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Global Capital Flows, Foreign Financing
and US Interest Rates

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Abstract

Almost 45 percent of all US Treasury securities and just under 20 percent of US Agency securities (bonds and MBS) are currently held by foreign investors. This paper addresses key questions concerning these large foreign investments in Treasuries and Agencies: Are these investments sustainable? What is the likely impact on US Treasury and mortgage interest rates if foreign investors begin to redeploy their investment resources? What could be the triggering or tipping points in China's diversification strategy? We trace the increase in foreign holdings of US securities, analyze the different scenarios that could unfold and their potential impact on interest rates, evaluate the likelihood and timing of the changes in demand, and speculate on the political economy of China's motivations and purchasing behavior.

**Global Capital Flows, Foreign Financing
and US Interest Rates**

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ABSTRACT

Almost 45 percent of all US Treasury securities and just under 20 percent of US Agency securities (bonds and MBS) are currently held by foreign investors. This paper addresses key questions concerning these large foreign investments in Treasuries and Agencies: Are these investments sustainable? What is the likely impact on US Treasury and mortgage interest rates if foreign investors begin to redeploy their investment resources? What could be the triggering or tipping points in China's diversification strategy? We trace the increase in foreign holdings of US securities, analyze the different scenarios that could unfold and their potential impact on interest rates, evaluate the likelihood and timing of the changes in demand, and speculate on the political economy of China's motivations and purchasing behavior.

Global Capital Flows, Foreign Financing and US Interest Rates²

1. Introduction

The large and continuing purchases of US securities by foreign investors represent an integral aspect of the equally large and continuing US trade deficits. Specifically, the US security purchases by foreign investors are a phenomenon that could be helping to reduce US interest rates. Furthermore, US mortgage-related securities are a significant part of the foreign purchases, especially by investors in China and other Asian countries, suggesting that lower mortgage interest rates may be a specific result of the foreign investments. On the other hand, there is a corresponding risk of rising interest rates, dollar depreciation, or related dislocations, were foreign investors to reduce or reverse these purchases. The goal of this paper is to provide a framework for analyzing the possible impact of such shocks in foreign investor demand on the US interest rates and the mortgage market, as an integral element of the global imbalances debate.

The agenda is as follows. Section 2 provides a graphical and quantitative analysis of the increased foreign investments in US financial and mortgage securities. Section 3 discusses the possible impact of changes in foreign demand on US Treasury bond and mortgage security interest rates. Section 4 evaluates the likelihood and possible timing of the changes in demand considered in Section 3. In particular, Section 4 discusses whether the increased foreign investments should be considered temporary or permanent, as well as the political-economic

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factors that might cause a rapid reduction in these investments. Section 5 provides a summary and conclusions.

2. Foreign Purchases of US Securities

The net international investment position of the US equals the value of US-owned securities and foreign direct investment located abroad minus the value of foreign-owned securities and foreign direct investment located in the US. The net investment position of the US was strongly positive through most recent history, but it became negative starting in 1989, and has grown significantly more negative since then; see Figure 1. By the end of 2005, the last year of available data, the net investment position reached -\$2.5 trillion, the difference between US-owned foreign assets of \$11.1 trillion and foreign-owned US assets of \$13.6 trillion.³

The large and expanding negative net international investment position of the US is the direct and unavoidable result of the large and continuing current account deficits in the US balance of payments, for which the US trade deficits are the primary source. Figure 2 shows the US trade deficit, in billions of current dollars and as a percent of US GDP. By the end of 2006, the trade deficit had crossed \$800 billion annually, or over 6 percent of GDP. Whenever the US runs a current account deficit, foreign investors unavoidably accumulate a greater net amount of dollar denominated securities; in fact, the expansion of net foreign holdings of US securities and dollar denominated assets must rise dollar for dollar with the US trade deficit. The details of this relationship and how it affects US dollar exchange rates and the interest rates of US securities are developed in Section 3 below.

³ Gourinchas and Rey (2005a and 2005b) discuss issues in the valuation of the net investment position of the US. They also point out that, even with a negative balance, the return on US investments abroad significantly exceeds the return on foreign investments in the US.

2.A Principal Classes of US Securities Held by Foreign Investors

Figure 3 shows the principal classes of US securities held by foreign investors at year-end 2006.⁴ Foreign investors were holding almost \$5 trillion of US equities and foreign direct investment (FDI), almost \$3 trillion of US corporate bonds, and over \$2 trillion of US Treasury bonds. Foreign ownership of US Agency securities—defined here as the sum of the bonds and mortgage backed securities (MBS) issued by the government sponsored agencies (GSEs) and direct government mortgage agencies (such as Ginnie Mae)—totaled over \$1 trillion.⁵ Agency securities are a particularly important class of assets in this study because they represent the primary US mortgage-related securities held by foreign investors. Foreign investors could also hold US mortgages directly and/or invest in non-agency MBS, but until recently the greater risk and transaction costs of these securities made holdings unusual. Recently, however, it appears that foreign investors are purchasing non-agency MBS in greater volume, although no explicit data are yet available to verify this presumption. Two banking firms, Washington Mutual and most recently Bank of America, have also sold covered bonds—corporate debt collateralized with mortgages—to foreign investors, another sign of increased willingness on the part of foreign investors to hold non-agency US mortgage-related securities.

⁴ Figure 3 is derived from the Federal Reserve's Flow of Funds data, which are currently available through 2006, whereas the data in Figure 1 are currently available only through 2005 from the Bureau of Economic Analysis. We do not show foreign holdings of US bank deposits, because foreigners also borrow significant amounts from US banks and the net foreign investment (deposits – loans) is substantially smaller than the asset classes that are shown.

⁵ Agency bonds represents debt issued by the Federal Home Loan Banks, Federal National Mortgage Association (FNMA), Federal Home Loan Mortgage Corporation (FHLMC), Federal Agricultural Mortgage Corporation (FAMC), Farm Credit System, the Financial Corporation, and the Resolution Funding Corporation. Agency and GSE MBS are issued by Ginnie Mae (GNMA), FNMA, FHLMC, FAMC and Farmers Home Administration.

The composition of foreign holdings of US securities by asset class, as a share of total foreign holdings of US securities, is shown in Figure 4.⁶ Equities and foreign direct investment represent, by far, the largest portfolio share, close to 40 percent of the total foreign holdings at year-end 2006. Foreign ownership of US corporate bonds and Agency securities have grown rapidly over the last 7 years, with US corporate bonds now representing close to 25 percent of the total foreign portfolio of US assets and US Agency securities almost 10 percent of that portfolio; see also Fratantoni (2007).

Foreign holdings of US asset classes as shares of the total outstanding US securities for each asset class are shown in Figure 5.⁷ The foreign share of US Treasury securities outstanding shows the greatest penetration, representing almost 45 percent of all US Treasury securities outstanding. This penetration has grown rapidly, from less than 20 percent of the total as recently as 1994. The foreign share of Agency securities has also grown rapidly, rising from about 6 percent share in 1994, to over 20 percent of the total US Agency securities outstanding. In 2006 alone, close to \$300 billion of Agency securities were purchased by private and official foreign investors. This is an important indicator of the large and rising holdings of US mortgage-related securities by foreign investors.

Figures 4 and 5 provide two different views of the foreign holdings of US securities by security class. For example, at year-end 2006, equities and FDI represented almost 40 percent of the total foreign holdings of US securities (Figure 4), but under 20 percent of all US equities outstanding (Figure 5). In our discussion below, we reference the foreign share of US securities

⁶ The denominator for these ratios is the total holdings of US securities by foreign investors, and includes “other” foreign holding not shown in the figure, such as US bank deposits and trade credit extended to US firms.

⁷ We use total US equities as the denominator for the foreign share of equities and foreign direct investment (FDI). This includes FDI in US sectors but excludes FDI in assets such as real estate. The recorded amount of FDI in direct assets is low, so this factor does not create any significant distortion in the computed shares.

outstanding by security class (Figure 5), because this is the most relevant measure for determining how much security prices and interest rates might change as the result of a change in foreign demand.

2.B Foreign Investments in US Asset Classes by Region and Country

Figure 6 shows the foreign holdings of US securities as shares of the total outstanding US securities, for major asset classes and world regions, as of December 2006.⁸ These data also allow us to separate Agency securities into its two components, Agency bonds and Agency MBS. Key features are:

- i) Asian investors hold 32 percent of all US Treasuries, 13 percent of all Agency bonds, and 6 percent of all Agency MBS, but relatively small shares of US corporate bonds and equities.;
- ii) European investors hold over 16 percent of all US corporate bonds, but relatively small shares of all other security classes;
- iii) Investors in the Rest of the world are holding almost 10 percent of all US Corporate bonds, but relatively small shares of all other security classes.⁹

We next look at how the regional holdings of US Treasury bonds and Agency securities have evolved over time.¹⁰ Figure 7 shows that the Asian holdings of US Treasuries have grown dramatically and steadily since 1994, reaching 32 percent of all US Treasuries outstanding by year-end 2006. This share more than doubled in the 6 years since 2000, and rose by almost 5-

⁸ Detailed holdings data from the US Treasury are currently available only to June, 2006. To get country-wise holdings as of December, 2006, we cumulated the available data on net purchases from June to December 2006. We then controlled the resulting total holdings by foreigners at December 2006 to equal the comparable total available from the Federal Reserve Flow of Funds data as of December 2006. We then apply this adjustment factor to the sum of country-wise holdings as of June, 2006 and the net purchases through December, 2006.

⁹ The Middle-East oil exporting countries hold only 2 percent of US Treasuries and less than 1 percent of all other US security classes.

¹⁰ The years 1994 and 2000 represent the two most recent US Treasury benchmark surveys of foreign investor holdings prior to 2002 when the surveys became annual. The text does not discuss the trends in foreign holdings of US corporate bonds and equities because they are not distinctive and are not a focus of this study.

fold in the 12 years since 1994. In contrast, the share of US Treasuries outstanding held by European investors and the rest of the world are much smaller and show no trends.

Figure 8 shows that the Asian holdings of Agency securities have also grown dramatically and steadily since 2000, reaching 11 percent of all Agency bonds and MBS outstanding by year-end 2006.¹¹ This share rose 4-fold in the 6 years since 2000. Agency security holdings of European investors and the rest of the world, in contrast, are much smaller and show no trend.

The dramatic growth in the Asian investor share of outstanding US Treasury bonds and Agency securities provides a benchmark for the possible reductions in the demand for these securities by Asian investors that could take place. For example, if Asian holdings of US Treasuries simply reverted back to their share as of year-end 2000, which is certainly a possibility, this would mean that about 17 percent of the total outstanding US Treasury securities would be placed on the market for sale. Similarly, if Asian holdings of Agency securities reverted back to their share as of year-end 2000, then about 8 percent of this asset class would have to be sold. In Section 4, we evaluate the impact on US Treasury and mortgage interest rates, and on other aspects of the US security markets, were reductions of this magnitude in the foreign demand for US Treasury and Agency securities to occur.

Figure 9 shows the 2006 foreign holdings of US securities by the largest investing countries--China and Japan in Asia and the United Kingdom in Europe--as shares of the total outstanding US securities for each asset class.¹² Key features are:

¹¹ The US Treasury Department has recently started to collect data that separates the foreign holdings of US Agency bonds from the foreign holdings of US Agency MBS, as shown in Figures 6 and 9. Separate data, however, are not available for the historical series shown in Figures 7 and 8 for world regions and in Figures 10 and 11 for countries.

