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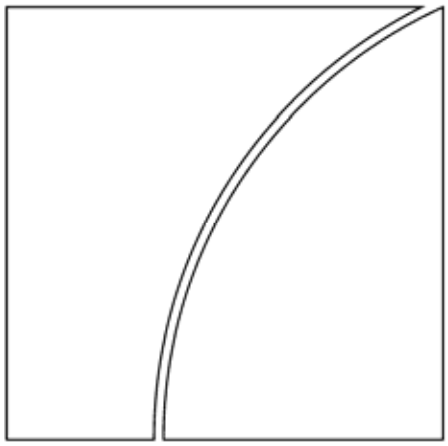

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The euro as a reserve currency: a challenge to the pre-eminence of the US dollar?

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Abstract

Well developed financial markets are a necessary condition for a currency to play a role as a reserve currency. The introduction of the euro greatly improved the functioning of euro financial markets. This paper investigates whether euro financial markets have developed sufficiently to facilitate the emergence of the euro as a reserve currency on par with the US dollar. We find that the liquidity and breadth of euro financial markets are fast approaching those of dollar markets, and as a result the euro is eroding some of the advantages that have historically supported the pre-eminence of the US dollar as a reserve currency. This strengthens the incentive for monetary authorities to reconsider the currency composition of their reserves. Nevertheless, the introduction of the euro has not yet resulted in a significant change in the currency composition of official reserve holdings. The US dollar has maintained its place as the dominant reserve currency, supported perhaps by the edge that dollar financial markets still have over euro markets in terms of size, credit quality and liquidity, as well as inertia in the use of international currencies.

Contents

1. Introduction[1]

Well developed financial markets are a necessary condition for a currency to play a role as a reserve currency. The introduction of the euro greatly improved the functioning of euro financial markets. The common currency and associated efforts to harmonise institutional structures led to a reduction in transactions costs as well as a decline in country-specific macroeconomic risks (Freixas et al (2004)). Indeed, the development of euro financial markets is often seen as the most tangible benefit of European monetary union (Bernanke (2004)). This paper investigates whether euro financial markets have developed sufficiently to facilitate the emergence of the euro as a reserve currency on par with the US dollar.

The analysis of reserve currencies and their driving forces has its roots in the literature on the theory of international money developed by Swoboda (1969), Cohen (1971), McKinnon (1979), Kindleberger (1981) and Krugman (1984). Building on this literature, economic historians have studied the rise and fall of international currencies, in particular the emergence of sterling as the leading reserve currency in the 19th century and its replacement by the US dollar in the 20th century (eg Eichengreen (2006), Flandreau and Jobst (2006)). Both strands of the literature point to European monetary union and the large net external debt of the United States as factors which could potentially undermine the pre-eminence of the US dollar as a reserve currency.

We focus on the role of financial markets in the choice of reserve currency and largely abstract from the macroeconomic factors that also influence this choice. We find that the liquidity and breadth of euro financial markets are fast approaching those of dollar markets. This strengthens the incentive for monetary authorities to reconsider the currency composition of their reserves. Nevertheless, the introduction of the euro has not yet resulted in a significant change in the currency composition of official reserve holdings. The US dollar has maintained its place as the dominant reserve currency, supported perhaps by the greater size of dollar financial markets as well as inertia in the use of international currencies.

The rest of this paper is organised as follows. The next section discusses the roles and determinants of a reserve currency. Section 3 reviews the literature on the role of the dollar and the euro as reserve currencies. Section 4 presents evidence on trends in the currency composition of reserves. In the subsequent three sections, we then assess the euro's role as an intervention currency, its gravitational pull, and finally its place in investment portfolios. Section 8 offers some conclusions.

2. Roles and determinants of a reserve currency

An international currency is one which is used by non-residents as a medium of exchange, store of value and unit of account (Truman (1999)). While in principle these roles can be

[1] This paper was originally written for the conference on "The euro and the dollar in a globalised economy" organised by the Washington University in St Louis and the Federal Reserve Bank of St Louis. The authors are very grateful to Michela Scatigna for her assistance in researching this paper, to David Archer, Claudio Borio and Guy Debelle for helpful discussions, and to Charles Engel, Philipp Hartmann, Robert McCauley, Srichander Ramaswamy and Ted Truman, participants in a seminar at the BIS, and participants at the St Louis conference for their comments. All errors and omissions remain our own. The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS.

fulfilled by different currencies, historically the international currency that has dominated as a medium of exchange has also served as the main store of value.

It is important to distinguish between the official sector's use of an international currency and the private sector's use (Frankel (2000)). Monetary authorities might hold an international currency to support their use of the exchange rate in their monetary policy framework, to intervene in foreign exchange markets, or to safekeep wealth. The currency used by the official sector to perform these functions is typically referred to as a reserve currency. Private market participants make quite different uses of an international currency, for example for invoicing or trading. Table 1 outlines the ways in which the use of an international currency differ in the official and private sectors.

The official and private uses of an international currency are obviously closely related, but the influence of one on the other is not clear. The choice of an international currency is often said to depend mainly on its private uses; it is not a product of a government decision or fiat (see eg Hartmann (1998), Truman (2004)). The small share of foreign official assets in total foreign holdings of US securities, at around 15% in recent years, is consistent with the view that the US dollar's pre-eminence as an international currency stems from its private use. Yet, the official use of a currency might influence market participants' choice. In recent years market participants have reacted to any signs of a change in the official use of the US dollar. Regressions using daily data suggest that, over the 2002-04 period, foreign exchange markets were very sensitive to signs that central banks might be inclined to diversify away from the dollar (BIS (2005)).[2]

The uncertain relationship between the private and official uses of a international currency aside, the emergence of a reserve currency is influenced by at least four factors.[3] First, a country's share in world output and trade. The larger a country's share, the more likely that other countries will use its currency either as a monetary anchor or in support of external trade (Eichengreen (1998), Frenkel and Sondergaard (1999), Frankel (2000)). In turn, a greater anchoring role of a currency might imply a larger weight in official reserves for two related reasons. First, if the exchange rate of the domestic currency vis-à-vis a major currency plays an important role in the monetary policy framework, the central bank would typically hold the latter currency to be able to intervene on short notice in the foreign exchange market. Second, if the country's liabilities are mainly in a particular currency (which might underpin the foreign exchange rate's role in the monetary policy framework), the central bank is likely to hold a significant portion of its assets in that currency.

Second, macroeconomic stability. Hartmann and Issing (2002) stress how price stability is an important precondition for the development and maintenance of the international role of a currency. Confidence in a currency's value is critical for its roles as a unit of account and a store of value (Eichengreen and Mathieson (2000)). From a theoretical point of view, Devereux and Shi (2005) show that in the extreme case, a currency can lose its reserve status following a sharp rise in inflation.

Third, financial market development. The larger and more liquid a country's financial markets, the more likely that other countries will use its currency for intervention purposes (Eichengreen (1998)). The size and liquidity of foreign exchange markets are particularly

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[2] The dollar tended to weaken following news – even if unsubstantiated – about central banks considering diversifying their foreign exchange reserves. The effect of such news was asymmetric: the impact was greatest when the news would point to dollar weakness. Moreover, the dollar on average also reacted to data releases on foreign purchases of US Treasuries. It tended to appreciate following a month-on-month increase in total purchases and to depreciate following an increase in official purchases. The impact of news about the US trade balance or official foreign exchange reserves started to be statistically significant around August 2004, a time when the dollar's decline was particularly pronounced.

[3] For a detailed discussion, see Chinn and Frankel (2005).

important (Cooper (2000)). Also, together with an independent central bank, a large financial sector can help to counterbalance the political influence of the trade sector in resisting political pressure in favour of depreciating the currency to boost external trade (Frieden (2000)).

Fourth, network externalities. A currency's status depends on others' use of it as a reserve currency (Kiyotaki, Matsuyama and Matsui (1993), Krugman (1984), Cohen (2000), Rey (2001)). The more a currency is used as a medium of exchange, the lower its transaction costs and the higher its liquidity, and hence the more attractive it becomes for new users.[4] Network externalities tend to push towards "centralisation", benefiting no more than a few international currencies or even just one (Gaspar (2004)).[5]

An important feature of the main determinants of a currency's international status is that they tend to change slowly, inducing inertia. Network externalities exacerbate this inertia and create strong path-dependence (Cohen (2000)).

Empirical studies on the evolution of the currency composition of official reserves across countries and its determinants confirm the importance of these four factors. The earliest such study was by Heller and Knight (1978). Using confidential IMF data, they examine a cross-section of 76 countries in 1975 and find evidence that the dollar's share was independent of trading patterns and exchange arrangements. A later study, by Dooley, Lizondo and Mathieson (1989), finds that the main determinants of the currency composition of reserves are the choice of currency peg, the composition of trade flows and the composition of foreign debt and financial flows. Eichengreen and Mathieson (2000) update this analysis for the 1979-96 period and conclude that these determinants are stable over time. They conjecture that this is in line with other aspects of the international monetary system that change gradually.

3. The debate over the status of the euro

For much of the post-war period, the United States' role in world output and trade, its macroeconomic stability and financial market depth, and network externalities clearly favoured the US dollar as the leading reserve currency. Then in the 1990s European monetary union (EMU) triggered a debate about the potential for the euro to challenge the US dollar. Some argued that the dominant role of the dollar would not wane, while others suggested that the use of the euro would come to match that of the dollar. McCauley (1997) emphasises the need to distinguish the early years of EMU from the steady state.

Studies that concluded that the euro would not challenge the dollar include Frankel (1995), Feldstein (1997) and Cohen (2003). Eichengreen (1998) stressed the uncertainties surrounding the impact of EMU in the light of two considerations. First, history and empirical work have highlighted the relevance of the advantages of incumbency. Eichengreen argued that network externalities lend inertia and path dependence to the development of reserve-currency status. Second, the institutional structure, and in particular the lack of supervisory

[4] Cooper (2004) emphasised the role of externalities compared to that of economies of scale for foreign exchange market trading. Krugman (1984) observes that the issue of economies of scale can be confusing, because the discussion often mixes up the advantages of transacting in a particular currency with those of transacting in a particular financial centre.

