The international role of the euro[1]

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1. Issues

1.1. Introduction

The introduction of the euro in 1999 coincided with a surge in globalization. Trade has continued to grow, and cross-border capital flows have risen much faster. There has been widespread financial liberalization, while companies have outsourced many operations abroad. Turnover in securities and foreign exchange markets has risen dramatically, as have cross-border asset holdings. The past decade has also been marked by growing current account imbalances that have led to a massive accumulation of foreign exchange reserves. This paper assesses the euro's current role in the international financial system.

Reserve accumulation, the expansion of capital and trade flows, the prolonged US current account deficit and the trade surpluses in many developing economies are closely linked. Thus understanding the driving factors and consequences of the euro's role in international markets may shed light on some of the most controversial issues in international economics. For example, portfolio shifts from dollar-denominated assets to those denominated in the euro and other main currencies could significantly affect exchange rates and the status of the dollar as the dominant international currency..

A portfolio shift could come from private investors, central banks, or both. The consequences would go beyond exchange rates. For example, if the dollar were to lose part of its international status, this would reduce the "exorbitant privilege" of the United

[1] This paper draws heavily on joint work with Elias Papaioannou, in which we benefited from excellent research assistance by Matteo Bobba and Kai Trümpler..

States, which has been able to finance large and prolonged current account deficits in its own currency and to maintain higher returns on its foreign-currency assets than foreigners achieve on their dollar assets (Gourinchas and Rey, 2007). In addition, both economists and international relations scholars have argued that the international dominance of the dollar is a key foundation for American foreign policy and geopolitical as well as economic dominance.[2] The converse, that US geopolitical strength underpins the international role of the dollar, is also widely believed.

1.2. Globalization Fact I: Increase in Trade and Financial Openness

International currencies are used in the trade of goods, services, and financial assets. Traded goods and services are usually denominated in the currency of the exporter or the importer. Yet when one or the other of the two counterparties has a 'small' or volatile and risky currency, then often one of the major international currencies is used for trade invoicing. A similar pattern applies in asset trade. For example, most emerging market economies tend to borrow from the international capital markets in foreign currency, because the interest rate will be lower. Thus the global stock of financial assets is overwhelmingly denominated in those same international currencies. Cross-border trade and asset transactions generate customer-dealer transactions in the foreign-exchange markets. Those in turn give rise to large volumes of inter-dealer transactions in the foreign-exchange markets. So the accelerating globalisation over the past two decades, the strong rise in trade and financial integration, has affected the functioning of currencies in the international markets.

As Figure 1 shows, international trade has expanded over the past decades globally. The United States, Japan and the United Kingdom have seen only moderate increases in the importance of international trade relative to GDP since the early 1990s, while the euro

[2] For a recent comment, see David Hale in *Financial Times* 23 November 2007 ('The great irony is that Washington's effort to slow the rise of China threatens to undermine one of the foundations of US economic power – the dollar's reserve currency status.'). The dollar is also seen as a major element in American 'soft power' (the term is from Joseph Nye 1990, 2004). See 'Is the dollar losing its lustre?', BBC 21 November 2007, at http://news.bbc.co.uk/1/hi/magazine/7103342.stm.

area, other industrial countries and developing countries have experienced a fairly rapid growth of trade. International financial flows, however, have grown at a remarkable pace in the past 15 years, and for industrial countries as a whole, much faster than trade in goods and services (Figures 2 and 3). For example, external bank assets and liabilities have grown more than fourfold since 1990 (Figure 4), while cross-border portfolio investment more than doubled from 2001 to 2005 (IMF, Coordinated Portfolio Investment Survey; see also Figure 5).

The foreign exchange markets have also expanded dramatically. Total turnover in April 2007 was USD 3.2 trillion/day, up 270% since 2001 (which was somewhat smaller than 1998, partly because the euro eliminated intra-EMU forex trading) (Figure 6). The increased turnover in forex markets has been accompanied by increased international use of derivatives and other structured products.

The message from these data is clear: the *international role of currencies today must be more closely related to financial flows than to trade flows*, relative to even fifteen years ago. And if we go back further, it is only in the period 1870-1913 that international financial flows had the same importance relative to trade that they did in the mid-1990s. Now, the dominance of financial flows and the importance of cross-border financial asset holdings have no precedent. And unless the financial crisis provokes a strong anti-globalization backlash, the international financial integration underlying these flows is unlikely to be reversed – the underlying fundamentals are too strong: technical progress in information and communications technology; financial deregulation and liberalization; increased efforts to protect investors (hedging); a significant fall in transaction costs; and the recognition by investors that 'home bias' means sacrificing better risk-return combinations (Ferguson, *et al.*, Chapter 6).

1.3. Globalization Fact II: Global Imbalances

The expansion of international financial markets has permitted countries to run current account deficits at levels that were not possible in the Bretton Woods period, when capital flows were heavily restricted. That is true regardless of whether current account deficits and surpluses 'cause' the capital flows, or the reverse. These large current account deficits and corresponding surpluses are often called 'global imbalances'. The euro area has shown small surpluses and deficits, but the United States has run a very large current account deficit since the late 1990s (see Figure 7).

There are of course other countries that have run large and persistent deficits (*e.g.*, Australia, New Zealand, Hungary, Turkey, Iceland,…), with corresponding surpluses elsewhere (China, Japan, oil exporters, …). It is *unprecedented, however, that the main international currency is that of a country in substantial, continuing deficit, with a large negative net international investment position*.[3] When sterling was the dominant international currency, in the period prior to 1914, the UK borrowed short and lent long, as the US does now. But it was a substantial net creditor and ran a large current account surplus, because its investment income was so high.

The US current account deficit generates foreign reserve accumulation in dollars. Foreign central banks must then decide how to invest those reserves, insofar as the private flow of capital to the US does not absorb them. Two questions arise: how far is the deficit sustainable, and what will be the allocation across currencies of the foreign surpluses.

