The Replacement of Safe Assets: Evidence from the U.S. Bond Portfolio

Carol Bertaut, Alexandra Tabova, and Vivian Wong

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Abstract: The expansion in financial sector "safe" assets, largely in the form of structured products from the U.S. and the Caribbean, in the lead-up to the global financial crisis has by now been fairly well documented. Using a unique dataset derived from security-level data on U.S. portfolio holdings of foreign securities, we show that since the crisis, it is mostly the *foreign* financial sector that appears to have met U.S. demand for safe and liquid investment assets by expanding its supply of debt securities. We also find a strong negative correlation between the foreign share of the U.S. financial bond portfolio and measures of U.S. safe assets availability: providing evidence on the importance of foreign-issued financial sector debt as a substitute when U.S. issued "safe" assets are scarce. Furthermore, although U.S. investors continue to tap foreign financial markets for "safe" assets, we show that the type of foreign financial debt that fills this portfolio niche post-crisis is quite different than pre-crisis. Post-crisis, we find that U.S. investors have replaced offshore-issued structured securities with high-grade U.S. dollar-denominated financial debt issued from a small group of OECD countries (most notably Australia and Canada). Lastly, these developments have led to a decline in home bias in the U.S. financial bond portfolio that we are able to document for the first time.

Keywords: safe assets, international portfolio choice, financial sector debt, home bias

JEL classifications: F21, F34, G11, G20

1   Introduction

Considerable attention has been paid to the interplay between increased demand for "safe and liquid" assets and the role of the financial sector in supplying such assets in the lead-up to the global financial crisis. Policy-makers and academics have outlined how the expansion of structured investment products such as mortgage-backed and other asset-backed securities contributed to the imbalances that led to the global financial crisis. Indeed, most asset-backed securities were rated AAA and thus seemingly offered limited credit risk with somewhat higher investment returns than Treasury securities (Bernanke et al., 2001). With the onset of the crisis the majority of these structured products were revealed to have been both highly illiquid and highly risky, and demand for and issuance of all types of asset-backed securities fell sharply (Federal Reserve, 2010). But U.S. investor demand for suitable "safe" portfolio alternatives that offer some degree of investment return remains in the post-crisis period.

In this paper, we show that post-crisis, it is the foreign financial sector that has supplied "safe" financial debt to meet this portfolio demand. In particular, post-crisis, U.S. investors have turned to foreign-issued dollar-denominated high-grade (rated at least AA-) financial sector debt as the amount outstanding of U.S. financial sector debt has declined, and as the Federal Reserve and foreign official investors have absorbed the lion's share of new Treasury issuance. In sharp contrast to the shares of nonfinancial and government bonds held by U.S. investors, the high-grade financial sector share in U.S. investor portfolios has been steadily increasing. That the high-grade financial share has been increasing since the financial crisis even as it has become harder for financial firms to issue debt with high credit ratings is an important development. And while part of the increase in the high grade share of U.S. holdings of foreign financial bonds arises from a sell-off of lower grade debt, we find that a more important part arises from acquisitions of newly-issued foreign high-grade debt. These developments in U.S. portfolios mirror developments in global bond issuance.

The empirical literature on safe assets has focused on the substitutability of U.S. government debt and privately produced safe assets by the U.S. financial sector. Gorton, Lewellen, and Metrick (2012) show that government and privately produced safe assets in the U.S. are strongly negatively correlated. Krishnamurthy and Vissing-Jorgensen (2012) also document this negative relationship between the supply of privately produced safe assets (by the U.S. financial sector) and the supply of U.S. government debt. They also find that financial crises are more likely to occur when outstanding amounts of U.S. Treasuries are low and "safe" debt issued by the financial sector is high, consistent with the argument in Gourinchas and Jeanne (2012) that safe asset shortages can create financial instability. In this paper, we document that in the post-crisis period it is the *foreign* financial sector that has produced and supplied "safe" debt to meet U.S. demand for safe assets.

To represent safe assets availability we update and extend Gorton, Lewellen, and Metrick (2012) measures of U.S. "safe assets", constructed as U.S. government debt and the "safe"

component of private financial debt relative to either all assets in the U.S. or relative to U.S. GDP. Because we are specifically interested in the demand for safe assets by private investors - and in the availability of such assets to private investors - we also construct an alternative measure that excludes from the "safe" category the holdings of such assets by the Federal Reserve and by foreign official investors. We then find that the foreign share of the U.S. financial bond portfolio is strongly negatively correlated with these different measures of safe assets availability: providing evidence on the importance of foreign-issued financial sector debt as a substitute when U.S. issued "safe" assets are scarce.

These developments in U.S. portfolios - in particular, the increased portfolio share devoted to foreign-issued financial sector debt with high credit ratings and thus presumed to be of high credit quality - have also affected measures of U.S. "home bias". We show that home bias in financial sector bonds has been steadily declining after its brief spike during the financial crisis which means that U.S. investors are absorbing a larger share of foreign-issued financial debt in their portfolios relative to the growth of foreign-issued financial debt in global financial market capitalization. In contrast, the relative stability of the home bias measures for government debt and non-financial corporate debt indicate that although that U.S. investors' holdings of these securities have also grown since the crisis, the increases have essentially kept pace with the growth of foreign-issued government and non-financial corporate debt in global market capitalization. A large literature has studied the phenomenon of home bias in equities since the seminal work of French and Poterba (1991). Bond holdings and the associated home bias have received much less attention. The studies that do explore the composition of bond portfolios across the world focus on aggregate bond holdings (Burger and Warnock, 2003 and Burger and Warnock, 2004 for the U.S.; DeSantis and Gerard, 2006 and Lane, 2005 for euro-area countries; Fidora et al., 2007). We go beyond the aggregate U.S. bond portfolio and we document to the best of our knowledge for the first time the sectoral decomposition of the home bias in the U.S. bond portfolio.

We find that there has been a significant shift in the countries that have supplied high-grade financial sector debt between the pre-crisis and post-crisis periods. As Caribbean and U.S. high-grade financial issuance plummeted post-crisis, U.S. investors have turned to securities with "safe" characteristics from a select group of foreign countries, most notably Australia and Canada, that began to issue high-grade, dollar-denominated financial sector debt more aggressively. This increase in high-grade issuance corresponds to a significant increase in U.S. investors' holdings of debt issued by financial firms in Australia and Canada, both in dollar terms and in share terms. As of end-2012 Australia and Canada's combined share in the U.S. foreign portfolio of high-grade dollar-denominated bonds was 40 percent compared to an average of only 8 percent pre-crisis. Next, using a panel of 45 countries we show that the geographical composition of the U.S. foreign financial bond portfolio is positively related to the ability of a country's financial institutions to issue dollar debt that is high grade. Our empirical work is done in a portfolio choice framework taking into account the return on bonds issued by individual countries and their covariance with the aggregate return on the U.S. foreign bond portfolio. Our unique dataset represents the complete U.S. foreign

bond portfolio; and with data on security prices and coupon rates for most of the bonds in our sample it allows us to construct the actual returns that the U.S. investor incurs in each foreign country and for the portfolio as a whole. Our results hold even when we control for other determinants of portfolio holdings that are common in the empirical literature. With this framework we focus on the U.S investor's international bond portfolio and while this approach ignores the domestic part of the overall investment portfolio, the analysis is informative about general drivers of portfolio shifts and trends of safe asset replacement.

The rest of the paper is structured as follows. In Section 2 we document the evolution of U.S. safe assets outstanding before, during, and following the financial crisis, and compare the developments in U.S. bond market capitalization with developments in U.S. portfolio holdings. We show that U.S. investors have been able to increase their foreign portfolio share of high-grade foreign-issued bonds, and provide econometric evidence for the importance of foreign-issued financial sector debt as a substitute when U.S. issued "safe" assets are scarce. Section 3 documents the decline in home bias in financial sector debt related to these developments. In Section 4 we focus on the country composition of the U.S. foreign portfolio and document a shift in the countries that have supplied high-grade financial sector debt between the pre-crisis and post-crisis periods. We also show empirically that the geographical composition of the U.S. foreign financial bond portfolio is positively related to the ability of these countries' financial institutions to issue dollar debt that is high grade. Section 5 concludes and outlines possible implications.

2 Safe assets and the U.S. bond portfolio

2.1 U.S. safe assets outstanding and the U.S. bond portfolio: before, during and after the global financial crisis

U.S. investor behavior in the lead-up to the global financial crisis, and in particular the portfolio expansion in financial sector "substitute" safe liquid assets (largely in the form of structured products), has received much attention in the literature as well as in policy circles (Caballero (2010), Bernanke et al (2011), Bertaut et al (2011, 2012), Tarullo (2012)). Demand for highly-rated, dollar-denominated "safe" assets in the build-up to the financial crisis was a feature of both U.S. and foreign portfolios. Caballero (2010) argues that the rise in global demand for safe debt instruments beyond those that could be adequately met by the financial sector through securitization was in fact a root cause of the financial crisis. Bernanke et al (2011) and Bertaut et al (2011, 2012) document how capital inflows to the United States from foreign official investors including those in the "saving glut" countries were largely invested in very safe U.S. Treasury and U.S. government agency securities, absorbing much of the supply of these assets, while equally large inflows from European investors were predominantly directed toward "safe" assets created by the U.S. financial

sector.[1]

Tarullo (2012) notes that additionally nonfinancial firms increased their demand for safe and liquid assets in response to the market disruptions caused by defaults of major corporations such as Enron, and that the adoption of more elaborate investment strategies required the availability of cash or cash equivalents for margining and other collateral purposes. In large part, this demand was met by the shadow banking system's creation of assets that were "seemingly safe and seemingly liquid". As laid out in Gorton and Pennachi (1990) and, more recently, Gorton, Lewellen, and Metrick (2012) and Krishnamurthy and Vissing-Jorgensen (2012), the financial sector is particularly well able to expand the supply of debt to meet the demand for safe and liquid investment assets.

The interactions of investor motivations in particular in terms of "safe" assets show through to the composition of the U.S. bond market and to changes in the aggregate U.S. investor bond portfolio. Figure 1 shows the evolution of U.S. debt securities outstanding from 2003 to 2012 while Figure 2 shows the evolution of U.S. holdings of both domestic and foreign debt securities. Figure 3 compares the changes in these outstanding amounts with changes in U.S. holdings for three sub-periods of interest: leading up to the global financial crisis (2003-2007 H1), during the crisis (2007H2-2009Q1), and post-crisis (2009Q2 to 2012). In the lead-up to the crisis, the stock of U.S. government-issued securities (in blue; Figure 1 and the left-hand "pre-crisis" bar in Figure 3) expanded briskly, but U.S. investors' holdings of these assets (Figure 2 and the right-hand "pre-crisis bar in Figure 3) grew little, as foreign official investors absorbed roughly 80 percent of the increase in U.S. Treasury and agency securities outstanding over this period. By effectively taking safe U.S. debt off the market and lowering its yields, this encouraged creation of highly-rated "safe" assets by the U.S. financial system (in yellow), primarily in the form of MBS and other asset-backed securities. Although some of these were acquired by foreign (primarily European) investors, the majority were acquired by U.S. investors, who also acquired highly-rated foreign bonds, primarily in the form of structured products issued out of the Caribbean banking centers, and included in the purple segments, as investment alternatives that appeared to offer slightly higher returns with little apparent increase in risk.

With the onset of the crisis, demand for ABS dried up, and issuance of ABS and other financial assets with high credit ratings and thus considered "safe" in the U.S. and out of offshore centers such as in the Cayman Islands fell off to a fraction of its previous rate (middle bars in Figure 3). The stock of government-issued assets increased markedly, and U.S. investors dramatically increased their holdings of these securities, in part to offset the losses from their holdings of financial sector bonds that they had formerly considered safe.

Previous research has documented most of these developments for the pre-crisis and crisis period. One of our contributions in this paper is documenting how U.S. investor demand has evolved post-crisis and showing that some of the factors that led to the decline of available

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[1]"Saving glut" countries refer primarily to Asian emerging markets and commodity exporters.

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safe U.S. assets leading up to the crisis in 2007 are even stronger in its aftermath. In the years since the crisis (right hand bars in Figure 3), the stock of Treasury securities has continued to grow briskly, but foreign official investors are again absorbing a sizable share. And at the same time, the large scale asset purchases of the Federal Reserve (shown as the lighter blue segments in Figure 2 and Figure 3) have absorbed more than half of the increase in safe government debt outstanding, thus further reducing the availability of these assets to private investors. And while bonds issued by the U.S. financial sector have been declining post-crisis (and declining in U.S. portfolios), we see that U.S. investors have stepped up their acquisitions of bonds issued by the foreign sector. In fact, we will show that much of this increase has been in foreign financial bonds that are highly rated and U.S. dollar-denominated, as U.S. investors have acted to fill this portfolio niche for safe bonds.

2.2 The role of high quality foreign financial bonds

To shed some light on exactly what type of foreign bonds U.S investors are acquiring after the crisis and whether the characteristics of these foreign bonds relate to the availability of U.S. "safe" assets, we use the confidential security-level data that underlie the annual Treasury International Capital (TIC) surveys of U.S. portfolio holdings of foreign securities.[2] Because these TIC survey data are at the underlying security level, we are able to decompose the U.S. foreign bond portfolio into holdings of debt issued by (1) the foreign financial sector; (2) the foreign nonfinancial corporate sector; and (3) foreign governments. Published TIC survey data only distinguishes between government and total corporate debt, but as we will show the distinction between financial and nonfinancial corporate debt is particularly useful in this context. Importantly, we are also able to identify the credit quality of the individual debt securities held by U.S. investors, which allows us to characterize the overall "safeness" of holdings of foreign-issued bonds by sector. We supplement these data on holdings of foreign bonds with data on holdings of domestic bonds from the U.S. Financial Accounts of the United States to construct the complete U.S. bond portfolio.

U.S. investor holdings of foreign bonds are split roughly evenly among securities issued by governments, financial institutions, and non-financial corporations (Figure 4). Figure 5 shows that while foreign-issued financial sector bonds still make up a relatively small share of U.S. investors' total holdings of financial sector bonds, that share has doubled in recent years, from roughly 10% in 2008 to about 20% more recently. And in dollar terms, U.S. holdings of foreign financial bonds have recovered since the crisis (Figure 6) in contrast to holdings of domestic financial bonds (Figure 7).

Although in dollar terms U.S. investor holdings of foreign bonds are roughly split across the government, financial, and non-financial sectors, there are important trend differences in

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[2]The Treasury International Capital (TIC) survey collects data at the underlying security (CUSIP or ISIN) level from U.S. resident custodians, broker-dealers, and institutional end-investors who hold foreign debt securities or foreign equity on their own behalf or for U.S.-resident clients.

terms of characteristics among the sectoral portfolios, most notably in terms of credit rating or grade. The majority of non-financial corporate bonds are investment grade but rated BB or BBB; relatively few are of high credit quality (rated AA- or higher[3]. This feature of non-financial corporate bond issuance is reflected in U.S. investor holdings of foreign non-financial corporate bonds: the high-grade share is less than 9 percent, and this share has changed little over time (Figure 8). The share of high-grade foreign-issued government bonds is considerably higher, but that share has edged down recently from roughly 50% just before the crisis to about 45% more recently, reflecting both active choices to invest in higher-yielding but lower-grade sovereign debt issued by emerging market economies as well as credit down-grades of some former high-grade sovereign issuers. In sharp contrast to the nonfinancial and government bonds held by U.S. investors, the share of high-grade *financial* bonds has been steadily rising and in 2012 it reached a level twice as high as in 2003. U.S. holdings of high-grade foreign financial bonds has also increased steadily in level terms (Figure 9).

