEs 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 think in particular about regulatory environment and creditor rights.

We must be cautious in our assessment of emerging local bond markets. First, we seek to emphasize that local currency borrowing by EMEs 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 EMEs should necessarily be encouraged, although all else equal, borrowing by issuing local currency bonds should dominate foreign-currency borrowing (except, possibly, for commodity exporters). Second, we emphasize that while much of the 2000s were remarkably stable for EMEs, that period of tranquility has clearly come to an end. The global financial crisis has generated significant stress in EMEs and local currency bond markets have not been spared. During the recent crisis many EMEs 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. Further, although some reports indicate flight from local currency assets, our data show that, on average, U.S. investors maintained or even increased their positions in EMEs' local currency bond markets through the crisis.

References

- AREAER, 2007. Annual Report on Exchange Arrangements and Exchange Restrictions (Washington, DC: IMF).
- Bank for International Settlements, 2011. BIS Quarterly Review.
- 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., A. Rebucci, F. Warnock, and V. Warnock, 2010. External Capital Structures and Oil Price Volatility. *Journal of Business, Finance and Economics in Emerging Economies* 5(2): 1-37.
- Burger, J., and F. Warnock, 2007. Foreign Participation in Local Currency Bond Markets. *Review of Financial Economics* 16(3): 291-304.
- Burger, J., and F. Warnock, 2006. Local Currency Bond Markets. *IMF Staff Papers* 53: 115-132.
- 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. *Brookings Papers on Economic Activity*.
- Carlton, D., 1984. Future Markets: Their Purpose, Their History, Their Growth, and Their Successes and Failures. *Journal of Futures Markets* 4(3): 237-271.
- 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 Investability Indicators. Manuscript.
- CRISIL, 2009. Gemloc Investability Indicators – Phase 2 extension. International Finance Corporation.

- Curcuru, S., T. Dvorak, and F. Warnock, 2010. Decomposing the U.S. External Returns Differential. *Journal of International Economics* 80: 22-32.
- 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. 2010. Why do foreigners invest in the United States? *Journal of International Economics* 80: 3-21.
- Goldstein and Turner, 2004. *Controlling Currency Mismatches in Emerging Economies*. Institute for International Economics, Washington, D.C.
- Griever, W., G. Lee, and F. Warnock, 2001. The U.S. system for measuring cross-border investment in securities: a primer with a discussion of recent developments. *Federal Reserve Bulletin* 87(10): 633-650.
- 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.
- International Monetary Fund, 2006. *World Economic Outlook April 2006*, Globalization and Inflation, Statistical Appendix, Washington, DC.
- Jeanne, O., and A. Guscina, 2006. Government Debt in Emerging Market Countries: A New Data Set. IMF Working Paper 06/98.
- J.P. Morgan, 2002. JPMorgan Government Bond Indices. J.P. Morgan Portfolio Research, January 14.
- J.P. Morgan, 2006. Introducing the JPMorgan Government Bond Index-Emerging Markets (GBI-EM): Index Methodology. J.P. Morgan Emerging Markets Research and Bond Index Research, January.

- 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.
- Saxena, S. and A. Villar, 2008. Hedging instruments in emerging market economies. In –Financial globalisation and emerging market capital flows”, BIS Papers No 44.
- Stulz, R., 1981. On the Effects of Barriers to International Investment. *Journal of Finance*, 36: 923-934.
- U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 2002. Report on Foreign Portfolio Investment in the United States as of December 31, 2001.
- U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 2007. Report on Foreign Portfolio Investment in the United States as of December 31, 2006.
- U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 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.

Data Appendix

Throughout, —bonds’ refer to debt instruments with greater than one year original maturity. We focus on bonds denominated in the currency of the issuer.

Bond Returns

Our main source of returns data is country-level JPMorgan Government Bond Indexes (GBI) and JPMorgan Government Bond Indexes-Emerging Markets (GBI-EM). See J.P. Morgan (2002, 2006) for complete descriptions.

GBI consists of “regularly traded, fixed-rate, domestic government bonds of countries that offer opportunity to international investors. These countries have liquid government debt markets, which are stable, actively traded markets with sufficient scale, regular issuance and are freely accessible to foreign investors.” The indices should be representative (span and weight the appropriate markets, instruments and issues that reflect opportunities available to international investors) and investible and replicable (include only securities in which an investor can deal at short notice and for which firm prices exist). The 13 countries in the original GBI include Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, UK, and the US.

The GBI-EM is similar to the main GBI in methodology but tracks emerging markets economies. Some of the bonds are speculative; some bond markets are not directly hedgeable. Countries in the GBI-EM include Brazil, Chile, Colombia, Czech Republic, Hungary, Indonesia, Malaysia, Mexico, Poland, Slovakia, South Africa, Thailand, and Turkey. Bonds in the countries in the narrow GBI-EM should be easy to access, with no impediments for foreign investors. A few countries with sizeable local bond markets but that have substantial restrictions on foreigners (China, India, Russia) are added to create the GBI-EM BROAD, which has 16 EMEs.