¹² The Cayman Islands, Bermuda, and Luxembourg figure prominently as major holders of various securities due to their status as tax havens. Given that we cannot ascertain the actual country of domicile of holders operating through such tax havens, we do not include them in our analysis.

- i) Chinese investors hold about 9 percent of US Treasuries, 5 percent of Agency bonds, and 3 percent of Agency MBS, with much smaller shares of US corporate bonds and equities;
- ii) Japanese investors hold about 15 percent of US Treasuries, 4 percent of US Agency bonds, and 2 percent of US Agency MBS, with smaller shares of US corporate bonds and equities;
- iii) United Kingdom investors hold about 5 percent of US corporate bonds, with much smaller shares of the other asset classes.

Figure 10 shows how the holdings of US Treasury bonds by Chinese, Japanese and United Kingdom investors have evolved over time. The Japanese investor share of Treasury bonds has been relatively stable in recent years, equal to about 15 percent of all US Treasury bonds outstanding. The Chinese investor share of Treasury bonds, in contrast, has grown steadily and dramatically, reaching a 9 percent share in 2006. During the 6 years from 2000 to 2006, the Japanese share of total Treasury securities has about doubled, while the comparable Chinese share has more than quadrupled. The United Kingdom investor share of US Treasuries reached just 2 percent in 2006, and has shown no trend since 2000.

Figure 11 shows the comparable evolution of the foreign holdings of US Agency securities. The Chinese investor share of all Agency securities outstanding has grown almost 10-fold since 2000, reaching 4.5 percent of all US Agency securities by 2006. The Japanese investor share of all US Agency securities has tripled since 2000, reaching a 3.3 percent share in 2006. The United Kingdom share of US Agency securities outstanding is well under 1 percent and has shown no trend since 2000.

The changing patterns in the holdings of US Treasury bonds and Agency securities by Chinese and Japanese investors, shown in Figures 10 and 11, provide a useful benchmark for evaluating the possible magnitude of a sharp reversal in demand, were these investors to reduce

their holdings to the levels of an earlier date, such as 2000. We will use these benchmarks in Section 3 below, where we evaluate the impact of a reduction in foreign demand on US security markets and US interest rates.

3. The Foreign Demand for US Securities: Origins and Possible Changes

Foreign net holdings of US securities arise in the first instance when foreign entities export to the US and are paid in US dollars. The foreign exporters then either invest the dollars directly or exchange the dollars with banks or others who invest them. In either case, the dollars are transferred into US investments, mainly US Treasury and corporate bonds, mortgage-related securities, and equities (including foreign direct investment). An individual foreign investor can eliminate his/her dollar assets simply by selling them, but this cannot be true for the foreign sector taken as a whole: *as long as the US continues to run a trade deficit, foreign investors taken as a whole cannot reduce their holdings of US securities.*¹³

The explanation for this proposition is that, while individual foreign investors can, of course, exchange their dollar assets for foreign assets, some other foreign entity necessarily ends up holding the net dollar assets. Perhaps the easiest way to see this is to consider a series of possible bank transactions:

- i) If a foreign holder deposits the dollars in a foreign bank, this only transfers the dollar asset to another foreign holder, namely the foreign bank.
- ii) If the foreign holder puts the dollars in a US bank, that entity still owns a US asset, namely a US bank deposit.
- iii) Finally, if the foreign holder exchanges the dollars for foreign currency with a US bank, the net investment position is still unchanged. It's true that the foreign holder has reduced its

holdings of dollars, but the US bank has reduced its holdings of foreign currency, so the net investment position (foreign holdings of dollars minus US holdings of foreign currency) remains unchanged.¹⁴

The bottom line is that the net foreign holdings of US securities is determined entirely by the history and current levels of the US current account deficit in its balance of payments, of which the trade deficit is by far the largest component.

3.A The Demand to Hold US Securities

The *demand*—meaning the willingness--of foreign investors to hold US securities, however, could influence the market prices and interest rates on these securities, as well as the dollar exchange rate. For example, if Chinese investors wish to hold fewer US Agency securities, this will cause downward pressure on both the market price of these securities (thus raising their interest rates) and on the Chinese currency (yuan)¹⁵ valuation of the dollar. The net demand of all investors to hold these securities will then determine by how much the market prices of the mortgage securities and the dollar will decline. Furthermore, if the sellers are private Chinese investors (which is not the case, at present) , but the Chinese central bank stands ready to purchase an equal amount of other dollar securities, then there will be no net change in the dollar-yuan exchange rate. And if, say, Japanese investors are prepared to buy the US Agency securities at just about the initial price, then the Agency security prices would also change very little. On the other hand, if there are no ready buyers, then the security prices, interest rates, and

¹³ This applies to the securities' face value. The market value of the holdings will change, of course, if interest rates or exchange rates fluctuate, a possible result of changes in the demand for the securities by foreign investors.

¹⁴ As in the previous footnote, the market value of the net investment position will change as the result of exchange rate fluctuations. Indeed, the net investment position measured as market value in dollars will improve (become a smaller negative value) if the dollar depreciates.

¹⁵ While renminbi (the people's currency) is the official currency of China, the main unit is the yuan. There is frequent interchangeable, even combined usage. We use the term yuan throughout.

exchange rates may have to change substantially before the market stabilizes.

There is also a long-run equilibrating process in which, eventually, the exchange rate should change so as to induce a balanced trade position. For example, if foreign investors were to start to sell their US assets, everything else the same, this will cause the dollar to depreciate in foreign exchange markets, thus encouraging US exports and discouraging US imports, and thereby starting to balance the trade position. There will also be pressure for US interest rates to rise, partly because the increased exports invigorate the US economy, and partly because the depreciating dollar will create inflationary pressure within the US. However, these equilibrating pressures may work very slowly. They also require that the governments take no action to nullify the equilibrating pressures. As a case in point, the Chinese central bank has been able to sustain an undervalued yuan against the US dollar by continuing to buy US assets for its own account.

3.B Interest Rate Effects of Changes in the Demand For US Securities: Five Cases

The possible interest rates effects of changes in the foreign demand for US securities can be illustrated with five specific cases:¹⁶

- 1) Foreign investors sell US Agency bonds and purchase US Treasury bonds.
- 2) Foreign investors sell US Agency MBS and purchase US Treasury bonds.
- 3) Foreign investors sell US Treasury bonds and purchase Eurodollar securities.
- 4) Foreign investors sell US Treasury bonds and purchase other dollar denominated assets.
- 5) Foreign investors sell US Treasury bonds and purchase Euro-Currency Treasuries

¹⁶ The same form of analysis could be applied to our five experiments, but with the securities bought and sold just reversed in each case; for example, in Case 1, the foreign investors would buy Agency bonds and sell Treasuries. The interest rate changes would then be just the opposite in direction. The cases refer to the net change in security positions held by foreign investors. It is possible there could be a number of intervening steps, with foreign investor 1 selling to foreign investor 2, selling to foreign investor 3 and so on. As long as the net change matches the specified conditions, our analysis should apply.

In analyzing these cases, we assume that the changes in demand by the foreign investors do not reflect any specific information these investors could have concerning the credit worthiness of the specific securities or of future likely actions by any central banks.¹⁷ We also assume that the US Treasury and the Agencies do not adjust their strategy for issuing new bonds and MBS as a result of the switch in investor demand. We now consider these cases.

Case 1: Foreign Investors Sell US Agency Bonds and Purchase US Treasury Bonds

The change involves both selling and buying US assets, so there would be no exchange rate ramifications. Selling Agencies and buying Treasuries, however, would create pressure to raise Agency bond interest rates and to lower Treasury bond rates.¹⁸ To simplify the discussion here, we focus on the Agency spread, defined as the Agency bond interest rate minus the Treasury bond interest rate. While the initial change in demand creates pressure for the Agency spread to rise, how much it rises will depend on the willingness of other market investors to take the other side of the exchange, namely to buy US Agencies and to sell US Treasuries.

To help analyze the role of other market investors, it is useful to introduce the concept of substitutes. Two securities—Treasury bonds and Agency bonds in our case—are perfect substitutes when a significant group of investors stand ready to exchange the two securities in volume (in either direction) at the current rate spread. Perfect substitutes need not be identical securities, but any differences between them must be fully compensated by the given rate spread.

Treasury bonds and Agency bonds of equal maturity represent securities that are close to perfect substitutes. The securities trade in highly efficient markets organized by the same group of government bond dealers. The primary distinction is that the Treasury bonds trade with the

¹⁷ If the change in foreign demand did reflect such information, then security prices and exchange rates might change just because new information has entered the market. By stipulating that there are no such information effects, we can focus on the price effects of the change in demand itself.

full faith and credit of the US government, whereas the Agency bonds have only the implicit guarantee of the US government. The implicit guarantee reflects the general presumption of investors that were either of the two main government sponsored enterprises, Fannie Mae or Freddie Mac, to fail on its obligations, the US Treasury would bail them out. The fact that investors, including foreign investors, rely on the implicit guarantee has been confirmed by both the current and previous Chairmen of the US Federal Reserve System; see Greenspan (2004) and Bernanke (2007).

To be sure, Treasury bonds and Agency bonds are not the same securities, which is why there is a spread, often between 10 and 40 bps depending on the specific maturity. It is then an empirical question to what extent Treasury and Agency bonds are perfect substitutes.

Unfortunately, this is not an easy determination to make. The simple fact that the Agency spread changes over time does not preclude that the securities are perfect substitutes. For example, Fannie Mae and Freddie Mac both announced in recent years that they would have to carry out major financial restatements. To the extent that investors interpreted this as providing a possible exception to the implicit guarantee, we could expect the Agency spread to widen, which it did to a small extent. However, once the Agency spread had adjusted to the new information, the two bond classes would still be considered perfect substitutes as long as investors could exchange meaningful volumes of the two securities without significantly changing the interest rate spread.

It is also possible that Treasury bonds and Agency bonds are close substitutes even if they are not perfect substitutes. This makes sense since, beyond the issue of the implicit guarantee, the two bonds differ in other technical aspects; for example, bank capital requirements are lower for Treasury bonds than for Agency bonds. Thus, a significant sale of Agency bonds could create at

¹⁸ The change in demand would, equivalently, reduce Agency bond prices and raise Treasury bond prices. The text discussion is stated in terms of interest rate effects for convenience.

least some upward pressure on the rate spread. To be precise, we will use the term close substitutes to refer to situations in which the rate spread changes by single digit amounts--less than 10 bps--even when there is a large change in investor demand.

Most evidence suggests that Treasury bonds and Agency bonds are indeed close substitutes:

- Fed Chairman Ben Bernanke (2007) has written, “Moreover, the spread of GSE debt over Treasuries has been remarkably unresponsive to the recent problems of the GSEs...., suggesting that the investors’ faith in an implicit government guarantee remains unshaken.”
- Studies by the Congressional Budget Office (2004), Passmore (2005) and Lucas and McDonald (2006) all suggest the value of the implicit guarantee for the GSEs is very large.
- The study by Lehnert, Passmore, and Sherlund (2006) indicates that changes in the supply of Agency bonds has very little effect on US mortgage interest rates.¹⁹

Our conclusion is that Treasury and Agency bonds are indeed close substitutes, and therefore sales of one and simultaneous purchases of the other would result in a single-digit bps impact on the spread.²⁰

Case 2: Foreign Investors Sell US Agency MBS and Purchase US Treasury Bonds

This case differs from Case 1 only in that here the foreign investors are selling Agency MBS, not Agency bonds. As in Case 1, there will be no exchange rate effect, and the effect on the rate spread—here between Agency MBS rates and Treasury rates—will depend on how close Agency MBS and the Treasuries are as substitutes. There is no additional factor of credit risk, since the implicit guarantee on Agency obligations applies equally well to Agency bonds and Agency

¹⁹ For an alternative view, representing the position of Freddie Mac, see Roll (2003).