That the high-grade financial sector share in U.S. investor portfolios has been steadily increasing even as it has become harder for financial firms to issue debt with high credit ratings since the financial crisis is an important development. And while part of the increase in the high-grade share of U.S. holdings of foreign financial bonds arises from a sell-off of lower-grade debt, we find that a more important part arises from acquisitions of newly issued-foreign high-grade debt.

These developments in U.S. portfolios - that holdings of domestically-issued financial bonds have declined, while holdings of foreign-issued financial bonds and especially high-grade financial debt have increased - mirror developments in global bond issuance. Figure 10 shows that while U.S. issuance of high-grade financial debt has declined substantially on average over 2009 to 2012, average foreign high-grade financial issuance over this period has remained roughly at its 2003 level. Figure 11 shows a declining U.S. share in global high-grade financial bond issuance, calculated as:

$$\text{U.S. high-grade fin. iss. share} = \frac{\text{High-grade fin. bond iss.}_t^{US}}{\text{High-grade fin. bond iss.}_t^{US} + \text{High-grade fin. bond iss.}_t^{ROW}}$$

A natural question is whether the increase in holdings of "safe" financial bonds–largely from Australia and Canada–has simply been a substitute for reduced holdings of shorter-maturity assets such as CDs issued by these same institutions. If anything, changes in U.S. investor holdings of foreign CDs suggest that similar motivations of looking for "safe" assets have been at play in this portion of the U.S. portfolio as well (Figure 12). U.S. holdings of foreign-issued CDs also rose pre-crisis, and after a brief dip during the crisis, picked up again through 2010. More recently, holdings have declined somewhat. But this more recent decline, most pronounced in 2011, appears associated with the short-term funding pressures of euro-area

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[3]This includes prime and high grade bonds following $S\&P$'s classification.

banks during the European debt crisis. A similar decline has also been documented for CDs issued by U.S. branches of euro area banks, as U.S. money market funds became reluctant to hold such CDs during the escalation of the euro area crisis (Correa, Sapriza, and Zlate (2012)). Looking at the detailed survey-level data on cross-border holdings of CDs suggests similar factors were at play for U.S. investors more generally, as the largest decreases in U.S. holdings are from CDs issued through London branches of euro-area banks. By contrast, U.S. holdings of Australian- and Canadian- issued CDs rose, offsetting to some extent the decline in CDs issued by European banks.

2.3 U.S. "safe" assets and foreign bonds

We might expect the reduced availability of U.S. "safe" assets (U.S. government bonds as well as U.S. high-grade financial debt) to have played a role in U.S. demand for foreign financial sector bonds. We next explore this connection more systematically.

To represent safe asset availability, we use the measure of U.S. safe assets constructed in Gorton, Lewellen, and Metrick (2012) as the sum of U.S. government debt and the "safe" component of private financial debt relative to either all assets in the U.S., which is the Gorton et al. "safe asset share", [4] or relative to U.S. GDP. We replicate their measure, extend it through 2012Q2 and, following their construction, we also compute "high" and "low" estimates of the safe asset measure which differ by whether certain items in the U.S. financial accounts are assumed to be "safe". Because we are specifically interested in the demand for safe assets by private investors - and in the availability of such assets to private investors - we also construct an alternative measure that excludes from the "safe" category the holdings of such assets by the Federal Reserve and by foreign official investors. We exclude the holdings of the Federal Reserve because such holdings essentially remove securities from potential acquisition by other investors. This adjustment is particularly important post-crisis when, as we noted above, the Federal Reserve's large-scale asset purchases absorbed more than half of the increase in government securities outstanding. Likewise, we exclude holdings by foreign official investors because their acquisitions are also likely motivated for different reasons than private investors, and also effectively remove such securities from the available investment pool.

Figure 13 shows the safe asset share constructed following the Gorton et al. definition and the same share augmented to exclude holdings of the Federal Reserve and foreign official institutions. Both the original construction and our augmented construction follow the same trajectory of a gradual decline leading up to the crisis, a sharp spike early in the crisis (as the supply of government-issued securities rose sharply), and a subsequent decline more

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[4]The safe asset share, constructed in Gorton, Lewellen, and Metrick (2012) as the ratio of U.S. government debt and the safe component of private financial debt to total liabilities and equity in all sectors in the U.S. The authors do not include in the safe amount any types of non-financial sector because of the relatively small size of the market for non-financial sector debt that can be perceived as "safe".

recently. However, this more recent decline in the safe asset share is more pronounced in our augmented measure. Figure 14 shows the factors behind this divergence. In the original Gorton et al. construction, a rising government share (from roughly 9 percent of all assets at the onset of the crisis to about 11.5 percent more recently) offsets some of the decline in the financial share (from roughly 30 percent to about 24 percent currently). In our augmented measure, the government share is more constant, increasing only from 6 percent to 7 percent by 2009 and then remaining at 7 percent through 2012. Safe assets relative to GDP show a similar pattern to the safe asset share (Figure 15).

The foreign share of the U.S. financial bond portfolio and the U.S. safe asset share (plotted in Figure 16) are indeed strongly negatively correlated, as shown by the results of a simple regression of the foreign share of the U.S. financial bond portfolio on our augmented U.S. safe asset share (adjusted for the holdings of the Federal Reserve and foreign official investors) in Column 1 of Table 1.[5] The results are similar if we instead use the original Gorton et al. measures. Since the observed decline in the safe asset share is driven by a decline in the financial component of this measure (as we saw in Figure 14), this suggests that it is the financial safe portion of total assets that drives this negative correlation, and not so much the government share. The results in columns (2) and (3) of Table 1 provide confirmation: regressing the foreign share separately on these two components, we find that it is strongly correlated only with the financial safe share. That is, the share of foreign bonds in the U.S. financial bond portfolio is significantly higher when the U.S. financial system contributes a smaller share of "safe" assets to the available supply of U.S. assets outstanding. The regressions in (1)-(3) use the "high" estimates of the safe asset shares; the bottom part of Table 1 shows that the results hold if we use the "low" estimate of the Gorton et al. safe asset measures.

That the share of foreign financial bonds in U.S. portfolios moves with changes in the availability of financial sector "safe" securities is perhaps not surprising, given the ability of the financial sector to expand the supply "safe" assets in a way that the government sector is not. Our results point out, however, that an important channel for the expanded supply of "safe" assets available to U.S. investors apparently comes from securities issued by the foreign financial sector. That is, the *foreign share* of the U.S. financial bond portfolio increases when the share of "safe" assets supplied by the U.S. financial sector decreases. As hinted to by the increased holdings of "foreign" debt in Figure 3 and as we develop further below, this result arises because U.S. investors turn to high-grade foreign-issued financial sector debt as a substitute when U.S. "safe" assets are scarcer.

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[5]While our annual survey data allow us to document the details underlying the evolution of U.S. holdings of foreign bonds issued by the foreign financial sector, non-financial sector, and governments as well as the evolution of their credit quality, we need a longer time series to be able to explore how the U.S. safe asset share relates to U.S. investors' holdings of foreign bonds and in particular to holdings of foreign financial bonds. To this end, we construct quarterly series for the foreign share of the U.S. financial bond portfolio for the period 2003Q1-2012Q4, using the same methodology and data sources as for the annual series, but using mild assumptions for the quarterly changes in the sectoral composition of the U.S. holdings of foreign corporate bonds (see Appendix for details).

If we use safe assets relative to GDP (plotted in Figure 15) instead of the share of safe assets in total assets, our results remain unchanged: we find a strong negative relation between the foreign share of the U.S. financial bond portfolio and safe assets presented as a share of GDP (Table 2).

The inclusion of additional controls does not alter our findings. Table 3 reports these results the share of safe assets in total assets and controlling for the bond market capitalization of the U.S. and the rest of the world. We use two alternative controls: the foreign share in the World Financial Bond Market Capitalization; and the difference in the financial bond market capitalization between the U.S. and the rest of the world. Total foreign and world bond market capitalization data by sector come from the BIS Quarterly Review.

In Table 4, motivated by portfolio theory and the empirical literature on determinants of capital flows, we control for expected excess returns and returns covariances. As shown in Krishnamurthy and Vissing-Jorgensson (2013), investors' demand for safe assets drives a premium on safe assets that the financial sector then exploits. In our case we are interested in the forces behind the observed evolution of U.S. holdings of foreign financial bonds. Since an increase in the foreign share means that U.S. investors put more weight in their bond portfolio on foreign financial bonds relative to domestic financial bonds, we control for the relative returns of these two financial sectors: that is, the returns from investing in debt supplied by the foreign financial sector relative to the returns from debt issued by the domestic financial sector. We use monthly Barclays Live returns data for foreign financial high grade bonds denominated in dollars (high grade Yankee bonds) to construct the foreign excess return relative to similarly rated U.S. financial bonds. Barclays monthly returns data for financial Yankee high grade bonds are available for 15 countries, mostly OECD countries. We use the Barclays weighted index of foreign returns from these 15 countries. Our estimation approach follows that in Coeurdacier and Guibaud (2011) and thus we use as a proxy for expected returns in a given quarter the actual realized return over the subsequent period. The quarterly covariances between these returns are computed over 15- or 30-month rolling windows and the return covariance enters the equation with a lag. Including lagged values for the safe asset share in these specifications does not alter the results. Our previous findings do not change.

3   Implications for U.S. home bias in bonds

How have these developments in U.S. portfolios - in particular, the increased portfolio share devoted to foreign-issued financial sector debt - affected measures of U.S. "home bias"? Home bias is the fact well documented in the literature that investors are overweight in domestic assets. The phenomenon of equity home bias has been well documented in the literature starting with the seminal work of French and Poterba (1991). The literature on home bias in bonds, however, is rather limited and the existing studies have focused on the bias in the

investors' total bond portfolio (Burger and Warnock, 2003 and Burger and Warnock, 2004 for the U.S.; DeSantis and Gerard, 2006 and Lane, 2005 for euro-area countries; Fidora *et al.*, 2007). Using the TIC survey data described above, we are able to decompose total U.S. bond home bias into home bias in government, corporate, financial and non-financial sector bonds.

To compute the measure of bond home bias (BHB) we use the standard definition in the literature where the extent to which the investor is over-weighed in domestic assets is measured relative to a benchmark, where the benchmark is the ICAPM[6]:

$$\text{Bond Home Bias (BHB)} = 1 - \frac{\text{Foreign Share in the U.S. Bond Portfolio}}{\text{Foreign Share in the World Bond Market Cap.}}$$

where:

$$\text{Foreign Share in the U.S. Bond Portfolio} = \frac{\text{U.S. holdings of foreign bonds}}{\text{Total U.S. bond portfolio}}$$

$$\text{Foreign Share in the World Bond Market Cap.} = \frac{\text{Foreign bond market cap}}{\text{World bond market cap}}$$

The sectoral components of the bond home bias are calculated analogously for bonds issued by the particular sector of interest. For example, the financial bond bias is calculated as:

$$\text{Financial Bond Home Bias (FBHB)} = 1 - \frac{\text{Foreign Share in the U.S. Financial Bond Portfolio}}{\text{Foreign Share in the World Financial Bond Market Cap.}}$$

where:

$$\text{Foreign Share in the U.S. Financial Bond Portfolio} = \frac{\text{U.S. holdings of foreign financial bonds}}{\text{Total U.S. financial bond portfolio}}$$

$$\text{Foreign Share in the World Financial Bond Market Cap.} = \frac{\text{Foreign financial bond market cap}}{\text{World financial bond market cap}}$$

In the top panel of Figure 17 we confirm the empirical fact, documented in the literature, of a relatively high but pretty stable aggregate U.S. bond home bias (BHB) (solid line). Aggregate

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[6]If the U.S. invested only in domestic assets, this measure of home bias would be one.

bond bias has been hovering near 0.90, which means the share of foreign bonds in the total U.S. bond portfolio is only a tenth of their share in the world bond market capitalization. Once we decompose total bonds into government bonds and corporate bonds (GBHB and CBHB respectively) it is clear that behind the relatively high and stable aggregate bias is an even higher and more stable bias in government bonds (GBHB) and a much lower and more volatile home bias in corporate bonds. Next, we decompose corporate bonds into bonds issued by the financial and the non-financial sectors and plot the associated bias measures (FBHB and NFBHB, respectively) in the bottom panel of Figure 17. Relative to the other sectors, U.S. bias in financial bonds is a good bit lower and has been steadily declining after its brief spike during the financial crisis. The Figure also shows that the evolution of corporate bonds bias since the crisis is driven almost entirely by the bias in financial bonds.

Importantly, the evolution of the financial bond home bias itself is driven by the evolution of the foreign share in the U.S. financial bond portfolio (Figure 18). The top panel of Figure 18 plots the financial home bias (FBHB). The two lower panels of Figure 18 plot the components of the U.S. FBHB ratio and show that it is the rise in the share of foreign financial bonds in the U.S portfolio in the post-crisis period that determines the observed path of the financial bond bias: this share has grown faster than the foreign share of financial debt outstanding. Thus, U.S. investors are absorbing a larger share of foreign-issued financial debt in their portfolios relative to the growth of foreign-issued financial debt in global financial market capitalization. In contrast, the relative stability of the home bias measures for government debt and non-financial corporate debt indicate that although (as we saw in Figure 4) U.S. investors' holdings of these securities have also grown since the crisis, the increases have essentially kept pace with the growth of foreign-issued government and non-financial corporate debt in global market capitalization.

4 The U.S. foreign bond portfolio: geographical composition

Thus far we have shown that U.S. investors actively adjusted their portfolios to acquire more highly-rated foreign-issued financial sector debt as the availability of "safe" U.S. debt has declined. We next explore which foreign countries have driven these increases in U.S holdings of foreign financial debt, and more specifically of foreign high-grade financial debt. We find that there has been a significant shift in the countries that have supplied high-grade financial sector debt between the pre-crisis and post-crisis periods.

As we noted before, much of the increase in holdings of foreign financial sector debt pre-crisis was in the form of highly-rated and thus considered "safe" ABS and other structured products issued out of the Caribbean. We find that post-crisis U.S. investors started replacing such Caribbean-issued securities with newly-issued securities from other foreign countries

that began to issue financial sector debt with "safe" characteristics (high-grade and dollar-denominated) more aggressively. Both Caribbean and U.S. high-grade financial issuance plummeted post crisis (Figure 19) and their combined share in total world issuance of high-grade financial debt fell from 85 percent in the pre-crisis period to 66 percent post-crisis (Figure 20), in large part reflecting the evaporation of the market for ABS and other structured investment products. However, increased issuance of dollar-denominated high-grade debt - both in level and share terms - by a small group of mostly OECD countries, most notably Australia and Canada (Figures 19 and 20), offset, to a certain degree the drop in high-grade issuance from the Caribbean and the U.S. The rise in issuance by these countries thus served to fill the gap in high-grade financial debt supply. This increase in high-grade issuance corresponds to a significant increase in U.S. investors' holdings of debt issued by financial firms in Australia and Canada, both in dollar terms (Figures 21 and 22) and in share terms (Figure 23). The increase in Australia and Canada's combined share in the U.S. portfolio is driven by increased holdings of highly-rated bonds: As of end-2012 Australia and Canada's combined share in the U.S. foreign portfolio of high-grade dollar-denominated bonds was 40 percent compared to an average of 8 percent in the pre-crisis period. In contrast, if we take all foreign financial sector bonds held by U.S. investors, not just those that are highly-rated, Australia and Canada's combined share, while also increasing, is only about 23 percent by 2012 (Figure 24). We also note a change in the type of financial debt instruments that correspond to this change in the countries that have supplied the newly-issued high-grade dollar-denominated financial sector debt: whereas ABS supplied much of the increase pre-crisis, most of the post-crisis increase comes from holdings of medium-term (3-5 year maturity) conventional coupon bonds.