[5] Cooper (2000) argues that network externalities are more relevant in the choice of an international currency than economies of scale. In his view, the G3 economies have large enough domestic markets to achieve economies of scale.

and regulatory authority of the ECB, was likely to have a negative influence on the euro's prospects as a reserve currency.

Cooper (2000) argued that the attractiveness of the US dollar as a reserve currency derived from the existence of a deeper and more liquid markets in US Treasury securities, and in particular in treasury bills, compared to euro markets. He concluded that this situation was unlikely to change. Portes and Rey (1998) emphasised the role of domestic and cross-border trade in euro-denominated assets and stated that obstacles to the full integration of euro-area government bond markets are an important factor limiting the international role of the euro.[6]

Truman (2004) argued that, at least for the functions of unit of account and means of payment, two international currencies would be inefficient and contrary to the rationale for having an international currency. He compared this situation to one where an international airline gives its pilots, who now universally communicate in English, the option of communicating, or not communicating as the case would be, in their own languages. He concluded that the emergence of the euro as a significant international currency is not likely to happen.[7] This is more clearly a sound argument for the medium of exchange function than the store-of-value role. In the last case, diversification arguments can be invoked in the name of the individual investor if not the system as a whole.

By contrast, Kenen (1995) and Bergsten (1997) predicted that the euro's role would match that of the dollar a decade after monetary union. Bergsten's prediction was based on the relative size of the euro area economy and its importance in global trade, as well as a view that EMU would spur the growth of euro area financial markets. He also argued that the euro would benefit from monetary stability, grounded on the Maastricht treaty.

Alogoskoufis and Portes (1997) also predicted a significant role for the euro. The authors argued that this would require a protracted current account deficit of the euro area. Using a mean-variance model with historical returns to calculate optimal reserve holdings, Masson and Turtleboom (1997) reached the conclusion that the euro would eventually have a role comparable to that of the dollar. Gaspar (2004) argues that an international investor should diversify to hedge their exposure to macroeconomic risks, resulting in a "multiplicity" of reserve currencies.

Chinn and Frankel (2005) presented predictions about scenarios under which the euro will challenge the dollar as the world's leading international reserve currency. They highlighted the importance of the relative size of the economy and financial markets and forecast that if the United Kingdom and other non-euro area EU members join EMU by 2020, or the recent depreciation trend of the dollar persists into the future, the euro may surpass the dollar as the leading international reserve currency by 2022.

4. Composition of official reserves

The available data suggest that, while official reserve assets are gradually being diversified, the currency composition has not changed as much as the instrument composition. Reserve managers have steadily reallocated their portfolios towards higher yielding, higher risk

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6 Portes and Rey (1998) also viewed the reluctance of the United Kingdom to join EMU as a factor hindering the euro's role as international currency.

7 This point is perhaps inspired by Kindleberger's analogy of adopting the dollar as an international currency and the situation where two individuals from two different countries meet and decide to communicate in the language of the larger country.

instruments. However, this reallocation has not been accompanied by a significant shift out of US dollars. The euro's share of reserves is higher today than it was immediately prior to monetary union, but it is still well below the US dollar's share and below even the share of euro legacy currencies in the 1980s and early 1990s.

Sources of data

While data on total foreign currency reserves are readily available from national sources and the IMF, a breakdown of these reserves by currency and instrument is harder to come by. There are three sources of data on the composition of reserves, but all are incomplete: national sources, surveys and counterparty data. The differences between these various sources are summarised in Table 2, taken from Wooldridge (2006).

National sources provide the most detailed data but the country coverage is relatively limited. Only around 20 central banks publish details about the currency composition of their foreign currency reserves. As many as 65 publish details about their instrument composition, as part of the reserves template of the IMF's Special Data Dissemination Standard (SDDS), but among those missing are China, which alone holds 20% of world reserves, and Taiwan (China), which holds 6% (Graph 1).

The country coverage of surveys is typically higher than that of national sources. Surveys provide aggregate data, in which no individual central banks are identified, and so reserve managers are often more willing to contribute data. One such survey, by the IMF, captures the Currency Composition of Official Foreign Exchange Reserves (COFER). Participating reserve managers report a breakdown of assets held in each of the five major currencies – US dollars, euros, yen, pound sterling and Swiss francs – plus a residual for all other currencies. The COFER data capture less than 70% of foreign currency reserves because the holdings of some important emerging markets are missing. According to the IMF, between 1995 and 2005 the sample of developing countries which reported to COFER ranged between 80 and 90 (out of 160 developing countries) and accounted for between 51 and 66% of total developing country reserves. The IMF does not identify the contributing countries but, considering the size of the gap, China appears to be among those missing. Furthermore, changes in reporting practices resulted in important breaks in series in 1979, 1995 and 1998 and so comparisons over time are difficult (Truman and Wong (2006)).

The IMF also conducts a survey capturing the geographic distribution of securities held as reserve assets, as part of the Coordinated Portfolio Investment Survey (CPIS). These data capture monetary authorities' and international organisations' combined holdings of equity and debt securities. However, there is no information about the currency in which these securities are denominated and the holdings of some important countries are missing.

Some market participants conduct informal surveys of reserve managers. These are usually more qualitative in nature than the IMF's surveys and cover a broad range of topics. But again the country coverage is limited. For example, 56 monetary authorities participated in Central Banking Publications' 2006 survey, accounting for 42% of world reserves (Carver (2006)).

Counterparty data, on liabilities to monetary authorities, are a close proxy for reserve assets. The country coverage is usually complete, but the definition of liabilities to official institutions is often different from the conventional definition of reserves. One often cited source of counterparty data is the United States' Treasury International Capital (TIC) system. It distinguishes between cross-border holdings of US securities by official institutions and those by private investors. These data include the holdings of government investment funds, such as the Kuwait Investment Authority, but exclude US dollar securities traded in offshore markets. On balance, they likely understate US dollar securities held as reserve assets.

Finally, the locational international banking (LIB) statistics compiled by the BIS capture reserves placed with commercial banks in the form of deposits or loans, including reverse

repos. Banks report their cross-border and foreign currency liabilities to "official monetary authorities" in each of the five major currencies plus the currency of the reporting country and a residual for all other currencies. Banks in all important financial centres contribute to the LIB statistics and so the coverage of central banks' offshore placements is virtually complete. However, the BIS data do not include reserves held by treasuries and government agencies, such as the Japanese Ministry of Finance and the Chinese State Administration of Foreign Exchange (SAFE). This is a large gap, considering that Japan and China are the largest holders of reserves and the Ministry of Finance and SAFE hold the bulk of their respective country's reserves. They also exclude deposits placed with the BIS itself.[8] Another limitation of the LIB data is that they include cross-border deposits denominated in domestic currencies. In particular, they include euro-denominated repo transactions by Eurosystem central banks with banks outside the reporting country.

Of course the primary limitation of the BIS LIB data is that they capture deposits only. Deposits account for a declining, but still sizeable, proportion of total reserves. Their share fell from almost 50% in 1980 to about 23% in the late 1990s and then edged upwards to 30% at end-March 2006 (Wooldridge (2006)). Nevertheless, the currency composition of the IMF COFER data loosely tracks that of the BIS LIB data. Over the 1977-2006 period, the correlation between the two series was about 0.7 for the proportion of reserves denominated in US dollars and 0.5 for the proportion denominated in euros.

A limitation common to both the IMF COFER and the BIS LIB data is that they refer to gross reserve assets and so give an incomplete picture of ultimate risk exposures. The composition of net reserves, after taking into account liabilities, can be very different from the composition of gross reserves. Furthermore, derivative positions, which are typically recorded separately from the transaction to which they may be linked as hedges, can have an important impact on exposures. In recent years, active management of the currency risk associated with an international portfolio has come to be seen by institutional investors as a way to generate higher returns. This has prompted central banks to at least reconsider how they manage currency risk. To the extent that central banks implement currency overlay strategies, it is most likely to increase their exposure to currencies other than the US dollar. Therefore, data on the allocation of reserve assets might overstate central banks' exposure to the US dollar. Many central banks are not yet authorised to engage in currency overlay strategies but a few, including the Nederlandsche Bank, are known to do so (Fels (2005)).

Currency composition

These caveats aside, the IMF COFER and BIS LIB data suggest that, over the past decade, there has been little diversification away from the US dollar. The thick lines in Graphs 2 and 3 plot currency shares at market values and the thin lines plot "quantity" shares, in which exchange rate movements are controlled for by redenominating all assets at constant (end-2005) exchange rates.

These data indicate that inertia was not as strong as emphasised in the literature. The nadir for the US dollar was in 1990, when it accounted for as little as 45% of reserves and deposits. The US dollar regained lost ground in the 1990s, helped by the fast growth of developing countries' reserves and their preference for dollars. By 2001, the US dollar's share had risen to about 70% of holdings, a level not seen since the 1970s. Its share subsequently declined to 66% of reserves and 59% of deposits at end-March 2006, similar to the level ten years earlier.

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[8] The BIS accepts deposits from monetary authorities and then invests these funds in deposits, reverse repos and securities. The BIS is classified as an official monetary authority and so the LIB statistics indirectly capture the portion of funds deposited with the BIS and reinvested in bank deposits and reverse repos.

The mechanical effect of exchange rate movements contributed to fluctuations in the US dollar's share but were certainly not the only explanation. The large swings in quantity shares, after controlling for exchange rate movements, suggest that reserve management decisions and differing paces of reserve accumulation across countries were also important driving factors (Wooldridge (2006)). Garcia-Herrero and Terada-Hagiwara (forthcoming) find that Asian reserve managers respond asymmetrically to valuation effects, increasing their purchases of US Treausury securities in response to capital losses by more than they reduce their purchases in response to capital gains. Moreover, they find that Asian reserve managers react more strongly to interest rate changes than to exchange rate change.

