

# International capital flows and the returns to safe assets in the United States 2003-2007

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*A broad array of domestic institutional factors –including problems with the originate-to-distribute model for mortgage loans, deteriorating lending standards, deficiencies in risk management, conflicting incentives for the government-sponsored enterprises (GSEs), and shortcomings of supervision and regulation– were the primary sources of the US housing boom and bust and the associated financial crisis. In addition, the extended rise in US house prices was likely also supported by long-term interest rates (including mortgage rates) that were surprisingly low, given the level of short-term rates and other macro fundamentals –a development that Greenspan (2005) dubbed a “conundrum.” The “global saving glut” (GSG) hypothesis (Bernanke, 2005 and 2007) argues that increased capital inflows to the United States from countries in which desired saving greatly exceeded desired investment –including Asian emerging markets and commodity exporters– were an important reason that US longer-term interest rates during this period were lower than expected.*

*This essay investigates further the effects of capital inflows to the United States on US longer-term interest rates; however, we look beyond the overall size of the inflows emphasised by the GSG hypothesis to examine the implications for US yields of the portfolio preferences of foreign creditors. We present evidence that, in the spirit of Caballero and Krishnamurthy (2009), foreign investors during this period tended to prefer US assets perceived to be safe. In particular, foreign investors –especially the GSG countries– acquired a substantial share of the new issues of US Treasuries, Agency debt, and Agency-sponsored mortgage-backed securities. The downward pressure on yields exerted by inflows from the GSG countries was reinforced by the portfolio preferences of other foreign investors. We focus particularly on the case of Europe: although Europe did not run a large current account surplus as did the GSG countries, we show that it leveraged up its international balance sheet, issuing external liabilities to finance substantial purchases of apparently safe US “private label” mortgage-backed securities and other fixed-income products. The strong demand for apparently safe assets by both domestic and foreign investors not only served to reduce yields on these assets but also provided additional incentives for the US financial services industry to develop structured investment products that “transformed” risky loans into highly-rated securities.*

*Our findings do not challenge the view that domestic factors, including those listed above, were the primary sources of the housing boom and bust in the United States. However, examining how changes in the pattern of international capital flows affected yields on US assets helps provide a deeper understanding of the origins and dynamics of the crisis.*

**NB:** Carol Bertaut, Section Chief, Laurie Pounder DeMarco, Economist, and Steven Kamin, Deputy Director, Division of International Finance, Board of Governors of the Federal Reserve System, co-authored this paper with Chairman Bernanke.

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The US housing boom and the bust that followed resulted from the interaction of a wide range of factors, including problems with the originate-to-distribute model for mortgage loans, a deterioration in loan underwriting standards, deficiencies of risk management among financial institutions, contradictions in the incentive structures of the government-sponsored enterprises (GSEs), and problems in the scope and implementation of financial supervision and regulation (Dokko *et al.*, 2009; Bernanke, 2010). In addition to these domestic institutional factors, international capital flows likely played a significant role in helping to finance the housing bubble and thus set the stage for its subsequent bust. Bernanke (2005, 2007) argued that an increase in notional saving relative to investment in many emerging market countries had given rise to a “global saving glut” (GSG), with capital flows to the United States helping hold down US longer-term interest rates earlier in the decade. Lower long-term interest rates, including mortgage rates, in turn contributed to the extended rise in house prices.

In this essay, we build on the GSG hypothesis to flesh out a more complete story of how international capital flows affected the pattern of longer-term yields in the United States. First, whereas the GSG hypothesis is based on a simple framework in which global saving and investment decisions determined the return on a single asset, we now consider how demands for a range of assets interacted with supplies of those assets to help produce declines in certain key interest rates. More specifically, in the spirit of Caballero and Krishnamurthy (2009), we analyse the channels through which the demand for apparently safe assets by foreigners contributed to their substantial acquisitions not only of US Treasury securities (Treasury) and Agency debt (Agency), but also of highly rated, privately issued mortgage-backed securities (MBS) and other structured investment products backed by US residential mortgages.<sup>1</sup> Second, whereas the GSG hypothesis focused mainly on capital flows into the United States from emerging market economies running current account surpluses –primarily developing Asian economies and oil exporters– this essay shows how capital inflows from other advanced economies also helped to suppress yields on apparently safe assets, including

mortgages. Finally, we discuss how the demand for apparently safe assets influenced their supply, as the US financial services industry developed a multitude of structured investment products that transformed risky loans into highly rated securities.

All told, our framework expands the simple GSG hypothesis to better explain the role international capital flows played in reducing yields on mortgages and other apparently safe assets. The analysis focuses on the period from 2003 to 2007, which encompasses the years when capital inflows into the United States were strongest, Treasury yields were most depressed, and the US housing boom was at its peak. First, we verify that the “GSG countries” –that is, emerging Asia and Middle Eastern exporters– did indeed evince a strong preference for the safest US assets.<sup>2</sup> On the margin, this preference most likely helped push down yields on MBS relative to other assets, as most MBS were either guaranteed by the Agencies or sold as tranches carrying AAA credit ratings.

Second, the downward pressure on yields exerted by inflows from the GSG countries was reinforced by the portfolio preferences of other foreign investors. We focus particularly on the case of Europe. Europe did not run a current account surplus as did the GSG countries, and thus was not a net exporter of saving to the rest of the world. But Europe leveraged up its international balance sheet significantly, issuing, among other instruments, considerable sovereign debt and bank debt, and using the proceeds to buy substantial amounts of highly rated US MBS and other fixed-income products. In fact, the strong preference of the GSG countries for Treasuries and Agency debt appears to have pushed Europeans and other advanced-economy investors, including US investors, into apparently safe “private label” MBS.

Finally, the demand for safe assets by investors, both domestic and foreign, appears to have engendered a strong supply response from US financial firms. In particular, even though a large share of new US mortgages during this period were of lower credit quality, such as subprime loans, Agency guarantees and financial engineering in the private financial services industry resulted in the overwhelming share of mortgage-related securities being rated AAA.