We next explore more formally whether the ability of a country's financial institutions to issue dollar-denominated debt that is high-grade plays a significant role in determining the geographical composition of the foreign segment of the U.S. bond portfolio. For each country, we proxy this ability by the share of high-grade (specifically, AA- or higher) dollar-denominated financial bond issuance in its total financial bond issuance: $\frac{\text{High-grade USD fin. iss.}_{it}}{\text{Fin. iss.}_{it}}$. For simplicity in the regressions and results discussion we name this variable "Credit quality$_{it}^{f}$".[7] With i we denote the foreign country, with t the year, and with f: financial sector. We can expect:

$$\frac{\partial H_i^f}{\partial \text{Credit quality}_{it}^f} > 0$$

Ideally, for the proxy, we would use either the share of high grade USD bonds outstanding, rather than new issuance, or a weighted average credit rating of countries' outstanding

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[7]Our proxy can also be interpreted as capturing transaction and information costs associated with acquiring foreign-issued debt.

bonds, but these data are not available.[8] To address the potential endogeneity of our credit quality variable, in some specifications we instrument it by countries' real GDP per capita. The ability and willingness of foreign institutions to issue high grade debt denominated in currency other than the local currency likely reflects a level of sophistication and depth of financial markets that is associated with a level of development that we proxy with per capital income.

We develop an annual panel of 45 to 77 countries, depending on the specification used, for the period 2003-2012. Our empirical work is done in a portfolio choice framework taking into account the return on bonds issued by individual countries and their covariance with the aggregate return on the U.S. foreign bond portfolio. Denote U.S. holdings of country i financial sector bonds in the U.S. portfolio by H_{it}^f. Portfolio theory (Merton, 1969 and 1971) predicts that H_{it}^f is related positively to the expected return $E(R^f)_{it}$ from country i's securities and negatively to the covariance of i's returns with the investor's overall portfolio return Cov_i^f:

$$\frac{\partial H_{it}^f}{\partial E(R_{it}^f)} > 0 \qquad \frac{\partial H_i^f}{\partial Cov_i^f} < 0$$

We estimate the following model:

$$\log(H_{it}^f) = \gamma_0 + \gamma_1 E_{t+1}(R_{it}^f) + \gamma_2 Cov_i^f + \gamma_3 \text{Credit quality}_{it}^f + \mathbf{Z_{it}} \, \mathbf{\Gamma_4} + \epsilon_{it} \tag{1}$$

The controls Z_{it} are mostly from the empirical literature on the determinants of capital flows.

4.1 Data and Variables

In all specifications the dependent variable is U.S. holdings of country i's financial sector bonds (in log) H_{it}^f. Our main data source is again the security-level data underlying the annual Treasury International Capital (TIC) surveys of U.S. portfolio holdings of foreign securities. With this framework we focus on the U.S investor's international bond portfolio. While this approach ignores the domestic part of the overall investment portfolio, the analysis is informative about general drivers of portfolio shifts and trends of safe asset replacement.

Expected return $E_{t+1}(R_{it}^f)$ variable: for asset returns the empirical literature uses the countries' stock and/or bond markets returns due to lack for disaggregated data. The assumption then is that the international investor holds the market in the foreign country. In this paper, however, our unique dataset actually represents the complete U.S. foreign bond portfolio;

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[8]In ongoing work we have started compiling a database on the credit quality of individual countries' outstanding debt by sector of issuance.

and with data on security prices and coupon rates for most of the bonds in our sample it allows us to construct the actual returns that the U.S. investor incurs in each foreign country and for the portfolio as a whole. All country returns we use in our empirical tests are weighted average returns of that country's individual financial sector bonds that the U.S. investor holds (using the market value of the security held). We follow the approach in Coeurdacier and Guibaud (2011) and use as a proxy for expected financial bond returns in a given year the actual realized return over the subsequent twelve months.[9]

The covariance of returns variable Cov_i^f is computed as the covariance of country i's annual returns on financial sector bonds with the returns on the overall U.S. foreign financial bond portfolio. The return on the overall U.S. portfolio is constructed as the weighted average of all individual financial bond returns using the TIC survey data. This covariance variable is not time varying since we only have annual data for country-specific bond returns from our TIC survey dataset.

For the control variables Z_{it} we follow the empirical literature on the determinants of capital flows. For foreign countries' financial wealth (size) measure we use their financial bond market capitalization (Fin. BMCAP). We include distance and common language (as proxies for familiarity with destination country's culture, laws, market operation, or common customs and practices), the destination country's trade share (expressed as the sum of exports and imports) in U.S. total trade, and government effectiveness rank from the World Governance indicators. We also include countries' real GDP growth among the control variables as a possible "pull factor" for the geographical allocation of U.S. investment abroad. [10]

4.2 Results

Table 5 reports the results of the panel estimation with time fixed effects. Specifications (1)-(5) are estimated using OLS. The results show that indeed the geographical composition of the foreign financial bond portfolio is positively related to the ability of countries' financial institutions to issue high-grade dollar debt as proxied by our credit quality variable. The coefficient on the credit quality variable is significant at the 1% level in all specifications, and remains at this significance when we control for other determinants drawn from the literature on portfolio allocations. The relationship is also economically significant: the point estimates show that if country i's issuance share of high grade dollar-denominated debt increases from 0.0 to 0.1 its financial bond holdings in the U.S. portfolio H_i^f increase by $9\% - 15\%$ depending on the model specification. Our main findings hold if we instrument

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[9]As a robustness check, we also construct and use in some of the specifications the excess return for country i, which is calculated as the difference between that country's return R_i and the return on the overall U.S. foreign bond portfolio R^p. The return on the U.S. foreign bond portfolio is the weighted average of all individual bond returns using the TIC survey data. Since R^p does not vary in the cross-section, the results are unchanged.

[10]See Appendix for more details on the data sources.

the credit quality variable with countries' real GDP per capita: the results are reported in column (6) of Table 5.

All other variables also enter with the expected signs. As we would expect, the size of the destination country's financial bond market is strongly positively related to that country's financial bonds in the U.S. portfolio. Our return variable that captures the country-specific returns that U.S. investors actually make on their foreign bond investments enters with the expected positive sign but is not statistically significant. The covariance of countries' returns with the return on the U.S. overall foreign bond portfolio also enters with the expected negative sign and is strongly significant in some of the specifications, indicating that diversification does play a role for the composition of the U.S. foreign bond portfolio.

Importantly, the results show that the significance and magnitude of these results hold even when we control for other determinants of portfolio holdings that are common in the empirical literature. The controls show with the expected signs and except for the trade share and GDP growth are statistically significant: U.S. investors clearly have a preference for debt issued by countries with English as the official language, and are deterred by debt issued by countries that are more geographically remote. The fact that trade enters with an insignificant coefficient is not surprising given that our dependent variable is the share of financial debt rather than corporate debt more generally, and familiarity with a country's firms gained through trade would be expected to matter more for non-financial corporate debt. Although GDP growth enters with the expected positive sign, it is not statistically significant and its inclusion does not alter our results. Even more importantly, the inclusion of the controls does not weaken the strength of our main variables.

Table 6 show that our main results still hold if we use pooled estimation or country fixed effects panel estimation. Since our covariance variable as well as distance and common language variables are not time varying, they do not enter in the country fixed effects estimations reported in specification (5).

5   Conclusions and Implications

The expansion in financial sector "substitute" safe liquid assets (largely in the form of structured products) leading up to the global financial crisis has by now been fairly well documented. In this paper we focus on U.S. investors' search for safe assets post-crisis and the associated adjustment of U.S. portfolios. Using a unique dataset derived from security-level data on total U.S. portfolio holdings of foreign securities, we show that since the crisis, it is mostly the *foreign* financial sector that appears to have met U.S. demand for safe and liquid investment assets by expanding its supply.

As a result, the foreign share of the U.S. financial bond portfolio has been steadily increasing in the past decade, apart from a brief dip in 2008. We show that this steady increase in the

foreign share of the U.S. financial bond portfolio is associated with the ongoing U.S. investor preference for high-grade dollar-denominated debt. In particular, we show a strong negative relationship between the availability of U.S. "safe assets" and the foreign share of the U.S. financial bond portfolio. As a proxy for this availability, we use the stock of U.S. safe assets as constructed in Gorton G., S. Lewellen, A. Metrick (2012) - the sum of U.S. government debt and the "safe" component of private financial debt - as a percentage of either U.S. GDP or all U.S. assets. Looking separately at the two components of this safe asset stock - U.S. government debt outstanding and the "safe" component of private financial debt - we find that the connection to the foreign share of the U.S. financial bond portfolio is driven by developments in the financial safe portion. That is, the foreign share of the U.S. financial bond portfolio is significantly higher when the U.S. financial system contributes a smaller share of "safe" assets to the available asset supply.

Our analysis relates to recent research (Gorton, Lewellen, and Metrick (2012); Krishna-murthy and Vissing-Jorgensen (2012)) that explores the role of financial institutions in expanding debt issuance to meet demands for safe and liquid assets, a market supply response that was clearly at play in the expansion of the "shadow" banking sector pre-crisis and remains important in an environment of central bank large scale asset purchases and concerns over the credit-worthiness of sovereign debt. How foreign financial institutions have responded to U.S. investor demand for "safe" investment alternatives is clearly an area for further investigation.

These developments have led to a decline in home bias in the U.S. financial bond portfolio that we are able to document for the first time. More specifically, we show the evolution of the sectoral components of the home bias in the U.S. bond portfolio: government, corporate, financial and non-financial bond home bias. By looking beyond the aggregate bond bias we are able to show that behind the fairly flat and relatively high aggregate bond bias is a steadily declining and relatively low home bias in bonds issued by the financial sector.

Although U.S. investors continue to tap foreign financial markets for "safe" U.S. dollar-denominated assets, we show that the type of foreign financial debt that fills this portfolio niche post-crisis is quite different than pre-crisis. Pre-crisis, much of the expansion of the foreign share of the U.S. bond portfolio consisted of ABS/MBS issued by Caribbean off-shore centers, arguably "foreign" to the U.S. in name only, because these securities were largely backed by pools of U.S. assets. Post-crisis, we find that U.S. investors have replaced these offshore-issued securities with high-grade, U.S. dollar-denominated conventional coupon bonds issued from a small group of OECD countries (most notably Australia and Canada).

We also provide empirical evidence that the geographical composition of the U.S. foreign financial bond portfolio is positively related to the ability of countries' financial institutions to issue dollar debt that is high grade. We proxy this ability by the share of a country's high-grade (credit rating of AA- or higher) dollar-denominated financial bond issuance in its total financial bond issuance. We develop an annual panel of 45 to 77 countries, depending

on the specification used, for the period 2003-2012. Our empirical work is done in a portfolio choice framework taking into account the return on bonds issued by individual countries and their covariance with the aggregate return on the U.S. foreign bond portfolio. Our results are robust to a number of alternative specifications and to the inclusion of a number of controls standard in the empirical literature such as market size, distance, common language, trade ties with the U.S., efficiency of government institutions, and GDP growth. Given that our data covers the period before and after the financial crisis, our results explain how U.S. investors have replaced their holdings of foreign-issued structured debt products with high-grade dollar-denominated financial sector debt primarily issued by a select group of foreign countries.

In the post-crisis low interest rate environment, highly-rated foreign financial institutions are finding it increasingly easy to tap the bond markets. However, a lesson of the financial crisis is that assets given a high investment rating by credit rating agencies did not necessarily turn out to be low-risk *ex post*. Although high investment grade ratings appear harder to come by post crisis, a potential concern is that increased U.S. dollar-denominated debt issuance abroad could turn out to be a risky strategy for financial firms in those countries if their assets are largely in the form of domestic currency loans in their domestic market. While a full exploration of this potential concern is beyond the scope of this paper, this does not appear to be the case for Australian banks, at least. As noted by the Reserve Bank of Australia (2010), Australian banks are fully hedged for the currency exposure generated by the increase in U.S. dollar debt issuance. This development suggests that while U.S. portfolio investors apparently are less willing to take on foreign currency risk or the hedging costs when investing in cross-border financial debt, another class of investors is apparently willing to take on specifically the risks associated with the currency hedge. Exploration of investor motivations and appetites across different foreign assets including equity and willingness to take on currency hedges as well as fixed-income investments should provide fertile ground for future research into cross-border investment.

References

Bekaert, G. and X.S. Wang (2009). Home Bias Revisited. Working Paper, Columbia Business School, February 2009.

Bernanke, B.S., C. Bertaut, L.P. DeMarco, and S. Kamin (2011). International Capital Flows and the Returns to Safe Assets in the United States, 20032007. International Finance Discussion Papers Number 1014, Board of Governors of the Federal Reserve System

Bertaut C., L.P. DeMarco, S. Kamin, and R. Tryon (2012). ABS Inflows to the United States and the Global Financial Crisis. Journal of International Economics 88, 219-234.

Bertaut C. and R. Tryon (2007). Monthly Estimates of U.S. Cross-border Securities Positions. International Finance Discussion Papers 910, Board of Governors of the Federal Reserve System

Board of Governors of the Federal Reserve System (2010). Report to the Congress on Risk Retention. October 2010.

Burger, J.D. and F. Warnock (2003). Diversification, original sin, and international bond portfolios. Board of Governors International Finance Discussion Paper No. 755.

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

Burger J.D., F. Warnock and V. Cacdac Warnock (2010). Emerging Local Currency Bond Markets. NBER Working Paper No. 16249, August 2010.

Caballero, R. (2010). The "Other" Imbalance and the Financial Crisis. NBER Working Paper No. 15636.

Coeurdacier, N. and S. Guibaud (2011). International Portfolio Diversification is Better Than You Think. Journal of International Money and Finance.

Coeurdacier, N. and H. Rey (2013). Home Bias in Open Economy Financial Macroeconomics. Journal of Economic Literature, American Economic Association, vol. 51(1), pages 63-115, March

Correa,R., H. Sapriza, and A. Zlate (2012). Liquidity Shocks, Dollar Funding Costs, and the Bank Lending Channel During the European Sovereign Crisis. International Finance Discussion Papers 1059, Board of Governors of the Federal Reserve System.

Curcuru S., T. Dvorak, and F. Warnock (2008). Cross-Border Returns Differentials. Quarterly Journal of Economics 123(4): 14951530.

Curcuru S., T. Dvorak, and F. Warnock (2010). Decomposing the U.S. External Returns Differential. Journal of International Economics 80: 22-32.

De Santis, R.A., Grard, B. (2006). Financial integration, international portfolio choice and the European Monetary Union. European Central Bank Working Paper No. 626.

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 (2007) 631-655.

Gorton G., S. Lewellen, A. Metrick (2012). The Safe-Asset Share. American Economic Review: Papers & Proceedings 2012, 102(3):101-106

Gorton, G. and G. Pennacchi (1990). Financial Intermediaries and Liquidity Creation. Journal of Finance, vol. 45(1), 49-71.

Gourinchas O., H. Rey, and K. Truempler (2012). The Financial Crisis and The Geography of Wealth Transfers. Journal of International Economics 88, 2012.

Gourinchas O. and O. Jeanne (2012). Global Safe Assets. Paper prepared for the XI BIS Annual Conference held in Lucerne, June 20-21 2012.

International Monetary Fund (2012). Global Financial Stability Report: *Safe Assets: Financial System Cornerstone?* Chapter 3. International Monetary Fund: Washington DC, April 2012

Hnatkovska, V. (2008). Home Bias and High Turnover: Dynamic Portfolio Choice with Incomplete Markets. Journal of International Economics.