The consensus view among international macroeconomists is that the US deficit is not sustainable, and a correction will be required, with an associated adjustment of exchange rates (*e.g.*, Eichengreen, 2006, although see the discussion of alternative views below). The dollar will have to depreciate further (Obstfeld and Rogoff, 2005), whether the

[3] Both the euro area and the United Kingdom also have negative NIIP, but of a much smaller magnitude than that of the United States.

depreciation is gradual (Blanchard *et al.*, 2005) or possibly abrupt (Krugman, 2007). The dollar's depreciation may be moderated by the valuation effect that gives the US a net capital gain with depreciation, because its assets are denominated primarily in other currencies and its liabilities in dollars (Gourinchas and Rey, 2007). While a dollar depreciation will help close the large trade deficit and mitigate global imbalances, a substantial depreciation could threaten the dollar's international status (Chinn and Frankel, 2007, 2008, discussed below). Conversely, a major portfolio switch out of dollars by foreign exchange reserve holders or private investors would accelerate the depreciation. And the US Federal Reserve might not be able to prevent the dollar's depreciation, as its reserve holdings are small compared to the dollar assets held in the international markets.

1.4 Globalization Fact III: Reserve Accumulation

There has been a remarkable accumulation of foreign exchange reserves in recent years. At the end of 2007 the stock of reported international foreign exchange reserves was 6.4 trillion dollars, up from 2.4 trillion dollars at end-2002. Total reserve holdings are even higher, since an increasing amount is held outside central banks and official monetary authorities in so-called "sovereign wealth funds" that aim to invest in non-traditional reserve assets (see Sec. 2.1.2 below). Market estimates of reserves in such funds are 2.5-3.0 trillion dollars, suggesting that the current stock of total international reserves is at least nine trillion dollars.

The increase has been driven primarily by the emerging and underdeveloped world. While in the 1990s, industrial and developing countries were holding roughly equal amounts of reserve assets, at the end of 2006 developing economies held roughly 70% of the total.

The demand for low-risk foreign reserve assets has been driven mainly by large emerging economies, such as China, Brazil and India and oil-exporting countries, such as Russia,

Mexico, and the Gulf states. Among the ten countries with the largest reserve holdings, only Japan and the combined euro area are from the industrial world. The People's Bank of China now holds just under two trillion dollars of foreign exchange reserves, while the Bank of Japan manages one trillion dollars of foreign assets. The third largest country in reserve holdings is Russia, with 500 billion dollars in reserves (up fourfold from December 2004). The rest of the top-10 list includes mainly East Asian countries (namely Taiwan, South Korea, India, Singapore, and Hong Kong) and Brazil.

There are several reasons behind the vast reserve accumulation. On the demand side, following the financial and currency crises of the 1990s in East Asia and Latin America, many developing countries have accumulated foreign assets as a precaution against future speculative attacks, sudden stops and massive capital outflows (Feldstein, 1999).[4] Second, some East Asian countries pursue export-led growth policies, which may involve maintaining undervalued currencies and accumulating reserves (Dooley, Folkerts-Landau and Garber, 2003, 2005). Third, the recent increase in oil (and some other primary commodity) prices has accelerated the accumulation of reserves in the Gulf States, Russia, and the other oil-producing countries. Fourth, financial underdevelopment and other institutional frictions (such as low levels of investor protection or weak property rights) in developing countries hamper the channelling of savings to domestic investment. The excess savings go to the countries with developed financial markets (Caballero, *et al.*, 2006; Caballero, 2006).

From the supply side, the main factor is the US current account deficit. If the current account deficit stems from low US savings and rising US demand for foreign goods (Blanchard, Giavazzi and Sa, 2005; Blanchard, 2007) the exchange rate will eventually have to adjust. According to Caballero *et al.* (2007) and Mendoza *et al.* (2007), however, this need not be the case, since the high sophistication of US financial intermediaries enables the US (and to a lesser extent the UK and some other industrial countries) to

[4] Reserve accumulation in East Asia is linked to sovereign risk concerns, which increase in periods of huge financial flow volatility (Aizenmann and Marion, 2003; Aizenmann and Lee, 2007).

finance large current account deficits, because of their ability to offer appealing financial assets to global investors.[5] This argument is now less plausible, at least for the medium term, since the financial turmoil since August 2007 has revealed the weaknesses of many of these assets and the financial engineering behind them. Moreover, the developing world might in any case prefer investing in assets of other industrial countries that offer superior returns and have appealing diversification (hedging) properties. The fall of the dollar from 2002 until the recent 'safe haven' rebound has clearly illustrated that the cost of investing in only one currency does carry some risk, no matter how strong the underlying economy.

1.5. Financial History

The dollar did not figure at all as an international currency before 1914, although the US weight in world output and trade would have justified parity with the UK and precedence over France and Germany. The reason carries an important lesson for the role of the euro a century later. The key obstacle to the rise of the dollar in the *international* financial system was the absence of broad, deep and liquid *domestic* financial markets.

Paul Warburg and others perceived that there were benefits ('denomination rents'[6]) that accrued to the banking centre of the issuer of an international currency. He linked financial reform – in the guise of the Federal Reserve Act of 1913 – to promotion of the dollar in competition with sterling and other international currencies. With the promise of gains for the New York money centre banks, he enlisted their financial and other support for the major lobbying effort which was necessary to overcome populist opposition to

[5] An additional factor, but of lesser importance, is the decision of many industrial countries (*e.g.* the Netherlands, the United Kingdom, Switzerland) to substitute interest-bearing assets for reserves held in gold. Furthermore, there might be some country-specific reasons for reserve accumulation. For example, it is argued that the Chinese government is accumulating foreign capital as a hedge to its fragile government controlled banking system (the Chinese central bank has already injected $60 billion of its reserves to recapitalize state-owned banks).

[6] Swoboda (1968); see also Tavlas (1991), Cohen (1971), Frankel (1995).

institutional changes that were widely seen to favour Wall Street over Main Street.[7] That opposition accounts for the highly decentralized structure of Federal Reserve System governance that may indeed have hindered effective response to the monetary disturbances beginning in 1929. Federal Reserve monetary policy decision-making has since become much more centralised in the Federal Open Market Committee, and some argue that this has implications for European Central Bank (ECB) governance today.[8]

1.6. Intellectual History

Following the design of the European Monetary Union (EMU) plans in the early nineties (and even earlier) there was a lively debate on whether the euro would challenge the dollar as the main international currency. Some argued that the euro could become a major international currency (Alogoskoufis and Portes, 1991, 1992, 1997; Portes and Rey, 1998; Bergsten, 1997). The dominant view, however, held that the euro's international impact would be small, maybe somewhat larger than that of the Deutsche mark, but by no means a threat to the dominance of the dollar (*e.g.*, Frankel, 1995; Eichengreen, 1998). Others argued that the euro's emergence in the international financial system would be very slow (Hartmann, 1998a,1998b), and some expressed strong scepticism regarding the sustainability of EMU (*e.g.*, Feldstein, 1997).