<sup>1</sup> “Agency” refers to the GSEs, most notably Fannie Mae and Freddie Mac, designed to promote homeownership by supporting the secondary market for residential mortgages. These enterprises both guaranteed MBS and purchased them for their own portfolios. Here and throughout this paper, Agency debt refers to both unsecured debt and Agency-guaranteed MBS.

<sup>2</sup> In the calculations described later, the GSG countries are taken to include all countries of Asia and the Middle East excluding Japan. This group, although not exhaustive, accounts for the lion’s share of investment in the United States by emerging market economies.

Of course, following the onset of the housing bust and financial crisis, the underlying weakness of these securities became evident.

To be clear, in no way do our findings assign the ultimate causality for the housing boom and bust to factors outside the United States. Domestic factors, including those listed in the first paragraph of this paper, were the primary sources of the boom and bust and the associated financial crisis. However, an examination of how changes in the pattern of international capital flows affected yields on US assets is important for understanding the origins and dynamics of the crisis.

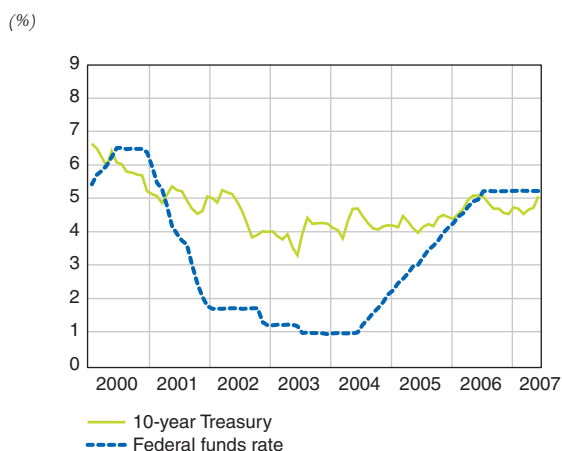
## 1 | THE GLOBAL SAVING GLUT AND RETURNS TO TREASURY AND AGENCY SECURITIES, 2003-2007

Our research is motivated by two puzzles in the evolution of interest rates during the period leading up to the financial crisis. The first of these puzzles is the very low level of long-term Treasury security yields, which remained relatively contained even as the federal funds rate was raised from 1 percent to an eventual level of 5¼ percent (See Chart 1). Greenspan (2005) famously referred to this development as a “conundrum” and various studies showed that bond yields, both in the United States

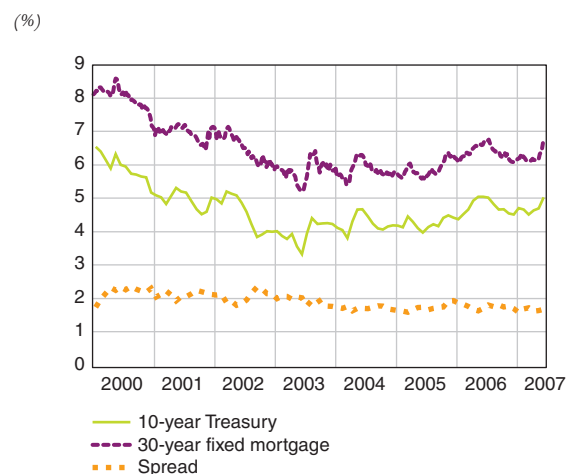
and abroad, fell below levels that were consistent with standard macro fundamentals such as inflation, growth in gross domestic product, and fiscal balances (Rudebusch, Swanson, and Wu, 2006; Gruber and Kamin, 2009). The second, related puzzle is the sustained low level of mortgage interest rates, also shown in Chart 1. While part of the weakness in these rates obviously is due to the low Treasury yields, the spread of mortgage rates over Treasury yields also edged down over the period, notwithstanding a sharp step-up in the pace of mortgage issuance; the outstanding stock of MBS and unsecuritised mortgages rose from USD 6.4 trillion at the end of 2002 to USD 11.1 trillion in 2007.

Of these two puzzles, the first has probably received the most attention. There are a number of explanations for the weakness in Treasury yields during this period, including declines in risk premiums (perhaps, at least initially, associated with the “great moderation”) and enhanced demands for long-term assets by pension funds and other institutional investors. In addition, observers have come to attribute at least part of the weakness of long-term bond yields to heavy purchases of securities by emerging market economies running current account surpluses, particularly emerging Asia and the oil exporters. Bernanke (2005, 2007) argued that in these countries, investment rates had fallen short of desired saving, creating a global saving glut that resulted in net capital outflows to the rest of the world and, as a consequence, declines in long-term interest rates. In fact, empirical research for the most

**Chart 1**  
**Federal funds rate and 10-year US Treasury rates**



**10-year US Treasury and 30-year US fixed mortgage rates, and spread**



Sources: For 10-year Treasury and federal funds, Federal Reserve Board, Statistical Release H.15; for 30-year fixed mortgage, Freddie Mac.

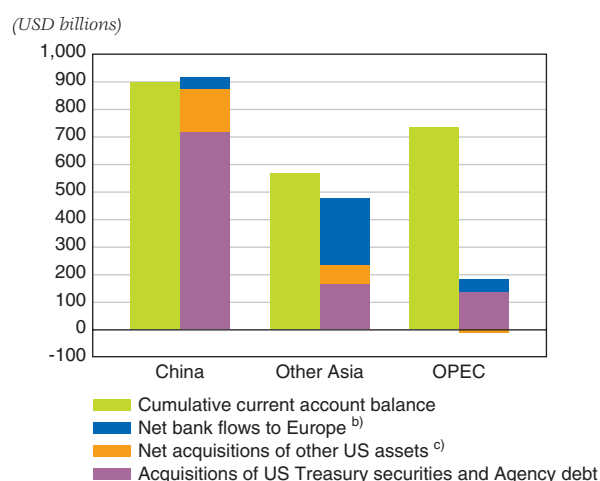
part confirms that such acquisitions had a statistically significant downward effect on bond yields.<sup>3</sup>