JPMorgan returns data are available for positions that are unhedged and hedged using exchange rates and forward rates from WM Company as of 4pm London time. Hedging for a few countries in the GBI-EM has not always been possible (e.g., Malaysia, Chile), so hedged returns for some EMs should be viewed as indicative but not actual. Please see Appendix E of JPMorgan (2006) for complete details.

We also include for comparison a U.S. corporate bond index, a dollar-denominated EME bond index (JPMorgan’s EMBI), and three equity indices. The Dow Jones Corporate Bond Index is an equally weighted basket of 96 recently issued, readily tradable, investment-grade corporate bonds. We use the index with 5-year maturity. The equity indices are the S&P500 (for the US), MSCI EM, and MSCI EAFE+Canada; see www.msci.com/products/indices/tools/index.html for details on the MSCI data.

Bonds Outstanding

We use two complementary sources of data on the amount of a country’s outstanding local currency bonds. Both are from the Bank for International Settlements (BIS) which compiles data from multiple sources.

One data set is on “domestic debt”, which the BIS defines as local currency bonds issued by locals in the local market (i.e., not placed directly abroad). Data are available in Table 16A: Domestic Debt Securities, in BIS Quarterly Review. Because our focus is on bonds (with original maturity longer than one year), we obtained the data underlying Table 16A to separate short term from long term.

The other data set is on “international bonds”, bonds issued either in a different currency or in a different market. Certain aggregates of this are presented Table 14B: International Bonds and Notes by Country of Residence, in BIS Quarterly Review. For our focus we obtained the underlying data, as issuance by currency by country is not presented in the Quarterly Review.

With these two sources (and our calculations), local-currency-denominated debt is the sum of the long-term debt component of “domestic debt” and the local currency / local issuer portion of “international bonds”. Our measure includes all bonds issued by all types of issuers (government and private).

U.S. Bond Holdings

Data on U.S. investors’ holdings of local currency bonds is from periodic, comprehensive benchmark surveys conducted by the Treasury Department, Board of Governors of the Federal Reserve System, and the Federal Reserve Bank of New York. See the actual surveys, for example, Treasury Department et al. (2002, 2009) or the Grier, Lee, and Warnock (2001) primer for details. Briefly, from Grier, Lee, and Warnock (2001), the so-called “asset surveys” of U.S. holdings of foreign securities collect data from two types of reporters: U.S.-resident custodians and U.S. institutional investors. Custodians are the primary source of information, typically reporting about 97 percent of total U.S. holdings of foreign long-term securities. Institutional investors, such as mutual funds, pension funds, insurance companies, endowments, and foundations, report in detail on their ownership of foreign securities only if they do not entrust the safekeeping of these securities to U.S.-resident custodians. If they do use U.S.-resident custodians, institutional investors report only the name(s) of the custodian(s) and the amount(s) entrusted (and the data are collected from the custodian, but not double counted).

Reporting on the asset surveys is mandatory, with both fines and imprisonment possible for willful failure to report. The data are collected at the security-level, greatly reducing reporting error; armed with a security identifier, a mapping to the currency of the bond and the residence of its issuer is straightforward. Reporting and the data are comprehensive, and the holdings data form the official U.S. data on international positions (for example, the number for international bonds in the Bureau of Economic Analysis’s International Investment Position report is formed by aggregating the survey’s security-level information).

For our purposes, we needed a split (U.S. holdings of local currency foreign bonds) not usually published in the Treasury Department reports, and so persuaded Treasury to include an “own currency” column in the published table on holdings by country by currency (see, for example, Table A.6 of Treasury Department et al. 2009). This is our measure of U.S. holdings of local currency bonds.

Other Variables

As explanatory variables in Tables 6, as well as in Figure 3, we use various data series. In Table 6, *Yield* is the yield-to-maturity in the GBI indexes from J.P Morgan. See J.P Morgan (2006) Appendix B. The other explanatory variables in that table are all from the IMF’s IFS database. *Exchange Rate* is the one-year change in the exchange rate, quoted as domestic currency per USD; a positive number 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. In Figure 3, inflation volatility is computed from ten years of quarterly year-over-year CPI inflation, with the underlying CPI data coming from the IFS database. Legal Rights is “legal rights for borrowers and lenders” from the World Bank’s Doing Business database.

Country Groupings

The groupings of “advanced economies”, or AEs, and “other emerging market and developing countries” (shortened here to emerging market economies or EMEs) follow IMF classification as of April 2006. See <http://www.imf.org/external/pubs/ft/weo/2006/01/pdf/statappx.pdf>.