Krishnamurthy A. and A. Vissing-Jorgensen (2012). Short-term Debt and Financial Crisis: What we can learn from U.S. Treasury Supply. Working Paper.

Lane, P.R. (2006). Global Bond Portfolios and EMU. International Journal of Central Banking, International Journal of Central Banking, vol. 2(2), May 2006.

Martin, P. and H. Rey, 2004. Financial Super-markets: size matters for asset trade. Journal of International Economics, 64 335-361

Portes, R. and H. Rey, 2005. The determinants of cross-border equity flows. Journal of International Economics, 65 269-296

Tarullo, D.K., 2012. Shadow Banking After the Financial Crisis. Speech at the Federal Reserve Bank of San Francisco Conference on Challenges in Global Finance: The Role of Asia, San Francisco, California June 12, 2012

Treasury International Capital (TIC) Surveys (various years). Available at: http://www.treasury.gov/r center/data-chart-center/tic/Pages/fpis.aspx

Figure 1: U.S. debt securities outstanding, 2003-2012

Billions USD

Other U.S.

Safe U.S. Financial

Treasuries and Agencies

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
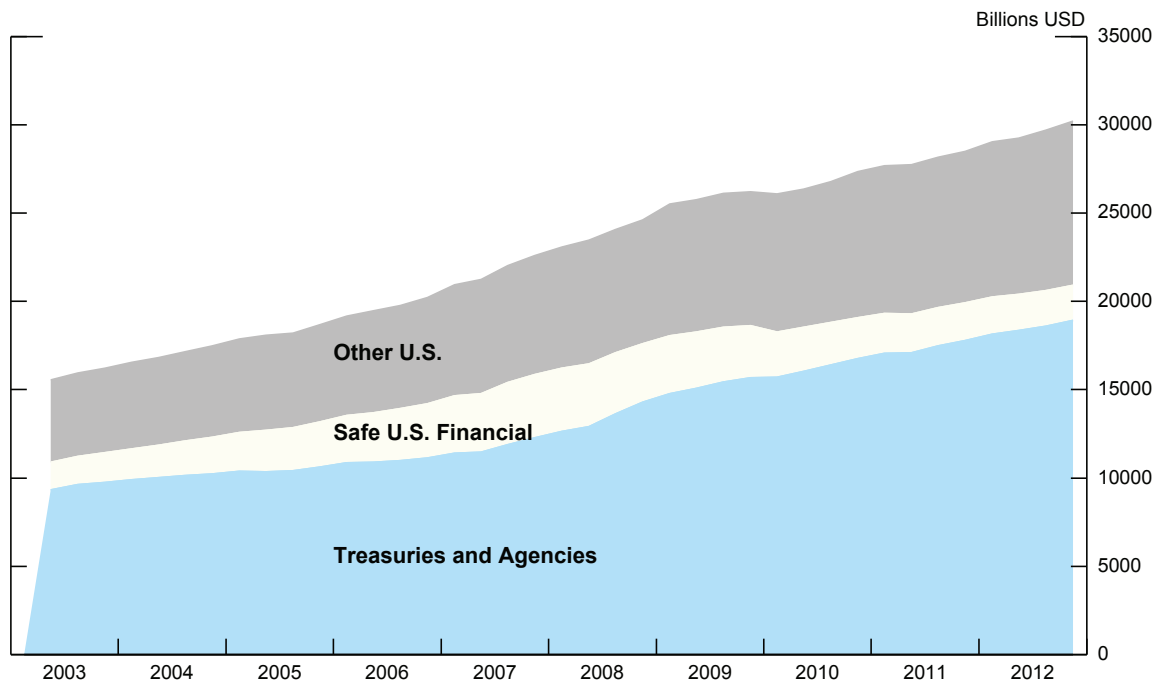
Figure 2: U.S. holdings of domestic and foreign debt securities, 2003-2012

Billions USD

Foreign

Other U.S.

Safe U.S. Financial

Treas. and Agcy. held by Fed

Treasuries and Agencies

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

20
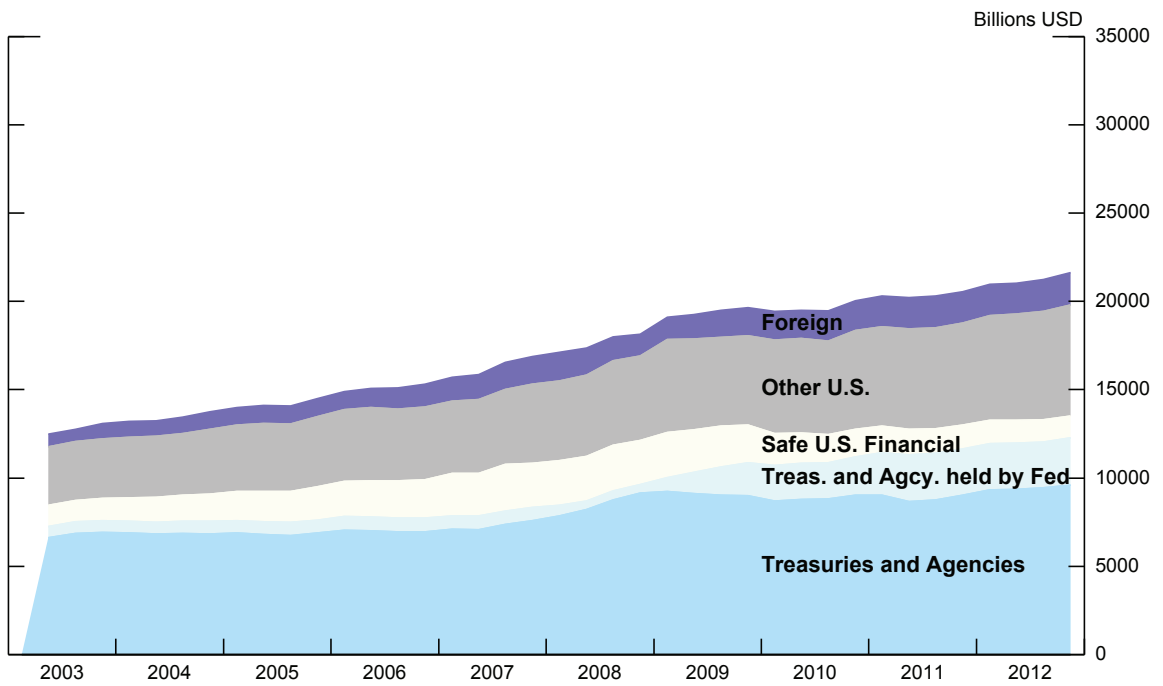
Figure 3: Change in U.S. bond market capitalization and change in U.S. investor bond holdings, 2003-2012
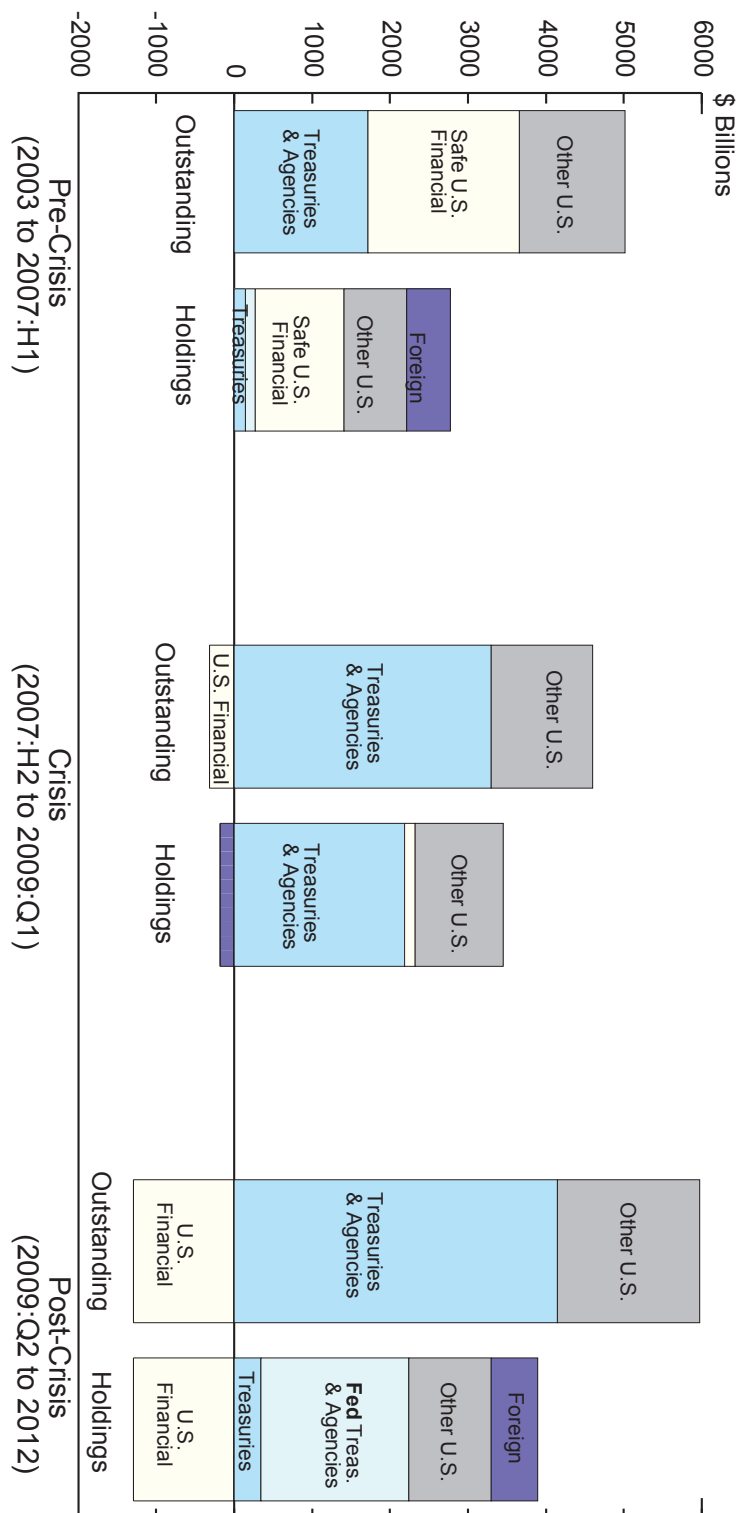
Figure 4: U.S. investor holdings of foreign bonds by sector, 2003-2012

$ Billion**

- Financial
- Non-Financial
- Government
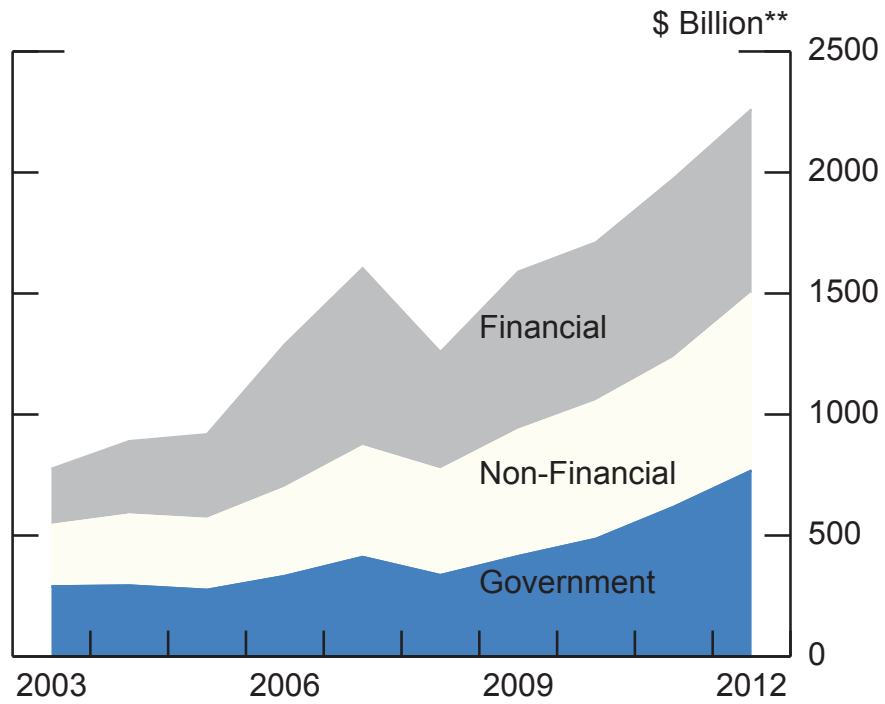
Figure 5: U.S. and foreign bonds in the U.S. Financial Bond Portfolio (shares)