For much of the past two decades, fluctuations in the dollar's share of reserves have been mirrored by fluctuations in the euro's share. The share of euro legacy currencies peaked in 1990 at 39% of reserves and 32% of deposits. Most of these funds were invested in Deutsche mark-denominated assets, with smaller amounts in French francs and European currency units. The share of euro legacy currencies then declined to around 20% on the eve of European monetary union.

The euro's share of reserves and deposits rebounded during the first few years after monetary union. The COFER data suggest that the proportion of reserves allocated to euro-denominated instruments rose by almost 7 percentage points between 1999 and 2003, to about 25%. The proportion of developing countries' reserves allocated to euros rose by even more, from 19% to 27% between 1999 and 2003 (Graph 3, right-hand panel). The dollar's share fell commensurately. The reallocation to euros was most pronounced among countries with close trade or financial ties to the euro area, and less significant in Asia and the Americas (Lim (2006)).

The CPIS data provide additional evidence of a shift towards euros. These data indicate that the proportion of total securities holdings invested in instruments issued by euro area residents rose by about 5 percentage points over the 2001-04 period, from 23% to 28% (Table 3). Admittedly, the reporting population may have changed over time and some of the securities issued by euro area residents were probably denominated in currencies other than euros. Nevertheless, the message from the CPIS data is consistent with an increase in the allocation to euro-denominated securities.

The euro's share of reserves levelled off after 2003 at a level not much higher than it had been in the mid-1990s. It is difficult to use the COFER data to compare the share of euros in reserves to the share of euro legacy currencies because, prior to 1998, euro area countries' holdings of assets denominated in euro legacy currencies accounted for a substantial portion of total euro-denominated reserves and these assets were excluded from global reserves after monetary union. Nevertheless, rough estimates of the amounts excluded suggest that the proportion of reserves allocated to euro-denominated instruments was only 3–5 percentage points higher in 2005-06 than in 1995-96: 25% versus 20–22%. Banks continued to report their euro-denominated liabilities to euro area central banks even after 1998 and so there is no break in the LIB data. These data confirm that the proportion of deposits denominated in euros was only slightly higher in 2005–06 than in 1995–96: 24%, compared to 23% for euro legacy currencies.

The most significant change in the currency composition of reserves in recent years has been the replacement of the yen by sterling as the third largest reserve currency. At its peak in the late 1980s, the yen had accounted for over 10% of reserves (Graph 4). By 2006, it accounted for less than 5%. The Swiss franc too has fallen out of favour, accounting for less than 1% of reserves in 2005-06. By contrast, according to the BIS LIB data, the share of sterling doubled between 1995 and 2006, from 5% of deposits to almost 12%. The IMF COFER data show a more modest increase, from 2% of reserves to 4%. The BIS LIB data also indicate an increase in the share of currencies other than the major five, but this is not confirmed by the IMF COFER data.

Instrument composition

Notwithstanding the continued concentration of reserves in US dollars, the management of reserves has been changing. Since the 1970s, reserve managers have gradually reallocated their portfolios towards instruments perceived to offer more attractive risk-adjusted returns. In the 1980s, foreign currencies replaced gold as the main reserve asset. During the 1980s and into the 1990s, reserve mangers extended the maturity of their foreign currency assets by investing in longer-dated securities and reducing their allocation to deposits (McCauley and Fung (2003)). Over the past decade, they have begun to take on more credit and liquidity risk through so-called "spread products" such as agency and corporate bonds.

These trends are clearly evident in the US TIC data, on foreign official holdings of long-term US securities. The allocation to US agency securities, mainly straight bonds but also mortgage-backed securities structured by Fannie Mae and Freddie Mac, increased from 4% of official institutions' holdings of US securities to 22% between 1994 and 2005 (Table 4).[9] The allocation to US corporate, municipal and asset-backed securities increased from 2% to 5% over the same period. Furthermore, whereas official institutions' holdings of Treasury bonds and notes are concentrated in maturities of 2 years or less, their holdings of agency and corporate bonds are concentrated in longer-term maturities (Table 5).

That being said, central banks as a group remain conservative investors. The bulk of reserves are still invested in bank deposits and government securities, and the duration of their corporate bond holdings is significantly lower than the duration of other investors' holdings (Table 5). Furthermore, less than 2% of total securities holdings are invested in equities (Table 3).

5. Role as a medium of exchange

As discussed in section 2, the most important role of a reserve currency is as a medium of exchange. This is linked to the monetary authorities' choice of the currency in which to intervene in foreign exchange markets. Historically, reserve management has been guided by preparations for contingencies and the consequent potential need to intervene in financial markets.[10] As a result, reserve managers have held most of their reserves in very liquid assets. The investment of what some central banks refer to as a "liquidity tranche" is constrained by the need to turn assets into cash at short notice and low cost, and in difficult market conditions.

Foreign exchange markets

Given these constraints, the literature on vehicle currencies (Swoboda (1969), Krugman (1980), Hartmann (1998)) suggests that the choice of intervention currency is influenced, at least in part, by liquidity conditions in foreign exchange markets. When intervening to

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[9] Preliminary US Treasury data for 2005 indicate that agency mortgage-backed securities accounted for 4% of foreign official holdings of long-term US securities, and corporate asset-backed securities accounted for 2%.

[10] The decision to hold reserves for intervention purposes is influenced by a variety of factors: the need to cover purchases of goods and services if there is a temporary shortfall in export earnings, or to service debt coming due in the event of a temporary loss of access to international capital markets; the provision of insurance against sudden reversals of capital inflows; and resisting appreciation of the domestic currency in order to sustain the rapid growth of exports. For further discussion of the reasons for intervention, see BIS (2005) and Truman (2003).

influence a bilateral exchange rate, it is sometimes more effective to do so in a third, more heavily traded currency.[11]

While the euro seems to be as liquid as its predecessor currencies, it is unclear whether the euro has become more or less liquid compared to the US dollar (Galati and Tsatsaronis (2003)). The results of the most recent Triennial Survey of Foreign Exchange and Derivatives Markets show that, in April 2004, the euro entered on one side of 37% of all foreign exchange transactions, more than the Deutsche mark in 1998 but less than all euro constituents taken together in 1998 (Graph 4 and BIS (2005)). Most of this difference can be explained by the disappearance of intra-EMS foreign exchange trading. The dollar's share in foreign exchange markets edged down from 94% in 1998 to 89% in 2004, while the yen's share doubled from 10% to 20%. Dollar/euro was by far the most traded currency pair in 2004, capturing 28% of global turnover. It was followed by dollar/yen with 17% and dollar/sterling with 14%.

Money and government securities markets

The choice of intervention currency is also influenced by liquidity conditions in asset markets. Reserve managers typically invest the bulk of their reserves in instruments with limited market and credit risk. For example, the Bank of Finland invests its liquidity tranche entirely in three assets: government securities, bank deposits and repurchase agreements (Hakkarainen (2005)).[12] While the duration of government securities might extend to several years, the latter assets are restricted to a maturity of one month or less.

EMU increased the attractiveness of diversifying reserves from dollars into euros by creating the second largest government securities market in the world. At the end of 2005, the outstanding stock of debt securities issued by euro area central governments totalled $4.7 trillion (Table 6). By comparison, the outstanding stock of US Treasury securities equalled $4.2 trillion. However, size alone is not sufficient to tip the balance in favour of the euro. After all, the Japanese government securities market has grown to be by far the largest, yet the proportion of reserves held in yen-denominated instruments has declined in recent years.

One characteristic of the US Treasury market that makes it a relatively more attractive destination for reserves is the large bill market. The short-term segment of the US Treasury market is much larger than its euro equivalent, mainly owing to the limited issuance of treasury bills in the euro area. The importance of this characteristic has diminished over time, however, as reserve managers have shifted into private money market instruments.

Another advantage is the homogeneity and high credit quality of the US Treasury market: there is one issuer, rated AAA. By contrast, twelve different issuers participate in the euro government securities market, and the single largest issuer – the Italian Treasury – accounts for only 30% of the outstanding stock of debt (Table 6). Furthermore, several euro area governments are rated below AAA, and so the average rating of outstanding euro government securities is AA+. This is higher than the Japanese government's credit rating but one notch below the US government's.

The most important advantage the US Treasury market has over its euro or yen equivalents is its tremendous liquidity. The daily turnover of US Treasuries greatly exceeds that of any other instrument (Graph 6). While turnover is not synonymous with market liquidity, it can be

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[11] Other considerations may also matter. For example, in the early 1980s participants in the European Monetary System intervened in US dollars to maintain bilateral parties, arguably because of political considerations rather than economies of scale (Krugman (1984)).

[12] A repurchase agreement, or repo, is essentially a collateralised loan: participants exchange securities for cash and agree to reverse the transaction at a pre-specified date and price.

indicative of the depth of the market, ie the size of the order flow that the market can accommodate without moving prices (CGFS (2000)). Bid-ask spreads on US Treasuries are reportedly tighter than those on most euro area government bonds. In the euro market, bid-ask spreads are tightest for French and Italian government bonds, tighter even than for benchmark German government bonds (Pagano and von Thadden (2004)).

That being said, some segments of euro government securities markets are as liquid as the US Treasury market. In the euro market, liquidity is concentrated in derivatives markets, in particular futures on German government bonds. Traders report that bid-ask spreads and trade sizes in the futures market for Bunds (10-year German government bonds) are similar to those in the physical market for US Treasuries. This makes Bund futures as attractive as US Treasuries for positioning and hedging purposes. However, as a medium of exchange, a physical instrument is preferred to a derivative instrument because, as previously mentioned, the investment of the liquidity tranche is constrained by the need to turn assets into cash. So the depth of the US Treasury market helps to reinforce the pre-eminence of the US dollar as an intervention currency.