Table 1. Monthly US\$ Returns (January 2002 to May 2011)

The table shows returns characteristics of various asset classes. Returns are monthly, in U.S. dollars, and reported for the January 2002 to May 2011 period and separately for the crisis/post-crisis period, from August 2007 to May 2011. Advanced Economies and Emerging Markets consist of countries included in JPMorgan GBI (excluding the US) and JPMorgan GBI-EM Broad, respectively. EMBI is of USD-denominated EME bonds.

	Mean (%)	Variance	Skewness	Correlation with US Govt Bonds
January 2002 to May 2011				
US Govt Bonds	0.46	2.34	-0.18	1.00
US Corp Bonds	0.59	2.45	-0.45	0.57
Unhedged Foreign Bonds				
Advanced Economies	0.81	6.85	0.00	0.53
Emerging Markets	1.01	5.50	-0.54	0.16
Hedged Foreign Bonds				
Advanced Economies	0.39	0.80	-0.07	0.91
Emerging Markets	0.46	0.98	0.78	0.45
EMBI	0.91	7.36	-2.45	0.24
Equities				
US	0.42	20.73	-0.78	-0.30
Advanced Economies	0.85	28.26	-0.88	-0.23
Emerging Markets	1.66	50.85	-0.87	-0.20
August 2007 to May 2011				
US Govt Bonds	0.56	3.48	0.38	1.00
US Corp Bonds	0.79	4.74	-0.83	0.28
Unhedged Foreign Bonds				
Advanced Economies	0.79	10.06	-0.14	0.66
Emerging Markets	0.61	9.96	-0.42	0.20
Hedged Foreign Bonds				
Advanced Economies	0.48	1.13	0.10	0.92
Emerging Markets	0.36	2.05	1.35	0.50
EMBI	0.77	16.16	-2.72	0.17
Equities				
US	-0.52	39.29	-0.61	-0.10
Advanced Economies	-0.54	59.92	-0.50	-0.10
Emerging Markets	0.35	108.97	-0.47	-0.16

Table 2. Bond Markets (2008)

Data on international bonds are from security-level data underlying Table 14B: International Bonds and Notes by Country of Residence in BIS Quarterly Review. Local-currency-denominated debt is the sum of the local currency portion of Table 14B and the long-term debt component from Table 16A: Domestic Debt Securities in BIS Quarterly Review. The country groupings follow IMF classifications of “advanced economies” and “other emerging market and developing economies” (shortened to emerging economies) as of April 2006. See <http://www.imf.org/external/pubs/ft/weo/2006/01/pdf/statappx.pdf>.

	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
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				
South Africa	99	84	30	84

Table 3. The Evolution of Local Currency Bond Markets.

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
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 Local Currency Bond Markets, 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							
South Africa	32	39	30		87	90	84

Table 4. The Evolution of Maturities in Emerging Market Economy Bonds

The table displays data on the maturity of domestic central government debt outstanding for emerging markets as of 2001, 2006, and 2008. The data, provided by the BIS as an update to BIS (2007), are available at <http://www.bis.org/statistics/secstats.htm>.

	Domestic Central Government Debt Outstanding					
	Original Maturity (years)			Remaining Maturity (years)		
	2001	2006	2008	2001	2006	2008
Europe	4.0	6.1	7.2	2.8	3.8	3.9
Croatia						
Czech Republic	6.9	9.3	9.3	4.9	6.3	5.8
Hungary			7.1	3.7	4.0	3.8
Poland	4.0	6.9	8.6	2.5	3.9	4.2
Russia	9.2	12.2	13.5	3.8	8.2	9.4
Slovakia						
Turkey	3.2	3.5	3.9	2.7	1.9	1.9
Latin America	5.1	13.7	14.5	3.0	4.0	4.9
Argentina		17.0	17.9		11.0	10.5
Brazil				3.3	2.6	3.3
Chile		5.6	10.2		7.8	9.2
Colombia	5.9	7.5	8.2	4.4	3.9	4.4
Mexico				2.0	4.3	6.5
Peru	2.3	13.9	19.4	1.8	12.2	16.6
Venezuela				2.4	11.9	14.1
Asia	10.6	13.0	11.9	4.6	7.8	7.9
China						
India	11.0	16.9	14.9		10.0	10.6
Indonesia		11.5	4.8	5.1	7.1	4.1
Malaysia		8.4	9.7	4.0	5.2	5.3
Pakistan						
Philippines	7.7	7.9	8.1	5.0	4.7	4.9
Thailand		8.8	10.2		5.4	5.8
Other						
South Africa		16.8	18.3		8.3	9.9

Table 5. U.S. Participation in Local Currency Bond Markets

The table shows U.S. investors' local currency bond portfolio as of the end of 2001 and 2008. Data are author's calculations using data on U.S. investment from the U.S. Department of the Treasury et al. (2002, 2009) and the size of local currency bond markets (mostly from the BIS; see Table 2 for details). ω_{US} and ω_{mkt} are the weight of the country in US and world market portfolios. The ω_{US} to ω_{mkt} ratio is a bias measure. It equals one, if the weight of the countries' bonds in US and world market portfolios are identical and less than one, if US investors' underweight the country (relative to its market size).