U.S.
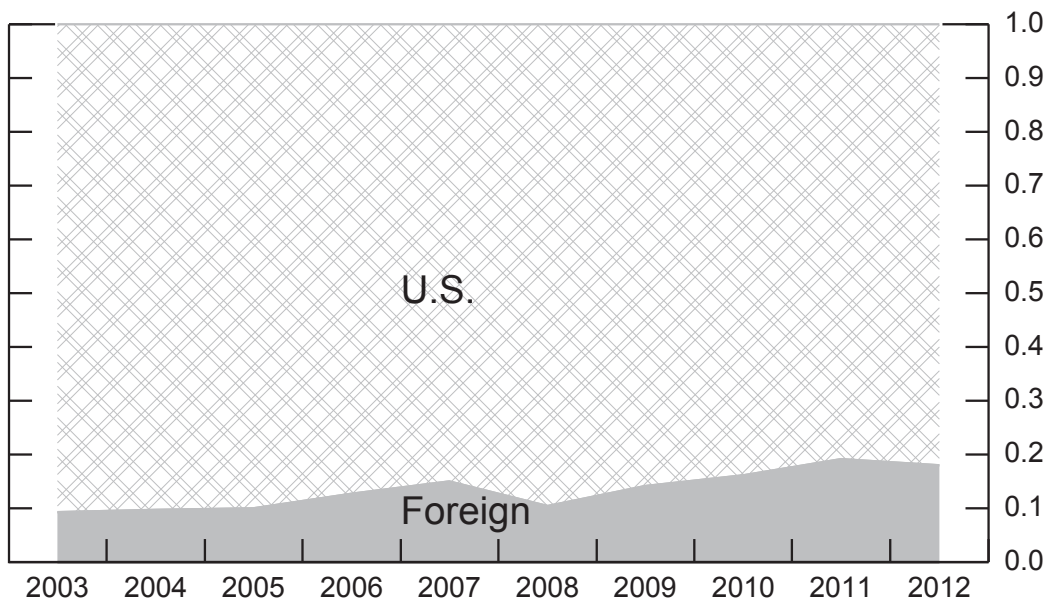
Foreign

Figure 6: Foreign bonds in the U.S. portfolio
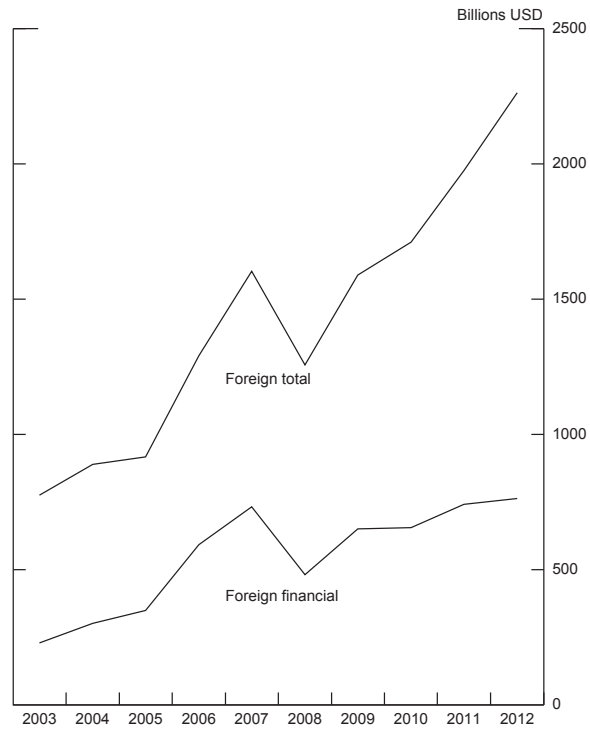
Figure 7: U.S. bonds in the U.S. portfolio
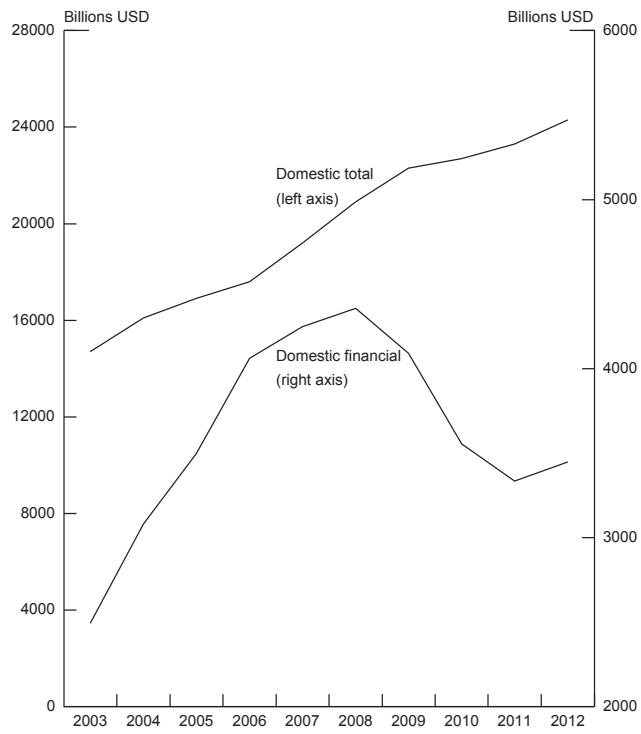
Figure 8: Share of high grade bonds per sector
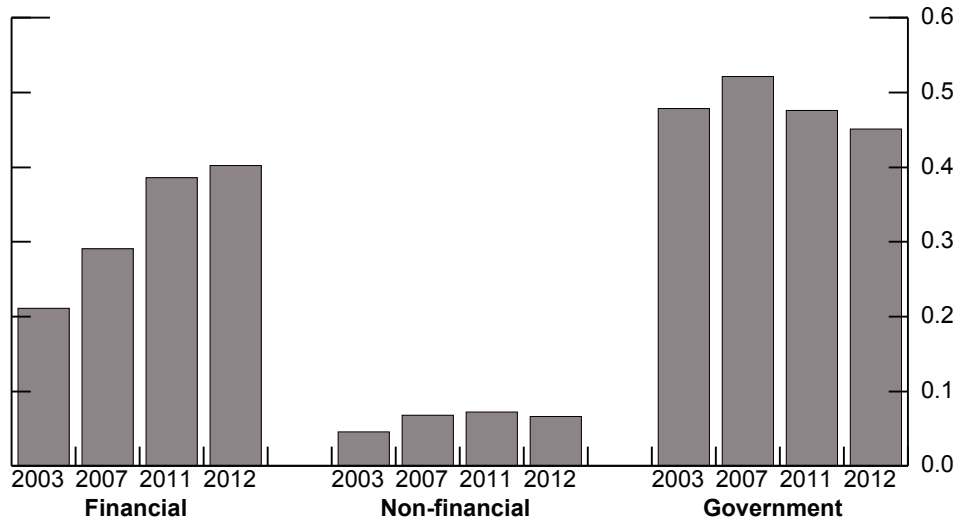
Figure 9: Foreign financial bonds in the U.S. portfolio: credit quality
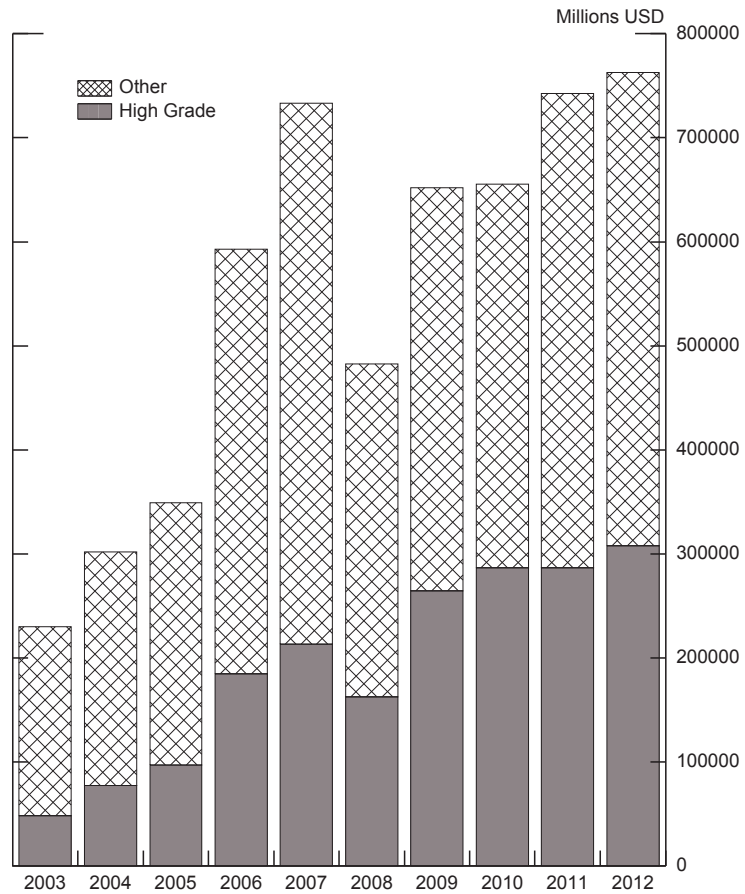
Figure 10: High quality financial bond issuance: U.S. and Rest of the World
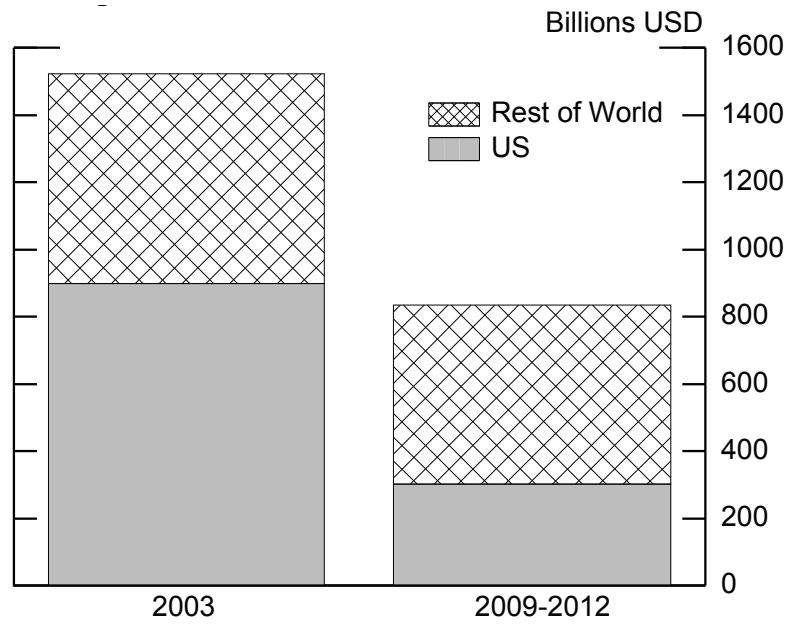
Figure 11: U.S. share of world high quality financial bond issuance
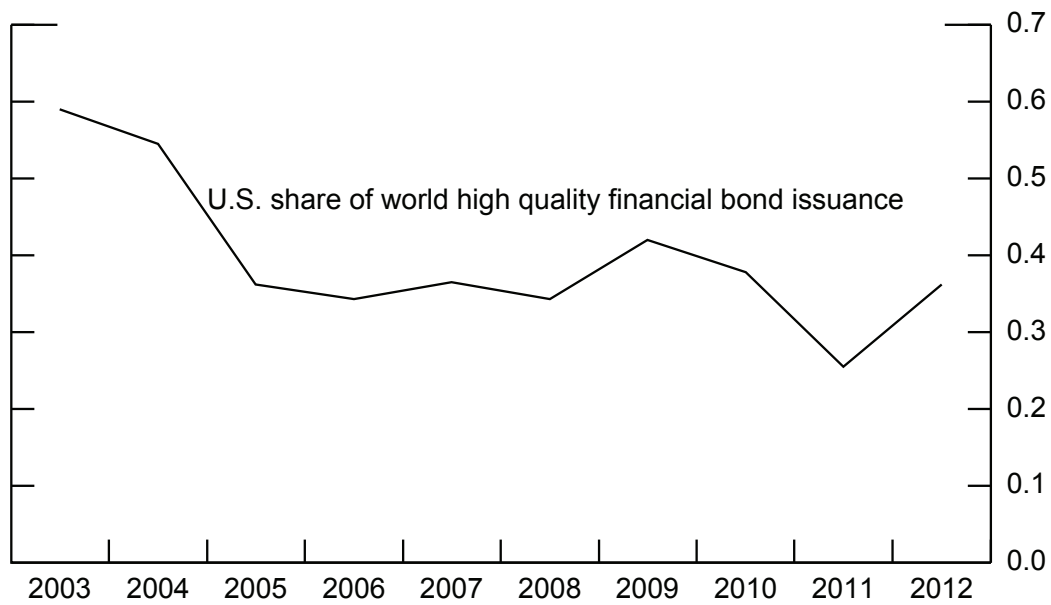
U.S. high quality fin. iss. share $= \dfrac{\text{High quality fin. bond iss.}_t^{US}}{\text{High quality fin. bond iss.}_t^{US}+\text{High quality fin. bond iss.}_t^{ROW}}$ High quality: rated AA- or higher.

25

Figure 12: U.S. holdings of foreign-issued dollar-denominated CDs
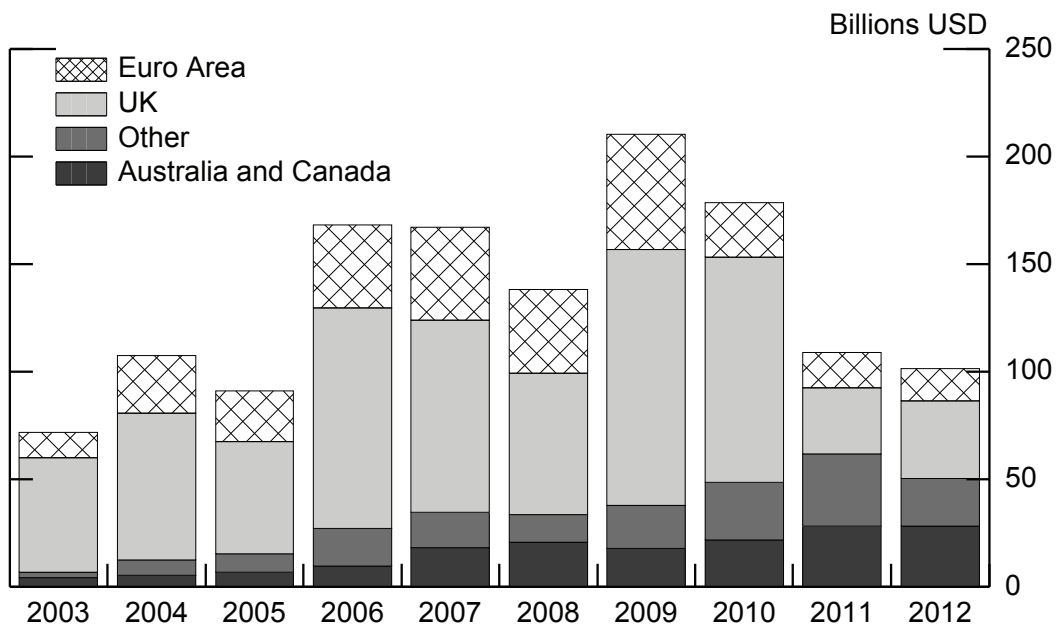
Figure 13: The U.S. safe asset share
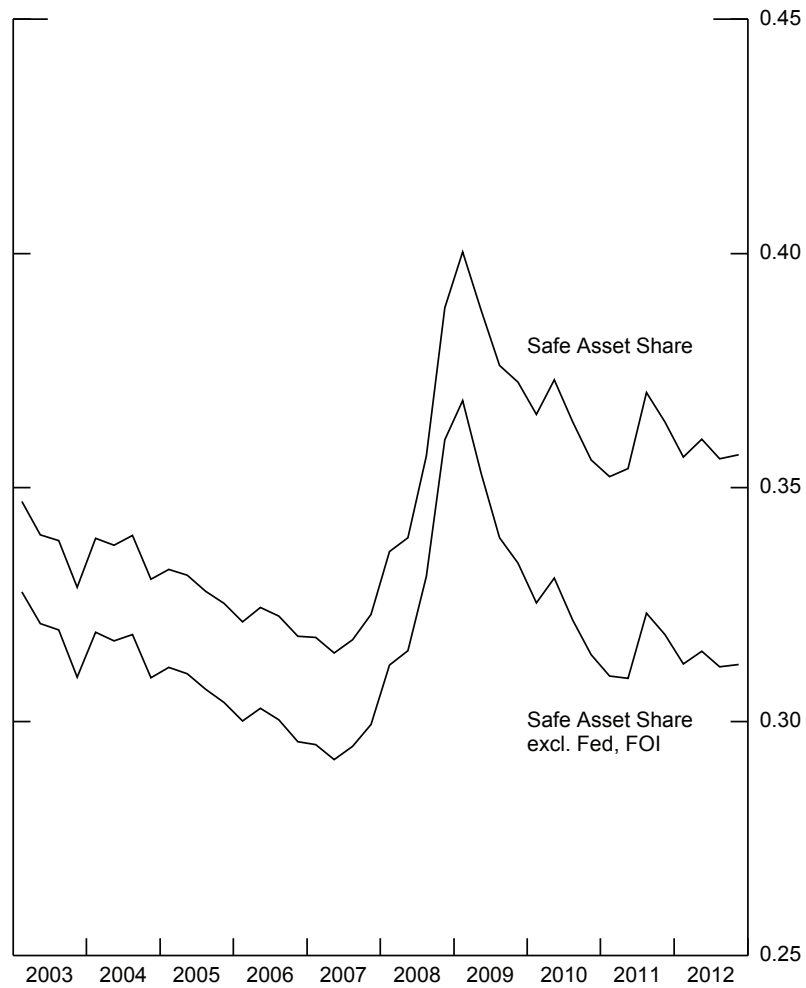
The "Safe Asset Share" is constructed as the "high" estimate following Gorton, Lewellen, and Metrick (2012). We construct "Safe Asset Share excl. Fed, FOI" following Gorton, Lewellen, and Metrick (2012) "high" estimate definition but we augment it to exclude holdings of the Federal Reserve (Fed) and Foreign Official Institutions (FOI). The denominator of the safe share are the total liabilities and equity in all sectors (which approximates total assets in the economy).