²⁰ The concept of perfect substitution refers to an equilibrium condition that applies to the market as a whole. Individual traders, in contrast, will see widening spreads as an investment or arbitrage opportunity, but may not

MBS. The bottom line is that the only new factor here is that the effective maturities of Agency MBS depend on how mortgage borrowers exercise their prepayment options, whereas the Treasury bonds all have fixed maturities.

The prepayment options on the mortgages underlying Agency MBS do create an additional risk—prepayment risk—that does not exist for Treasury bonds. It is sensible to infer that this additional risk means Agency MBS, compared to Agency bonds, will be less perfect substitutes for Treasury bonds; the question, however, is how much less. Recall that we concluded that Agency bonds and Treasuries were close substitutes, in our terminology meaning that even with a substantial exchange of Agency bonds for Treasury bonds, that rate spread would change by no more than single-digit amounts. We now suggest here that Agency MBS and Treasury bonds are good substitutes, meaning that even with a substantial sale of Agency MBS for Treasury bonds, the rate spread would change by less than 20 bps. Figure 12 shows the spread between the standard US 30 year fixed mortgage interest rate and the 10-year constant maturity US Treasury bond rate. The spread varied substantially in earlier periods, but appears quite stable in recent years, an indication of a trend toward a high degree of substitution between mortgage-related securities and Treasuries. The spread is also currently approximately equal to its historical average, suggesting that the recent upsurge in Asian purchases may not have had a significant effect on reducing the spread, again a sign of a high degree of substitution.

Our conclusion that Agency MBS and Treasury bonds are good substitutes primarily rests on the fact that investment banks have developed techniques—based on interest rate derivatives—to hedge the prepayment risk that is embedded in Agency MBS. Investors, including foreign investors, who wish to hold Agency MBS, but do not want to bear the prepayment risk, can use

directly substitute one security for the other. Nevertheless, there can be a chain of transactions, each with a different trader, with only the net effect indicating the two securities were in fact close substitutes.

these hedging techniques to, in effect, purchase prepayment risk insurance. MBS yields are generally high enough that, even after covering the hedging cost, the net return on Agency MBS still exceeds the return on Agency bonds. Financial markets, of course, rarely provide a free lunch, and the catch here is that the hedging results are likely to be less than perfect, so there is at least a small residual risk for which investors will expect to be compensated. The evidence, however, is that the amounts at issue are no more than 20 bps, which is consistent with Agency MBS and Treasury bonds being good substitutes.

This conclusion is reinforced by another factor, namely that a number of financial institutions stand ready to buy Agency MBS if the yields become high enough to support an arbitrage transaction. The investment banks that create the hedging instruments and hedge funds who specialize in MBS market arbitrage would both consider carrying out such transactions. In addition, Fannie Mae and Freddie Mac themselves would have incentive to increase the size of their retained portfolios, by issuing more Agency bonds and purchasing Agency MBS, if they were to observe a rising rate spread for Agency MBS. It thus appears that Agency MBS are, indeed good substitutes for Treasury bonds (and for Agency bonds as well), and that sales and purchases in either direction would not impact the spread by greater than around 20 bps.

Case 3: Foreign Investors Sell US Treasury Bonds and Purchase Eurodollar Securities

For this case, we assume that the foreign investors decide to sell some of their US Treasury bonds in exchange for London-based Eurodollar instruments (sometimes referred to as Libor Dollar securities). As in the previous two cases, there are no exchange rate implications, because this is an exchange between two dollar-denominated securities. The new factor here is that the transaction covers two financial regions, with the US Treasury market based in the US and the

Eurodollar markets based in London. The question here is whether the sale of the US Treasury bonds would tend to raise Treasury interest rates relative to the corresponding Eurodollar rates.

In considering securities trading in different countries, an immediate issue is “country risk”, reflecting concern for expropriation or the imposition of capital market and exchange market controls. Neither the US nor the UK, however, presents any significant country risk for the type of trades and traders being considered here. A second issue is credit risk, and this will play a role, since the issuers of the Eurodollar securities are private market institutions with perhaps AA credit ratings, distinctly below the AAA+ of the US Treasury. In fact, it is precisely for this reason that Eurodollar instruments do trade at a spread over otherwise comparable Treasuries.

The question, however, as in the previous two cases, is how close are the Treasury and Eurodollar instruments as substitutes. In other words, given an exchange of some substantial volume, how much would we expect the spread to change. We believe the answer is that Treasuries and Eurodollar securities are close substitutes, so their yield spread would change in the range of 10 to 20 bps in the face of a substantial sale of Treasuries for comparable Eurodollar instruments.

One basis for this conclusion is that a large number of investment banks and hedge funds track this spread and stand ready to carry out arbitrage transactions whenever they feel the spread has exceeded its normal band. Such arbitrage transactions are further facilitated by the existence of exchange-traded futures contracts on Eurodollar instruments and Treasury bills (the Chicago Mercantile Exchange), an extensive list of Treasury bond futures and options (the Chicago Board of Trade), and various Eurodollar contracts (the NYSE Euronext family of exchanges).

Case 4: Foreign Investors Sell US Treasury Bonds and Purchase other dollar denominated assets

The recent deal, whereby the government of China agreed to acquire a significant stake in the Blackstone private equity group, would seem to belong to this category. Overall, this represents a transaction in which the Chinese government sells some US Treasury bonds and purchases US equities. In terms of the impact, it is comparable to the many debt for equity swaps we have seen recently in the US capital markets, including leveraged buyouts and stock repurchases. In these cases, the assets are not close substitutes, so the possible effect in raising US Treasury interest rates would exceed the 10 to 20 basis points discussed for the previous cases. However, there is no exchange rate impact to further exacerbate the interest rate effect, so the impact would not reach the 90 basis points we estimate for the following Case 5.

Case 5: Foreign Investors Sell US Treasury Bonds and Purchase Euro-Currency Treasuries

This case is distinguishable from the preceding ones because it alone involves the exchange rate markets. The financial press has, in fact, suggested within the last year that the Chinese government is considering transferring some of its dollar positions into euro positions, so we will use this possibility as the specific example.

The exchange rate effects of such an adjustment in foreign portfolios could, in principle, be very important. Since the transaction involves the selling of dollars and purchase of euros, it creates pressure for the dollar to depreciate relative to the euro. It would also pressure the dollar to depreciate against the Chinese yuan, although how much will depend on the Chinese central bank's exchange rate policy at the time. In addition, if the market were to interpret the transaction as a signal of a new Chinese government policy to allow the yuan to float more freely against the dollar, then the exchange rate adjustment could be swift and large. Given the inordinate amount of focus on China's intentions and motivations, and their sizeable role in purchases, it is possible that even a minor change in their policy direction vis-à-vis purchases and

holdings of US securities could have major impact on the expectations of market participants regarding the future trajectory of the yuan-dollar relationship.

The second key question is whether the sale of Treasury bonds would cause Treasury interest rates to rise. Three key factors suggest that Treasury rates would rise, perhaps significantly:

- 1) The direct market effects of selling US Treasuries and buying euro Treasuries creates pressure for US Treasury interest rates to rise relative to euro Treasury rates. The quantitative importance of this direct factor depends on how close are the US and Euro Treasury securities as substitutes.²¹
- 2) The depreciation in the dollar will cause upward pressure on US inflation rates through more costly imports, thereby creating an upward adjustment in nominal US interest rates. The Federal Reserve could try, of course, to thwart the inflationary pressure with a tighter monetary policy, but this just creates an alternative channel leading to higher interest rates.
- 3) The depreciation in the dollar will also expand US exports and decrease US imports, thus increasing the aggregate demand in the US economy. This rising demand then creates pressure for higher US interest rates.

The potential increase in interest rates here would be much larger than the increase in spreads we considered to be plausible in the preceding three cases. Perhaps surprisingly, only one study, by Warnock and Warnock (2006), provides a quantitative estimate.²² Warnock and Warnock (WW) estimate that the recent accumulations of US Treasury and Agency securities by foreign

²¹ If the US and Euro Treasury securities are close substitutes, then the interest rate spread between the two sets of securities is constrained by interest rate parity, which quantifies the arbitrage potential between similar securities denominated in two different currencies, taking into account the expectations for future exchange rate fluctuations.

²² Fratantoni (2007) and Chinn and Frankel (2005) also offer the opinion that US Treasury interest rates have been depressed by the accumulation of US Treasury securities by foreign governments, but they offer no quantitative estimates. Presumably, they would also expect rising interest rates were this pattern to be reversed.

governments have reduced US Treasury rates by about 90 basis points.²³ They further suggest that US Treasury rates would rise by the same 90 bps were the foreign agencies to stop accumulating US Treasuries, and might rise by still another 90 bps (for a total increase of 180 bps) if the foreign agencies were also to sell their previously accumulated US Treasury and Agency securities.

Studies of the impact of the US government's fiscal deficit on interest rates provide evidence that can be considered consistent with the WW results. Economists have long studied, and argued about, how much US interest rates rise as a result of increases in the US fiscal deficit. Laubach (2003) provides a recent estimate that a one percentage point increase in the projected deficit/GDP ratio would raise long-term interest rates by about 25 basis points.²⁴ Just as the issuance of Treasury bonds to finance a fiscal deficit raises interest rates, the purchase of these Treasury bonds by foreign investors could well neutralize the increase. For example, if the deficit/GDP ratio were 2 percentage points, Laubach predicts an increase in US Treasury rates of 50 basis points. The US is running a trade deficit/GDP ratio of about 6 percentage points, and assuming the foreign recipients of these dollars allocate one-third of this amount to buying US Treasury bonds, this could cause US Treasury rates to fall by 50 basis points, thus reversing the initial increase. An effect of this size is very much consistent with the WW estimates.

There are two important issues, however, which lead us to anticipate that the rise in US Treasury rates as a result of our experiment would be distinctly less than the WW result of a 90 basis point increase. The first issue is that the WW study implicitly assumes that the foreign agency reinvests the proceeds of the sale only in that country's domestic instruments. In our

²³ By summing US Agency and US Treasury securities for this purpose, Warnock and Warnock are assuming that the two sets of securities are perfect substitutes.

case, in contrast, the foreign sale of US Treasuries is paired with the purchase of euro-Treasuries. The euro-Treasury purchase will create downward pressure on euro-currency interest rates, certainly offsetting some of the increase in US Treasury rates.

The second issue is that the WW study also implicitly assumes that no other central banks in the world choose to purchase the Treasury bonds. While this is possible, it would seem much more likely that a 90 basis point increase in US Treasury rates would provide incentive for other foreign governments, or private investors for that matter, to purchase the excess supply of Treasuries, thus limiting the actual increase in Treasury interest rates. In fact, the US Federal Reserve is one such possible purchaser, which is exactly what the Fed would do if it wished to limit the resulting increase in US interest rates.