	2001				2006				2008			
	US holdings (Bil \$)	ω_{US}	ω_{mkt}	$\omega_{US} / \omega_{mkt}$	US holdings (Bil \$)	ω_{US}	ω_{mkt}	$\omega_{US} / \omega_{mkt}$	US holdings (Bil \$)	ω_{US}	ω_{mkt}	$\omega_{US} / \omega_{mkt}$
EMERGING ECONOMIES	1.71	0.01	4.89	0.00	19.28	0.13	5.47	0.02	27.48	0.16	6.14	0.03
Europe	0.74	0.01	0.77	0.01	4.74	0.03	1.13	0.03	4.65	0.03	1.06	0.03
Croatia	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00
Czech Republic	0.01	0.00	0.03	0.00	0.01	0.00	0.09	0.00	0.04	0.00	0.11	0.00
Hungary	0.17	0.00	0.08	0.02	0.62	0.00	0.15	0.03	1.52	0.01	0.15	0.06
Poland	0.55	0.00	0.15	0.03	3.83	0.03	0.28	0.09	2.89	0.02	0.26	0.06
Russia	0.00	0.00	0.14	0.00	0.02	0.00	0.16	0.00	0.10	0.00	0.16	0.00
Slovakia	0.00	0.00	0.03	0.00	0.24	0.00	0.04	0.04	0.00	0.00	0.04	0.00
Turkey	0.00	0.00	0.31	0.00	0.02	0.00	0.39	0.00	0.10	0.00	0.32	0.00
Latin America	0.46	0.00	1.99	0.00	10.73	0.07	1.47	0.05	16.74	0.10	1.37	0.07
Argentina	0.07	0.00	0.43	0.00	2.39	0.02	0.24	0.07	0.34	0.00	0.17	0.01
Brazil	0.08	0.00	0.63	0.00	4.72	0.03	0.43	0.07	8.49	0.05	0.49	0.10
Chile	0.01	0.00	0.13	0.00	0.00	0.00	0.09	0.00	0.01	0.00	0.08	0.00
Colombia	0.00	0.00	0.06	0.00	1.44	0.01	0.04	0.23	3.37	0.02	0.03	0.58
Mexico	0.29	0.00	0.62	0.00	2.08	0.01	0.57	0.02	3.99	0.02	0.49	0.05
Peru	0.00	0.00	0.04	0.00	0.06	0.00	0.04	0.01	0.33	0.00	0.04	0.05
Venezuela	0.02	0.00	0.08	0.00	0.05	0.00	0.05	0.01	0.22	0.00	0.07	0.02
Asia	0.06	0.00	1.98	0.00	2.77	0.02	2.66	0.01	5.18	0.03	3.55	0.01
China	0.00	0.00	0.85	0.00	0.01	0.00	1.40	0.00	0.20	0.00	2.23	0.00
India	0.00	0.00	0.43	0.00	0.00	0.00	0.56	0.00	0.01	0.00	0.59	0.00
Indonesia	0.01	0.00	0.15	0.00	1.08	0.01	0.12	0.06	1.85	0.01	0.10	0.11
Malaysia	0.02	0.00	0.23	0.00	1.06	0.01	0.23	0.03	2.59	0.02	0.26	0.06
Pakistan	0.00	0.00	0.06	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.03	0.00
Philippines	0.01	0.00	0.11	0.00	0.04	0.00	0.12	0.00	0.05	0.00	0.10	0.00
Thailand	0.03	0.00	0.15	0.00	0.58	0.00	0.21	0.02	0.48	0.00	0.23	0.01
Other	0.45	0.00	0.15	0.02	1.04	0.01	0.21	0.03	0.91	0.01	0.15	0.04
South Africa	0.45	0.00	0.15	0.02	1.04	0.01	0.21	0.03	0.91	0.01	0.15	0.04