Figure 14: Components of the U.S. safe asset share
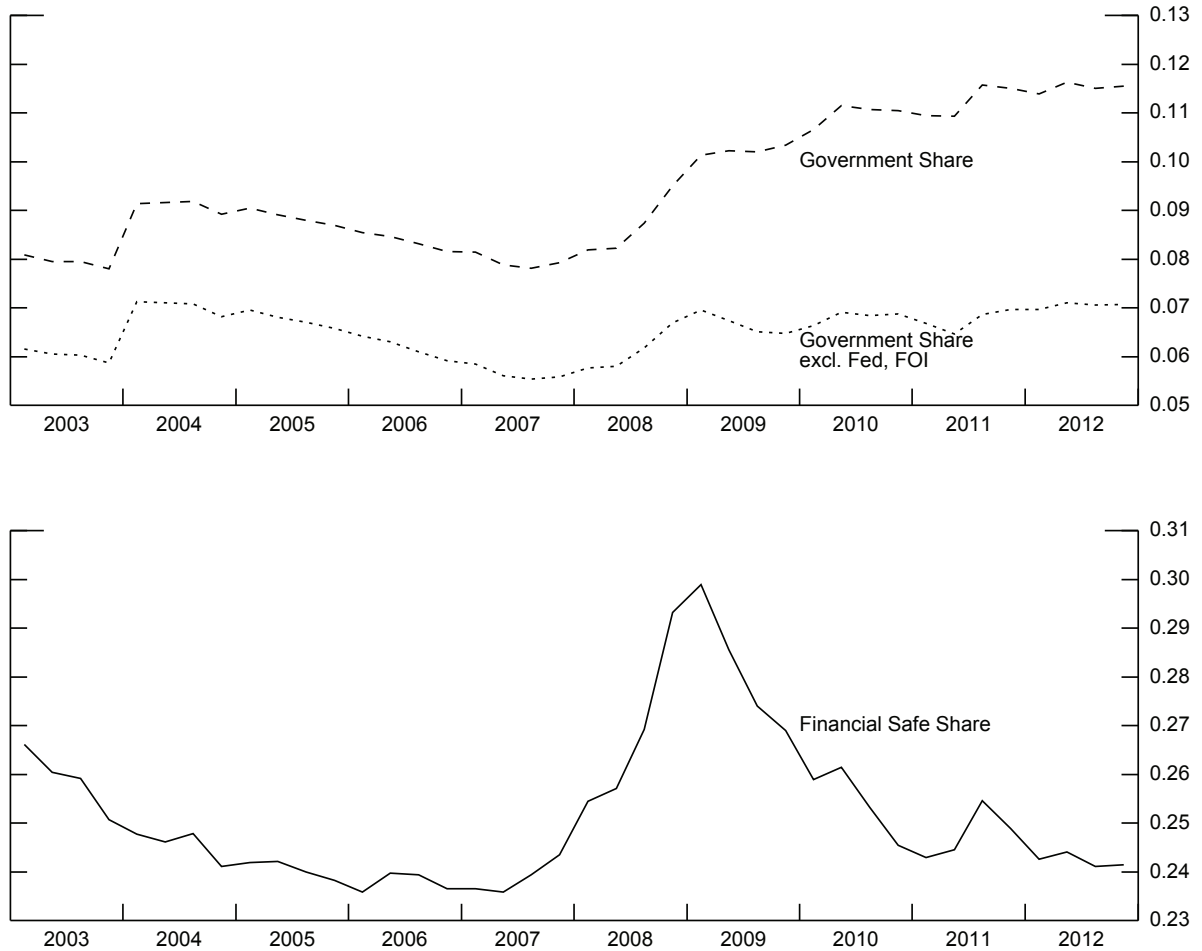
The "Financial Safe Share" and "Government Share" are constructed as the "high" estimates following Gorton, Lewellen, and Metrick (2012). We construct "Government Share excl. Fed, FOI" following Gorton, Lewellen, and Metrick (2012) "high" estimate definition but we augment it to exclude holdings of the Federal Reserve (Fed) and Foreign Official Institutions (FOI). The denominator of the safe share are the total liabilities and equity in all sectors (which approximates total assets in the economy).

Figure 15: U.S. safe assets (excl. holdings by Fed and FOI) as a share of GDP
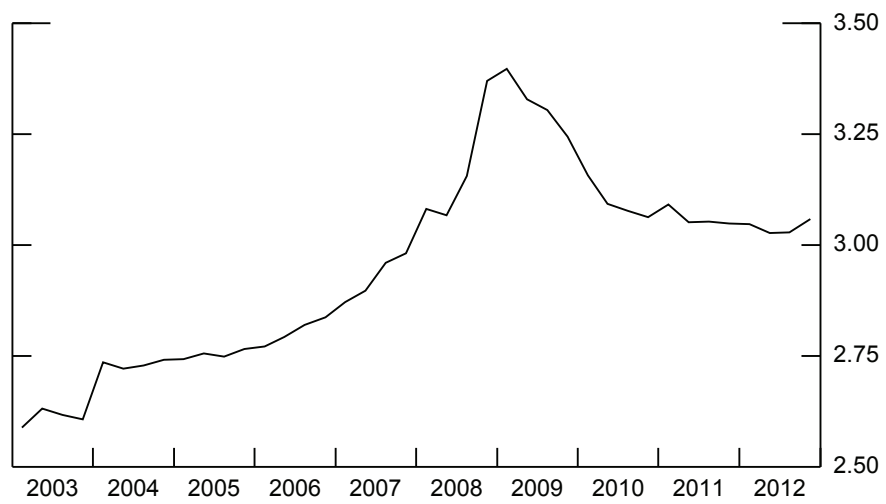
U.S. safe assets are constructed following Gorton, Lewellen, and Metrick (2012) "high" estimate definition but augmented to exclude holdings of the Federal Reserve (Fed) and foreign official institutions (FOI). It is presented as a share of U.S. GDP.

Figure 16: Foreign share in the U.S. financial bond portfolio and the U.S. financial safe share
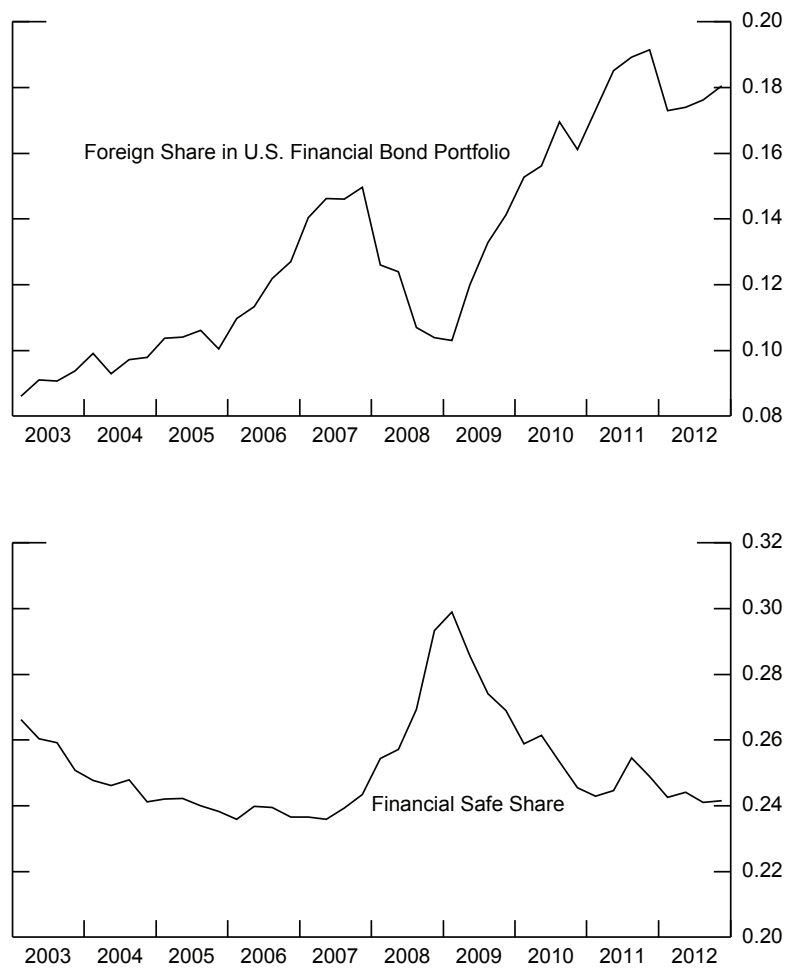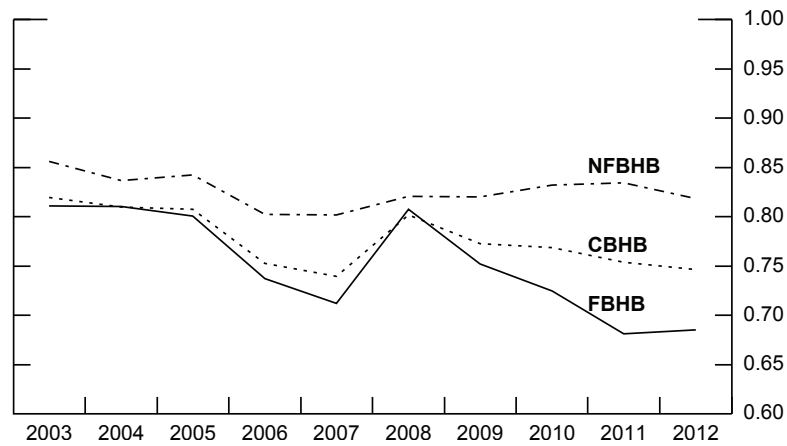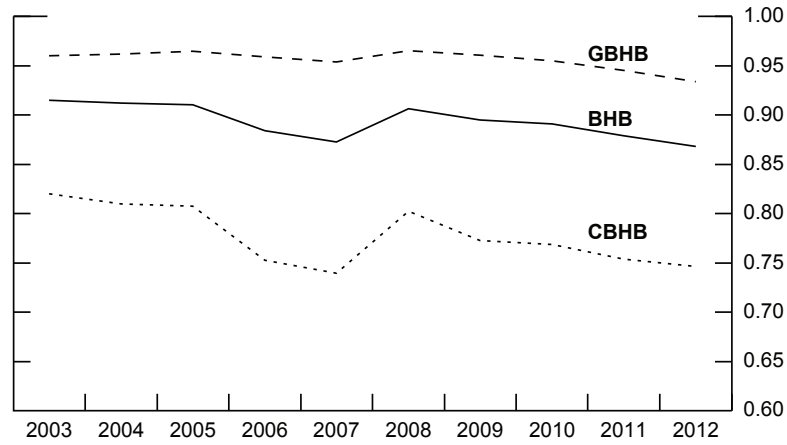
Figure 17: U.S. home bias in bonds and its sectoral components

BHB: home bias in total bonds; GBHB: home bias in government bonds; CBHB: home bias in corporate bonds; FBHB: home bias in financial sector bonds; NFBHB: home bias in nonfinancial sector bonds.

Figure 18: The U.S. home bias in financial bond and its components

Financial Bond Home Bias

Foreign Share in the U.S. Financial Bond Portfolio

Foreign Share in the World Financial Bond Market Capitalization
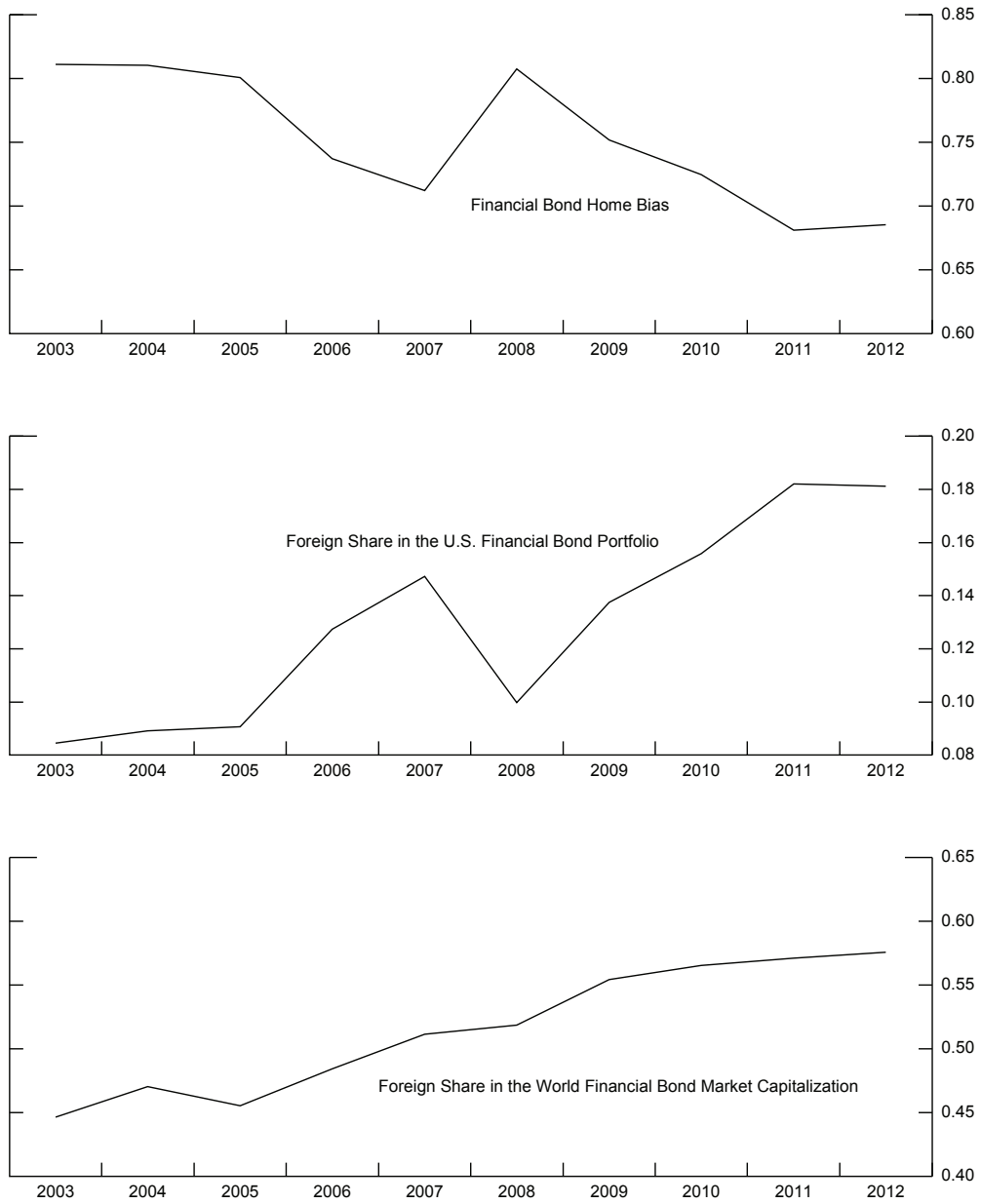
$$\text{Financial Bond Home Bias} = 1 - \frac{\text{Foreign Share in the U.S. Financial Bond Portfolio}}{\text{Foreign Share in the World Financial Bond Market Cap.}}$$