Portes and Rey (1998) shifted the emphasis of the discussion from goods markets to financial markets. ('The internationalisation of the euro will depend mainly on the liquidity of the euro financial markets.' p. 315) Their analysis set out several scenarios, which formally were multiple equilibria in a calibrated three-region model that identified feasible configurations in the light of transaction costs in securities and forex markets. The key roles for the international currency were that of the vehicle currency in foreign exchange markets and the dominant currency in financial market transactions. The two

[7] This explicit recognition a century ago of the private benefits of running an international currency is well documented by Broz (1999).
[8] See Faust (1996) and the application to EMU in Dornbusch *et al.* (1998).

scenarios they found most plausible were '*quasi status quo*', in which the euro replaces the dollar in Europe-Asia securities transactions; and the 'medium euro', in which the euro also takes the dominant role in financial market exchanges between Europe and the US. The 'big euro', in which the euro takes over the vehicle currency role, might also be feasible, but appeared unlikely. They concluded that 'the most likely outcome is that the dollar will have to share the number-one position…depend[ing] on policy decisions and on the beliefs of market participants.' (pp. 308, 310) Structural reforms (in particular, in financial markets) would be necessary to move beyond the *quasi status quo*, and 'the willingness of the ECB not to hinder internationalisation…[as well as] UK participation' would be critically important. Their time frame for all this was 'five to ten years'.

The early analysis of Alogoskoufis and Portes correctly identified the issues, but with inadequate emphasis on financial markets, and foresaw a major role for the euro as an international currency, although they believed that inertia was likely to maintain dollar dominance. Feldstein overstated by far the political and economic vulnerabilities of EMU. Bergsten believed wrongly that a massive portfolio shift towards the euro was likely in the fairly short run, and Portes and Rey also thought this was a serious possibility. Hartmann was right to believe that the euro would not soon challenge the dollar's dominance as vehicle currency in the forex markets, but he underestimated the speed of financial development accompanying EMU and the EU Financial Services Action Plan (which was not introduced until after he wrote). Frankel has since 1995 changed his view, in the light of changes in the data (see Chinn and Frankel, 2007, 2008, who now suggest that the euro could pass the dollar in central bank reserves by 2015).

Regarding the conditions set by Portes and Rey, financial market reforms have been extensive, though so far weak in regard to some aspects of cross-border transactions (especially clearing and settlement); the UK has not joined EMU; and the ECB has been less than enthusiastic about internationalisation of the euro. Nevertheless, the euro's status as the second reserve currency is confirmed (and has expanded), and the euro has progressed fairly steadily in the other dimensions of international currency status,

especially in the financial markets. The ‘medium euro’ scenario now seems the most likely development over the next several years, although a major shock could result in the ‘big euro’ configuration.

1.7. The Functions of an International Currency

The figure below from Kenen (1983) is the standard summary of the functions of an international currency. Money is used by governments, firms and individuals, as a store of value (in investment, for example), as a medium of exchange (in international trade, for example) and as a unit of account (quoting commodity prices, for example). For analytical purposes, we will use it to structure our discussion below. Yet it should be stressed from the outset that there are strong links among these functions, so they cannot be understood in isolation.

Function of Money	Government	Private Agents
Store of Value	International Reserves	Investment Currency (incl. currency substitution)
Medium of Exchange	Vehicle Currency for Foreign Exchange Intervention	Invoicing (vehicle) currency for trade in goods and assets.
Unit of Account	Anchor for currency peg	Quotation currency for trade in goods and assets.

For example, the choice of international *reserve* currency is now thought to depend on currency stability (inflation rate, exchange rate – see Chinn and Frankel, 2007) as well as the size of the economy and the country's role in world trade (Eichengreen and Mathieson, 2000; Dooley *et al.* 1989). Portes and Rey (1998) argue that the use of the vehicle currency for intervention plays a major role in determining the composition of reserves. In the choice of vehicle currency, they stress the underlying *financial market determinants*: the size, depth and liquidity of the issuing country's financial markets, the latter being measured by transactions costs in foreign currency and bond markets, as represented by bid-ask spreads. And these are of course important in the choice of investment currency – this is the interaction of asset and vehicle currency roles referred to above (see also Dwyer and Lothian (2003) and Tavlas (1998)).

Others stress the medium of exchange and unit of account functions for private users of the international currency. The literature on invoicing is scant, primarily because the data

are limited (see, however, Goldberg (2007), as well as Kamps (2006)). Another aspect of firms' behaviour, almost totally ignored by the existing international currency literature, is hedging. Here we have an important new paper by Campbell *et al.* (2007), which relates also to the central bank optimizing behaviour studied by Papaioannou *et al.* (2006, 2007). These studies offer some evidence that the importance of the euro in mean-variance portfolios is increasing. Some analysts believe that the currency of invoicing of raw materials, especially oil, plays a major role in international currency status (Toloui 2007, also discussed by Hartmann, 1998b).

1.8. The determinants of currency internationalisation

The dollar has been the main international currency during the post war period. The Bretton Woods agreement established its 'key currency' role in the fixed exchange-rate system. Most international trade transactions were held in dollars; the dollar was used even when neither the importing nor the exporting party was a US resident. The dollar was the dominant currency in international foreign exchange reserves and the main forex market intervention currency, and even after the breakdown of the Bretton Woods exchange-rate system, most countries outside Europe were explicitly or implicitly pegging their currencies to the dollar.