	2001				2006				2008			
	US holdings (Bil \$)	ω _{US}	ω _{hnt}	ω _{US} /ω _{hnt}	US holdings (Bil \$)	ω _{US}	ω _{hnt}	ω _{US} /ω _{hnt}	US holdings (Bil \$)	ω _{US}	ω _{hnt}	ω _{US} /ω _{hnt}
ADVANCED ECONOMIES	149.73	1.23	48.75	0.03	245.70	1.64	55.74	0.03	267.72	1.59	56.72	0.03
Euro Area	82.02	0.67	22.29	0.03	105.49	0.70	28.90	0.02	120.65	0.71	29.48	0.02
Austria	0.75	0.01	0.79	0.01	1.20	0.01	0.97	0.01	0.80	0.00	1.01	0.00
Belgium	2.77	0.02	0.96	0.02	3.37	0.02	0.80	0.03	4.58	0.03	0.96	0.03
Finland	0.57	0.00	0.24	0.02	0.92	0.01	0.24	0.03	0.54	0.00	0.20	0.02
France	14.70	0.12	4.10	0.03	29.93	0.20	5.14	0.04	27.86	0.16	5.24	0.03
Germany	38.15	0.31	6.60	0.05	38.63	0.26	7.09	0.04	55.12	0.33	6.31	0.05
Greece	1.38	0.01	0.37	0.03	1.14	0.01	0.54	0.01	0.81	0.00	0.61	0.01
Ireland	0.49	0.00	0.25	0.02	5.90	0.04	1.53	0.03	5.25	0.03	1.94	0.02
Italy	9.55	0.08	4.51	0.02	6.18	0.04	5.27	0.01	8.86	0.05	5.47	0.01
Netherlands	7.83	0.06	3.00	0.02	14.29	0.10	3.77	0.03	12.77	0.08	3.69	0.02
Portugal	0.16	0.00	0.26	0.01	0.30	0.00	0.34	0.01	0.24	0.00	0.42	0.00
Spain	5.69	0.05	1.19	0.04	3.63	0.02	3.22	0.01	3.80	0.02	3.62	0.01
Other	67.71	0.56	26.46	0.02	140.21	0.94	26.84	0.03	147.08	0.87	27.24	0.03
Australia	3.26	0.03	0.70	0.04	6.20	0.04	1.13	0.04	7.75	0.05	1.04	0.04
Canada	21.48	0.18	2.29	0.08	39.99	0.27	2.01	0.13	44.24	0.26	1.82	0.14
Denmark	2.27	0.02	0.85	0.02	8.36	0.06	1.07	0.05	7.98	0.05	1.06	0.04
Hong Kong SAR	0.07	0.00	0.15	0.00	0.25	0.00	0.13	0.01	0.26	0.00	0.11	0.01
Iceland	0.00	0.00	0.03	0.00	0.34	0.00	0.19	0.01	1.28	0.01	0.10	0.08
Japan	21.35	0.18	15.41	0.01	39.41	0.26	12.95	0.02	49.67	0.29	14.02	0.02
New Zealand	1.29	0.01	0.06	0.17	1.75	0.01	0.06	0.19	1.28	0.01	0.04	0.18
Norway	0.41	0.00	0.29	0.01	2.06	0.01	0.39	0.04	1.48	0.01	0.40	0.02
Singapore	0.04	0.00	0.16	0.00	2.48	0.02	0.17	0.10	1.59	0.01	0.18	0.05
South Korea	0.25	0.00	1.61	0.00	2.32	0.02	1.83	0.01	3.43	0.02	1.33	0.02
Sweden	3.66	0.03	0.68	0.04	6.42	0.04	0.82	0.05	3.61	0.02	0.77	0.03
Switzerland	0.11	0.00	0.54	0.00	0.25	0.00	0.44	0.00	1.02	0.01	0.42	0.01
United Kingdom	13.51	0.11	3.70	0.03	30.39	0.20	5.67	0.04	23.50	0.14	5.95	0.02
memo:												
United States	12020.00	98.76	46.36	2.13	14715.00	98.23	38.79	2.532285	16592.00	98.25	37.15	2.64

Table 6. Regressions for Expected Mean, Variance, and Skewness

The table shows dynamic panel regressions of one-year ahead mean, standard deviation, or skewness of unhedged 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 the Data Appendix. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

DepVar:	Mean	Standard deviation	Skewness
DepVar			
Lag 1	0.293**	0.084*	-0.173**
Lag 2			0.211***
Yield	0.006***		
Lag 1	-0.001**		
Exchange Rate	0.057***		
Lag 1	0.035***		
Inflation	-0.001		
Lag 1	0.001		
Current Account Balance	0.001***		0.027
Lag 1	0.000		0.045
Lag 2			-0.081***
GDP Growth	-0.001**		
Lag 1	-0.000		
# observations	251	520	244
# groups	41	41	39
Wald Statistic	100.9***	3.3*	29.9***
Correlation of predicted and actual	0.529***	0.513***	0.251***

Table 7. 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, and skewness of unhedged returns are the predicted values (as of end-2006 or end-2008) from Table 6. Correlations are computed using 3 years of monthly data. For information on the underlying returns data, see Table 1 and the Data Appendix. Regressions include all countries listed in Table 5 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% levels, respectively.