What factors led to the excess saving (or dearth of investment) and the resulting current account surpluses of the GSG countries? Certainly, some of these surpluses were due to the 1997-1998 Asian financial crisis, which substantially reduced investment in emerging Asia, as well as to the run-up in oil and commodity prices in the following decade, which provided commodity exporters with more revenues than they could spend productively at home in the near term. High saving rates in rapidly growing emerging-market economies also contributed to the surpluses. Although this analysis helps explain the sources of the GSG, it has the shortcoming of treating all forms of saving and the resulting capital flows as homogeneous. By contrast, an interesting recent body of literature has focused on the portfolio preferences embodied in capital flows to advanced economies. Specifically, it proposes that these emerging market economies sought safe, high-quality financial assets that their own governments and financial systems could not provide but were being produced in the advanced economies.<sup>4</sup> Accordingly, the emerging market economies were willing to run current account surpluses in order to finance the acquisition of these safe assets (Caballero, Farhi, and Gourinchas, 2008; Mendoza, Quadrini, and Rios-Rull, 2007). Moreover, the notable depth, breadth, and apparent safety of US financial markets led the emerging market economies to direct most of their capital outflows to the United States (Blanchard, Giavazzi, and Sa, 2005; Clarida, 2005; Cooper, 2005; Hubbard, 2005). If confirmed, this hypothesis about the foreign demand for safe assets could explain the strength of the capital flows from emerging market economies to advanced economies with deep capital markets, such as the United States. It could also explain why yields on the safest US assets, Treasuries and Agencies, were so low.

So, did the emerging market economies running current account surpluses generally acquire safe, liquid assets, primarily in the United States? The answer appears to

be yes.<sup>5</sup> Chart 2 compares the current account balances of three major categories of GSG economies – China, other emerging Asian economies, and the Organisation of the Petroleum Exporting Countries (OPEC) – with such measures as are available of their overseas asset purchases.<sup>6</sup> On net, China's current account surpluses were used almost wholly to acquire assets in the United States, more than 80 percent of which consisted of very safe Treasuries and Agencies. The other emerging Asian economies used their current account surpluses to purchase roughly equal amounts of safe US assets and European bank deposits. Data on the allocation of OPEC assets, unfortunately, is incomplete, but it is likely that a good portion of their investments abroad went into purchases of US and European assets that are held by third-party custodians.

**Chart 2**  
Current account surpluses and certain financial acquisitions of GSG regions, 2003-2007<sup>a)</sup>



a) Acquisitions of European and other non-US securities by emerging Asia and OPEC are unavailable.

b) Bank flows to Europe calculated from BIS data.

c) Other US assets comprises corporate securities, bank assets, and other miscellaneous assets included in the Financial Accounts.

Sources: For current account balance, Haver Analytics and BEA; for balance of payments accounts, staff estimates based on Treasury International Capital system and Bank for International Settlements banking data.

3 Bernanke, Reinhart, and Sack (2004) find that Treasury yields declined significantly during intervals around Japanese interventions to purchase dollars in the 2000-2004 period. Warnock and Warnock (2009) estimate regressions of US 10-year bond yields on standard macroeconomic variables as well as foreign official purchases of US Treasury and Agency bonds; they find that foreign purchases significantly lowered US Treasury yields, including by some 90 basis points in 2005. Conversely, Rudebusch, Swanson, and Wu (2006) estimate term structure models of Treasury yields and find that foreign official holdings have no explanatory power. Beltran, Kretschmer, Marquez, and Thomas (2010) find that these models are sensitive to changes in variable definitions and econometric specification, but conclude that, overall, foreign official inflows likely pushed down Treasury yields.

4 The demand for these safe assets may have included the demand for international reserves by emerging market economy governments. Most of the acquisitions of US assets by GSG countries were in the form of official inflows.

5 See also Brender and Pisani, (2010).

6 Comprehensive data on overseas asset purchases by these countries are not available. Therefore, we have attempted to capture these purchases by combining data on GSG-country acquisitions of US assets, based on US balance-of-payments, Treasury International Capital (TIC), and Bank for International Settlements (BIS) banking data, with GSG net bank flows to Europe, based on BIS banking data. Unfortunately, data on foreign purchases of non-US securities, which likely represent the largest gap in our coverage, are not available for most GSG countries.

**Chart 3**  
**US securities outstanding**

(%)



Note: In all charts, RMBS refers to residential mortgage-backed securities, CMBS refers to commercial mortgage-backed securities, and ABS refers to all other asset-backed securities.

Source: Staff estimates based on Flow of Funds and Treasury International Capital system data.

Chart 3 examines the portfolio preferences of the GSG countries from a different angle, comparing the mix of these countries' holdings of US securities in 2007 to

the mix of US securities outstanding at that time, and produces a reinforcing result. More than three-fourths of the GSG countries' US security holdings consisted

of AAA-rated debt, mainly Treasuries and Agencies, whereas these categories account for only 36 percent of total US securities outstanding.