In repo markets, too, liquidity conditions favour US dollar instruments. While the introduction of the euro did much to boost the euro repo market, the dollar repo market remains the largest, most developed in the world. The growth of the dollar repo market has outpaced that of the euro market in recent years. In December 2005, the outstanding value of repo and reverse repo agreements on the books of dealers was $6.1 trillion in the dollar market, compared to $4.8 trillion in the euro market (Table 7).

Moreover, the euro repo market is less deep and robust than its dollar counterpart. Since monetary union, the euro repo market has been slower to integrate than unsecured deposit markets. Baele et al (2004) estimate that cross-country dispersion relative to within-country dispersion is greater for euro repo rates than for deposit rates. The process of integration has been impeded by the absence of standardised legal documentation, among other factors. As a result, there is greater fragmentation in the euro market than in the dollar market. In the dollar repo market, almost half of all agreements had a maturity of one day and about one quarter were tri-party agreements, in which the cash and collateral legs of the transaction are settled through a common custodial bank (Table 7). Furthermore, about two thirds of all transactions used US Treasuries as collateral. By contrast, in the euro repo market, one-day and tri-party agreements accounted for a relatively small proportion of the total: 10% and 16%, respectively. In addition, no one source of collateral was dominant: German government securities were used in less than 30% of all euro transactions.

The market where euro instruments compare the most favourably with US dollar instruments is that for unsecured deposits. The wholesale deposit market is larger in euros than in dollars, owing to the greater dependence of the euro area banking system on interbank funding. In the offshore (eurocurrency) market, the euro segment is now almost as large as the dollar segment. Whereas in 1999 euro-denominated deposits placed by non-residents in the London market were around 65% as large as dollar-denominated placements, in 2005 that proportion had risen to 83% (Graph 6). About 35% of all deposits held by monetary authorities are placed with banks in London, more than in any other financial centre. The decision to place reserves in the eurocurrency market rather than onshore was once driven by yield differences, but since 1990 other factors, such as country risk and habit, have dominated (McCauley (2005)).

Moreover, the unsecured deposit market for euros is one of the most liquid markets in the world. Indeed, overnight index swaps are considered the benchmark instrument at the very

short end of the euro yield curve (Remolona and Wooldridge (2003)).[13] Interbank instruments are widely traded at longer maturities also. For example, the daily turnover of 3-month euro interest rate futures contracts averaged $810 billion in 2005 (Graph 6). This was half the turnover of dollar contracts, which averaged $1.6 trillion, but far greater than the turnover of sterling or yen contracts.[14]

To summarise, the US dollar retains several advantages over the euro as a medium of exchange. The US dollar is more widely traded in foreign exchange markets, and dollar government securities and repo markets are more liquid than their euro counterparts. This supports the continued pre-eminence of the US dollar as a reserve currency. That being said, differences between the dollar and euro markets are small relative to differences between the dollar and other markets, and so for intervention purposes the euro is an increasingly attractive alternative to holding dollars.

6. Role as unit of account

Another key role of an international currency is as an unit of account. While in private use this role is linked to the currency of choice for invoicing, in official use it is linked to the choice of an exchange rate as a monetary anchor. Even after the collapse of the Bretton Woods system, which was effectively a gold-dollar standard, the US dollar remained the pre-eminent anchor currency. In recent years, however, the euro has played an increasingly important role in international exchange rate arrangements. Empirical evidence indicates that the euro has an increasingly important gravitational pull on other currencies.

The gravitational properties of a currency can be assessed in two different ways. First, *de jure* measures consider the weight that official exchange rate policies assign to the dollar, the euro and other currencies (eg Frankel (2000)). ECB (2005) reports that out of 150 pegged currencies listed by the IMF in 2004, 40 had the euro as an anchor currency. However, the classification of exchange rate policies is difficult, in part because some countries, such as China and Singapore, do not publish the weights of the different currencies in the baskets to which they peg. A second approach is to consider a currency's gravitational pull, based on the actual co-movement of currencies. This can be measured by the volatility of exchange rates or by the sensitivity of currencies with respect to particular exchange rates (Frankel and Wei (1995), Bénassy-Quéré (2001), Galati (2001), Levi-Yeyati and Sturzenegger (2003), ECB (2006)). A low volatility (or a high sensitivity) of the currency of country X with respect to the dollar could either result from the monetary framework of country X assigning weight to the dollar, or reflect synchronous business cycles and strong trade links between country X and the United States. In both cases, low exchange rate volatility (or high exchange rate sensitivity) would suggest that the dollar plays an important role as official reserve currency in country X. As discussed earlier, a greater role of the dollar in the monetary policy framework of a country typically implies a greater role of the dollar in official reserves because of foreign exchange market intervention needs and efforts to match the country's

[13] An overnight index swap (OIS) is a fixed-for-floating interest rate swap with a floating rate leg tied to an index of daily Interbank rates. In the euro market, OISs are overwhelming referenced to the Euro Overnight Index Average (EONIA) rate – a weighted average of interest rates contracted on unsecured overnight loans in the euro area Interbank market.

[14] Data refer to the 3-month EURIBOR futures contract traded on the London International Financial Futures and Options Exchange, the 3-month US dollar LIBOR futures contract traded on the Chicago Mercantile Exchange, and the 3-month yen LIBOR futures contracts traded on the Tokyo International Financial Futures Exchange and the Singapore Exchange.

assets and liabilities. The same reasoning applies to low volatility/high sensitivity of currency X to the euro or the yen.

In this paper we follow an approach similar to that proposed by ECB (2006) and look at the sensitivity of the dollar exchange rate of a currency to dollar/euro and yen/dollar movements. In practice, this involves regressing percentage changes of the dollar exchange rate of a currency on a constant and percentage changes of the dollar/euro and the dollar/yen exchange rates. At one extreme of the spectrum, a low coefficient in absolute value on the dollar/yen and the dollar/euro exchange rates would indicate that the actual movements of that currency track mainly the dollar, while the euro and the yen do not play a significant role. Conversely, at the other extreme, a high coefficient on the dollar/euro (the dollar/yen) exchange rate would suggest that the currency tracks mainly the euro (the yen). Coefficients that lie someway in between zero and one indicate that the currency only partially tracks the movements of the euro or the yen against the dollar.

Sensitivities estimated over different sample periods provide information on changes over time in the gravitational role. Graph 4 compares the sensitivities estimated over the past three years (on the vertical axis) to those of the three years preceding EMU (on the horizontal axis). If a currency lies above (below) the 45 degree line, this indicates that it has tended to co-move more (less) closely with the euro over the past years than with the Deutsche mark during the pre-EMU period.

The evidence in the graph suggests that the gravitational force of the euro on other currencies has tended to rise in recent years.[15] Estimates carried out over different sub-periods indicate that this rise has occurred fairly steadily during the EMU period.[16] Currencies that match closely the euro's movements include the Swiss franc, the Danish krone, the Norwegian krona and, in recent years, the Swedish krona. Currencies in central and Eastern Europe now closely track the euro's daily movements against the dollar. The dollar exchange rates of these currencies match between 75 and 90% of the movements of the euro against the dollar. The pound sterling now tracks about two thirds of the euro's movements vis-à-vis the dollar, compared to around 50% with the mark in the late 1990s. Another interesting change is that of the Australian, Canadian and New Zealand dollars. They traditionally belonged to the dollar pole but are now behaving similarly to sterling, sharing between one half and two thirds of the euro's movements vis-à-vis the dollar.

Graph 4 also shows that for emerging market countries, the gravitational role of the euro is becoming more important outside Europe. The South African rand has comoved closely with the euro in recent years, and some currencies in Latin America, most notably the Brazilian real and the Chilean peso, have tended to track the euro's movements more closely than in the past. By contrast, emerging market currencies in Asia still follow the dollar's movements quite closely.

In summary, evidence from exchange rate co-movements suggests that the euro plays an increasingly important gravitational role. *Ceteris paribus*, this would tend to boost the euro's share of global reserves over time. The US dollar, however, is still the most important currency along this dimension. Moreover, it is unclear whether the increasing gravitational pull of the euro reflects a structural change or cyclical developments. Since 2002, the US dollar has depreciated against many currencies, and so the higher co-movement of currencies with the euro may reflect temporary dollar weakness rather than a long-term increase in the euro's influence.

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[15] Very similar results obtain when we looked at exchange rate volatilities with respect to the dollar and the euro.

[16] Details of these estimations are available from the authors upon request.

7. Role as a store of value

The third role of an international currency is as a store of value. In the strictest sense, this will be a currency whose value is reliable in terms of future purchasing power. This in turn is linked to the maintenance of sustainable macroeconomic policies. Moreover, as discussed in section 2, the store of value function can also depend on the anchoring role of a currency to the extent that the central bank tries to align the currency composition of its country's assets and liabilities. More generally, the store of value function of an international currency is linked to the breadth and depth of financial markets, in particular to the availability of investments which meet wealth holders' risk-return objectives.

While reserve managers have in the past given greater consideration to a currency's role as a medium of exchange than to its role as a store of value, this is now changing. The accumulation of reserves over the past decade has outpaced the growth of world trade, financial flows or GDP. Total foreign currency reserves rose from 4% of GDP in 1990 to almost 10% in 2005 (Graph 1). Consequently, reserves are now commonly perceived to be greater than needed for intervention purposes. This has led monetary authorities to focus their reserve management decisions increasingly on the maximisation of returns for a given level of risk and to place less importance on the preservation of liquidity and capital.

Opportunities for diversification

The management of reserves is usually constrained by a set of investment policies which define the monetary authority's appetite for currency, credit, interest rate and other risks. Therefore, the relative attractiveness of different international currencies as a store of value will be influenced by the availability of financial instruments for gaining exposure to, or hedging, these risks. The characteristics of dollar-denominated instruments are still closest to those desired by reserve managers. However, the introduction of the euro in 1999 did much to close the gap, and today euro markets more closely resemble dollar markets than do any other markets.