2008 Regressions							
Investability Measure:	Aggregate	CA Open	Liq Eff	Reg_CR	Mkt St	Tax	Dominv
Investability	0.0515** (0.0216)	0.0916* (0.0517)	0.207** (0.0901)	0.265** (0.123)	0.306*** (0.110)	0.0921 (0.122)	0.384** (0.148)
exp_mean08	-0.0390 (0.226)	0.0483 (0.242)	-0.170 (0.278)	0.0874 (0.230)	-0.164 (0.213)	0.00894 (0.281)	-0.0154 (0.194)
exp_sd08	1.415 (1.326)	0.540 (1.175)	2.302 (1.498)	1.217 (1.339)	2.030 (1.348)	0.743 (1.134)	1.685 (1.394)
exp_skew08	0.0158 (0.0125)	0.0158 (0.0138)	0.0186 (0.0135)	0.0151 (0.0128)	0.0210* (0.0119)	0.0186 (0.0143)	0.0185 (0.0120)
corr3yr08	-0.0344* (0.0178)	-0.0207 (0.0153)	-0.0416* (0.0209)	-0.0231 (0.0144)	-0.0405** (0.0170)	-0.0155 (0.0141)	-0.0301** (0.0143)
Observations	36	36	36	36	36	36	36
2006 Regressions							
Investability Measure:	Aggregate	CA Open	Liq Eff	Reg_CR	Mkt St	Tax	Dominv
Investability	0.0483** (0.0177)	0.0982** (0.0386)	0.209* (0.104)	0.257** (0.108)	0.198** (0.0835)	0.179*** (0.0579)	0.217* (0.108)
exp_mean06	0.272 (0.194)	0.373* (0.198)	0.221 (0.206)	0.387* (0.204)	0.128 (0.204)	0.374* (0.206)	0.214 (0.222)
exp_sd06	6.366 (4.223)	5.357 (4.047)	7.616 (4.886)	5.580 (4.100)	6.769 (4.358)	5.183 (4.212)	5.796 (4.167)
exp_skew06	0.0179 (0.0109)	0.0173 (0.0109)	0.0165 (0.0115)	0.0134 (0.0106)	0.0218* (0.0119)	0.0161 (0.0112)	0.0219* (0.0112)
corr3yr06	0.0194 (0.0259)	0.0306 (0.0296)	0.0184 (0.0239)	0.0250 (0.0274)	0.0170 (0.0243)	0.0321 (0.0309)	0.0214 (0.0281)
Observations	34	34	34	34	34	34	34

Table 8. 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 for Bond Portfolios

Each frontier includes a range of portfolios varying from 100% U.S. bonds (the common point in each line) to 100% foreign bonds. The figure includes three definitions for the rest-of-world (ROW) portfolio: (1) an *unhedged* portfolio of 80 percent AE and 20 percent EME bonds (the steep, blue line), (2) a *hedged* portfolio of 80 percent AE and 20 percent EME bonds (the downward-sloping red line), and (3) a 50-50 combination of (1) and (2) (the line in the middle). Returns data are from January 2002 to May 2011. The vertical axis is monthly return (in percent); the horizontal axis is standard deviation of the monthly returns.