The continuing dominance of the dollar was usually explained with theories of "network externalities" that arise from the use of a single currency in the international financial system (Rey (2001), Zhou (1997), and Matsuyama, Kiyotaki, and Matsui (1993)). An economic agent (individual, corporation or government) is more likely to use a particular currency in the goods or asset markets if others are also using this money. Dollar dominance was strengthened since the US was by far the largest economy, and the Deutsche Bundesbank was unwilling to see a rising role of the Deutschemark. In addition, inertia might arise from legal and administrative restrictions in the operations of the central banks or big banks (Truman and Wong, 2006). On the other hand, the introduction of the euro offers an alternative to the dollar. Its use (at least as a pegging or

'anchor' currency) by other countries may create new network externalities that partly counterbalance those associated with the dollar.[9]

Network externalities give a strong argument favouring the use of a single currency in the international financial system; yet there is an inherent trade-off between holding assets in just one currency and *diversifying risk* among other monies. Although the literature has recognized this trade-off, the argument was that market size and liquidity were too low and transaction costs too high in other currencies. While this was indeed the case throughout the postwar period, it is no longer so. There is now a viable alternative to the dollar as an international currency: the euro.

The empirical literature has also tried to identify the underlying factors that give rise to an international usage of a currency (*e.g.,* Eichengreen and Mathieson, 2001; Dooley *et al.*, 1989; Chinn and Frankel, 2008). First is economic strength and market size. Since the end of the Second World War, the US economy has been by far the largest in the world. In addition the U.S. was the main trading partner for most countries, absorbing most of global exports. Now, however, the euro zone is comparable with the American economy in terms of GDP and trade openness. The euro area may soon become even larger, when the non-eurozone EU members join in. During the 1990s the US economy grew faster than the EU countries. In the late nineties growth was similar across the Atlantic. The dot-com crash and the 9/11 crisis had less sharp but more prolonged negative effects on euro-area countries than on the US.[10] Still, the evidence is not clear. For example, GDP per capita has grown just as fast in the euro zone as in the US since 1999 (IMF, *World Economic Outlook* 2008, Table B1).

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[9] Bobba *et al.* (2007) interpret their results in this way. Note that they find a significant euro anchor currency effect on securities issuance only for developing countries – this may be related to the observation that developing country reserves have shifted towards euros more rapidly than those of developed countries.

[10] See, for example "Economic Forecast Spring 2008", European Economy 1/2008, Directorate General for Economic and Financial Affairs, European Commission. There is little reliable evidence on total factor productivity growth rates for the euro zone (although the literature on the EU as a whole suggests a productivity slowdown since the mid-1990s, while TFP growth in the US accelerated for several years – Gordon and Dew-Becker, 2008).

Many argue that the dynamism and flexibility of the US economy and a supposed ECB 'anti-growth bias' give an edge to the dollar (e.g. Posen, 2007a; Cohen, 2007). But the data do not support the view that ECB monetary policy has been unduly restrictive, with negative consequences for economic growth. On the other hand, the U.S. product, labor, and capital markets are less regulated than those in Europe, and this tends to speed productivity growth by enabling the fast reallocation of resources to firms and sectors that face good prospects (see among others, Caballero et al. (2004); Ciccone and Papaioannou (2007, 2008) and Fisman and Love (2004, 2007)). Yet recent evidence shows that the introduction of the euro has led to an acceleration of reforms in the product markets (Alesina, Ardagna, and Galasso, 2008) and financial sector (e.g. Hartmann, *et al*. 2007). These policies foster macroeconomic flexibility and will most likely have positive medium-term consequences for productivity growth.

Second, currency internationalization is positively associated with low inflation and exchange rate stability. The ECB has managed to keep inflation quite low and has effectively signaled to the markets that price stability is its primary objective. In addition the exchange-rate volatility of the euro and the dollar against most other currencies is similar. Most importantly the negative current account position of the US raises serious concerns of a future dollar depreciation. While the US current account deficit has long surpassed 5% of GDP, euro area trade has been close to balanced.

Third, broad, deep and efficient financial markets are also key determinants of currency international usage. The integration and development of euro-area financial markets since 1999 has been substantial. For example, bid-ask spreads in euro-denominated bonds and equities are comparable with those of the US. While the US does offer some alternative assets, such as mortgage and asset-backed securities, recent events have reduced their attractiveness, and the euro area now offers a wide variety of financial instruments.

Fourth, although hard to quantify, political power also contributes to currency internationalization. Indeed before the introduction of the euro many were skeptical of its prospects, pointing out the potential political economy conflicts between euro area member states (e.g. Feldstein, 1997, 1999). While the euro area is still a group of independent nation states, the likelihood that a member state would decide to abandon the euro zone and pursue independent monetary policies is very small indeed (see Eichengreen (2008)). Moreover, euro area countries are politically tied through the European Union (EU) political and economic institutions. That is unlikely to change in the foreseeable future. In addition many academics, commentators, and politicians argue that US geopolitical strength has declined significantly since the turn of the century.

The ECB has kept inflation expectations low, minimizing fears that it might abandon the anti-inflationary tradition of the "core" countries. Meanwhile, the dollar has depreciated substantially against the euro since early 2002, even allowing for its recent rise. Trading costs in the euro forex markets are almost zero. Furthermore transaction trading costs in the currencies and short-term notes of several other economies have fallen drastically, making diversification cheaper and thus more attractive.[11] The integration and development of euro-area financial markets since 1999 has been substantial. The US deficits raise fears of a “hard landing” and thus make diversification to other currencies even more appealing. We cover these issues in detail below.

Whatever the fate of the Lisbon Treaty, the constitutional status of the EU is unlikely to change significantly in the foreseeable future. There will be no ‘United States of Europe’. But many academics and politicians argue that US geopolitical strength has declined significantly since the turn of the century. There may be no President of the euro area, but the US President is an unlikely and enfeebled defender of a strong and internationally dominant dollar.

[11] See Detken and Hartmann (2000, 2001), Hau *et al.* (2001, 2002), and Papaioannou, *et al.* (2006) for details on the evolution of bid-ask spreads in forex markets following the introduction of the euro. After a brief period of contradictory movements in the euro markets, these spreads have fallen dramatically over the past six years.

The analysis that follows is based on the simple taxonomy in Sec. 1.7, although it stresses the interrelations among the international currency roles. In the next section we analyze government use of the euro, mainly in international reserves and as an anchor currency. In Section 3 we turn to the private sector use of the euro, covering the impact of the single European currency in international trade, security issuance, and invoicing. Section 4 discusses the extent to which the euro area has taken on the role of the US as 'world banker'. In Section 5 we turn to political economy considerations. Section 6 concludes.