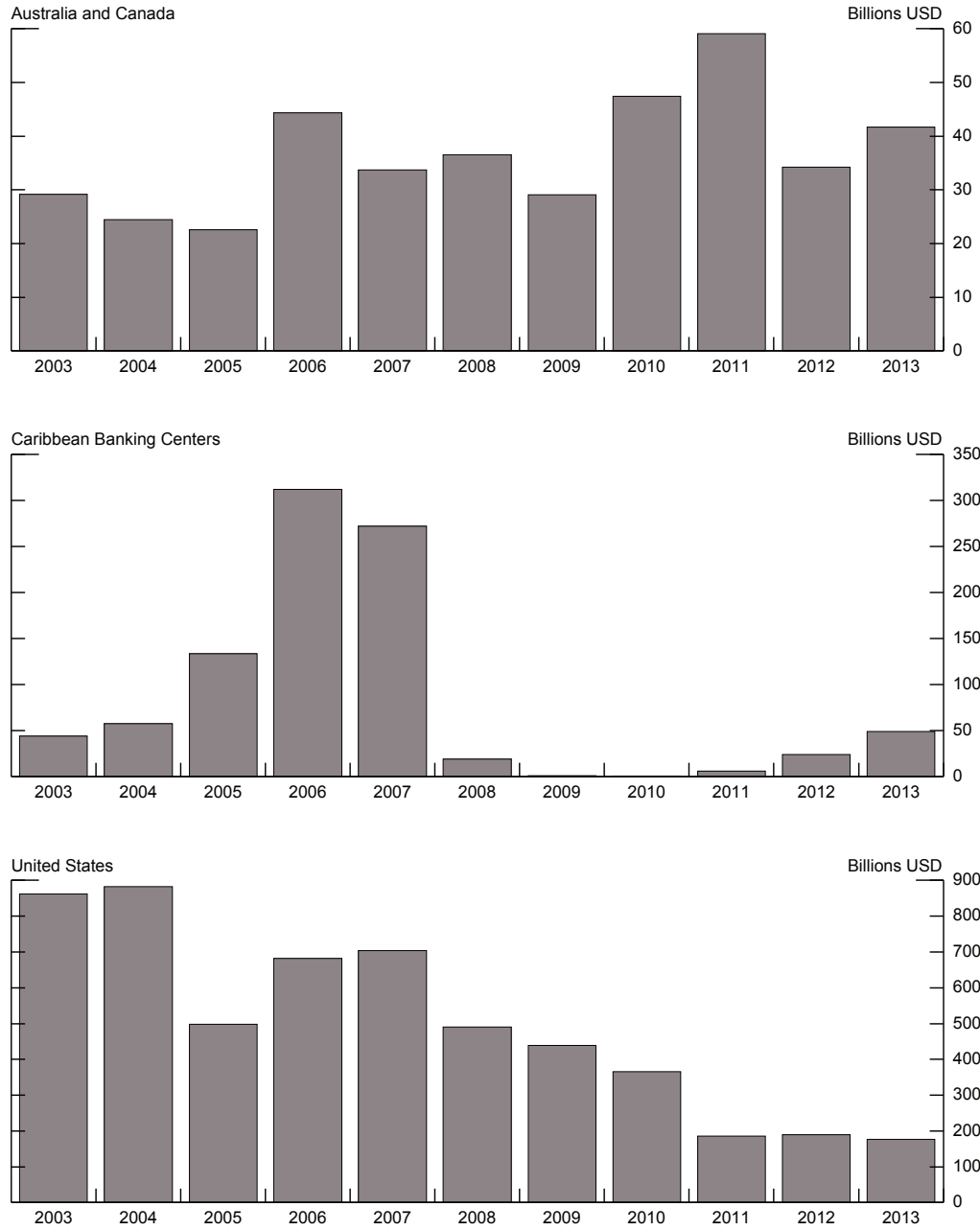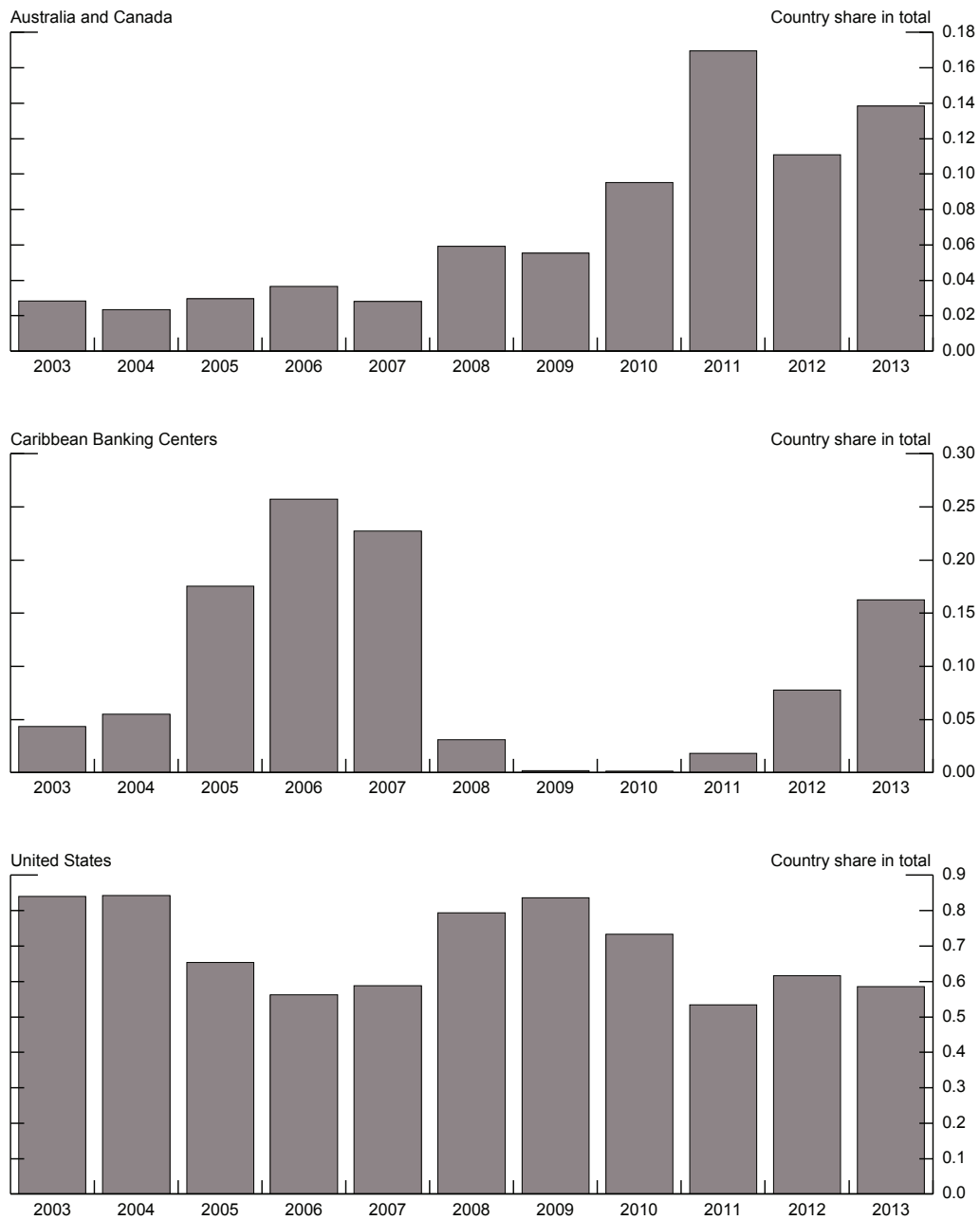Figure 19: Issuance of high grade USD bonds by the financial sector

Figure 20: Issuance of high grade USD bonds by the financial sector, country shares

Shares are calculated as country i's financial sector issuance of high grade USD bonds relative to total world issuance of high grade USD financial sector bonds. High grade: rated AA- or higher.

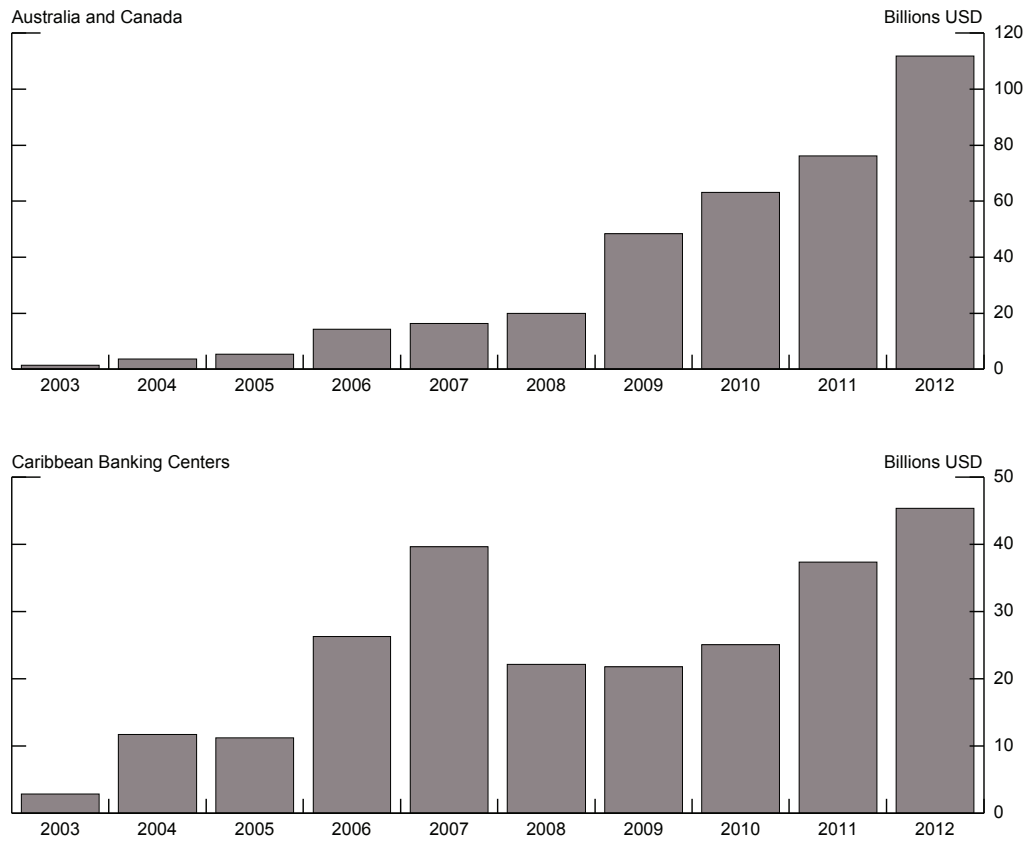Figure 21: U.S. holdings of high grade USD bonds issued by the foreign financial sector
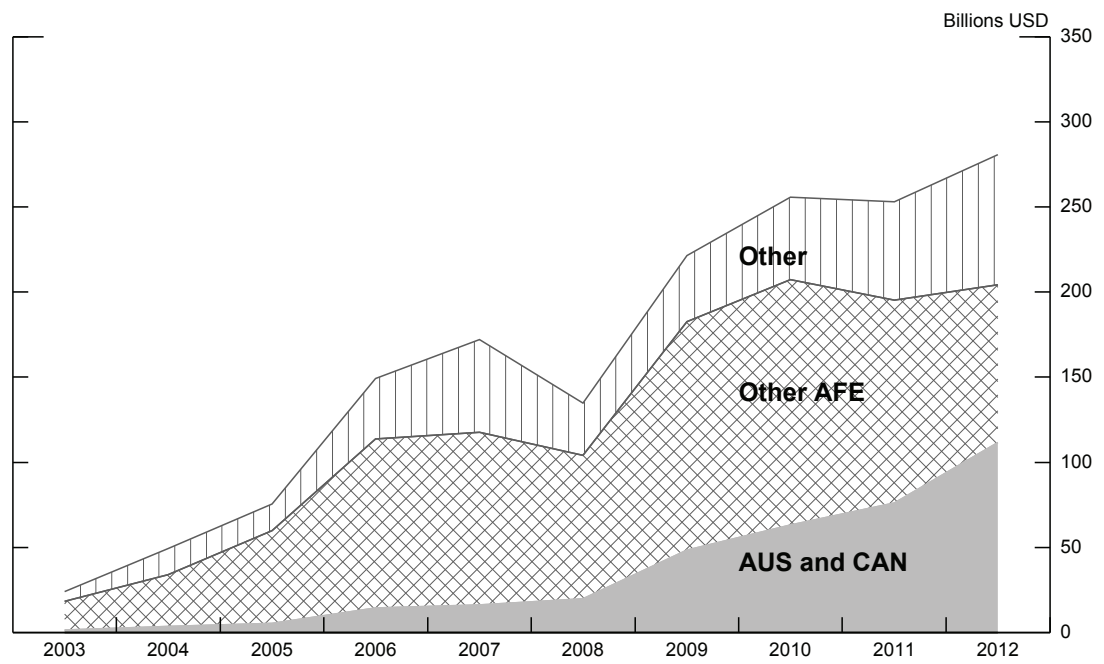

35

Figure 22: U.S. holdings of high quality USD foreign financial bonds by region, 2003-2012

All values are as of year-end. High quality: rated AA- or higher.

Figure 23: U.S. holdings of high grade USD bonds issued by the foreign financial sector, country shares

Shares are calculated as U.S. holdings of country i's high grade USD financial sector bonds relative to total U.S. holdings of foreign high grade USD financial sector bonds. High grade: rated AA- or higher.

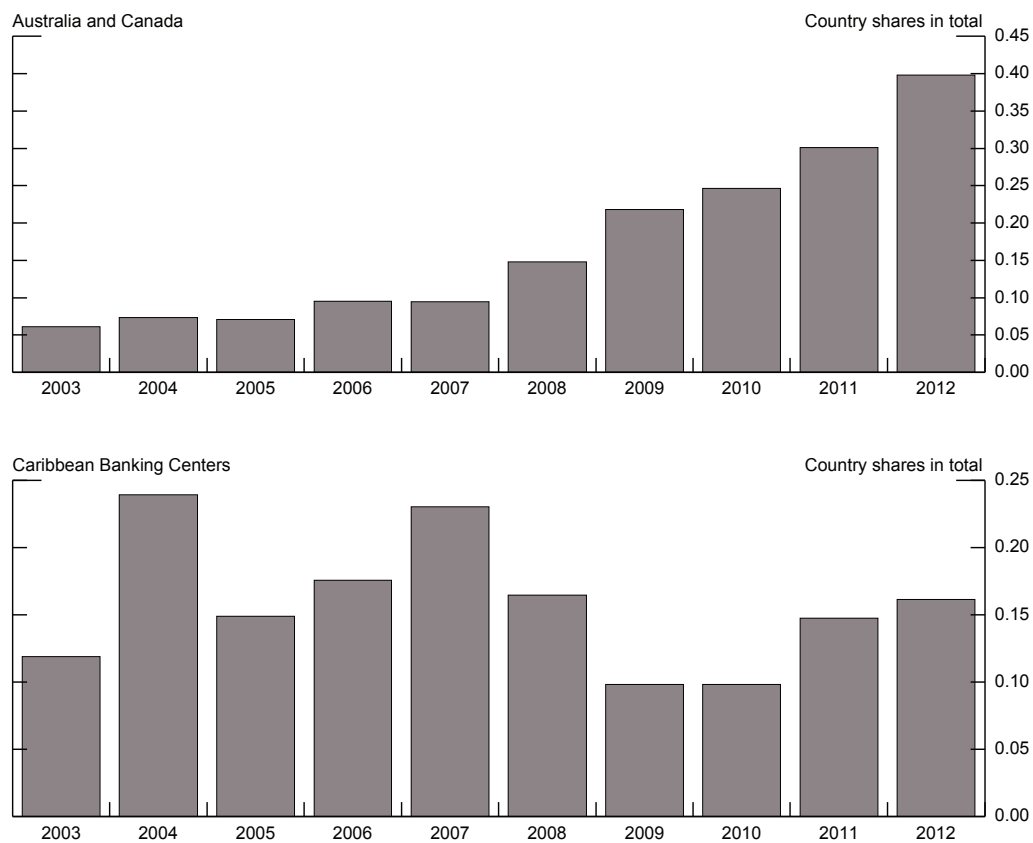Figure 24: U.S. holdings of all bonds issued by the foreign financial sector, country shares
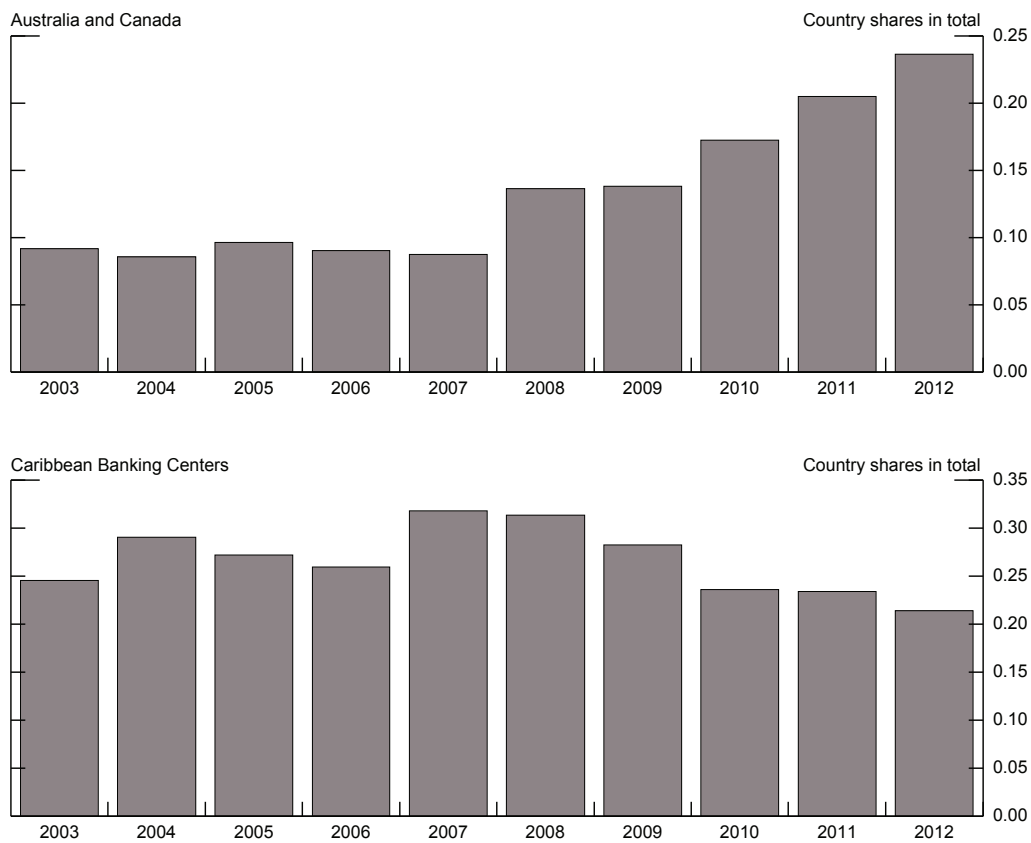
Shares are calculated as U.S. holdings of country i's financial sector bonds relative to total U.S. holdings of foreign financial sector bonds.