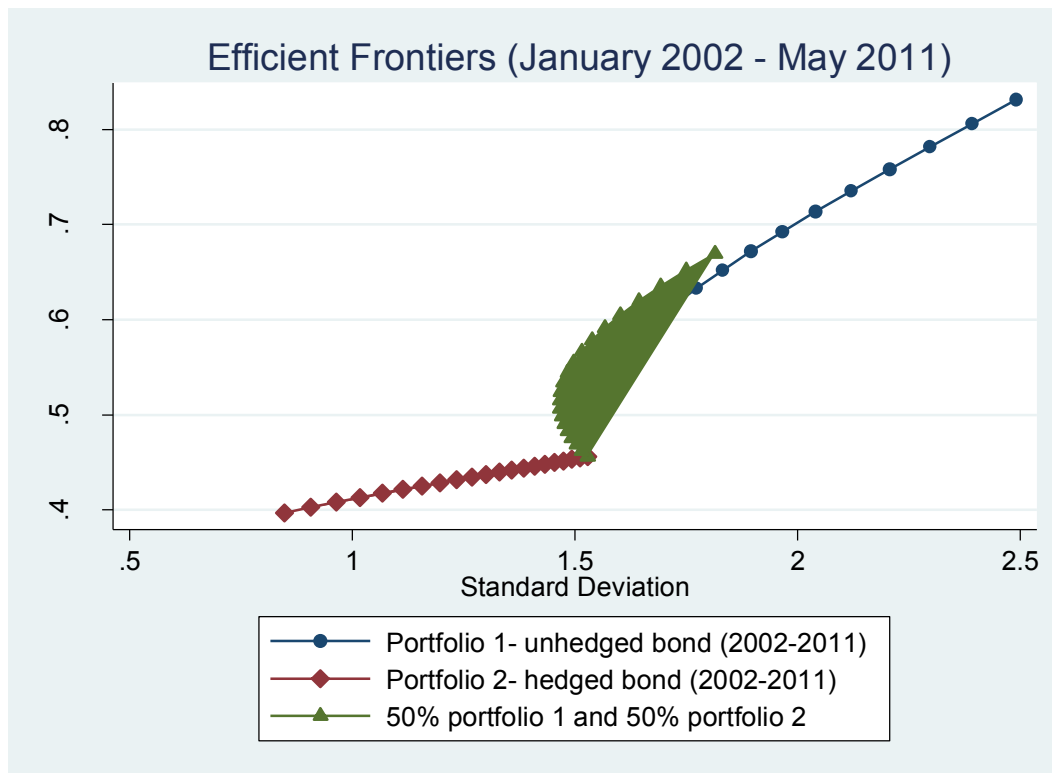


Figure 2. Efficient Frontiers for Broad Portfolios

Each frontier includes a range of broad portfolios varying from 100% U.S. (the common point in each line) to 100% foreign. For weights for the U.S. portion we chose 2006 estimates from the Federal Reserve's Flow of Funds accounts: 62% equities, 38% bonds, of which 43% government and 57% corporate. For the rest-of-world (ROW) portion, weights, which come from Treasury Department surveys as described in Table 5 and the Data Appendix, are 77% equity (of which 79% AE and 21% EME) and 23% bond (89% AE, 9% USD-denominated EME, 2% local currency EME). The figure includes three definitions for the ROW bond portfolio: (1) *unhedged* (the steepest, blue line), (2) *hedged* (the red line), and (3) a 50-50 combination of (1) and (2) (the line in the middle). In the bottom graph we ramp up the local currency EME bond weight by increasing the overall bond weight in the ROW portfolio to 59.4% and the local currency EME portion of that to 20%. Returns data are from January 2002 to May 2011. The vertical axes are monthly return (in percent); the horizontal axes are standard deviation of the monthly returns.