2. Government Use

2.1. International Reserves

2.1.1. Trends in Reserve Management

Around two-thirds of global central bank foreign exchange reserves are in US dollar assets, mainly in short-term Treasury bills and agency debt. About one fourth is in euro-denominated securities, while the yen, the pound sterling and the Swiss franc play a considerably smaller role. Table 1 illustrates this. The Table reports the shares of the main international currencies in international allocated reserve holdings, as communicated by the IMF in its Annual Report. A limitation of the IMF data is that the currency composition does not cover all of the official reserve holdings, since most East Asian central banks (including China) do not report this information to the IMF. In addition, the data do not cover assets held in sovereign wealth funds.

The share of the dollar in international reserves increased over the 1990s, partly reflecting the initial uncertainty regarding the EMU project and the reserve accumulation of emerging economies after the crises of the nineties. It has since fallen back, but there is clearly considerable inertia in these data.

Theories of network externalities usually feature multiple equilibria, however, suggesting that there might be an abrupt switch between equilibria if expectations change, in particular if there are high elasticities of substitution between assets denominated in the different major currencies. Those who foresee a moderate and gradual adjustment contend that most central banks with large reserve holdings, especially those in East Asia, wish to maintain exchange-rate stability relative to the dollar (Bretton Woods II, see Dooley *et al.*, 2005). That in turn supposedly implies accumulating dollar-denominated reserves.[12]

[12] Eichengreen (2005) and Roubini (2007) argue that Bretton Woods II is unstable and will break up sooner rather than later. In contrast Rose (2007) argues that the Bretton Woods II system is inherently more stable that the original Bretton Woods system.

The Bretton Woods II story runs in parallel with Caballero's (2006) 'global asset shortage' argument, noted above, according to which both central banks and the private sector outside the United States have no alternative but to put their excess savings into dollar-denominated assets. This is because emerging economies do not have efficient financial intermediaries to transform savings into investment. The argument further maintains that the US has a comparative advantage in transforming fixed assets into securities, *i.e.* in issuing tradeable claims, and the US capital markets are significantly more attractive than elsewhere (Rajan 2005 and Mendoza *et al.* 2007 take similar views – see the discussion in Ferguson *et al.*, 2007, Ch. 3.3).

It is not clear, however, even on the Bretton Woods II hypothesis, why the central banks should buy only dollar-denominated assets. The euro area is nowadays a trading partner comparable to the US market for China, India and other emerging economies with large reserve holdings. And the relative depth and liquidity of euro-denominated asset markets is increasing, as we discuss below. Moreover, there are various shocks that could reverse the pattern modelled by Caballero *et al.* (2007): an acceleration of growth in Europe and Japan, with a deceleration in the US; accelerated financial development in Asia, and a shift in Asia's appetite for its own financial assets; a credit-risk concern with growing US liabilities; a fall in Asian savings (see Ferguson, *et al.*, 2007, Ch. 3.4.2); and the medium-term fallout from the current financial crisis.

Traditionally foreign exchange reserves were held in highly liquid (mainly short-term) US assets. The primary consideration of central banks is wealth preservation and liquidity in turmoil periods; in addition, during the period 1945-1971, reserves were mainly used for intervention purposes. Yet the massive accumulation of foreign reserves is exerting pressure on central banks to seek alternative investment assets and to diversify. There are two main issues. First, should the central banks move away from government securities and invest in riskier assets? Second, should central banks diversify away from the dollar and invest in securities of other industrial countries?

2.1.2 Diversification across asset classes and currencies

The historically low yields in US and in other industrial countries' government securities are pushing central banks to consider investing in alternative assets, such as corporate bonds, hedge fund composites, derivative products, even equity. For example, it has become clear that some central banks invested heavily in US mortgage-backed securities. In addition central banks are steadily increasing the duration of their portfolio, moving away from short-term money market instruments and T-bills to medium- and long-term government securities.

The sovereign wealth funds of countries such as Norway, Singapore, South Korea and Russia explicitly aim to pursue active asset management strategies in an effort to increase returns. The China Investment Corporation began in summer 2007 with 200 billion dollars and a clear mandate to invest in a range of securities, including illiquid non-voting shares. In addition, an increasing number of central banks now consult asset managers in an effort to increase the return-risk profile of their investment (see for example Gmuer and Carvegn (2003)). Royal Bank of Scotland's survey (RBS, 2007) suggests that reserve managers have recently started investing in riskier and longer-maturity securities. For example, more than half of respondents believe that they should be able to invest in equities, although in many countries this is not permitted. Furthermore, many central bank managers also believe that they should be able to invest in commodities other than gold. The massive reserve holdings and the nice return-volatility characteristics of some alternatives push central banks further away from traditional instruments.

The issue that has received most attention is whether central banks will shift away from the dollar, allocating an increasing amount of their reserves to the euro and possibly some other industrial countries' currencies. The main message of Table 1 is the high inertia in the currency composition of global reserves; yet there are some noteworthy dynamic patterns. First, the share of the dollar has fallen somewhat from 70% (in 1998-2002) to 65% (at end-2006). While this is partly driven by the recent weakening of the dollar, it

suggests that central banks may be willing to reduce their exposure to the US currency (by passive reserve diversification).[13]

The Chinese authorities do not disclose the composition of their reserves, but market estimates suggest that the share of the dollar is currently between 65% and 75%. Setser (2007) argues that China raised the share of the dollar from around 65% to around 80% after the euro was introduced, then cut back and by 2006 held 72%-75% of its reserves in dollars.

Returning to the IMF global data, we see that following the initial period since its introduction in 1999, the share of the euro has increased to 25% (in 2002-2003) and since then has remained relatively stable.[14] The importance of the yen has fallen from 6% (in 2000) to roughly 3% (the share of the yen had reached 10% in the early nineties), most likely reflecting the structural problems of the Japanese economy and its financial sector and the low returns of yen short-term fixed-income assets. The share of the pound sterling has increased, probably due to the higher yields that UK money market instruments and government bonds offer to global investors.