In terms of size, euro securities markets are second only to US dollar markets. The outstanding stock of euro-denominated debt securities, excluding government bonds, totalled $10 trillion at end-2005, smaller than the $22 trillion dollar bond market but much larger than the third largest market, for yen bonds (Table 8). The market capitalisation of euro-denominated equities was $7 trillion, again smaller than the dollar market but larger than the yen market.

In terms of credit quality, both the US dollar and the euro debt securities markets are open to a broad range of issuers. The euro high yield debt market was almost non-existent prior to the introduction of the euro and is now the second largest in the world, after the dollar market. Nevertheless, the dollar market for non-government bonds has the largest concentration of AAA-rated issues: 60%, compared to 49% in the euro market. This is because an exceptionally large proportion of dollar bonds are collateralised. Asset- and mortgage-backed securities (ABS and MBS) account for more than 40% of the dollar market, compared to less than 1% of the euro market (Table 8).[17]

For reserve managers seeking to maximise yield pick up for a given rating, the availability of a large stock of collateralised issues might seem to add to the relative attractiveness of the dollar market. However, the risks associated with AAA-rated MBS and ABS differ from those

[17] Covered bonds, or Pfandbriefe, account for a further 9% of the euro market, but these are different in nature from ABS. Whereas an ABS is backed only by the collateral held, a covered bond is backed, in the first instance, by the originator of the loan; investors have recourse to the underlying collateral only if the originator defaults.

associated with AAA-rated government or corporate bonds. While the credit ratings of structured finance securities tend to change less frequently than those of corporate securities, when they are downgraded they fall farther: by almost four notches compared to less than two for corporate securities, according to Moody's (2006). Therefore, over reliance on rating agency assessments could lead holders of collateralised bonds to underestimate the risks to which they are exposed (CGFS (2005)).

Finally, in terms of liquidity, the dollar's advantage is quickly eroding. In derivatives markets, euro securities are as liquid as, if not more liquid than, dollar securities. The turnover of euro-denominated interest rate swaps greatly exceeds that of their dollar counterparts (Graph 7). In addition, whereas the normal functioning of the dollar swaps market has on occasion in the past been disrupted by the hedging activities of MBS investors, the euro swaps market has proven more resilient (Feldhütter and Lando (2006)). However, cash or underlying markets tend to be more liquid in dollar instruments. The average daily turnover of dollar MBS exceeds that of most other instruments.

Mean-variance analysis

Modern portfolio theory suggests that, providing returns are not perfectly correlated, diversification can help to reduce risk in a portfolio. The portfolio that best conforms to an investors' risk-return objectives will consist of a mix of assets. This argues in favour of investing reserves in several currencies. Empirical studies, however, find mixed results about the role of the dollar and the euro in an optimal portfolio.

Masson and Turtelboom (1997) use a mean-variance model with historical returns for 1981–1995 to calculate optimal reserve holdings in dollars, yen, and euro. They find that once lags have worked themselves out, the optimal portfolio gives a greater potential weight to the euro than the mark, and one that is comparable to that of the dollar. In a more recent study, Masson (2006) estimates that in an SDR-based portfolio, the optimal share of dollars would be around 43% and that of euros around 30%. Masson's result align fairly closely with the views expressed by portfolio managers participating in the quarterly portfolio poll conducted by *The Economist* (2005). In 2005, they allocated on average 48% of their assets to dollar-denominated bonds and 29% to euro-denominated bonds.

Papaioannou et al (2006) develop a dynamic mean-variance optimization framework with portfolio rebalancing costs for a representative central bank to estimate optimal portfolio weights for the main international currencies. The authors also perform simulations for Brazil, China, India and Russia. They find that their optimizer matches the large share of the US dollar in reserves only when the dollar is taken to be the reference (risk-free) currency. They also find that their optimizer assigns a much lower weight for the euro than is observed and interpret this result as implying that the euro may already enjoy an enhanced role as an international reserve currency. Finally, they show that three factors would boost the euro's optimal share in international reserves: growth in issuance of euro-denominated securities, a rise in euro zone trade with key emerging markets, and, above all, an increased use as an anchor currency.

Of course, at best, mean-variance analysis is only one of several inputs into central banks' reserve management policies. Central banks tend to be more concerned than other investors about market conditions during periods of stress, given that this is when the need for foreign currency reserves is greatest. Correlation coefficients and other model parameters often change abruptly during such periods, and as a result investors might find their exposure to various risks larger than historical experience would suggest (CGFS (1999)). Such considerations may be a contributing factor to the seemingly cautious approach central banks have taken to the diversification of the currency composition of their reserves.

Asset and liability management

The diversification of reserve assets may also be constrained by the composition of external liabilities.[18] Cardon and Coche (2004) suggest that central banks have in recent years given greater consideration to the integrated management of their assets and liabilities. To the extent that monetary authorities consider the country's international investment position when determining the allocation of their reserves, then the US dollar's share of reserves may be too low and the euro's share too high. Table 9 compares the currency distribution of emerging market countries' international liabilities with the currency distribution of their reserves. The dollar's share of liabilities is significantly higher than its share of reserves, and the euro's share significantly lower. Only the yen's share is broadly in line.

Central banks might give greater weight to short-term liabilities than long-term liabilities, given the suddenness with which short-term credit can evaporate. Taking cross-border loans as a proxy for short-term external liabilities, then the currency distribution of loans is closer to that of reserves than was the currency distribution of international debt.[19] Nevertheless, again the euro's share of cross-border loans is significantly lower than its share of reserves.

The comparison in Table 9 should not be taken too seriously. It treats emerging markets as a homogeneous group when each country's circumstance is in fact very different. For example, European issuers borrow more heavily in euros than do Asian or Latin American issuers. Furthermore, many Asian countries are net external creditors, whereas many European and Latin American countries are net external debtors.

Moreover, there is no consensus on the best approach to asset and liability management at central banks. Liabilities might be broadly defined, as the country's external liabilities, or narrowly defined, as the central banks' on-balance sheet liabilities. Central banks might also wish to consider potential drains on foreign currency reserves, such as foreign currency deposits placed by residents with local banks.[20]

Claessens and Kreuser (2004) present a more formal framework for integrating macroeconomic, macro-prudential risk and sovereign debt management considerations with asset allocation considerations. In earlier work, Claessens (1992) analyses the optimal currency composition of a country's net debt position, ie external debt minus foreign exchange reserves. He applies his model to Brazil and Mexico but gets impractical results. In particular, he finds that optimal currency shares are very volatile.

8. Conclusions

Since the start of EMU there has been an intense debate on whether the euro would challenge the US dollar's dominant role as an official reserve currency. In this paper we investigate how the euro's role in international financial markets has influenced the use of euro-denominated assets as official reserves.

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[18] This is certainly true in the short and medium run. In the long run, the choice of currency for debts is endogenous.

[19] According to the BIS consolidated banking statistics for end-2005, 53% of banks' claims on developing countries matured within one year. These data include banks' holdings of debt securities, which usually have a longer maturity than loans.

[20] The IMF and Committee on the Global Financial System (CGFS) recommend that monetary authorities disclose both predetermined and contingent short-term net drains on foreign currency reserves (CGFS (1998)). This recommendation was incorporated into the reserves template of the IMF's SDDS.

The introduction of the euro in 1999 did much to promote the development of euro financial markets, and as a result the euro is eroding some of the advantages that have historically supported the pre-eminence of the US dollar as a reserve currency. Nevertheless, in terms of size, credit quality and liquidity, dollar financial markets still have an edge over euro markets. This, coupled with the inertia typical of the use of international currencies, suggests that the euro is not yet in a position to match the role of the US dollar as a reserve currency. Indeed, the available data suggest that the euro's share of reserves rose during the first few years after monetary union but then levelled off after 2003. In early 2006, the euro's share was still well below the US dollar's share and below even the share of euro legacy currencies in the 1980s and early 1990s. The euro comes closest to challenging the dollar in its role as a store of value. As a unit of account and medium of exchange, the dollar's role is not as secure as it once was, but the dollar is still pre-eminent.

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Tables

Roles of an international currency

Role	Private use	Official use
Medium of exchange	Vehicle currency (in foreign exchange markets)	Foreign exchange intervention
Store of value	Banking	Reserve accumulation
Unit of account	Invoicing (for trade or financial transactions)	Monetary anchor

Source: Variant of a table in Cohen (1971). Table 1

Selected sources of data on the composition of foreign currency reserves

	World total	National data	Survey data		Counterparty data	
	IMF IFS[1, 2]	SDDS template[2]	IMF COFER[2]	IMF CPIS[3]	US TIC[4]	BIS LIB[2]
Identified holdings	4,347	2,832	2,911	2,145	1,938	1,079
Official institutions included						
Monetary authorities	✓	✓	✓	✓	✓	✓
Other national authorities[5]	✓	✓	✓	✓	✓	×
Public investment funds	×	×	×	×	✓	×
International organisations	×	×	×	✓	BIS	BIS
Countries included	184	65	114	?	184	184
Industrial countries	24	24	24	(23)[6]	24	24
Japan	✓	✓	✓	✓	✓	(×)[7]
Developing countries	160	41	90	(45)[6]	160+[8]	160+[8]
China	✓	×	×	×	✓	(×)[7]
Taiwan, China	✓	×	×	×	✓	✓
Instruments included						
Cash in vault	✓	✓	✓	×	×	×
Deposits	✓	✓	✓	×	×	✓
Including reverse repos	×	×	×	×	×	✓
Debt securities	✓	✓	✓	✓	✓	(×)[9]
Equity securities	✓	✓	✓	✓	✓	(×)[9]
Other reserve assets	✓[10]	✓[10]	✓[10]	×	×	(×)[9]
Disclosed breakdowns						
By instrument	×	✓	×	✓	✓	✓
By currency	×	(×)[11]	✓	×	✓[12]	✓

[1] IMF's International Financial Statistics. [2] At end-March 2006. [3] Sum of SEFER and SSIO data; at end-December 2004. [4] Annual survey of foreign portfolio holdings of US securities; at end-June 2005. [5] National authorities, other than the monetary authority, which hold foreign currency reserves, eg finance ministries and exchange stabilisation funds. [6] Countries that participated in the 2004 CPIS. [7] Coverage is incomplete for those countries where reserves are not held by the monetary authority. [8] Includes Iran, Iraq and other countries not included in the IMF's world total. [9] Deposits and loans accounted for 99% of reported liabilities to official monetary authorities; securities and financial derivatives accounted for the remainder. [10] Includes financial derivatives and securities borrowed under reverse repos. [11] Currencies in the SDR basket (grouped together) and all other currencies. [12] Available only for total foreign portfolio holdings (private and official holdings combined).