3.C Interest Rate Effects of Changes in the Demand For US Securities: Conclusions

The discussion in this section has confirmed, if nothing else, how difficult it is to know what would be the likely impact on US interest rates were foreign investors to decide to sell or exchange some or all of their US security holdings.

One complication is that the experiment at issue has to be very precisely stated. For example, it is one thing for the Chinese Central Bank to sell its holdings of US Agency bonds and to buy an equal amount of US Treasury bonds. Our discussion indicated that the likely effect would be, at most, a single-digit increase in Agency bond rates, which might not even visibly show up in US mortgage interest rates, for example, given all the other factors that have a continuing impact on those interest rates.

At the opposite extreme, however, if the Chinese Central Bank were to sell all of its dollar-based securities—US Agency and Treasury securities alike—and simply to convert the proceeds

²⁴ See also Engen and Hubbard (2004) for an extended review of the extensive literature concerning the effect of US

into yuan assets, then the results of Warnock and Warnock (2006) would imply a rise of at least 90 basis points in US interest rates. Assuming that the Agency-Treasury interest rate spread remained unchanged, the upward shock in US Treasury rates would raise US mortgage interest rates by 90 basis points or close to that. Such an increase in mortgage rates, of course, would have quite a chilling effect on US housing and mortgage markets.

There are other possible changes by foreign investors that would likely have results falling between these extremes. For example, perhaps the most likely change would be for Chinese investors to exchange some of their US Treasury and Agency securities for similar euro-currency securities. Because this would cause the dollar to depreciate and because US Treasuries and euro-Treasuries are less than perfect substitutes, we would expect much more than a single-digit increase in US Treasury rates. But the purchase of euro-securities by the foreign investors would temper the increase to an amount below the Warnock and Warnock estimate of 90 basis points. One might posit something toward the middle, perhaps a 40 to 50 basis point increase in US Treasury rates.

It is important to emphasize that the discussion so far has only tried to calibrate the likely impact on US interest rates, assuming that foreign investors have decided to sell or exchange their US financial assets. Therefore, to put these results in a practical context, we next discuss just how likely it is that foreign investors will actually undertake such portfolio adjustments.

4. The Political Economy of Asian Demand for US Treasury and Agency Securities

In this section, we address issues relating to the intentions and motivations of Asian investors, in particular those of China's authorities, and how likely it is that they could substantially change their demand for US securities. The discussion also considers whether the

increased foreign investments should be considered temporary or permanent, as well as the political-economic or any other triggering factors that might cause a rapid reduction in these investments.

4.A Motivations and Reserve Management Behavior

There are several reasons for focusing on issues regarding China's reserves, China's reserve management, and its US security purchases:

- 1) Global attention is focused on the US trade deficit, China's financing of the deficit, and the implications for the yuan-dollar exchange rate, which is one of the centerpieces of the global imbalances story;
- 2) The opaque decision-making process of China's reserve management makes it a continuing topic of debate and uncertainty; in other words, what is the objective function of the reserve managers? The one sure thing, at least so far, is that China's reserves are large and growing rapidly;
- 3) China's reserve management can have a major impact on a wide range of economic and social policies in China.

As pointed out earlier, the large and continuing US trade deficits with the rest of the world, and in particular with China, are a significant source of China's purchases of US securities. On the Chinese side, key factors that motivate the continuing purchases of US Treasury and Agency securities include:

- 1) Maintenance of a relatively undervalued yuan vis-à-vis the dollar in order to promote exports to the US, which are a key driver of the Chinese economy;

- 2) The current political economy of the development strategy for China, which accepts the implicit consumption tax created by an undervalued yuan, in order to expand export-driven employment to deal with the rural-urban divide that currently exists in China;
- 3) The continuing process of economic integration within Asia, which would be disrupted by major multilateral exchange rate fluctuations.
- 4) The possibility of relatively safe and stable returns with low transactions costs across a relatively homogeneous, substitutable range of US securities;

Figure 13 shows the share of China and Japan in global reserve accumulation, while Figure 14 provides our estimates of China's reserves in dollar denominated assets. Brad Setser and Christian Menegatti (2007) suggest adding the transfers by the Peoples Bank of China (PBC) to other State Banks to the reserve figure, giving an additional \$118 billion to the already high \$1.066 trillion in 2006 reserves. As the latter graph shows, the share of reserves in dollar denominated assets has actually gone up over the period, notwithstanding the increasing debate in China and elsewhere regarding the wisdom of keeping most of their foreign assets in dollars.

Figure 15 gives a "flow variable" perspective on China's financing of US deficits. In 2006, China ran a \$232 billion trade surplus with the US and ended up making net purchases of \$105 billion worth of US securities, mostly Treasuries (\$37.7 billion) and Agencies (\$35 billion including MBS), but increasingly, also corporate bonds and asset backed securities (\$31 billion). Over the same period, the yuan appreciated by about 3.5% against the dollar, suggesting that in the present global economic-financial scenario, expenditures by China of approximately 4% to 5% of its GDP on purchases of US dollar denominated securities might not be enough to arrest the appreciation of the yuan, and that increasing purchases might be warranted in the future, raising the costs of this intervention.

The institutional structure of China's reserve management is as follows: the State Administration of Foreign Exchange (SAFE) manages the reserves on behalf of the Peoples Bank of China; additionally, the Central Huijin Investment Co is a supplementary institution, ostensibly managing the reserves injected into the large state banks, such as the Industrial and Commercial Bank of China, Bank of China and China Construction Bank. Reportedly, informal channels for expertise and advice are maintained with the State Development and Reform Commission (SDRC), the Research Institute of Finance, Development Research Center of the State Council, and the Financial Research Center of the Chinese Academy of Sciences, among others, leading to a quite complex decision-making process; see Zhou (2007) and Hui (2007).

The evolution of the reserve management structure reached a new stage in March of 2007, when China's Foreign Minister Jin Renqing announced the creation of a professional agency to manage the vast reserves, tentatively titled the National Foreign Exchange Investment Co., while not disclosing its specific terms of reference or the amount of funds entrusted in its care. The Chinese authorities have indicated that the new agency would be modeled on Temasek Holdings, the government investment agency of Singapore. The New York Times reports that,

“Some analysts say the formation of the new agency means China is moving away from heavy reliance on investing in United States dollars through Treasury securities. ...The new agency would be able to invest some of the money more diversely and aggressively, analysts said,But foreign exchange reserves in China are accumulating so quickly -- by more than \$20 billion a month, analysts say -- that China is likely to continue buying huge numbers of Treasury bonds for a long time to come even if the new agency gets a fast start.”

The search for higher yields is not limited to Chinese reserve managers alone. The Royal Bank of Scotland reports that the low yield environment in major economies has pushed Central Banks around the world to broaden their search for riskier investment opportunities and “widen their investment universe in order to improve the return on reserve assets” (see RBS Reserve

Management Trends 2007, page 128). In the case of Asian banks, in particular, there was the added impetus to search for higher yields brought about by the need to counteract the increasing costs of sterilization of the accumulated reserves. Indeed, in the RBS survey, 69% of the Central Bank respondents admitted that there was a growing trend to invest in riskier assets in search of yield, with 20% saying the trend is toward more safety and 7% suggesting there is a greater trend toward liquidity concerns. The Chinese central bank governor has, however, gone on record cautioning against a riskier approach (International Herald Tribune, January 23, 2007, quoting Zhou Xiaochuan, the Governor of the PBC):

“China should be prudent with any plans to invest the reserves as actively as countries including Singapore do. Speculative inflows are of a short-term nature. Keeping them in less liquid assets with high returns may not be advisable”.

While gauging motivations is necessarily a speculative exercise, it is possible to analyze past behavior to get a sense of some underlying patterns. We look at monthly net purchases of Agencies and Treasuries by the three key countries of interest, China, Japan and UK, starting from January 1994 and ending December, 2006, to see if there are any inter-relationships and patterns, particularly in the case of Chinese purchases of Agencies. Table 1 shows the correlation matrix for the monthly purchases. Chinese Agency purchases are highly correlated with their own Treasury purchases, as well as Japanese and UK Agency investments. We next run a multivariate vector auto-regression model with a lag structure to extract some more information out of the limited data available. Our tentative conclusions can be summarized as follows:

- 1) Chinese monthly Agency purchases are positively associated with Chinese and Japanese Agency purchases in the previous month (previous purchases by UK are insignificant determinants of Chinese purchases), as well as contemporaneous Chinese Treasury purchases.

- 2) Japanese monthly Treasury and Agency purchases are in a world of their own...they are affected only by their own one-month lag.

The Japanese, therefore, continue to strike out on their own in response to the specific needs of their exchange-rate, and more broadly their macro-economic policies, while it does not seem that the Chinese are, in any broad sense, shifting out of Treasuries and into Agencies, but they are rather carrying out complementary purchases.

4.B Likelihood and Tipping Points of Alternative Scenarios

The debate over how to manage China's fast-increasing reserves has heated up over the last five years. Indeed, quite a few asset managers, policy makers and academics have been vocal in expressing support for a more diversified portfolio, particularly after the introduction of the euro. Some economists have explicitly called for diversification into a greater share of euro security holdings, while still maintaining sufficient liquid reserves to safeguard international payment liabilities, to cover emergency purchases, to finance infrastructure investments, and to maintain exchange rate and macroeconomic control.²⁵ In recent years, the discussion has become wide-ranging, with calls for investing the reserves in natural resources and strategic assets around the world, major infrastructure projects in the underdeveloped hinterland of China, funding a pension system, and more broadly a social welfare infrastructure.

The key issue here, from the viewpoint of US interest rates and the dollar exchange rate, is the likelihood of a move into non-dollar denominated assets. The case for diversifying away from dollar assets arises primarily from the following concerns:

- 1) The low yield obtained on current investments (reportedly around 3% in 2006 according to Setser and Menegatti (2007));

- 2) An impending, perhaps inevitable, slide of the dollar, creating losses on all dollar assets; indeed, the consensus forecast seems to be for a continued, slow depreciation over the next few years.
- 3) Credit and related risks that are magnified with a large and non-diversified dollar portfolio;
- 4) A sense among some that the reserve bonanza should be used for broader social and economic goals in what is still a developing country.

The case for a continued status quo can be expressed in terms of the following:

- 1) The costs of a major portfolio reallocation, since any significant amount of sales would create adverse price changes, bringing down the value of the remaining portfolio through both exchange rate and price movements; the costs of researching new investments and the costs associated with dislocations in trade with third parties;²⁶
- 2) The focus of Chinese domestic political-economic policy on job creation through exports, which requires capital investment to expand manufacturing facilities and an undervalued yuan to maintain the demand for the exported products.
- 3) As pointed out by Rajan (2006), the global savings glut, together with a shortage of creditworthy assets has, particularly in debt markets, created low yields and made it difficult to find productive investments;
- 4) The historical record in favor of slow, deliberative, shifts in major policies in China;

²⁵ See Ouyang Fang and Yu Qichang (2001), Hu Ya-quan and Cheng Jing (2005). The discussion is further elaborated in a series of articles listed at <http://scholar.ilib.cn/A-dzjsjgl200106001.html>.

²⁶ Based on Hui (2007), a rough calculation shows that the depreciation of the dollar vis-à-vis the yuan by 4% over the past one year would have cost the PBC some \$ 25 billion, effectively nullifying the yield. Depreciation in the range of 20% would entail losses of over a \$100 billion.