The academic literature has used various approaches to explain the determinants of the currency composition of foreign exchange reserves.[15] Historical analyses (*e.g.* Eichengreen, 2005), surveys (RBS, 2005, 2006, 2007), case studies (ECB, 2005), regression-based work (*e.g.* Eichengreen and Mathieson, 2000; Chinn and Frankel, 2005), and other applied studies (*e.g.* Papaioannou, *et al.*, 2006) all tend to suggest that besides inertia, the following factors are key: the country's dominant invoicing currency in international trade, the currency of its foreign debt, the anchor currency (if the

[13] The share of the dollar in the eighties and the early nineties was around 50% (down from 70 % in the early seventies).
[14] Truman and Wong (2006) gather data from countries that release information on the currency composition of their reserves, and they document a gradual shift towards the euro in the period 2000-2004, mainly at the expense of the dollar and the yen.
[15] See Lim (2006) for a recent overview.

exchange rate is pegged or otherwise managed), as well as the diversification strategy of the central bank. In addition, although hard to measure, the development of the financial sector and political issues also appear to be important. As noted above, the US dollar played no international role until institutional changes created the basis of a modern financial system. The pound sterling established its position as the main international reserve currency during the Industrial Revolution, when the UK became the dominant imperial power. Likewise the pound weakened after the First and especially the Second World War, when the UK lost its political dominance to the US (see Eichengreen, 2005, for a recent historical overview).

Data limitations, the unwillingness of central banks to give information on their practices and the high inertia observed in aggregate data make it extremely hard to quantify the importance of each of these underlying factors.[16] The literature is also inconclusive on whether the international financial system will be dominated by a single currency or whether a multi-polar system with two (or more) currencies of similar importance is a likely scenario. While in most periods there was just a single dominant international currency, in some periods two currencies were of equal importance in the global financial system (the pound sterling and the dollar in the inter-war period, the pound and the Dutch guilder before the Industrial Revolution). In addition, since the decisions on the anchor currency or the currency of international debt and the share in international reserves are jointly determined, it is hard to establish causal mechanisms.

There is a high persistence in the currency composition of international reserve holdings. For example, the dollar has been the dominant currency over the past fifty years, while the pound sterling was the dominant currency throughout the 19th century. High inertia in the usage of currencies is also present in asset trade, the invoicing of international trade, and transactions in the foreign exchange market (see Hartmann (1998) for a general discussion). Econometric studies that regress the aggregate shares of each currency on

[16] In Table 2 we report the composition of foreign exchange reserves from selected countries that disclose this information.

various characteristics of the economy of the main international currencies – such as inflation, exchange rate volatility, financial depth, GDP, etc. – formally demonstrate the high persistence. Thus Chinn and Frankel (2007) report an autoregressive coefficient of 0.85-0.95 when they examine the determinants of the currency composition of global international reserves in the period 1973-1998 (they find similar results when they distinguish between industrial and developing countries).[17] While some other factors, such as size and exchange rate volatility are also significant factors, the bulk of the explanatory power comes from high inertia. The RBS surveys (RBS, 2003, 2005, 2007) also show that while respondents say that they have increased their exposure to the euro (and expect a further increase in the upcoming years) they believe that this change will occur gradually rather than abruptly.

Some empirical studies employ confidential (from the IMF COFER database) country-specific data on the shares of major international currencies in reserve holdings (*e.g.* Dooley, Lizondo and Mathieson (1989); Eichengreen and Mathieson (2000)). In contrast to work that uses global (reported) shares, these studies are able to identify which country characteristics correlate with the currency shares in reserve holdings. While there are non-trivial data issues, these studies formally show that the currency of the peg, the direction of international trade, and the currency of foreign debt are significant correlates of the currency shares of foreign exchange reserve holdings. These results appear very stable across periods and are very robust to various model permutations. This evidence also formalizes the strong regionalism in international reserve holdings. As trade and financial flows exhibit strong regional patterns and are quite sensitive to distance and information asymmetries (*e.g.* Portes and Rey, 2005; Lane, 2006; Aviat and Coeurdacier, 2007; Papaioannou, 2005), this yields a similar pattern in international reserve holdings. In Table 3 we report the currency composition of reserves for some central banks that reveal this information. The euro is dominant in non-euro-area EU countries, such as the Baltic states and the Balkans (Bulgaria and Romania), while its share in Latin America is minimal. The share of the euro is also high in countries that have strong trade and

[17] Bobba *et al.* (2007) also show high inertia in international debt issuance. They document autoregressive coefficients in the range of 0.75-0.85.

financial linkages with the euro area, such as Algeria, Norway, Switzerland, and countries to the east and southeast of the EU. Similarly, the dollar is dominant in Latin America and Australia.

Papaioannou, *et al.* (2006) quantify the potential gains from diversification across currencies, employing a finance-based approach. They develop a dynamic mean-variance currency portfolio optimizer with rebalancing costs to obtain the optimal global currency composition of a global central bank during the years surrounding the introduction of the euro (Fisher and Lie (2005) employ a similar though static and somewhat ad hoc approach; see also Codirla *et al.* (2006) and Dellas and Yoo (1991)). The authors study the five main international currencies, namely the U.S. dollar (USD), the euro (EUR), the Swiss franc (CHF), the British pound sterling (GBP), and the Japanese yen (JPY), to assess how the "optimal" share of the euro altered after 1999, compared to the optimal pre-1999 allocation to the three main euro predecessor currencies, the French franc (FFR), the Deutsche mark (DEM) and Dutch guilder (NLG). In the optimization they allow for various forms of dynamic correlations and serial dependence in the variance-covariance matrix of returns and make various assumptions (scenarios) about currency returns.

Papaioannou and co-authors start by performing the analysis for a global "representative central bank" and compare the estimated optimal currency shares with the reported aggregate reported shares. This enables them to construct a measure of currency internationalization, defined as the difference between the optimal and the actual allocations. Then they perform simulations for optimal currency allocations for four large emerging market countries, Brazil, Russia, India, and China (the BRICs), incorporating into the optimization framework constraints capturing central banks' interest in holding a sizable portion of their portfolios in the currencies of the peg, the foreign debt and international trade.