Sources: BIS; IMF; national data; Wooldridge (2006). Table 2

Distribution of securities held as reserve assets[1]

	USD bn	As a percentage of allocated securities		
	End-2004	2001-02	2003-04	Δ^2
All securities	2,145.0	100	100	--
Money market instruments	541.9	27	25	-2
Bonds and notes	1,568.0	72	73	+2
Equities	35.1	1	2	--
All countries	2,145.0	100	100	--
International organisations	138.0	7	6	-1
Industrial countries	1,946.1	93	94	+1
United States	1,164.8	59	56	-3
Euro area	576.4	23	28	+5
Japan	89.2	5	4	-1
United Kingdom	65.3	3	3	--
Other European countries[3]	26.3	1	1	--
Other industrial countries[4]	24.2	1	1	--
Developing countries[5]	1.4	--	--	--
Unallocated	59.5			

[1] Market value of securities holdings; including international organisations' securities holdings. [2] Change from 2001-02 to 2003-04. [3] Denmark, Iceland, Norway, Sweden, Switzerland. [4] Australia, Canada, New Zealand. [5] Cayman Islands, Hungary, Lithuania, Singapore.

Source: IMF; authors' calculations. Table 3

Foreign holdings of US long-term debt securities, by instrument[1]

	Official holdings				Private holdings
	Total bond holdings (USD bns)	Treasury securities (% of total)	Agency securities (% of total)	Corporate securities (% of total)	Corporate securities (% of total)
1989 (end-Dec)	197	95	4	1	50
1994 (end-Dec)	276	94	4	2	48
2000 (end-Mar)	595	83	15	2	55
2002 (end-Jun)	717	78	19	3	61
2003 (end-Jun)	854	76	21	2	58
2004 (end-Jun)	1 186	78	18	4	59
2005 (end-Jun)	1 474	73	22	5	63

[1] Market value of securities holdings, excluding holdings of money market instruments; based on annual benchmark surveys.

Source: US Department of the Treasury et al (2005); authors' calculations. Table 4

Foreign holdings of US long-term debt securities, by remaining maturity[1,2]

	Official holdings				Private holdings
	Total bond holdings	Treasury securities	Agency securities	Corporate securities	Corporate securities
0-1 years	17	20	7	8	12
1-2 years	22	24	18	11	11
2-5 years	34	34	33	42	28
5-10 years	22	19	31	25	26
> 10 years	6	4	11	14	23

[1] Market value of securities holdings, excluding holdings of money market instruments; based on annual benchmark surveys. [2] As a percentage of all maturities for a given instrument.

Source: US Department of the Treasury et al (2005); authors' calculations. Table 5

Government securities markets[1]

USD bns	Total outstanding		Short-term debt securities				Credit rating[3]	
			Total[2]		Treasury bills			
	1995	2005	1995	2005	1995	2005	1995	2005
JPY	2 073	6 351	614	2 153	324	1 194		AA-
USD	3 292	4 184	1 267	1 597	761	964		AAA
EUR	2 938	4 658	720	910	474	410		AA+
Italy	1 039	1 324	344	291	233	139		AA-
France	526	1 080	78	170	54	112		AAA
Germany	449	832	45	203	0	41		AAA
GBP	457	679	43	74	27	36		AAA

[1] Debt securities issued by the central government in domestic markets, in billions of US dollars; amounts in other currencies are converted to US dollars at the end-2005 exchange rate. [2] Treasury bills plus notes and bonds with a remaining maturity of one year or less. [3] Standard & Poor's local currency rating; for the euro area, average rating weighted by each sovereign's outstanding debt.

Source: BIS; national data; Standard & Poor's; authors' calculations. Table 6

Repo markets

	Total outstanding[2] (USD bns)		Overnight maturity[2,3] (% of total)		Tri-party[2,4] (% of total)		Main collateral[2,5] (% of total)	
	2001	2005	2001	2005	2001	2005	2001	2005
USD[6]	3 380	6 141	39	44	. . .	26	60	65
EUR[7]	3 011	4 733	13	16	6	10	31	25

[1] Outstanding repurchase and reverse repurchase agreements; amounts in other currencies are converted to US dollars at the end-2005 exchange rate. [2] For EUR, data refer to repos in all European currencies. [3] For USD, includes repos which have no specified maturity but can be terminated without advance notice. [4] For USD, data refer to June 2004. [5] Collateral most commonly used; for USD, US Treasury securities; for EUR, German government securities. [6] Repo financing by US government securities dealers; daily average for December. [7] Based on responses to the ICMA repo survey; December.

Source: BMA et al (2005); ICMA (2006); national data, authors' calculations. Table 7

Non-government debt securities markets

	USD		EUR		JPY		GBP	
	1995	2005	1995	2005	1995	2005	1995	2005
By instrument, in billions of US dollars[1]								
Total outstanding	8 319	21 714	3 364	10 254	2 370	2 503	375	1 504
Domestic	7 215	16 142	2 733	4 090	1 983	2 020	170	323
International	1 104	5 572	631	6 164	387	484	205	1 181
Money markets	1 175	3 252	451	1 000	271	429	145	418
Commercial paper	733	1 767	61	476	60	162	6	99
Other short-term[2]	441	1 485	390	524	211	266	138	318
Bond markets[3]	7 145	18 462	2 913	9 254	2 099	2 075	230	1 086
By credit rating, as a percentage of bonds outstanding[4,5]								
AAA		60		49		6		39
AA		6		19		26		20
A		12		19		62		27
BBB		11		9		6		12
< BBB		11		5		0		2
By sector of issuer, as a percentage of bonds outstanding[4]								
Local governments		0		6		0		0
Supranationals[6]		8		8		4		14
Agencies[7]		14		11		36		12
Corporations[8]		22		33		34		26
Financial institutions		12		41		25		36
of which: Pfandbriefe[9]		0		20		0		1
Collateralised debt		44		1		0		12
of which: MBS[10]		41		0		0		1

[1] Debt securities issued in domestic and international markets, excluding central government securities; amounts in other currencies are converted into US dollars at end-2005 exchange rates; domestic and international data are not fully comparable and so some issues may be counted twice. [2] Mainly certificates of deposit. [3] Including medium-term notes. [4] As a percentage of the market value of outstanding bonds with a remaining maturity of greater than one year; based on the constituents of the Merrill Lynch Global Broad Market, Global High Yield and Emerging Markets Plus indices, at end-February 2006. [5] Based on a composite of Moody's and Standard & Poor's ratings. [6] Including foreign sovereigns. [7] Government-sponsored enterprises and government-guaranteed bonds. [8] Non-financial corporations. [9] Covered bonds. [10] Residential and commercial mortgage-backed securities.

Source: BIS; Dealogic; Euroclear; ICMA; Merrill Lynch; Thomson Financial Securities Data; authors' calculations. Table 8

Foreign currency assets and liabilities of emerging markets

	Cross-border loans[1,2]			International debt[1,3]			Reserve assets[4]		
	1995-98	1999-02	2003-05	1995-98	1999-02	2003-05	1995-98	1999-02	2003-05
All emerging markets									
USD[5]	67	63	61***	70	67***	66***	68	63	59
EUR[5]	18	24***	26***	15	22***	24***	18	26	31
JPY[5]	6	5	4	8	6***	4	7	5	4
GBP[5]	1	1***	1***	1	1***	1***	4	4	5
CHF[5]	1	1***	2***	1	1***	1***	1	0	0
Other[5]	6	5***	6***	4	3***	4***	3	1	2
Total[6]	$ 877	$ 717	$ 1 116	$ 1 360	$ 1 295	$ 1 853	$ 973	$ 1 508	$ 2 878
Unall.[6,7]	$ 197	$ 113	$ 222	$ 197	$ 113	$ 222	$ 354	$ 612	$ 1 354
Asia									
USD[5]	65	61	65	68	69	74	. . .	. . .	. . .
EUR[5]	9	20	16	7	13	11	. . .	. . .	. . .
JPY[5]	16	10	9	17	11	8	. . .	. . .	. . .
GBP[5]	1	1	1	1	1	1	. . .	. . .	. . .
CHF[5]	1	1	1	2	1	0	. . .	. . .	. . .
Other[5]	8	7	8	5	5	6	. . .	. . .	. . .
Total[6]	$ 320	$ 218	$ 384	$ 441	$ 350	$ 584	. . .	. . .	. . .
Unall.[6,7]	$ 144	$ 75	$ 151	$ 144	$ 75	$ 151	. . .	. . .	. . .
Europe									
USD[5]	30	35	42	33	42	45	. . .	. . .	. . .
EUR[5]	35	43	47	33	41	46	. . .	. . .	. . .
JPY[5]	2	2	1	8	4	2	. . .	. . .	. . .
GBP[5]	1	1	1	1	1	1	. . .	. . .	. . .
CHF[5]	2	2	3	2	1	2	. . .	. . .	. . .
Other[5]	30	18	6	23	11	4	. . .	. . .	. . .
Total[6]	$ 320	$ 218	$ 384	$ 388	$ 327	$ 556	. . .	. . .	. . .
Unall.[6,7]	$ 171	$ 82	$ 101	$ 171	$ 82	$ 101	. . .	. . .	. . .
Latin America									
USD[5]	91	86	86	87	79	79	. . .	. . .	. . .
EUR[5]	4	5	6	8	14	15	. . .	. . .	. . .
JPY[5]	2	5	4	3	4	3	. . .	. . .	. . .
GBP[5]	0	0	0	0	1	0	. . .	. . .	. . .
CHF[5]	1	1	1	1	0	0	. . .	. . .	. . .
Other[5]	3	3	4	2	2	3	. . .	. . .	. . .
Total[6]	$ 241	$ 209	$ 188	$ 519	$ 516	$ 498	. . .	. . .	. . .
Unall.[6,7]	$ 12	$ 7	$ 6	$ 12	$ 7	$ 6	. . .	. . .	. . .