- 5) The need to continue to invest very large inflows; in the first two months of 2007, China accounted for over one-third of all foreign purchases of US Treasury and Agency securities (\$24 billion out of the total \$69 billion purchased by foreigners).

What could be some tipping points, economic or political-economic, that could hasten the switchover? While this is purely in the realm of conjecture, various analysts have mentioned the following:

- 1) Reaching a critical threshold for reserves in dollar denominated securities or for returns; total reserves of \$1 trillion used to be mentioned, but that landmark was crossed recently; (Threshold events, such as next year's Olympic Games in Beijing might be another!)
- 2) Events exogenous to China, such as a US recession, creating greater dollar vulnerability;
- 3) Significant domestic strains in the Chinese economy, calling for major social expenditures;
- 4) Serious ratcheting up of rhetoric and tension between China and US on trade or other issues.

Indications of a gradual rethinking include, in recent times, both the establishment of the official investment company to deal with reserves, the new rule of more flexible daily trading band for the yuan, as well as the foray into the private equity world through a significant stake in the Blackstone group, all taking place in the first few months in 2007. In any case, major foreign holders, including China, find themselves in a bind. Invoking a chess analogy, their position could be described as being in a zugzwang (a position in chess, where one player would rather not make a move, since anything he/she does would tend to worsen his/her prospects).

4.C Sustainability of Global Imbalances

In addition to the possible Chinese induced impact on US debt and mortgage markets discussed above, the systemic issues surrounding the ongoing global imbalances raise the issue of long-term sustainability of simultaneously maintaining large US trade deficits, low interest

rates and a relatively strong dollar. *The case for sustainability* can be expressed in the following points:

- 1) The global economy has seen a significant improvement in fiscal management, leading to lower budget deficits, particularly in the emerging economies. At the same time, high savings rates are likely to continue due to the strong growth and stable productivity improvements in the developing countries.²⁷ The relative mismatch between high global savings and a limited global supply of high quality debt instruments may keep investors in the US market for some time still.
- 2) The significant role played by the US banking and financial intermediary infrastructure in financing global debt and equity operations, regardless of where the actual investments are taking place, and hence the need for channeling funds through the US.
- 3) The US economy accounts for, in dollar terms, just under 25% of the global GDP. With increasing global economic-financial integration, it should not be surprising if a significant share of global savings (of the order of \$8 billion in 2006) comes to the US.
- 4) Eichengreen (2006) points out that US investments abroad have significantly higher returns than foreign investments in the United States, suggesting that the US current account deficits may be easier to sustain than otherwise assumed. Mendoza et al (2006) point out that a developed financial infrastructure allows the accumulation of foreign liabilities vis-à-vis less developed countries, even a negative net foreign asset position may result in positive net earnings.

The case for non-sustainability, rests on the following:

²⁷ Increasing inequality within emerging nations has also been a factor in the high savings rates in those countries.

- 1) Obstfeld and Rogoff (2005) argue for a large exchange rate adjustment, suggesting that “any correction to the trade balance is likely to entail a very large change in the dollar exchange rate: our baseline figure, with moderate adjustment speed, is over 30 percent.” Shocks that could cause the United States current account to fall from 6 percent to 3 percent of GDP may lead to depreciation against Asian currencies by roughly 25 percent. The relationship between nominal interest rates and expected depreciation, or uncovered interest parity, will cause the interest rates to rise substantially. Roubini and Setser (2004) also predict a serious adjustment shock and the possibility of the US losing its reserve currency status.
- 2) Many economists express concern that Chinese investments are carried out mostly by official/government entities, and not by private investors; it is easier to understand the motivations and prospective behavior of the latter. Moreover, only a very small proportion is in the form of direct investments, which would have directly increased productive capacity, and would also be more stable and less footloose, unlike the present portfolio inflows.
- 3) Spending on consumer goods and housing has reached 76 percent of GDP in the past two years, compared to an average of 68 percent in the post WWII era. The unsustainability of the very high household indebtedness could lead to a wave of bankruptcies, and ultimately a correction in the current account. Hovering over the household consumption issue is also concern for the potential impact of a long downturn in the housing market.

Gradual adjustment, preferably starting soon, seems to be the main channel through which these two conflicting scenarios can be reconciled. According to Eichengreen (2006), “For the United States, insuring against a disorderly correction would involve progressively tightening fiscal policy and thus gradually narrowing the gap between absorption and production,” while

he, and others, as mentioned before, think that at the other end, China must stimulate consumption and broaden social expenditures to absorb greater imports from abroad.

5. Summary and Conclusions

Almost 45 percent of all US Treasury securities and over 20 percent of all US Agency securities (bonds and MBS) are currently held by foreign investors. In part, these high foreign ownership shares reflect the fundamental role of US assets in a world where the US dollar remains the world reserve currency. In part, however, these shares reflect the needs of certain Asian countries, most notably China, to maintain an overvalued dollar with respect to their domestic currency in order to pursue their economic policies of export-driven growth.

This paper addresses two main questions concerning these large foreign investments in US Treasury and Agency securities. The first question is whether these investments are sustainable? In order to answer this, it is first essential to recognize that the trade imbalances occurring in the markets for traded goods, and the capital imbalances occurring in the securities markets, are intrinsically related; in fact, they are two sides of the same coin.

The example of China illustrates this very clearly. Export-driven growth is a focus of China's economic policy: if the fundamental economic and social changes facing China in coming years and decades are to be successfully completed, it is essential that its export industries create an expanding number of jobs. An undervalued yuan has been one of the policies adopted to maintain the high level and growth of exports. This policy necessarily creates a large trade surplus with the US, which in turn necessarily creates the need to invest the resulting dollar inflows, in US dollar or other assets.

This creates the basis for the Chinese conundrum. On the one hand, the standard economics of portfolio diversification indicate the Chinese government should diversify its security

positions across currencies other than the dollar. On the other hand, such a portfolio reallocation would necessarily cause the dollar to depreciate, reducing the incentive for US consumers to purchase Chinese manufactured goods, as well as reducing the value of the remainder of China's portfolio. What is the likely outcome? It is hard to imagine the Chinese government making a large scale redeployment of its dollar holdings, in a sudden manner. The risk in terms of failing to achieve the goal of export-driven growth would appear much greater than any benefits it could achieve with a better diversified portfolio, at least in the near term. Much more likely, indeed inevitable, would be changes in degree, not of kind; that is, a significant strategic redeployment out of dollar assets, but only as opportunities arise.

The second key question addressed in this paper is the likely impact on US Treasury and mortgage interest rates if foreign investors, principally Chinese investors, did begin to redeploy their dollar assets. This is a more purely economic and financial question. The answer, it turns out, depends on the form of the redeployment, but there are really only two main cases. To the extent that the portfolio adjustment remains within dollar assets—swapping US Agencies (either bonds or MBS) for US Treasuries, or swapping US Treasuries for Eurodollar securities—the likely impact on US interest rates is likely to be *de minimus*, except perhaps in the case of a switchover to non-debt securities. On the other hand, a redeployment that involves selling dollar assets and buying euro assets, or even yuan assets, could have a much greater impact on US interest rates. A benchmark case might be a 50 basis point increase in US Treasury interest rates, going up to a 100 basis points, which would be translated into an equivalent increase in US mortgage rates, assuming that most spreads remain unchanged.

What are the overall implications for the US mortgage market? It might seem farfetched as a story, let alone as sound economics, but the truth appears to be that US mortgage borrowers have

been a primary beneficiary of China's decision to move a large part of its population from rural agriculture to urban manufacturing through export-driven growth, with the US as a major market. The connection is that the need to maintain a somewhat undervalued Chinese yuan has caused China to make extensive investments in US Treasury and Agency securities, with the likely result that US mortgage rates have been at least 50 basis points lower; indeed, a case could be made that US mortgage rates are a full percentage point lower as a result.

The benefits of international trade happen to have landed on one of the most land-locked asset classes imaginable, namely US housing and mortgage markets. These benefits could well shrink in coming years, as Chinese and other Asian investors start to diversify their investment portfolio away from dollar assets. That is, Chinese and other investors could decide that the gains from a more diversified investment portfolio—diversified outside of dollar assets—have started to outweigh the benefits of its export-driven growth policy. Our conclusion is that such an abrupt and rather complete change is unlikely, but that a strategic redeployment out of US assets as opportunities arise is inevitable - a redeployment carried out in an environment where there is a smaller chance of a major impact on dollar-yuan exchange rates.

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Figure 1: US International Investment Position (at current market prices)