The analysis reveals some noteworthy results. First, the mean-variance optimisation yields unstable results. Small changes in the variance-covariance matrix or minimal perturbations alter the optimal allocations noticeably. In addition the optimal allocations change considerably across years; since the actual allocations do not, this suggests high rebalancing costs. The results also change depending on the various assumptions about expected currency returns. In addition, if the central banks could take short positions, the optimal allocation implies that they should apply "carry strategies" (*i.e.* shorting low yield currencies, such as the yen and the Swiss franc, and investing heavily in the pound-sterling that has the highest return).[18] This result may explain the high inertia in reserves and shows that while diversification is a theoretically plausible counter-argument to network externalities, it is quite hard to implement. Second, the currency optimizer can match the high allocation of the dollar in reserve holdings (about 65%) when the US currency is used as the base-reference currency (risk-free asset). Thus the high share of the dollar should not come as a surprise, since most central banks (even in industrial currencies) do express their returns in dollar terms. Third, the optimizer yields roughly equal allocations of about 10% to each of the four non-dollar currencies (the pound sterling, the Japanese yen, the euro, and the Swiss franc). Since the actual share of euro-denominated assets in global foreign exchange reserves is significantly higher (around 25%), this may be interpreted as tentative evidence of an increasing international role of the euro as a reserve currency. Fourth, the constraints reflecting the currency of external debt and international trade have a small effect compared to the reference currency in explaining the currency composition of reserves.[19]

2.2. Vehicle Currency for Foreign Exchange Intervention

A main reason behind the prominent role of the dollar in international reserves was its use for foreign exchange market intervention. Until the break-up of the Bretton Woods (I) exchange-rate system, most countries were anchoring their monetary policies to that of

[18] For details on the profitability of "carry trades", see Burnside, *et al.* (2007), and Burnside, *et al.* (2006), as well as Ferguson *et al.* (2007).
[19] In ongoing work (Papaioannou, *et al.*, 2008) we explore currency diversification, disaggregating across various assets within each country (currency).

the US, employing exchange rate arrangements that were targeting the level of the exchange rate, usually at a small band with the dollar. To minimize exchange rate fluctuations and keep the official exchange rate within the pre-announced band, the central bank had to hold adequate dollar reserves to be able to intervene in the forex market if there were pressure on the currency to depreciate. The potential need for forex market intervention also required central banks to hold most of their reserves in highly liquid, mainly short-term, assets and money market instruments.

In recent years there has been a gradual shift of monetary policy from targeting the level of the exchange rate to targeting inflation (*e.g.*, Mishkin (2007)). Rose (2006) concludes that inflation targeting appears more stable, and thus more appealing for both industrial and developing countries, than fixed-exchange-rate regimes. The increased tendency of many countries to shift their monetary policy to inflation rather than exchange-rate targeting and to let their currencies float makes foreign exchange market intervention less important in the conduct of monetary policy. Thus, while central banks will likely allocate a portion of their reserves for market interventions in turmoil or crisis periods, this fundamental policy change leads monetary authorities to consider alternative instruments and currencies to maximize the risk-adjusted returns of their portfolio.

2.3 Anchor currency

As discussed above, mean-variance (or the risk/variance minimization) approaches do not yield very stable results; yet the analysis in Papaioannou *et al.* (2006) illustrates that among the various factors that determine global currency allocation, the choice of the reference currency is quantitatively the most important factor. The intuition is simple. Since currency and bond returns among developed countries do not differ considerably, the optimal allocations are mainly driven by the variability of returns. The variance of bond returns across the main developed countries, however, is quite similar, and bond returns tend to be positively correlated among Europe, the US, UK, and Japan. Therefore, if a central bank pegs its currency vis-à-vis the dollar (or expresses its balance sheet in dollars) then returns in dollar-denominated assets (of any kind) will exhibit significantly

lower variability than returns in other currencies (just because returns in non-dollar assets will also incorporate exchange-rate variability). Thus the optimizer will naturally put a very high weight on dollar-denominated assets.[20]

To forecast the dynamics of currency shares in global central bank portfolios, therefore, one has to forecast whether countries in the developing world will switch from dollar pegs to either euro-based pegs or anchor to a basket of currencies (such as the SDR), where the euro is a significant part. Currently the dollar is still the main anchor currency. But the importance of the euro is steadily increasing. While pegging to the euro is mainly observed in the new EU member states and EU-neighbouring regions (ECB, 2007), countries with sizable reserve holdings outside the European sphere of influence, like Russia and Libya, are using the euro in their basket pegs (or basket reference value, like China). It now seems likely that some of the GCC countries, like the UAE and Qatar, will shift from their dollar pegs to basket pegs that include the euro. Dollar depreciation has generated inflationary pressures in countries pegged to the dollar, and the domestic monetary strains of maintaining the peg are greater for countries running large balance-of-payments surpluses (GCC, China, Russia).

In several steps, Russia rapidly raised the share of the euro in its basket peg from 10% in February 2005 to 45% from February 2007 (with the dollar at 55%). On the other hand, Frankel and Wei (2007) estimate that although China switched from a dollar peg to a basket peg in 2005, the implicit weight of the dollar is still high (87%), with little or no weight on the euro and the yen; rather, the other currencies with a significant role in the basket appear to be the Malaysian ringgit, the Thai baht, and the Korean won. Yet their estimates imply that the importance of the dollar (which in 2005 was the sole currency in the peg) will most likely fall.

[20] The importance of the anchor currency in explaining the composition of foreign exchange reserves has also been shown by studies that use confidential IMF data (*e.g.* Eichengreen and Mathieson, 2001).

Cobham (2007) constructs indicators of de-facto anchoring to the dollar and the euro using monthly exchange rate data for the period 1994-2006. A very strong peg is identified when the percentage change in the exchange rate vis-à-vis either of the two currencies is less than 0.5%. A strong peg is defined when the percentage change in the exchange rate is greater than 0.5% but less than 2%, while a weak alignment (weak peg) is defined when the percentage change is between 2% and 5%. Table 4 reproduces his tentative results. In 2001-2006, 23-34 countries anchored strongly or very strongly to the dollar and 25-29 to the euro. While this difference is not big, a significantly larger number of countries loosely align their exchange rates with the dollar rather than the euro. Most importantly, most countries with large reserves (such as China, Hong Kong, and Malaysia) use the dollar as reference currency, while none of the top-20 countries in reserve holdings pegs to the euro. Yet the number of countries that align their currencies to the euro (or its predecessors) in a strong and very strong peg is higher in 2005-2006 than in 1994-1998. In addition, the group of countries whose currencies are more closely aligned to the euro than to the dollar includes some economies with significant reserves (such as Norway, Switzerland, the UK). In addition, Cobham documents that many countries that formerly anchored their currencies to the dollar now take a neutral position between the two currencies. This is also in line with Frankel and Wei's (2007) results that to a small extent the Chinese central bank does include currencies other than the dollar in its basket. Indeed, a growing number of countries are adopting baskets of currencies (such as the SDR or their own trade-weighted baskets) to anchor their exchange rates.