Notes: *** indicates that the period average is significantly different from the period average for reserve assets at the 1% level; *t*-statistics were not calculated for the 1995-98 period owing to the small number of observations.

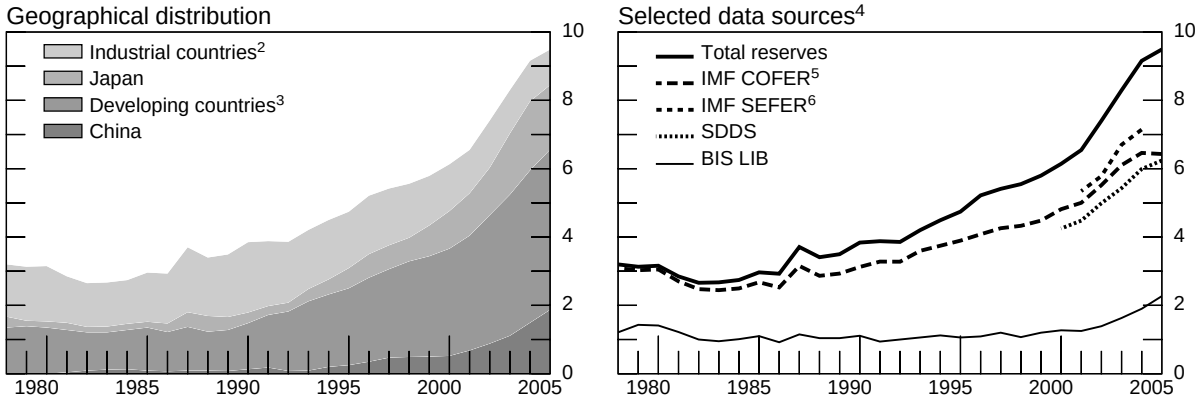
[1] Liabilities of countries classified by the BIS as developing countries, ie excluding Hong Kong, Singapore and other offshore centres. [2] Loans by BIS reporting banks. [3] Cross-border loans plus debt securities issued in international markets. [4] Assets of countries classified by the IMF as developing countries, ie including offshore centres. [5] As a percentage of total outstanding, excluding unallocated currencies; shares are calculated at constant, end-2004 exchange rates and averaged over the period; for 1995-98 annual data, otherwise quarterly data. [6] In billions of US dollars, at the end of the period. [7] Unallocated currencies.

Sources: BIS; IMF; authors' calculations. Table 9

Graphs

Official reserve holdings[1]

At year-end, as a percentage of world GDP

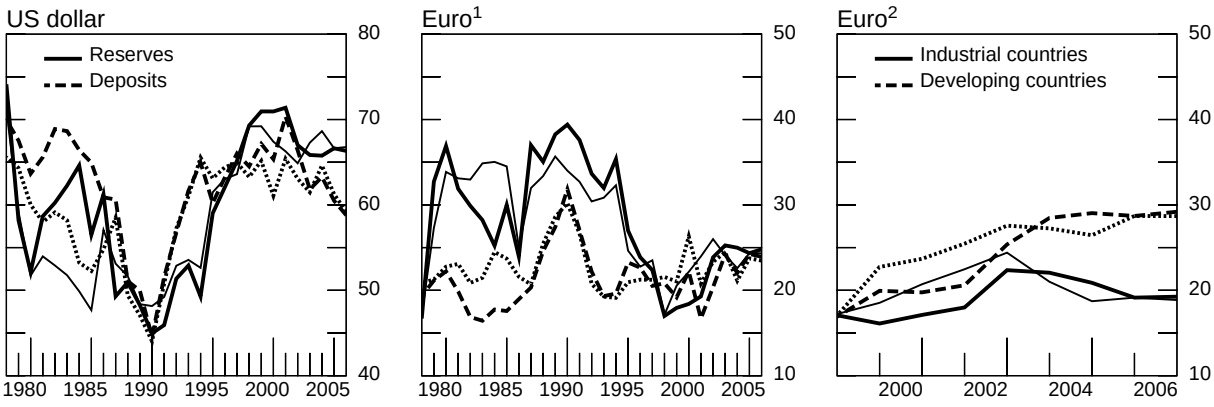


[1] Foreign currency reserves, excluding SDRs, reserve position at the IMF and gold. [2] Excluding Japan. [3] Excluding China. [4] See Table 1 for an explanation of the data sources. [5] Prior to 1996, data are from Table I.3 of the IMF Annual Report; from 1996, COFER database. [6] Sum of the IMF CPIS data (on securities holdings) and the BIS LIB data (on bank deposits).

Sources: IMF; national data; BIS; authors' calculations. Graph 1

Currency composition of reserves

As a percentage of total allocated foreign currency holdings



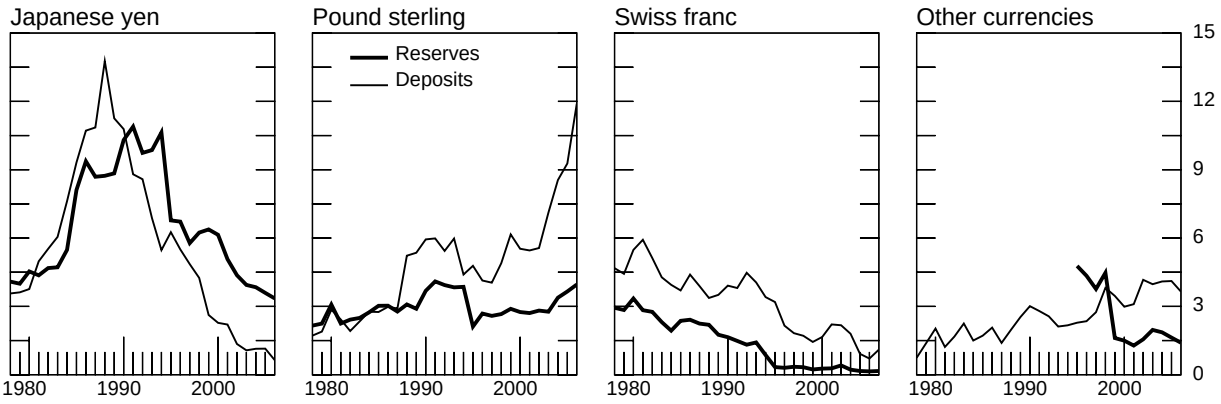
Note: Thick lines calculated at market values ("value" shares); thin lines calculated at end-2005 exchange rates ("quantity" shares).

[1] Prior to 1999, identified euro legacy currencies. [2] As a percentage of reserves.

Sources: IMF; BIS; authors' calculations. Graph 2

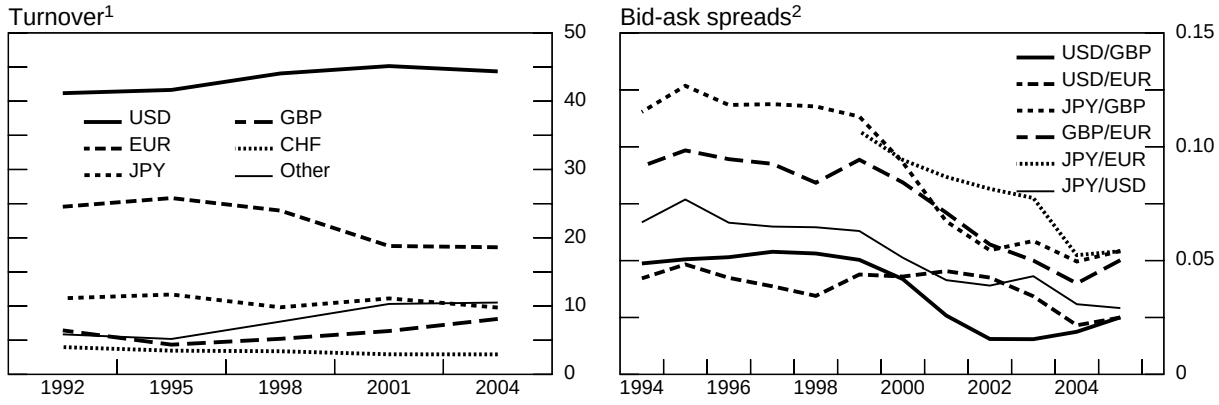
Currency composition of reserves

At market value, as a percentage of total allocated foreign currency holdings



Sources: IMF; BIS; authors' calculations. Graph 3

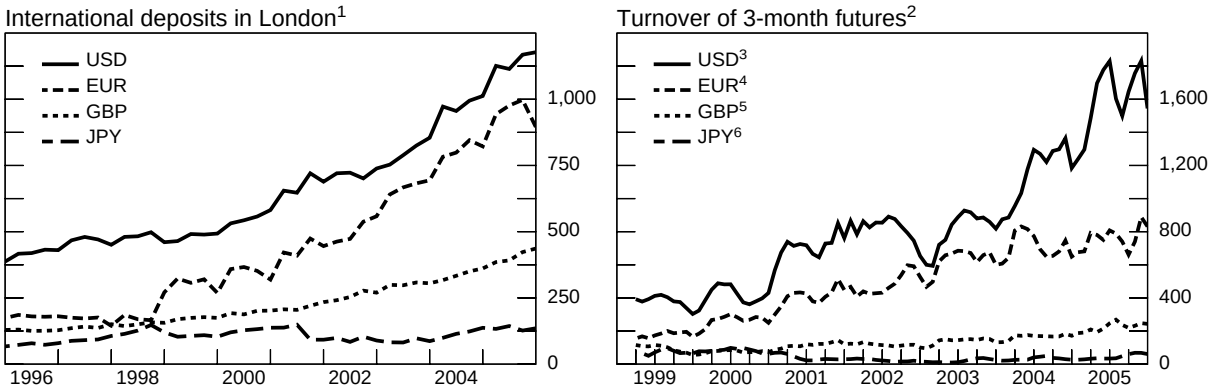
Foreign exchange markets



[1] Turnover in a given currency as a percentage of total turnover in all currency pairs; based on average daily turnover in April. [2] Annual averages.