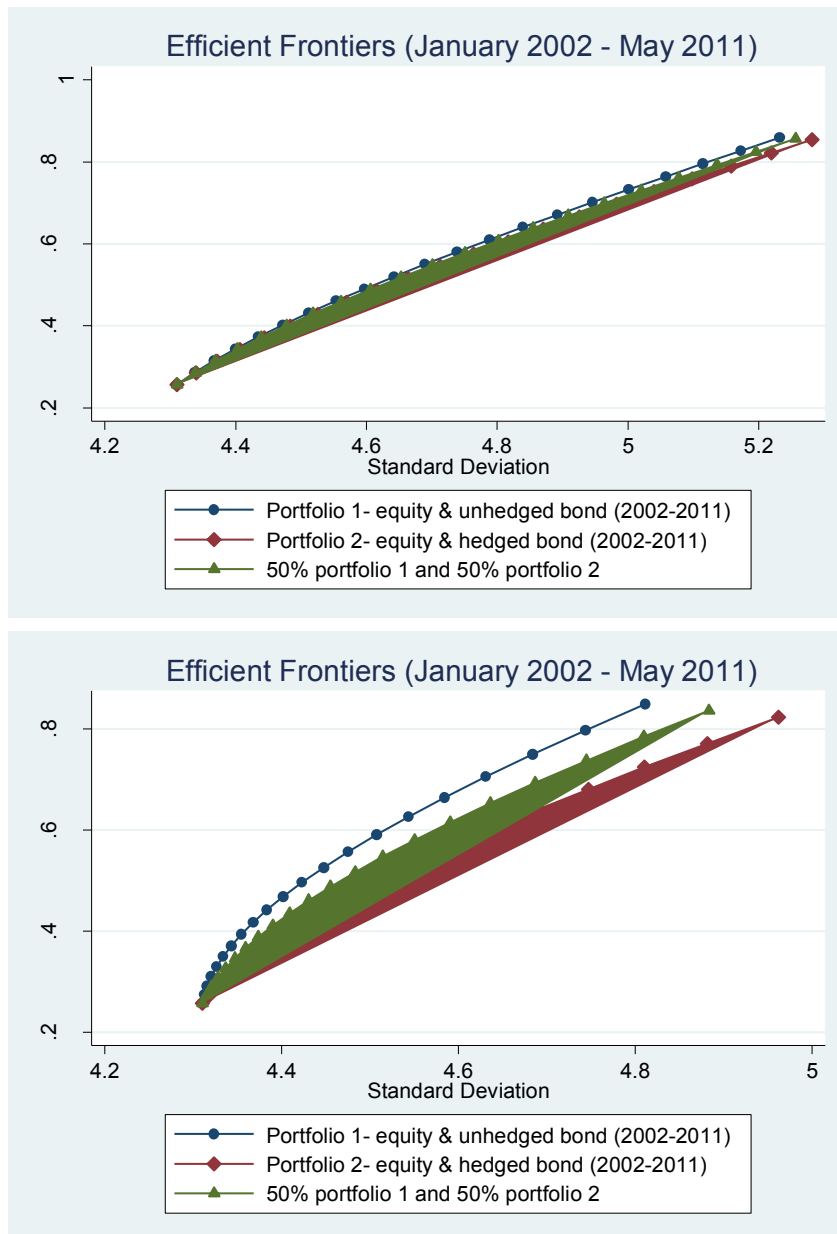


Figure 3. Some Determinants of Local Bond Market Development

Two fundamental factors of local currency bond market development are inflation volatility (shown as the volatility of 10 years of quarterly year-over-year inflation) and legal rights for borrowers and lenders (from the World Bank's Doing Business reports). As in 2001 data analyzed in Burger and Warnock (2006), in 2008 countries with less inflation volatility and stronger legal rights had larger local currency bond markets (expressed as a percent of GDP).

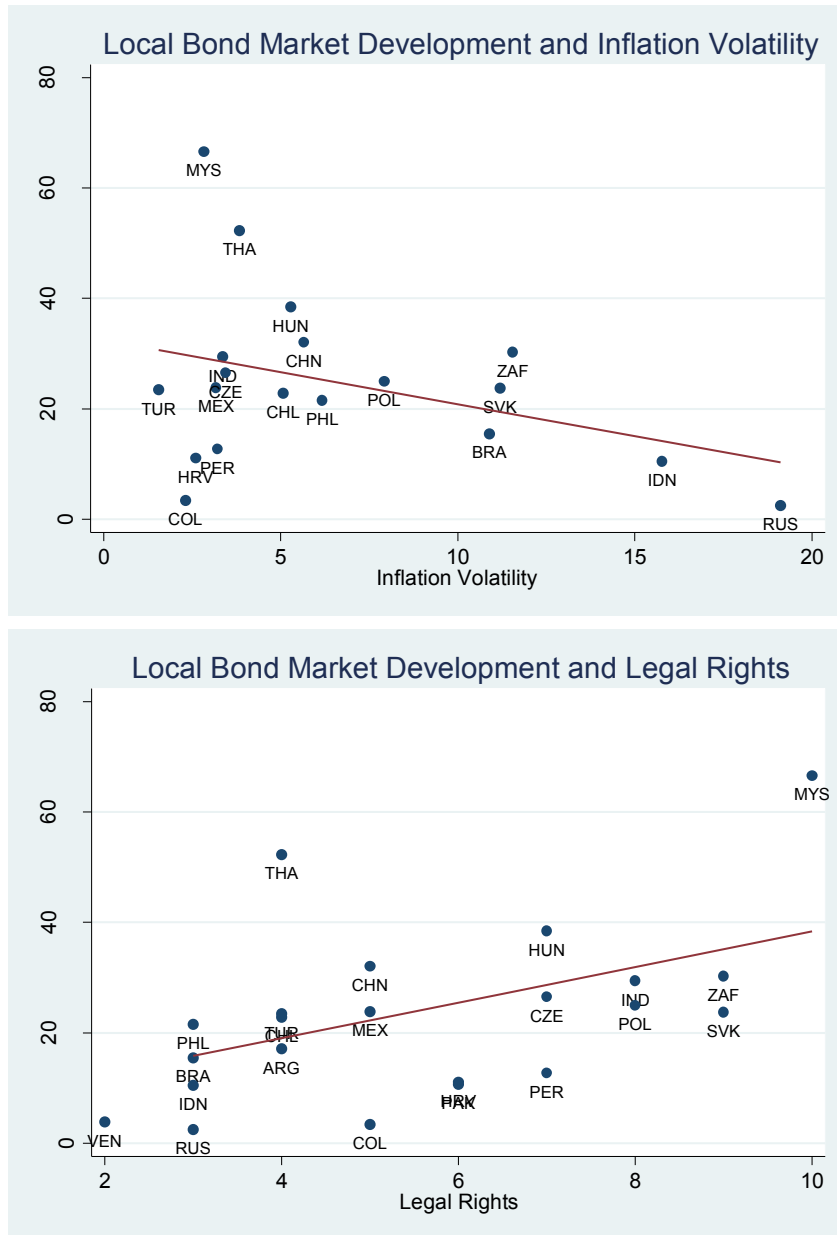


Figure 4. U.S. Investment and Investability Index, GEMX Countries

U.S. Holdings is the portion of the country's outstanding local currency bonds that is held by U.S. investors; bond holdings data are as of end-2006 from U.S. Department of the Treasury 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.