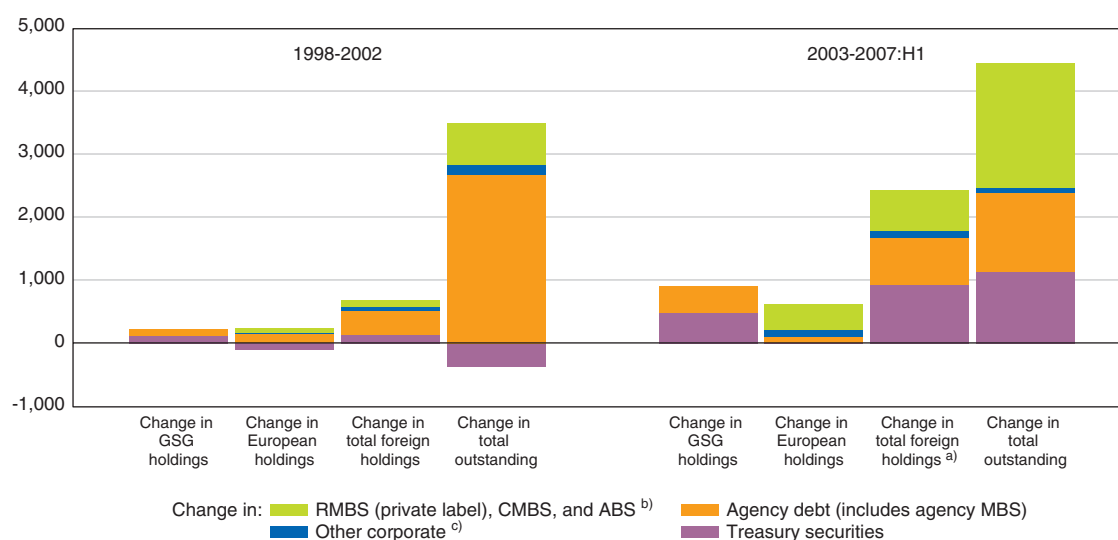
Moving from the one-asset framework underlying the original GSG hypothesis to a multi-asset framework that allows for assets of different degrees of riskiness, the story of how capital inflows from the GSG countries ultimately helped to depress interest rates on US assets perceived to be safe, including mortgages, becomes only a bit more complicated. GSG acquisitions of US Treasuries and Agencies took these assets off the market, creating a notional scarcity that boosted their price and reduced their yield. Because GSG investments were for purposes of reserve accumulation and guided by considerations of safety and liquidity, those countries continued to concentrate their holdings in Treasuries and Agencies even as the yields on those securities declined. However, other investors were now induced to demand more of assets considered substitutable with Treasuries and Agencies, putting downward pressure on interest rates

on these private assets as well. Thus, the interest rates on conforming mortgages shown in Chart 1 declined from their levels at the start of the decade.<sup>7</sup>

For capital inflows from the GSG countries to have put downward pressure not only on Treasury and Agency yields, but also on returns on other safe assets such as highly rated private label MBS, several conditions would have had to be met. First, GSG inflows would have needed to be focused on the safest US assets. Second, these inflows would have had to have been sizable relative to the total net issuance of apparently safe assets in the United States. Chart 4 presents mixed evidence on this point. It compares gross capital inflows into apparently “safe” US securities –Treasuries, Agencies, and AAA-rated private debt– from a number of regions with the increase in the total outstanding stock of safe US securities. On the one hand, acquisitions of safe assets by the GSG countries stepped up sharply from the 1998-2002 period to the 2003-2007 period, both in dollar terms and as a fraction of total net issuance. On the other hand, during the later period, inflows

**Chart 4**  
**Inflows to US AAA-rated securities**

(USD billions)



a) Of the US AAA inflows not accounted for by GSG countries and Europe, Japan purchased about USD 240 billion of Treasuries and USD 130 billion of Agencies, and Caribbean offshore centers purchased about USD 55 billion of Agencies and about USD 160 billion of AAA RMBS, CMBS, and ABS.

b) We estimated the change in foreign holdings (both total foreign holdings and Europe's holdings) of AAA RMBS, CMBS, and ABS by multiplying the change in foreign holdings of all asset-backed securities by the share of such securities outstanding that are estimated to be rated AAA during the relevant period.

c) We estimated the change in foreign holdings (both total foreign holdings and Europe's holdings) of other AAA corporate debt securities by multiplying the change in foreign holdings of all securities by a weighted share of such securities outstanding that were rated AAA during the relevant period. For both periods, the weighted share averages the shares of financial and non-financial debt securities that were rated AAA. For 1998 to 2002, the weights are determined by the growth in financial debt securities outstanding relative to non-financial debt securities. For 2003 to 2007, when more detailed data on foreign holdings are available, the weights are determined by the growth in foreign holdings of financial debt securities relative to non-financial debt securities.

Source: Staff estimates based on Flow of Funds, Treasury International Capital system and Dealogic data.

<sup>7</sup> See also the discussions of the effects of capital inflows, especially from the GSG countries, on the US financial market in Caballero and Krishnamurthy (2009); Jagannathan, Kapoor, and Schamurg (2009); Brender and Pisani (2010); Bertaut, DeMarco, Kamin, and Tryon (2010); and Linde, Martin and Vigfusson (2010).

from the GSG countries alone accounted for less than one-fourth of the total increase in the stock of safe US securities. Therefore, one may question whether the effect of GSG inflows on the yields of safe US assets outside the circle of Treasuries and Agencies, such as private label MBS, was all that sizable.

Whereas GSG inflows may not have risen sufficiently to exert a strong downward effect on safe asset yields in the private sector, inflows from all foreign sources may have been large enough to play this role. Chart 4 shows that such inflows rose sharply in the 2003-2007 period, accounting for more than one-half of the net issuance of highly rated US assets. To explain the behaviour of safe asset yields in this period, it may therefore be useful to expand the analysis to include investments by other foreigners besides the GSG countries, which we will do in the next section.

## 2 | THE DEMAND FOR SAFE US ASSETS BY THE ADVANCED FOREIGN ECONOMIES

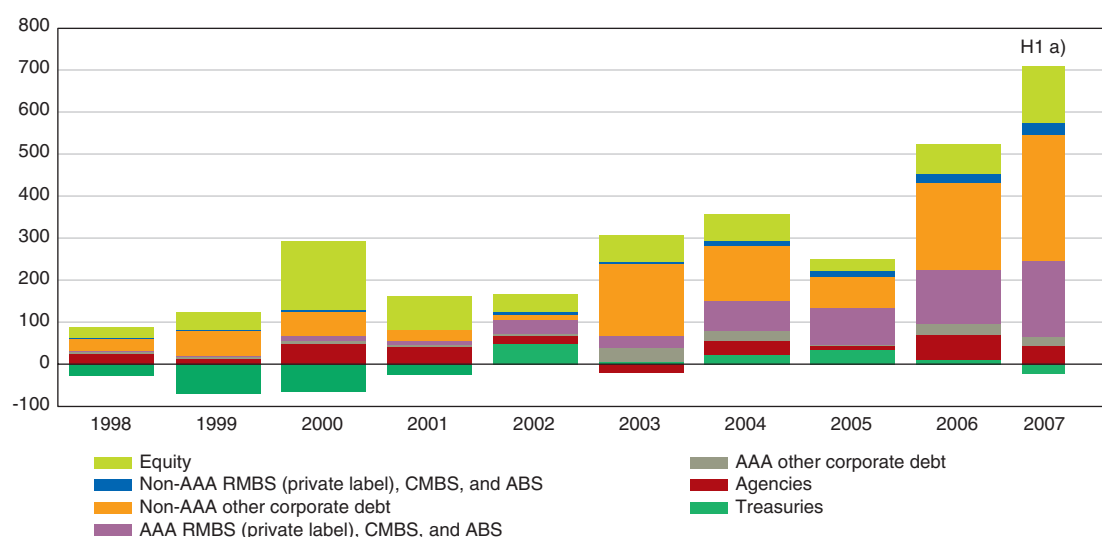
As indicated above, a large share of the highly rated securities issued by US residents from 2003 to 2007 was sold to foreigners –55 percent. This share