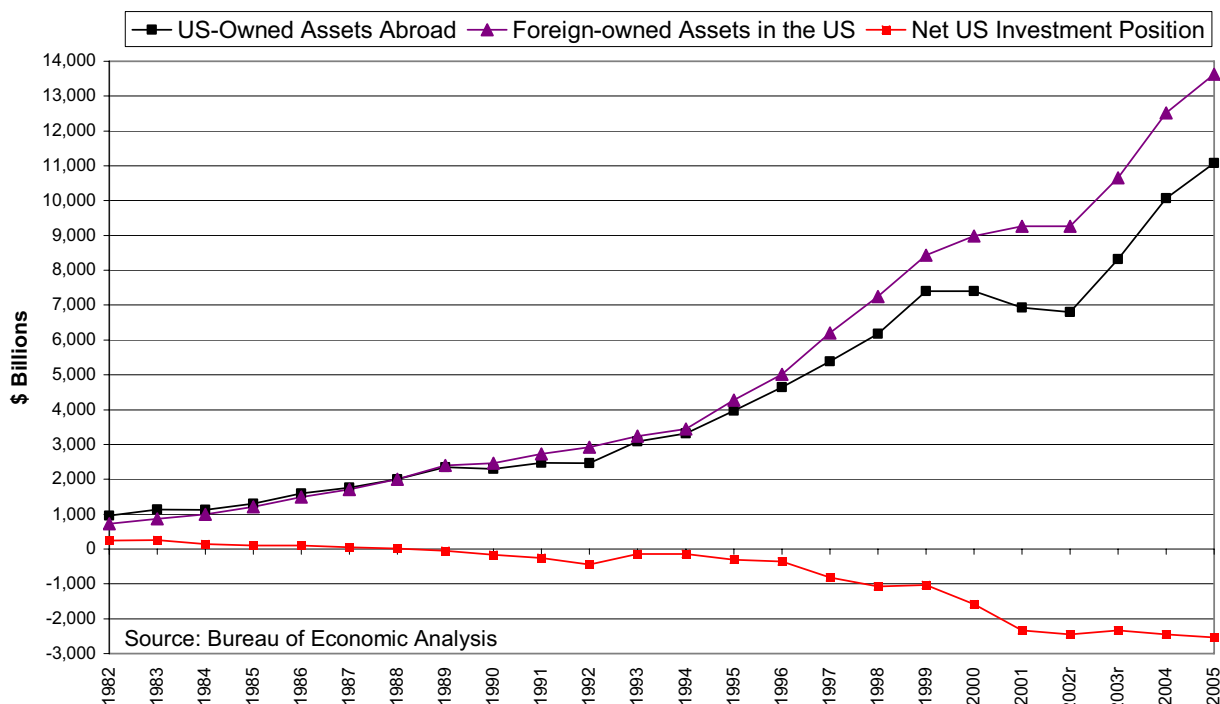


Figure 2: US Trade Deficit, \$ Billions and Relative to GDP

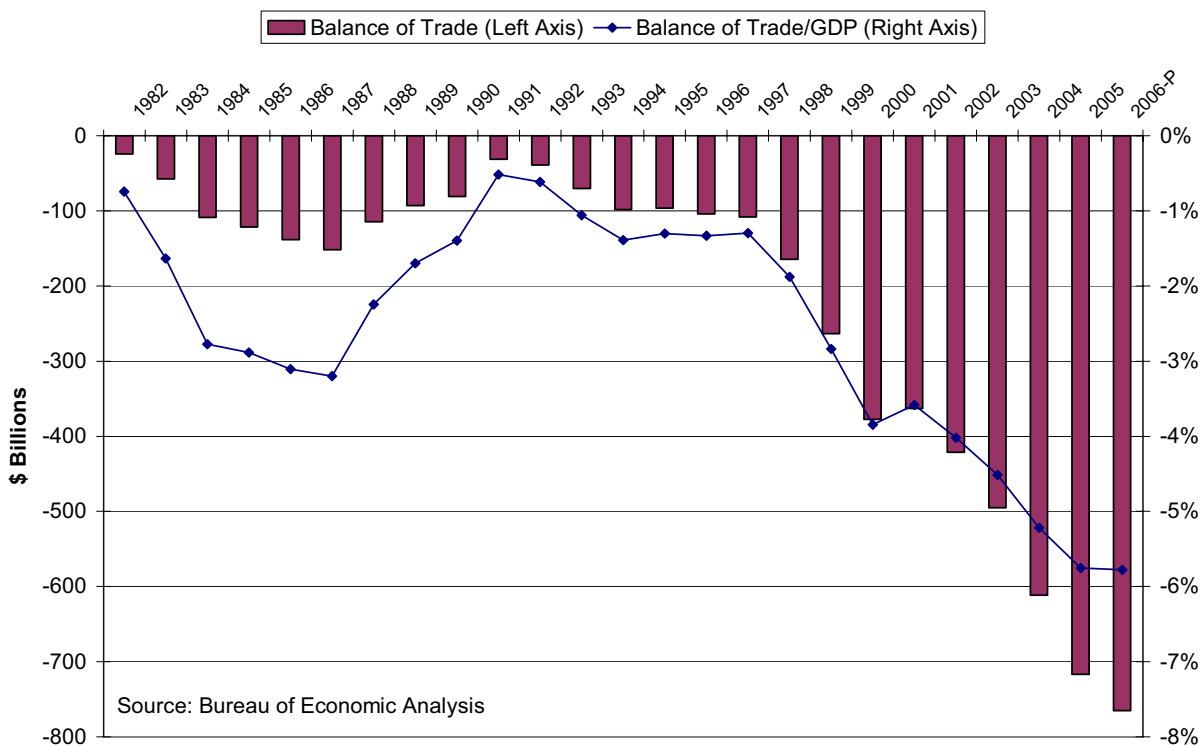


Figure 3: Foreign Holdings of US Assets
(Source: Federal Reserve Flow of Funds Data)

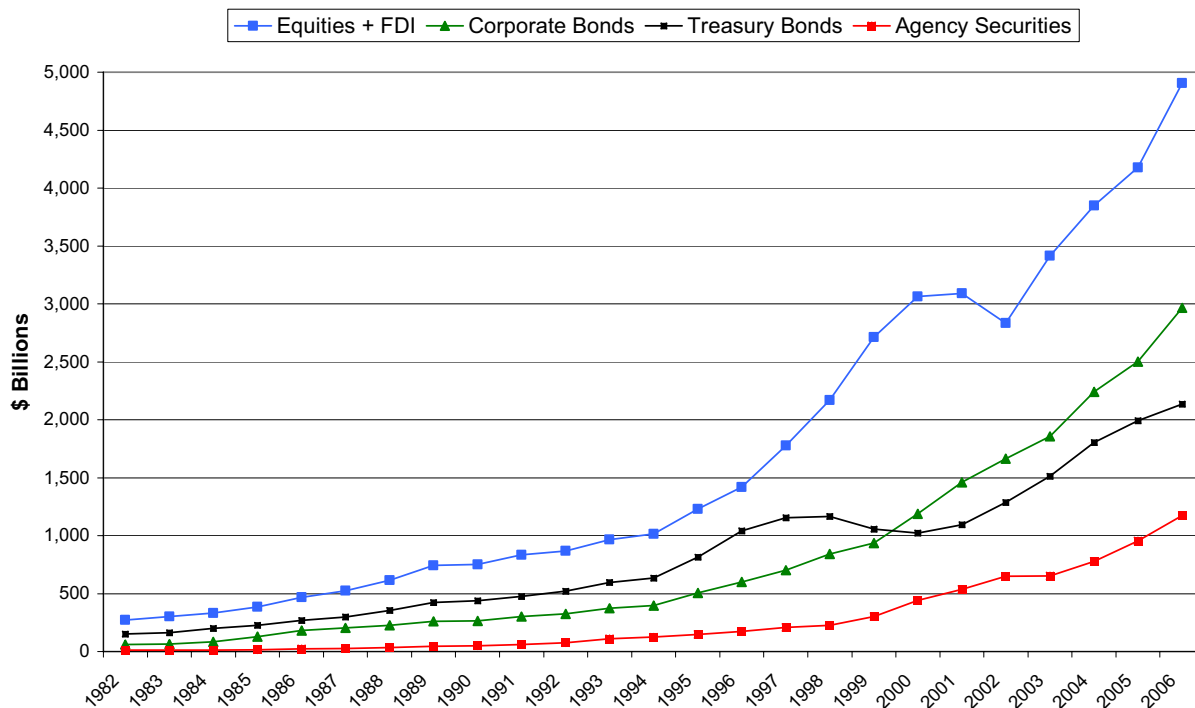


Figure 4: Foreign Holdings of US Assets, as Percent of Total Foreign Holdings
(Source: Federal Reserve Flow of Funds Data)

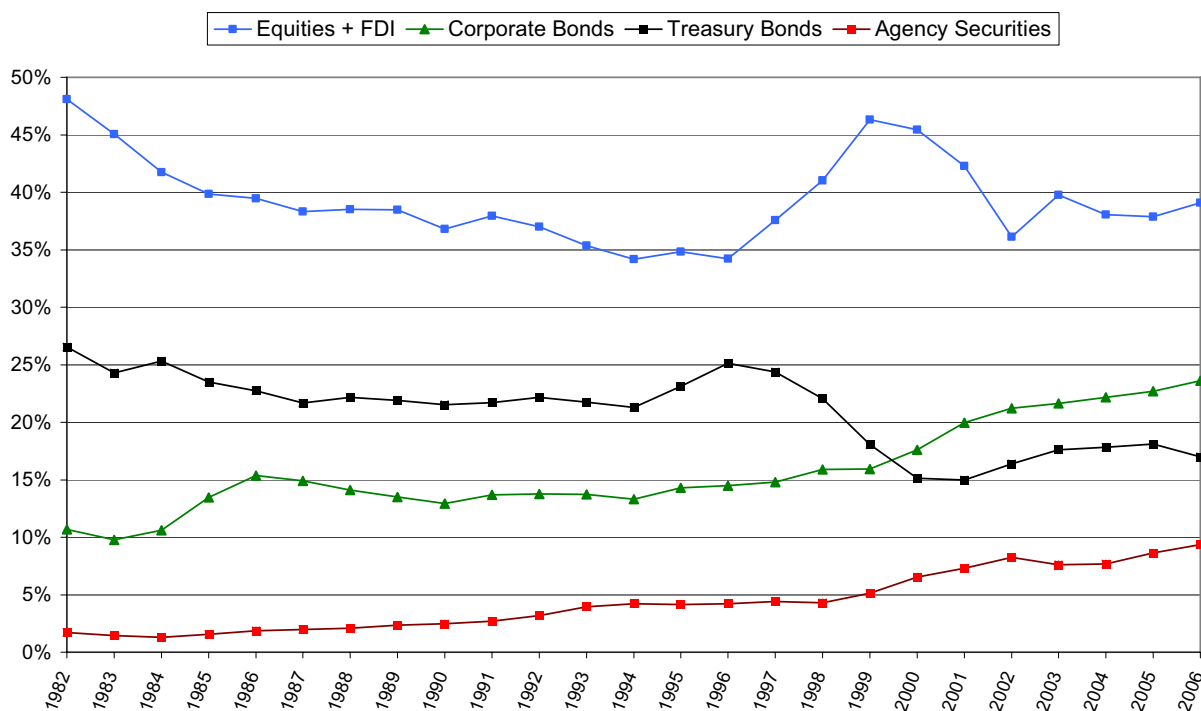


Figure 5: Foreign Holdings of US Securities, as Percent of Total US Amount Outstanding
 (Source: Federal Reserve Flows of Funds Data)

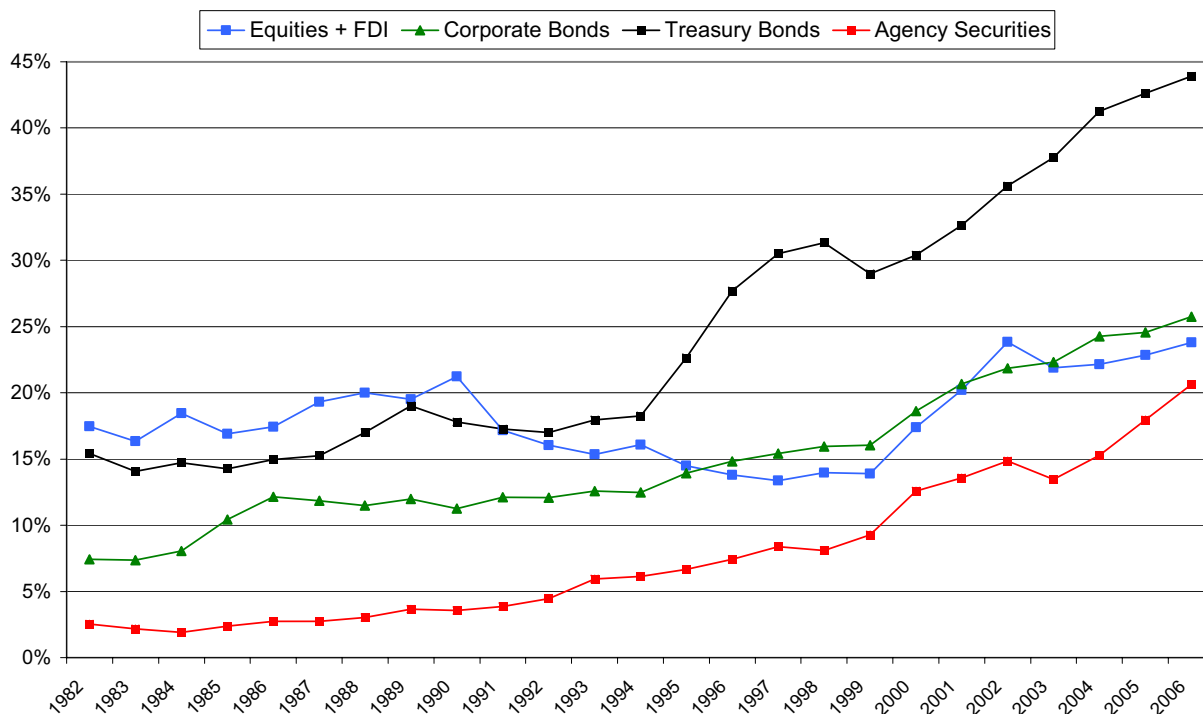


Figure 6: Foreign Holdings of US Securities as Shares of US Security Class Outstanding, by World Region, 2006