Table 1: The foreign share of U.S. holdings of financial bonds and the U.S. safe asset share

	(1)	(2)	(3)	(4)	(5)	(6)
Safe share excl. Fed, FOI (High)	-0.539***					
	(0.000)					
Financial safe share (High)		-0.620***	-0.593***			
		(0.001)	(0.003)			
Gov. share excl. Fed, FOI (High)			-0.301			
			(0.493)			
Safe share excl. Fed, FOI (Low)				-0.669***		
				(0.001)		
Financial safe share(Low)					-0.777***	-0.746***
					(0.003)	(0.005)
Gov. share excl. Fed, FOI (Low)						-0.435
						(0.335)
Time trend	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	39	39	39	39	39	39
Adj. R-sq	0.68	0.67	0.69	0.65	0.63	0.67

The dependent variable in all specifications is the foreign share of U.S. holdings of financial bonds.

p-values in parentheses. GLS estimation assuming an AR(1) process for the error terms.

Regressions include a constant (not reported for brevity).

"Low" and "High" refer to the low and high estimates of the safe asset share in Gorton, Lewellen, and Metrick (2012).

"Gov. share excl. Fed, FOI" is the Gorton, Lewellen, and Metrick (2012) government share which we adjusted to exclude the holdings of the Federal Reserve (Fed) and foreign officials (FOI).

Table 2: The foreign share of U.S. holdings of financial bonds and U.S. safe assets-to-GDP

	(1)	(2)	(3)	(4)	(5)	(6)
Safe excl. Fed, FOI (High)-to-GDP	-0.066***					
	(0.002)					
Financial safe (High)-to-GDP		-0.064***	-0.064***			
		(0.012)	(0.006)			
Gov. excl. Fed, FOI (High)-to-GDP			-0.000			
			(0.287)			
Safe excl. Fed, FOI (Low)-to-GDP				-0.070***		
				(0.008)		
Financial safe (Low)-to-GDP					-0.065**	-0.067**
					(0.041)	(0.025)
Gov. excl. Fed, FOI (Low)-to-GDP						-0.000
						(0.276)
Time trend	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	39	39	39	39	39	39
Adj. R-sq	0.60	0.52	0.63	0.53	0.46	0.54

The dependent variable in all specifications is the foreign share of U.S. holdings of financial bonds.
p-values in parentheses. GLS estimation assuming an AR(1) process for the error terms.
Regressions include a constant (not reported for brevity).
All regressors are the "safe" assets in the U.S. (following Gorton *et al.* definition) relative to GDP.
"Low" and "High" refer to the low and high estimates of safe assets in Gorton *et al.*
"Gov. excl. Fed, FOI" is the Gorton, Lewellen, and Metrick (2012) government measure
which we adjusted to exclude the holdings of the Federal Reserve (Fed) and foreign officials (FOI).

Table 3: The foreign share of U.S. holdings of financial bonds and the U.S. safe asset share

	(1)	(2)	(3)	(4)
Safe share excl. Fed, FOI (High)	-0.533***		-0.518***	
	(0.000)		(0.001)	
Financial safe share (High)		-0.612***		-0.597***
		(0.001)		(0.001)
Bond market cap. diff.	0.000	0.000		
	(0.784)	(0.679)		
Foreign share in world bond market cap.			0.101	0.153
			(0.589)	(0.391)
Time trend	0.003***	0.003***	0.003***	0.002**
	(0.000)	(0.000)	(0.001)	(0.015)
Observations	39	39	39	39
R-sq	0.682	0.672	0.704	0.714

The dependent variable in all specifications is the foreign share of U.S. holdings of financial bonds.
p-values in parentheses. GLS estimation assuming an AR(1) process for the error terms.
Regressions include a constant (not reported for brevity).
"High" refers to the high estimates of the safe asset share in Gorton, Lewellen, and Metrick (2012).
Bond market cap. diff. refers to the difference in the financial bond market capitalization between
the U.S. and the rest of the world.
Foreign Share in the World Bond Market Cap. $= \frac{\text{Foreign bond market cap}}{\text{World bond market cap}}$.

Table 4: The foreign financial bond share in the total U.S. bond portfolio the U.S. safe asset share

	(1)	(2)	(3)	(4)
Safe share excl. Fed, FOI (High)	-0.549***		-0.529***	
	(0.002)		(0.007)	
Financial safe share (High)		-0.634***		-0.607***
		(0.002)		(0.005)
Bond market cap. diff.	0.000	0.000		
	(0.845)	(0.761)		
Foreign share in world bond market cap.			0.085	0.141
			(0.681)	(0.467)
Expected return diff.	0.002	0.002	0.002	0.002
	(0.810)	(0.786)	(0.833)	(0.831)
Covariance of returns (lag)	0.000	0.000	0.000	0.000
	(0.653)	(0.674)	(0.841)	(0.963)
Time trend	0.003***	0.003***	0.002**	0.002**
	(0.000)	(0.000)	(0.016)	(0.024)
Observations	38	38	38	38
R-sq	0.665	0.661	0.682	0.696

The dependent variable in all specifications is the foreign share of U.S. holdings of financial bonds.
p-values in parentheses. GLS estimation assuming an AR(1) process for the error terms.
Regressions include a constant (not reported for brevity).
"High" refers to the high estimates of the safe asset share in Gorton, Lewellen, and Metrick (2012).
Bond market cap. diff. refers to the difference in the financial bond market capitalization between the U.S. and the rest of the world.
Foreign Share in the World Bond Market Cap. $= \frac{\text{Foreign bond market cap}}{\text{World bond market cap}}$.

Table 5: Panel estimation results: U.S. holdings of foreign financial debt

	(1)	(2)	(3)	(4)	(5)	(6) IV
Credit quality, fin.	0.894***	1.341***	0.893***	1.456***	1.303***	19.51***
	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Fin. BMCAP, L.(log)		0.341***	0.524***	0.525***	0.421***	0.677***
		(0.010)	(0.000)	(0.000)	(0.000)	(0.000)
Exp. return			0.089	0.117	0.233	0.055
			(0.770)	(0.682)	(0.418)	(0.956)
Covariance			-	-	-0.358	-0.202
			0.912***	0.767***		
			(0.000)	(0.001)	(0.271)	(0.658)
Distance(log)				-	-	-
				0.966***	0.972***	0.893***
				(0.001)	(0.003)	(0.000)
Common language				1.119***	0.892**	0.063
				(0.009)	(0.036)	(0.908)
Trade, L.(log)				0.071	0.179	-0.120
				(0.536)	(0.140)	(0.308)
Growth, L.				1.718	0.672	3.523
				(0.567)	(0.824)	(0.478)
Gov. Eff.(log)					1.492**	
					(0.017)	
Observations	620	432	287	267	267	267
Groups	77	60	50	45	45	45
$\hat{R}^2$	0.05	0.56	0.62	0.69	0.70	0.55

p-values in parentheses

Coefficients for the time dummy variables and the constant not shown.

(1)-(5): Panel estimation with time fixed effects, OLS.

(6): Panel with time fixed effects; IV: USD high grade is instrumented with log of GDP per capita (lag) .

Table 6: Panel estimation results: U.S. holdings of foreign financial debt (1)

	(1) Time FE	(2) Time FE, Cntry FE	(3) Pooled	(4) Time FE	(5) Time FE, Cntry FE	(6) Pooled
Credit quality, fin.	0.894*** (0.003)	0.710** (0.020)	6.800*** (0.000)	1.456*** (0.001)	0.809** (0.043)	3.112*** (0.001)
Fin. BMCAP, L.(log)				0.525*** (0.000)	0.108 (0.316)	0.738*** (0.000)
Exp. return				0.117 (0.682)	0.269 (0.341)	0.252 (0.779)
Covariance				-0.767*** (0.001)		-0.824*** (0.000)
Distance(log)				-0.966*** (0.001)		-0.755*** (0.000)
Common language				1.119*** (0.009)		1.038*** (0.000)
Trade, L.(log)				0.071 (0.536)	0.447 (0.260)	-0.149* (0.059)
Growth, L.				1.718 (0.567)	2.060 (0.462)	-1.525 (0.604)
Time fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	no	yes	no	no	yes	no
Observations	620	620	620	267	267	267
Groups	77	77	n.a.	45	45	n.a.
$\hat{R}^2$	0.05	0.18	0.11	0.69	0.27	0.74

p-values in parentheses

Coefficients for the time dummy variables and the constant not shown.

APPENDIX: DATA DESCRIPTION

1 Main variables and data sources:

- The U.S. holdings data source is the underlying security level data for the Treasury International Capital (TIC) survey of U.S. holdings of foreign securities. The TIC survey measures total U.S. portfolio holdings of foreign securities. Data are collected from major U.S. custodian banks, broker-dealers, and large institutional end-investors who invest in foreign securities or hold them on behalf of U.S.-resident end-investors. The individual security level data provide information on current market value and current face value of holdings, currency of issue, coupon rates, current price, industry of issuer, and issue and maturity dates for each security. The survey is available on annual basis since 2003.

- U.S. liabilities data: security level data from the TIC survey of foreign holdings of U.S. securities. The survey is available on annual basis since 2003.

- Financial Accounts of the U.S. data from the Federal Reserve Board (previously U.S. Flow of Funds): U.S. assets outstanding, U.S. holdings of foreign bonds (total), Foreign holdings of U.S. bonds (total)

- Bond market capitalization (per country issuer of debt securities): BIS Quarterly Review data from the Bank for International Settlements.

- Debt issuance data: Thomson One.

- Credit ratings: credit ratings information on U.S. holdings of foreign securities is obtained by matching securities at the CUSIP level with ratings data from Markit and Bloomberg. We use S&P ratings; our high grade category corresponds to S&P's High Grade category (includes AA-, AA, AA+, and AAA ratings)

- Bond returns (series used in time series regressions): monthly data on Barclays Live returns on foreign financial high grade bonds denominated in U.S. dollars (high grade Yankee bonds). Barclays monthly returns data for financial Yankee high grade bonds are available for 15 countries, mostly OECD countries. We use the Barclays weighted index of foreign returns from these 15 countries.

- Bond returns (series used in annual panel regressions): calculated using Treasury International Capital (TIC) survey data that includes information on coupon rates and current prices.

- Trade shares: Direction of Trade Statistics (DOTS) and International Financial Statistics (IFS).

- Real GDP growth: World Development Indicators (WDI).

- Government effectiveness: Worldwide Governance Indicators. Data on percentile rank among all countries (rank) is expressed as a number from 0 to 100, with smaller numbers indicating better government effectiveness. http://info.worldbank.org/governance/wgi/index.asp

- Distance and common language: Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). http://www.cepii.fr/anglaisgraph/bdd/distances.htm

2   U.S. safe assets outstanding, U.S. safe asset share

We follow Gorton G., S. Lewellen, A. Metrick (2012) to reproduce and update the safe assets outstanding and shares. We also construct an alternative measure that excludes the holdings of the Federal Reserve and of foreign official investors (FOI). For this adjustment we exclude the following series from the original Gorton G., S. Lewellen, A. Metrick (2012) definition:

Financial Accounts of the U.S. (previously Flow of Funds) series mnemonics:

1. Federal Reserve holdings
   FL713061100: Monetary authority; Treasury securities; asset
   FL713061705: Monetary authority; agency- and GSE-backed securities; asset

2. Foreign official investors (FOI) holdings
   FL263061130: Rest of the world; Treasury securities held by foreign official institutions; asset
   FL263061713: Rest of the world; agency- and GSE-backed securities held by foreign official institutions; asset

3   Foreign share of the U.S. financial bond portfolio

Share of foreign bonds in the U.S. financial bond portfolio:

$$\frac{\text{U.S. financial long-term (LT) claims on the world}}{\text{U.S. fin. LT claims on world + U.S. total fin. bonds outstanding - foreign hold. of U.S. fin. bonds}}$$

1. Annual series:

   - Annual data for U.S. total financial bonds outstanding: FL793163005 ("Financial business; corporate and foreign bonds; liability") from Financial Accounts of the U.S.

- Annual data for U.S. fin. LT claims on the world: TIC Survey of U.S. Holdings of Foreign Securities.
- Annual data for Foreign holdings of U.S. fin. bonds: TIC Survey of Foreign Holdings of U.S. Securities.

2. Quarterly series

   (a) Quarterly data for U.S. total financial bonds outstanding: FL793163005 ("Financial business; corporate and foreign bonds; liability") from Financial Accounts of the U.S.

   (b) Quarterly U.S. financial long-term claims on the world are constructed using:
      - Interpolated annual share of financial in total corporate bond holdings from the TIC U.S. claims surveys that is then applied to:
      - Quarterly claims positions constructed following Bertaut and Tryon (2007).

   (c) Foreign holdings of U.S. financial bonds
      - Interpolated annual share of financial in total corporate foreign holdings of U.S. bonds from the TIC U.S. liabilities surveys that is then applied to:
      - Quarterly data on foreign holdings of U.S. corporate bonds from Financial Accounts of the U.S. (FL263063005 "Rest of the world; U.S. corporate bonds; asset").