was even higher than in the 1998-2002 period –22 percent– even though total net issuance of apparently safe assets rose from USD 3.1 trillion in the first period to USD 4.5 trillion in the second (the net issuance of private label AAA-rated asset-backed securities outstanding, including MBS, rose from USD 0.7 trillion in the first period to USD 2 trillion in the second). That both the level of mortgage interest rates and their spread over Treasury yields could decline during the recent decade, notwithstanding substantial issuance of mortgages, would seem attributable, in part, to the strong demand for safe assets by foreigners.

Among the advanced economies, the most prominent source of gross capital flows into AAA-rated US securities from 2003 to 2007 was Europe.<sup>8</sup> As indicated in Chart 4, these acquisitions stepped up markedly from the 1998-2002 period and were nearly as large as those of the GSG countries. Moreover, Chart 4 likely understates Europe's purchases of apparently safe US assets, because it depicts purchases of only the safest (AAA-rated) assets. Unlike the GSG countries, whose net purchases of US assets during the period consisted almost exclusively of Treasuries and Agencies, Europeans bought a much wider range of assets, shown in Chart 5.

**Chart 5**  
European inflows to US securities, by type

(USD billions)



a) Annual rate.

Note: The split of European inflows to corporate debt into non-AAA asset-backed securities, non-AAA other, AAA asset-backed securities, and AAA other is estimated. For a description of the estimation process, see the footnotes to Chart 4.

Source: Staff estimates based on Treasury International Capital system data.

<sup>8</sup> In the statistics presented in this paper, Europe is represented as the euro area plus the United Kingdom, with financial claims between them netted out.

In addition to AAA-rated securities, Europeans purchased substantial amounts of non-AAA-rated securities, particularly corporate bonds –many of these, while not receiving the highest rating, were nonetheless investment grade. Accordingly, taking into account both European purchases of AAA-rated securities and those that were just a little less highly rated, net European acquisitions of apparently safe US assets (more broadly construed) almost certainly exceeded those of the GSG countries.

Although Europe's demands for apparently safe US assets thus substantially reinforced those of the GSG countries, there were some important differences between these two groups of investors. First, as noted earlier, European asset preferences were considerably broader than those of the GSG countries. Returning to Chart 3, it is clear that European investors held a much smaller share of their portfolio of US assets in Treasuries and Agencies than did the GSG countries, while holding a much larger share in AAA-rated asset-backed securities (including private label MBS), as noted previously, as well as in equities and lower-rated debt. In fact, by our estimates, the share of the most highly rated securities in Europeans' US portfolios was about the same as in the total amount of US securities outstanding.<sup>9</sup> As regards the riskier assets, Europeans held a smaller share of equities, but appear to have held a somewhat larger share of lower-rated instruments, including both corporate debt and asset-backed securities, than the market capitalisation benchmarks.

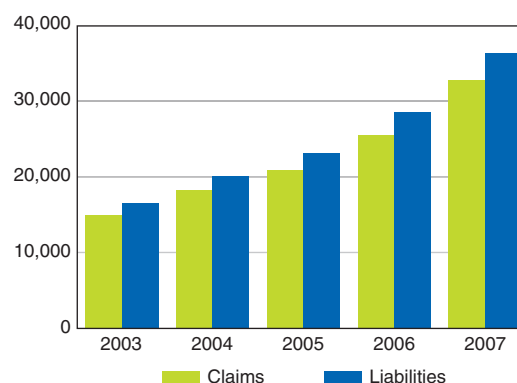
Accordingly, European investments in the United States seem unlikely to have been motivated exclusively by the same objective –the acquisition of very safe, liquid financial assets– as the investments of the GSG countries. Rather, European investors appear to have targeted a portfolio that was riskier than that held by the GSG countries and, indeed, broadly similar to the mix of US securities outstanding. As to what accounted for the substantial increase in European holdings of US assets –including MBS– during the 2003-2007 period, a number of explanations seem plausible. First, as in the United States, reductions in longer-term interest rates in Europe undoubtedly generated interest in assets such as US MBS that offered slightly higher returns while still being highly rated. Second, Europe

started this period with a relatively pronounced degree of “home bias” in its investments, and generalised declines in home bias around the world as financial globalisation progressed likely also motivated acquisitions of US assets (Bertaut, 2008). Third, much of the investment in US MBS around the world came from the expanding off-balance-sheet vehicles of large global banks, and many of those banks were located in Europe (Arteta, Carey, Correa, and Kotter, 2009). A final possibility, advanced by Acharya and Schnabl (2010) among others, is that the regulatory capital charges levied on banks that set up off-balance-sheet conduits to invest in US MBS were inadequate, which also served to encourage investments in these assets.

A second difference between the GSG and European investors is that, whereas the GSG countries were running current account surpluses and investing their accumulated wealth in US securities, Europe was running roughly balanced current accounts and was financing its acquisition of US securities through external borrowing. Chart 6 shows the growth in Europe's gross international claims and liabilities over the period 2003-2007. The fact that Europe was issuing external liabilities and acquiring external assets in roughly equal quantities does not mean, however, that the net effect of these transactions on global financial markets was a “wash”.

**Chart 6**  
Europe's international gross claims and liabilities:  
2003 to 2007

(USD billions)



Sources: Bank of England and the European Central Bank via Haver Analytics.