(Source: Federal Reserve Flow of Funds and Treasury TIC Data)

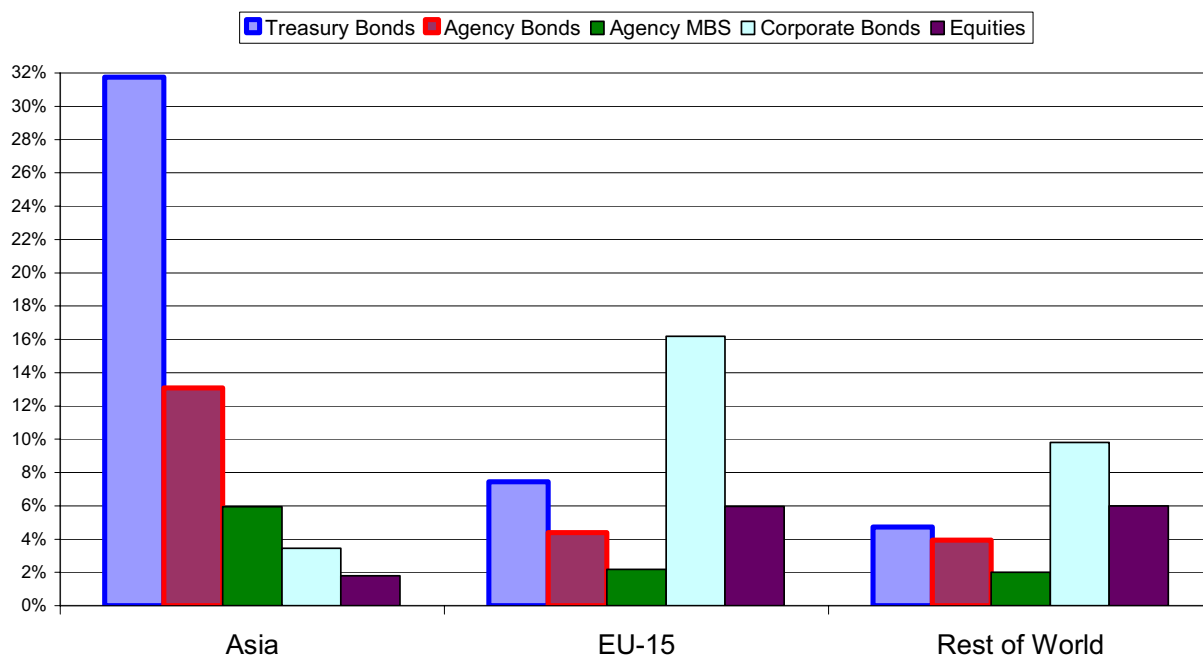


Figure 7: Foreign Holdings of US Treasury Securities by Region and Year, As Shares of Total US Treasuries Outstanding
(Source: US Treasury TIC Data)

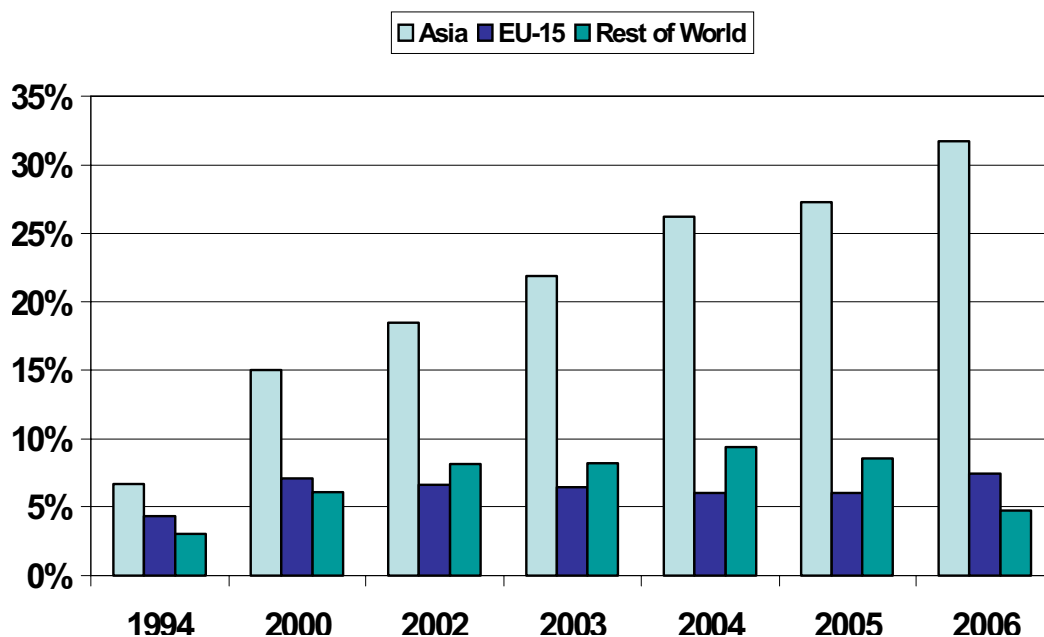


Figure 8: Foreign Holdings of US Agency Bonds and MBS by Region and Year, as Shares of Total Agency Securities Outstanding
(Source: US Treasury TIC Data)

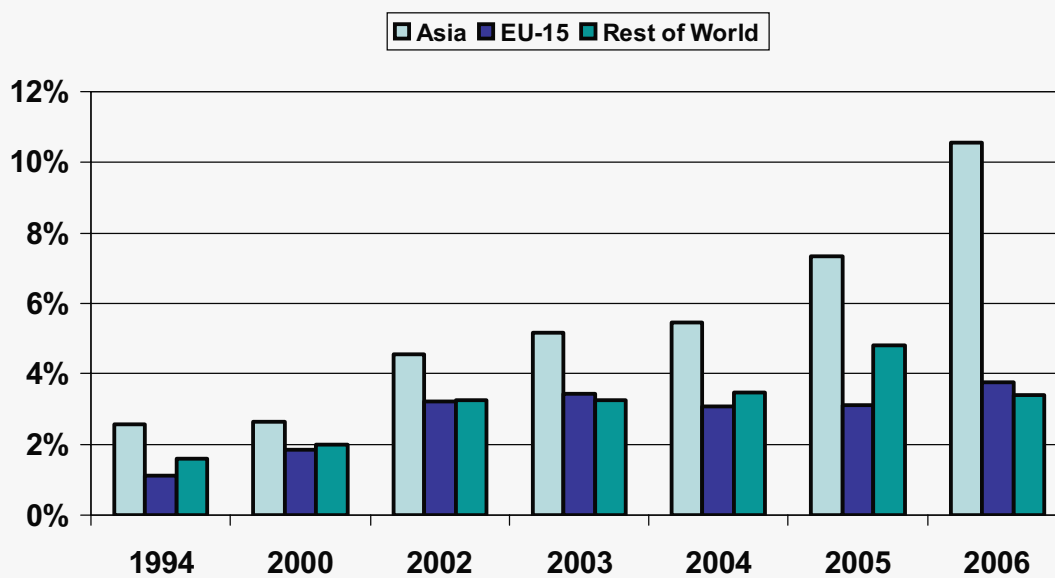


Figure 9: Foreign Holdings of US Securities as Shares of US Security Class Outstanding, by Major Holding Country, 2006

(Source: Federal Reserve Flow of Funds and Treasury TIC Data)

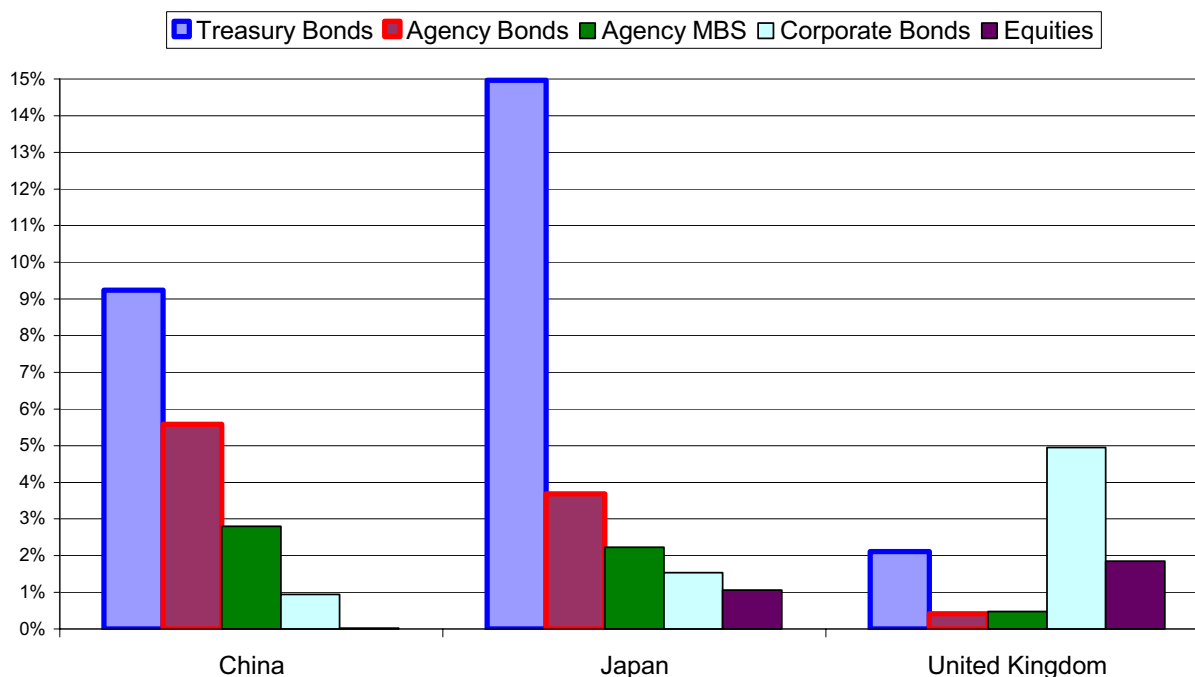


Figure 10: Holdings of US Treasury Securities by Country and Year, As Shares of Total US Treasuries Outstanding (Source: US Treasury TIC Data)