Sources: BIS; Datastream; national data; authors' calculations. Graph 4

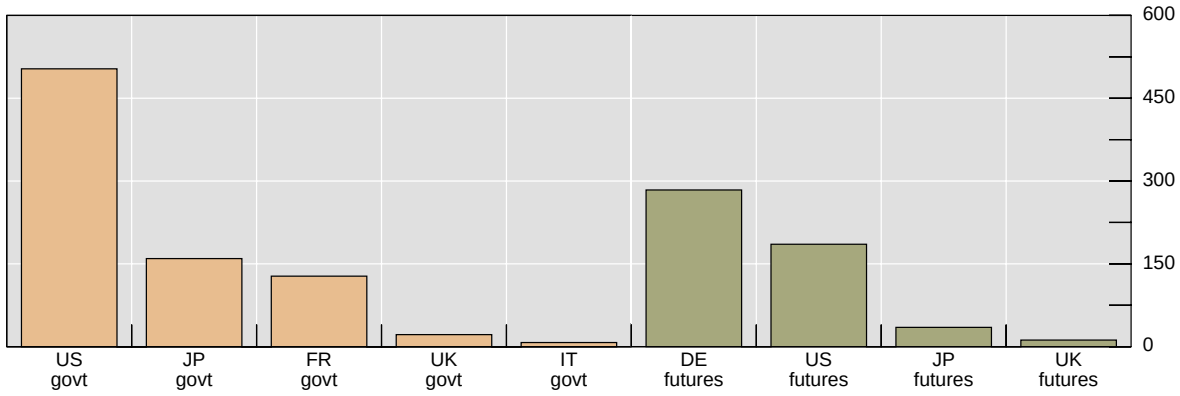
Eurocurrency markets



[1] Outstanding liabilities to non-residents of commercial banks located in the United Kingdom, excluding inter-office positions; in billions of US dollars; amounts in other currencies are converted to US dollars at end-2005 exchange rates. [2] Daily turnover in billions of US dollars; 3-month moving average; volumes in other currencies are converted to US dollars at end-2005 exchange rates. [3] Eurodollar contracts traded on the Chicago Mercantile Exchange. [4] EURIBOR contracts traded on the London International Financial Futures and Options Exchange (LIFFE). [5] Short Sterling contracts traded on LIFFE. [6] Euroyen contracts traded on the Tokyo International Financial Futures Exchange and the Singapore Exchange.

Sources: BIS; FOW TRADEdata; Futures Industry Association; authors' calculations. Graph 5

Turnover in government bond and futures markets[1]

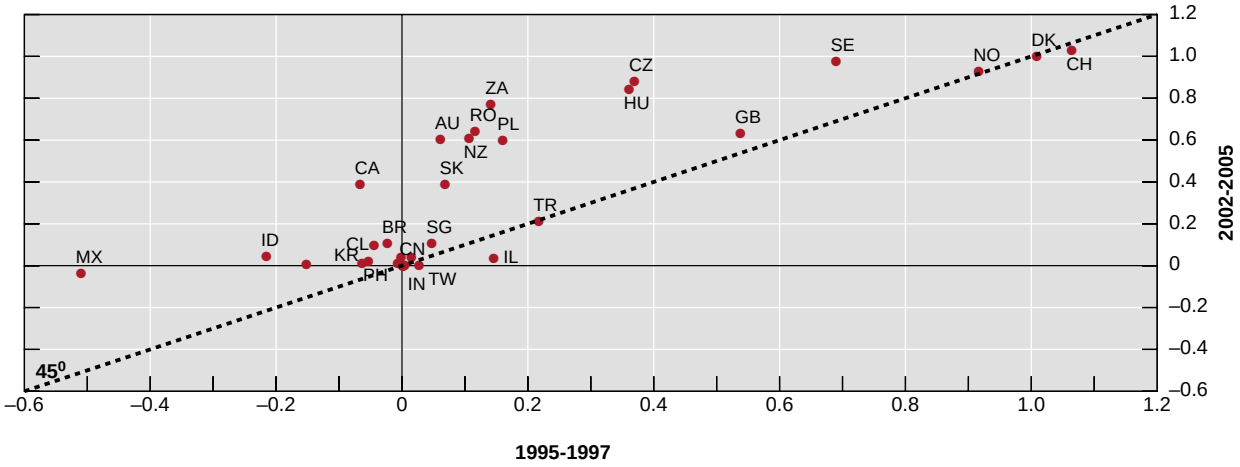


Notes: US govt = US Treasury coupon securities and inflation-linked bonds; JP govt = Japanese government medium- and long-term bonds; FR govt = French government bonds (OATs); UK govt = UK government securities, excluding Gilts with a remaining maturity of one year or less; IT govt = Italian government securities; DE futures = Schatz, Bobl, Bund and Buxl contracts traded on Eurex; US futures = US Treasury note and bond contracts traded on the Chicago Board of Trade and Eurex US; JP futures = Japanese government bond contracts traded on the Tokyo Stock Exchange, Singapore Exchange and LIFFE; UK futures = Long Gilt contracts traded on LIFFE.

[1] Average daily turnover in 2005, in billions of US dollars; volumes in other currencies are converted to US dollars at end-2005 exchange rates.

Sources: BIS; FOW TRADEdata; Futures Industry Association; Japan Securities Dealers Association; national data; authors' calculations. Graph 6

Exchange rate sensitivities with respect to dollar/euro rate changes[1]

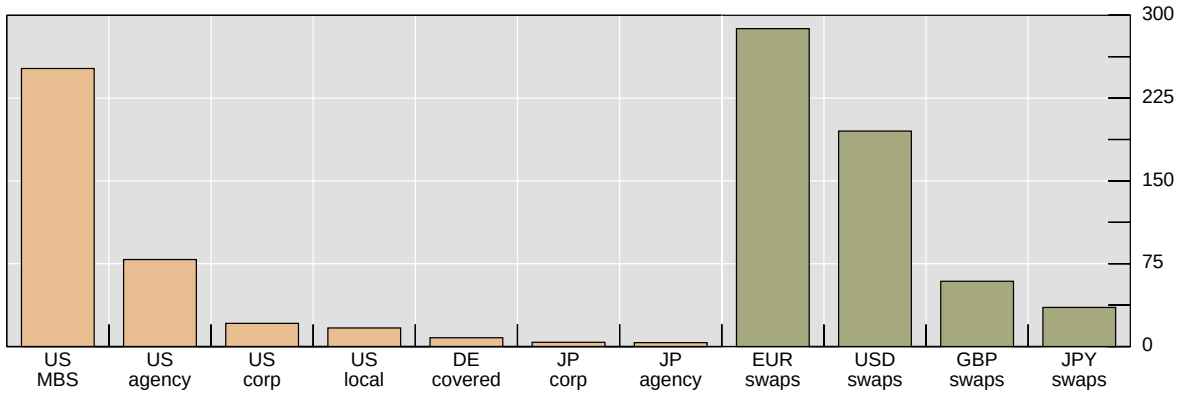


Notes: AU = Australia; BR = Brazil; CA = Canada; CH = Switzerland; CL = Chile; CN = China; CZ = Czech Republic; DK = Denmark; GB = United Kingdom; HK = Hong Kong; HU= Hungary; ID = Indonesia; IN = India; IL = Israel; KR = South Korea; MX = Mexico; MY = Malaysia; NO = Norway; NZ = New Zealand; PH = The Philippines; PL = Poland; RO = Romania; RU = Russia; SA = Saudi Arabia; SE = Sweden; SG = Singapore; SK = Slovak Republic; TH = Thailand; TR = Turkey; TW = Taiwan; ZA = South Africa; dots near the origin for which the country name has not been plotted are: Hong Kong, Thailand, Malaysia, Saudi Arabia and Russia.

[1] Data points represent the coefficients in the regression of the dollar exchange rate of a currency on a constant, the dollar/mark (euro) and dollar/yen exchange rates, estimated with daily data over the periods shown. All exchange rates are taken at New York noon time except for: Indonesia; the Philippines, Turkey, Israel, Chile and Saudi Arabia.

Sources: IMF; BIS; authors' calculations. Graph 7

Turnover in non-government bond and swaps markets[1]



Notes: US MBS = mortgage-backed securities issued by US agencies; US agency = corporate bonds issued by US federal government agencies and government-sponsored enterprises; US corp = US corporate bonds, excluding agency issues; US local = US municipal government bonds; DE covered = Pfandbriefe, based on dealers' estimates; JP corp = Japanese bank debentures and corporate bonds; JP agency = Japanese government-guaranteed bonds and FILP-agency bonds; EUR, USD, GBP and JPY swaps = interest rate swaps.

[1] Average daily turnover in 2005, in billions of US dollars; volumes in other currencies are converted to US dollars at end-2005 exchange rates; for swaps, turnover in April 2004.

Sources: BIS; Bond Market Association; European Mortgage Federation; Japan Securities' Dealers Association; national data; authors' calculations. Graph 8