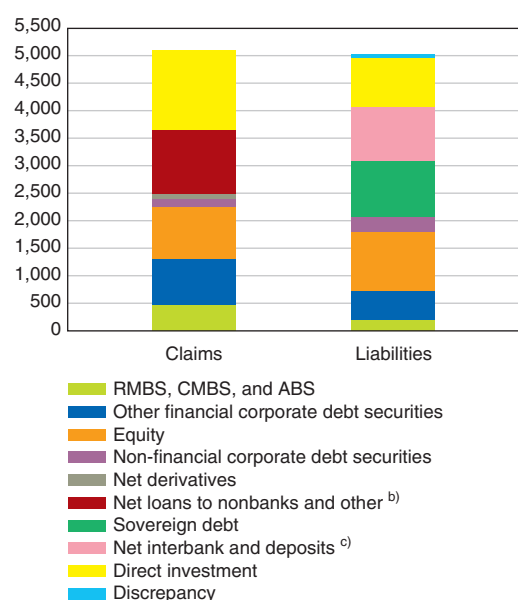
<sup>9</sup> The composition of foreigners' holdings of US assets shown in Chart 3 is based on the TIC data. These data specify the types of instruments held –e.g., Treasuries, Agencies, corporate debt, MBS, equities– but not their credit ratings. The breakdown of corporate debt and MBS into AAA and non-AAA shares is based on the rating shares for the total amounts outstanding of these securities. Because nearly all US MBS was rated AAA (see Section 3 below), our estimate of the AAA share of European-held MBS is likely to be approximately correct. For European holdings of corporate debt, the breakdown by credit rating is more uncertain.



Chart 7 depicts the evolution of Europe's international balance sheet from 2003 to 2007, showing how its acquisition of external claims was financed by issuance of external liabilities. The composition of these flows of claims and liabilities was broadly similar, but the rise in claims included significant amounts of asset-backed securities and other complex financial instruments, whereas the rise in liabilities was tilted toward traditional securities and bank deposits.

**Chart 7**  
**Cumulated European cross-border financial flows <sup>a)</sup>**  
**January 2003 to June 2007**

(USD billions)



a) Flows of euro area and the United Kingdom with the rest of the world, net of intra-Europe flows.

b) Components of 'Other Investment' in the euro area and United Kingdom Financial Accounts that are not identified as interbank or deposits from nonbank residents, primarily loans to nonbank firms and transactions of brokers.

c) Estimates of interbank flows and deposits from nonbank residents are based on the banking component of 'Other Investment' in the euro area and United Kingdom Financial Accounts, and Bank for International Settlements data.

Source: Federal Reserve Board staff estimates.

10 Sovereign debt refers to debt issued by governments. While capital inflows to purchase European sovereign debt helped finance the acquisition of external assets by Europe as a whole, there is no presumption that these inflows financed external asset accumulation by European governments themselves. No sovereign debt appears on the asset side of the balance sheet shown in Chart 7 because the change in Europe's holdings of foreign sovereign debt over the period was negligible.

11 Because the gross two-way flows between Europe and the rest of the world are so large for the "Net loans to nonbanks and other" and "Net interbank and deposits" categories, we show only their net flows in Chart 7. "Net loans to nonbanks and other" primarily contains long-term bank loans to nonbank corporations, intercompany loans between nonbank corporations, and certain transactions by brokers. "Net interbank and deposits," in addition to interbank flows and deposits from nonbank residents abroad, also includes estimates of net repurchase agreements transacted by nonbank corporations, such as brokers. These two categories are derived from and completely cover the "Other Investment" category of the Financial Account of the balance of payments of the euro area and the United Kingdom. But in order to present these categories on the basis shown in Chart 7, we also used data from the BIS, individual European countries' Financial Accounts, and the US Financial Account.

12 It should be noted that not all of the dollar funding of US asset-backed securities by Europeans is captured by these data. In many cases, US subsidiaries of European institutions, including their off-balance-sheet vehicles, both received dollar-funding and purchased asset-backed securities in the United States or the Caribbean; accordingly, these transactions did not give rise to the cross-border financial flows with Europe shown in Chart 7. This is particularly true of dollar funding through commercial paper vehicles.

13 Part of the increase in the value of these securities is due to valuation changes for equities; valuation changes for the debt securities were likely fairly small.

Specifically, and focusing first on securities, Chart 7 shows that much of Europe's issuance of externally held securities was in the form of equity and sovereign debt, whereas much of its acquisition of external securities was in the form of asset-backed securities and other debt securities issued by foreign financial corporations, most of which ultimately were issued in the United States.<sup>10</sup> Turning to transactions among banks and other primarily financial institutions, Europe was a net lender abroad to nonbank corporations ("net loans to nonbanks and other"), but was a net recipient of international interbank flows and other deposits from abroad ("net interbank and deposits") during this period.<sup>11</sup> As became apparent after the financial crisis broke, many European financial institutions were funding their purchases of US assets with short-term dollar-denominated liabilities like commercial paper or bank deposits, much of which attracted US investors (McGuire and von Peter, 2009, Acharya and Schnabl, 2010).<sup>12</sup>

Thus, even though Europe was not running current account surpluses, its financial firms and investors engaged in a process of intermediation which augmented the supply of financing for MBS and related instruments, especially in the United States. As Acharya and Schnabl (2010) point out, investment inflows from current account deficit countries as well as surplus countries were both quite significant for US financial markets.