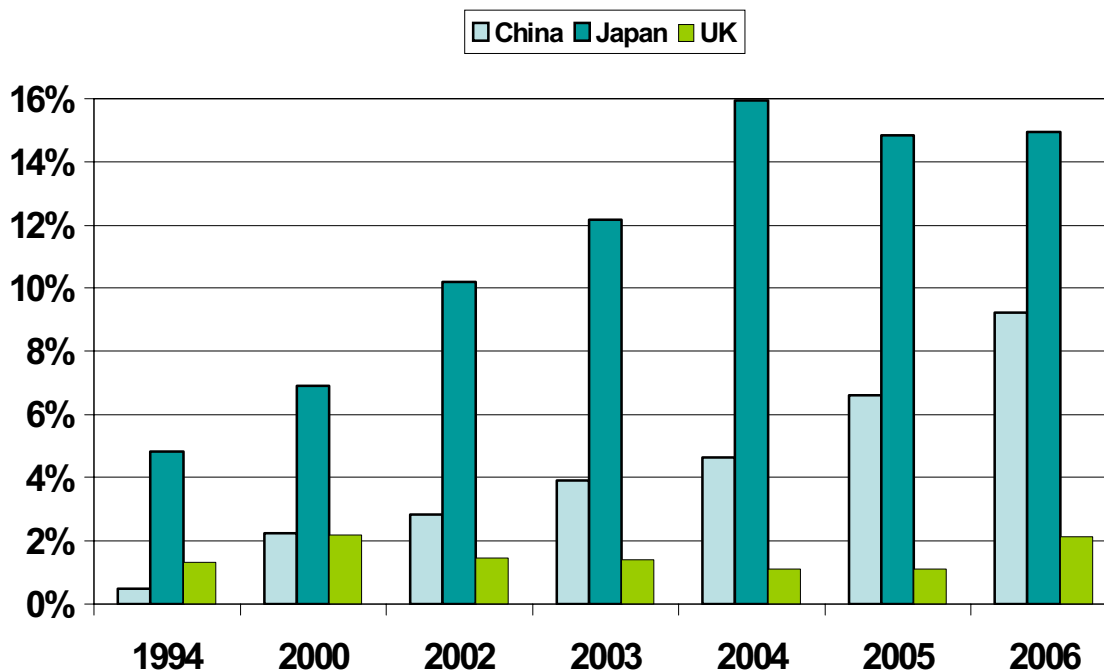


Figure 11: Holdings of US Agency Bonds and MBS by Country and Year, As Shares of Total US Agencies Outstanding (Source: Treasury TIC Data)

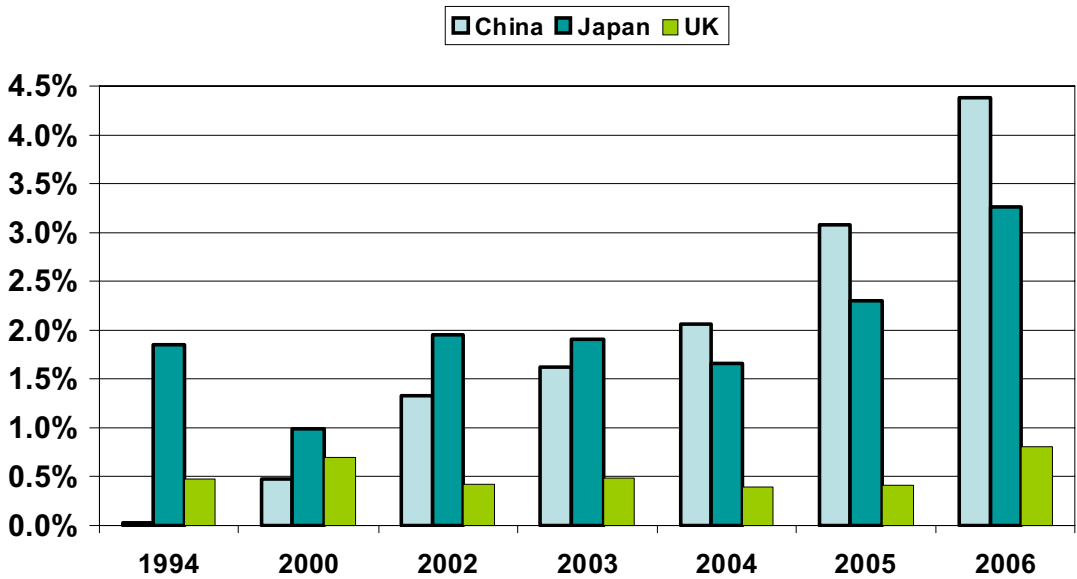
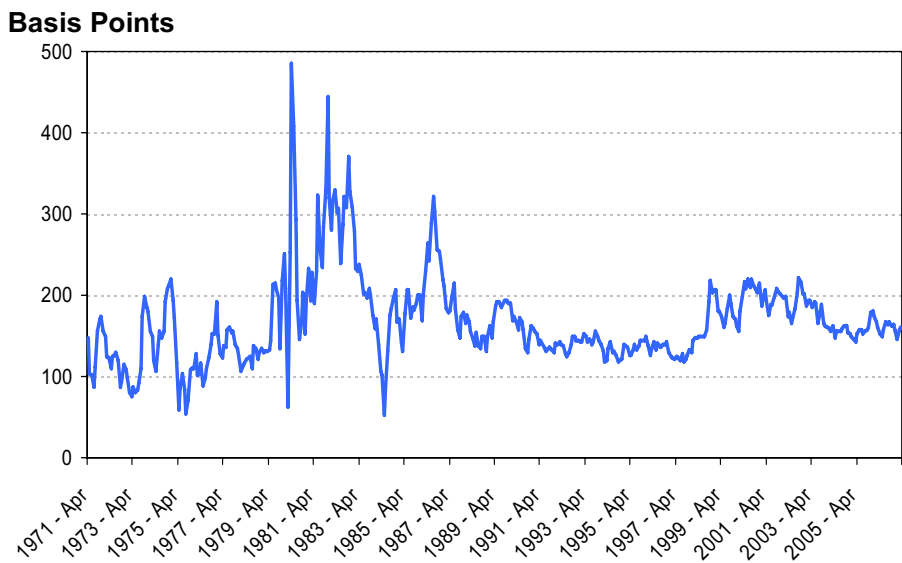
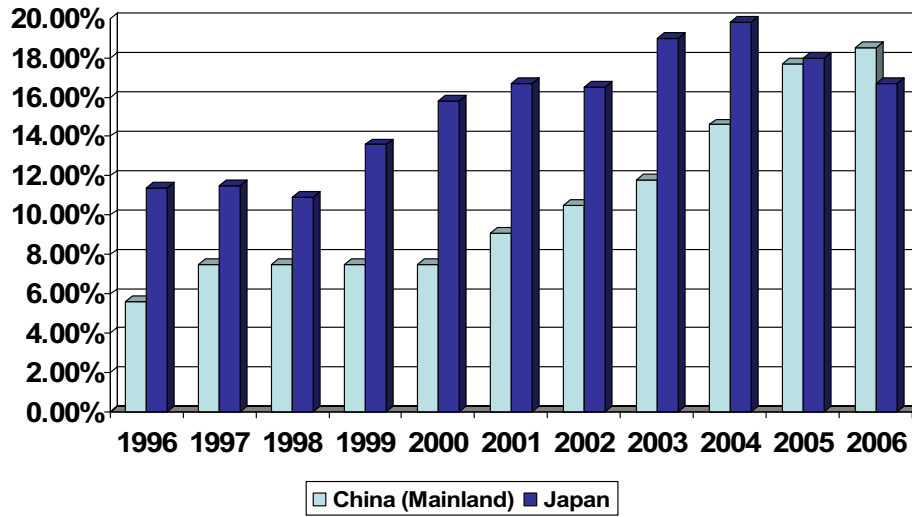


Figure 12: Yield Spread:
30-Year Fixed Mortgages and 10-Year Treasuries



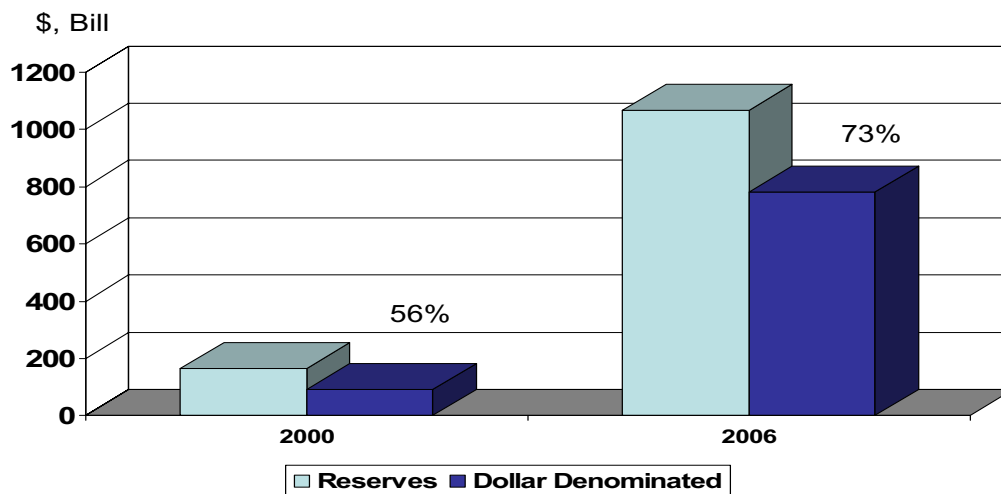
Source: Federal Reserve Board

Figure 13
Share of Global Reserves



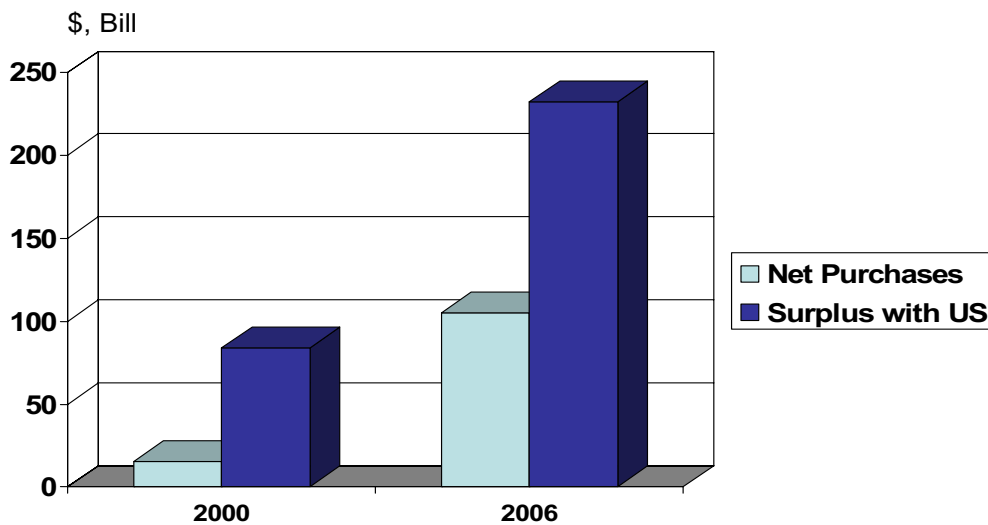
Source: BIS, IMF

Figure 14: Share of Chinese Reserves in Dollar Denominated Securities



Source: Peoples Bank of China, US Treasury, Estimates by Authors

Figure 15: Chinese Net Purchases of Dollar Denominated Securities and Trade Surplus with US



Source: BEA, National Bureau of Statistics of China, US Treasury

Table 1: Correlations Analysis, Monthly Purchases of Treasuries and Agencies, 1994-2006

	CHN Agency	JAP Agency	UK Agency	CHN Treas	JAP Treas
Chinese Agency	1				
Japanese Agency	0.250*	1			
British Agency	0.248*	0.431*	1		
Chinese Treasury	0.415*	0.204*	0.240*	1	
Japanese Treasury	-0.021	0.037	-0.021	-0.029	1
British Treasury	0.188*	0.216*	0.138	0.241*	0.002

*: 5 percent significance level

Source: US Treasury (2007)