The table below fleshes out the interplay between changes in the supply and demand for various US securities during the period of the housing boom. Between year-end 2003 and year-end 2007, the value of total US securities outstanding rose about USD 10 trillion, of which roughly USD 4.5 trillion was absorbed by foreign investors.<sup>13</sup> The supply of Treasuries and Agencies outstanding rose USD 1.6 trillion, and this was fully taken up by foreigners (on net),

## US securities outstanding, 2003 and 2007

(USD billions)

	Total Securities (1)	Treasury securities (2)	Agency debt (3)	Corporate AAA (4)	ABS/MBS AAA (5)	Corporate Non-AAA (6)	ABS/MBS Non-AAA (7)	Equity (8)
<b>Total US securities outstanding, 2003</b>	<b>29,757</b>	<b>3,342</b>	<b>5,969</b>	<b>393</b>	<b>1,439</b>	<b>4,093</b>	<b>254</b>	<b>14,266</b>
Held by foreign investors	5,239	1,477	571	157	162	1,003	29	1,839
Of which: Europe	2,182	345	192	74	86	496	15	974
GSGs	870	449	198	5	11	33	2	172
Held by US residents	24,518	1,864	5,398	236	1,277	3,090	225	12,427
<b>Total US securities outstanding, 2007</b>	<b>40,169</b>	<b>4,113</b>	<b>6,786</b>	<b>425</b>	<b>3,154</b>	<b>5,286</b>	<b>458</b>	<b>19,947</b>
Held by foreign investors	9,796	2,384	1,384	214	788	1,679	114	3,232
Of which: Europe	3,978	399	308	126	487	993	71	1,594
GSGs	2,082	905	656	9	44	72	6	389
Held by US residents	30,373	1,729	5,402	210	2,366	3,607	344	16,715
Memo:								
Change in foreign held /change in value outstanding (%)	43.8	117.5	99.6	182.0	36.5	56.7	42.0	24.5

Note: Changes in holdings and securities outstanding include valuation changes. Global saving glut (GSG) countries include Asia (excluding Japan) and the Middle East. Sources: Staff estimates based on Flow of Funds and Treasury International Capital system.

of which USD 0.9 trillion was purchased by the GSG countries and less than USD 0.2 trillion by Europeans. The amount outstanding of AAA-rated asset-backed securities rose USD 1.7 trillion, of which US residents took USD 1.1 trillion and Europeans USD 0.4 trillion.<sup>14</sup> All told, as indicated at the bottom of the table, the share of the increase in the value outstanding of US securities absorbed by foreigners ranged from 182 percent for AAA-rated corporate securities –that is, foreigners ultimately absorbed all of the new issuance of these securities and bought some from US residents, too– to only 25 percent for equities.

Overall, the substantial *net* capital inflows financed by the current account surpluses of the GSG countries, coupled with the substantial *gross* capital inflows from Europe –as they issued sovereign debt and bank deposits, among other liabilities, to acquire US structured instruments– probably raised net demands for apparently safe US assets. Together with the original GSG hypothesis, this likely helps to explain why US assets perceived to be safe, including MBS, saw little change in yields

despite tightening monetary policy and heavy issuance of mortgages.

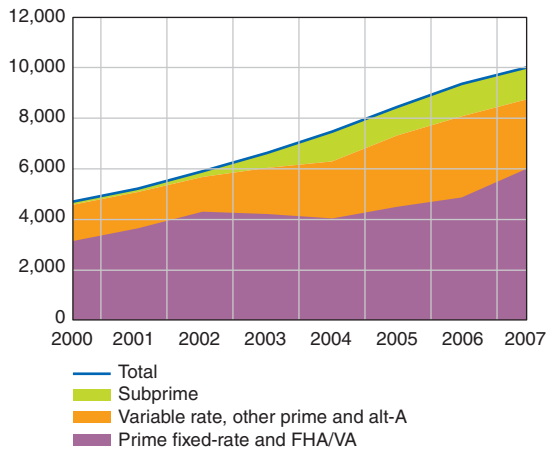
### 3| CHANGES IN THE SUPPLY OF APPARENTLY SAFE US ASSETS

Given the strength of demand for safe US assets, it would have been surprising had there not been a corresponding increase in their supply. Caballero and Krishnamurthy (2009) argue that the desire to accommodate the demand for safe assets by global investors was a prominent factor in a process that transformed risky loans into highly rated securities. As shown in the top panel of Chart 8, during the US housing boom, not only was there a surge in origination of new mortgage loans, but the share of these loans that were considered riskier –subprime and variable-rate prime including alt A– rose substantially as well. And yet, remarkably, as depicted in the bottom panel, nearly all the surge in asset-backed securities outstanding is estimated to have been rated AAA.

<sup>14</sup> These figures may understate somewhat the amount of US MBS that were ultimately owned by Europeans. Many off-balance-sheet vehicles of European banks were located in the United States, and purchases of asset-backed securities by these vehicles would be recorded as purchases by "US residents." In addition, many vehicles of European and US global banks were located in offshore financial centers, where much of the remaining USD 0.3 trillion in US asset-backed securities were held.

**Chart 8**  
Value of mortgages outstanding

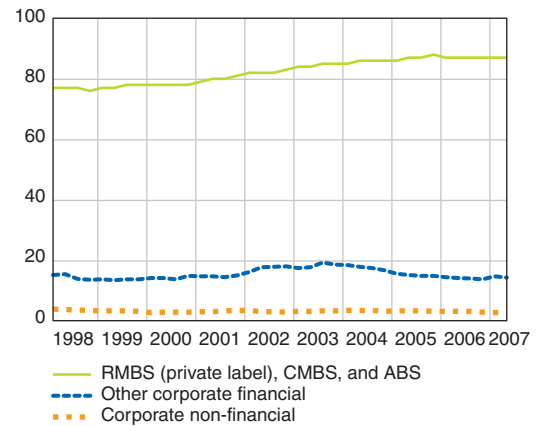
(USD billions)



Source: Federal Reserve Board staff estimates.

**Chart 9**  
Share of bonds outstanding rated AAA, by type

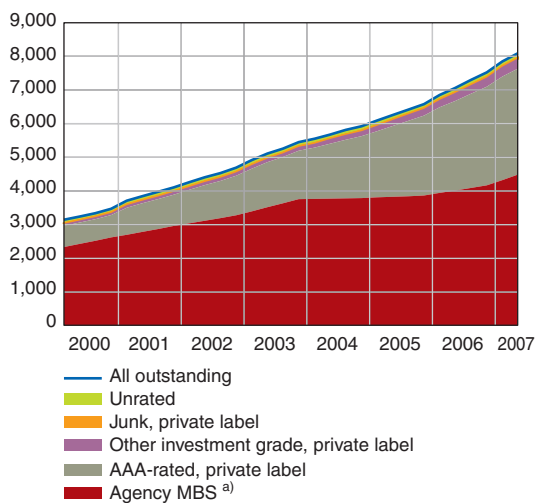
(%)



Sources: For RMBS, CMBS, and ABS, staff estimates based on Dealogic data; for corporate financial and non-financial, Moody's.

**ABS, RMBS, & CMBS outstanding, by rating**

(USD billions)



a) Includes MBS guaranteed by the government-sponsored enterprises, the Federal Housing Administration (FHA), and the Veterans Administration (VA).

Sources: Flow of Funds and staff estimates based on Dealogic data.

Chart 9 examines the AAA-rated shares of different categories of private securities.<sup>15</sup> The share of private label asset-backed securities that was rated AAA during the housing boom, at about 85 percent, dramatically exceeded the AAA-rated share of

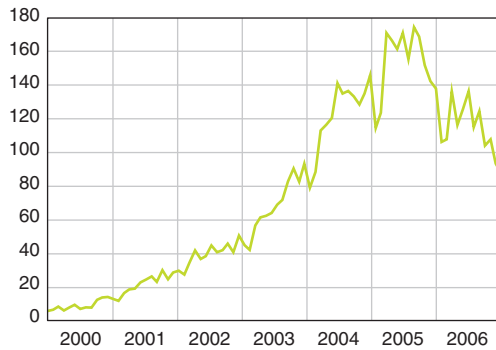
financial corporate bonds (15 percent) and non-financial corporate bonds (3 percent). Moreover, whereas the AAA-rated share of corporate bonds was flat or declining during the height of the housing boom, the AAA-rated share of private label asset-backed securities rose slightly.

The process by which collections of loans, many of dubious quality, were transformed into highly rated structured investment products has been well covered by Gorton (2008, 2009) and Coval, Jurek, and Stafford (2008), among others. In brief, pooling loans and establishing tranches with a pre-established priority ordering for payments allowed many securities to be deemed much safer than the average loan in the underlying pool. The motivation for this financial engineering was clear: there were profits to be made by selling securities at a price that ultimately proved much higher than the value of the underlying collateral. But, equally important, it was recognised that the willingness of investors to deliberately take on additional risk was limited. Investors were willing to reach for some additional yield by purchasing AAA-rated MBS rather than Agency debt (or sovereign bonds at home), but they likely would not have absorbed BBB-rated MBS in significant quantities. Accordingly, the surge in financial engineering to tranche the payouts from mortgages so as to create

15 Data on credit ratings for corporate bonds were obtained from Moody's DRS data. Data on credit ratings for outstanding MBS were estimated based on new-issue ratings in Dealogic data.

### Chart 10 Subprime adjustable-rate mortgage (ARM) issuance

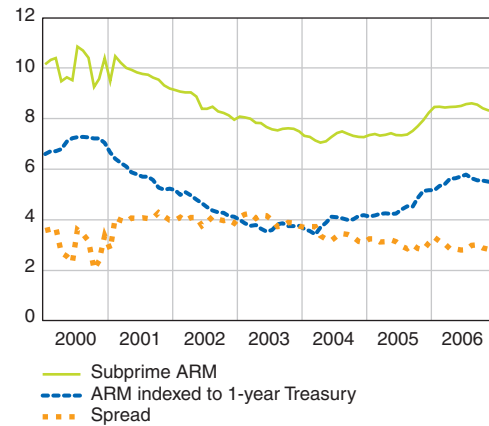
(thousands of loans)



Source: Federal Reserve Board staff estimates.

### Rates on subprime and conforming adjustable-rate mortgages (ARMs)

(%)



highly rated debt securities was, at least in part, an endogenous response to the risk preferences of domestic and foreign investors. (See Nadauld and Sherlund, 2009; Gerardi, Lehnert, Sherlund, and Willen, 2008; and Mayer, Pence, and Sherlund, 2009.)

The combination of heavy demand for highly rated MBS, along with the transformation of risky mortgages into highly rated MBS by the financial services industry,

increased the effective demand for “raw materials” –that is, new mortgage originations. As indicated in Chart 10, issuance of subprime adjustable-rate mortgages (ARMs) soared during this period, but spreads of the interest rates on these mortgages relative to those on conforming ARMs (which were guaranteed by the GSEs) continued to decline. The growing demand for securities backed by these loans on the part of investors, both foreign and domestic, helped keep these spreads low.

*In this paper, we have argued that international capital inflows likely played an important role in lowering Treasury yields and returns on other apparently safe US assets, especially mortgages, in the years leading up to the financial crisis. As highlighted by both the GSG hypothesis and the more recent literature focusing on the international pattern of asset supplies and preferences, these capital inflows included purchases of Treasuries and Agencies by emerging market economies seeking safe assets in which to invest their current account surpluses. However, these capital inflows also included purchases of highly rated private label MBS by investors in other advanced economies, especially in Europe, who sought a broader range of assets but continued to place a high value on perceived safety. Although Europe as a whole was not running a current account surplus during this period, unlike the GSG economies, it financed purchases of US securities, including MBS, through issuance of a range of external liabilities. As the composition of home mortgages became increasingly skewed toward subprime and other risky loans, the US financial services industry developed techniques to transform these loans into the apparently safe, AAA-rated securities demanded by investors at home and abroad. The subsequent bursting of the housing bubble and recognition that many of these securities were far riskier than had previously been recognised helped to trigger the financial crisis.*

*Looking back on the crisis, the United States, like some emerging-market nations during the 1990s, has learned that the interaction of strong capital inflows and weaknesses in the domestic financial system can produce unintended and devastating results. The appropriate response is not to try to reverse financial globalisation, which has conferred considerable benefits overall. Rather, the United States must continue to work with its international partners to improve private sector financial practices and strengthen financial regulation, including macroprudential oversight. The ultimate objective should be to be able to manage even very large flows of domestic and international financial capital in ways that are both productive and conducive to financial stability.*

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