3. Private Use

3.1. Invoicing in international goods and asset trade

An important aspect of a currency's international role is its use in international trade. While data on international trade invoicing are scant, most studies illustrate the primary role of the dollar throughout the past fifty years. Yet there are some indications that the euro invoicing is modestly increasing. Thus the euro share in British imports and exports is around 21% and 27%, respectively, not far from the dollar's share of 27% and 37% (ECB, 2007). But the importance of the euro has mainly increased in transactions in

which one of the two counterparties is an EU member country. This is, for example, illustrated by the recently released data from the Japanese Ministry of Finance on the invoicing patterns of Japanese firms (summarized in Table 5). Roughly 4% and 8% of all Japanese imports and exports respectively are invoiced in euros. The share of the euro in Japanese exports to Europe has risen from roughly 40% to almost 60% since 2001. Similarly, the share of the euro in Japanese imports from the EU is around 35%, significantly higher than that of the dollar, at 10%-15%.

The dollar has enjoyed a prominent role in international trade for three main reasons. First, before the creation of the euro area, the US was by far the largest market in the world. Yet nowadays the euro area economy equals the size of the US economy. In addition the euro area is a market equally important to the US for most big emerging economies (such as China and India). The GCC's exports of oil go increasingly to Asia, and its imports come from Asia and Europe. More broadly, financial flows (in particular, reserve currency accumulation) no longer correspond well to trade flows. This suggests that a rising number of international trade transactions that involve the euro area will be settled in euros. The euro has clearly more than replaced the legacy currencies in European imports and exports. Kamps (2006) studies a large number of countries and shows that the prospect of joining the single currency also raises use of the euro, both with existing euro area countries and also with third parties. The role of the euro in international trade is also high in countries that peg their monetary policy to that of the euro area.

Second, trade invoicing is affected positively by low exchange-rate risk, low volatility of inflation (menu costs), developed capital markets, and the absence of capital controls and a black market (Kamps (2006) provides cross country empirical evidence, while Donnenfeld and Haug (2003), Wilander (2004) and Silva (2004) study the trading invoicing patterns in Canada, Sweden, and the Netherlands, respectively). Traditionally, the US was offering a stable currency with low inflation and risk. (Tavlas (1991) shows that the importance of the deutsche mark in international goods markets rose considerably in the 1970s and 1980s, when US inflation was high.) Yet the euro is nowadays offering

an attractive alternative. The ECB has kept inflation low; the euro exchange-rate volatility is not higher than that of the dollar, and the euro area has developed sophisticated capital markets. Wilander (2004) presents evidence that the euro has increased its status in Swedish exports. Yet the increased share of the euro compared to the legacy currencies comes at the expense of the Swedish krona rather than the dollar.

Third, the major factor behind the dollar's dominance in international trade arises from the use of the dollar in reference-priced and organized-exchange traded goods. For example, most commodities, including oil, are settled in international markets in dollars. Indeed McKinnon (1980) and Krugman (1980) have argued that when a currency has established itself in a particular market, then a small price-taking firm always finds it optimal to follow, because if it were to chose another invoicing currency this would yield more volatile sales. The key insight is that once a currency has acquired a dominant role due to historically low costs, then it will continue to enjoy this status, even if alternative currencies offer similar (or even smaller) costs.

Recent theoretical work by Bacchetta and van Wincoop (2005) and Goldberg and Tille (2006) stresses the effects of the structure of demand and production on invoicing (see also McKinnon (1979) and Swoboda (1968) for early contributions). These models yield a herding effect, implying that the exporter has an incentive to follow its competitors and use the same currency, because this limits output volatility. The main empirical prediction of this theoretical work is that reference-based pricing is more likely in homogeneous goods, such as oil, gold, and basic commodities. The intuition is simple. If a firm produces and sells differentiated goods, then it faces (the usual) downward-sloping demand curve and thus can choose to index sales in the currency of the exporter. When the good is homogeneous, the producer is typically a price taker and thus will use the currency that the good is settled in to minimize loss of sales and profits arising from exchange-rate fluctuations. Goldberg and Tille (2006) assemble invoicing data from 24 countries and show that dollar's importance is international transactions is mainly driven by its predominant role in reference-priced goods, usually traded on organized

exchanges.[21] Kamps (2006) reaches similar results, showing that the dollar is still the dominant vehicle currency, mainly because of its role in settling commodities and oil transactions. Theories of network externalities suggest that it is unlikely that these markets will switch to another currency, unless transaction costs (broadly defined to include exchange rate volatility, inflation, and other risk considerations) in the dollar increase significantly. Yet the euro might still play some role in newly established markets (as for example natural gas, discussed below).

[21] A critical assumption of these models is that actions are taken by small firms/individuals, who are price takers. Yet in many commodities, like oil, a small number of countries control most of global supply. There might be big changes if a large player decides to switch to an alternative currency.

3.2. Investment Currency

Theory and empirical studies have stressed the importance of financial development and transactions costs in securities and foreign exchange markets as determinants of the international role of a currency in those markets (*e.g.*, Portes and Rey, 1998). During the Bretton Woods period and the 1970s and 1980s, the US capital markets were significantly larger and more liquid than the segmented European markets. The US offered liquid markets with low transaction costs as well as a variety of alternative instruments, such as agency debt, highly rated commercial paper, and low-risk equity. The US markets had sound investor protection and were relatively transparent, with a reassuring political risk environment. All these factors translated into low transaction costs, as measured by bid-ask spreads.

Yet after the initial period of euro introduction in 1999, bid-ask spreads in euro-denominated corporate bond markets are nowadays actually below those for corresponding dollar-denominated bonds (Biais *et al.*, 2006), while spreads in the euro-denominated government bond markets are not much higher than those for US Treasuries (Dunne, *et al.*, 2006). Transaction costs (bid-ask spreads) for euro transactions in the foreign exchange markets have fallen to equality with dollar transactions (both now close to zero). In addition foreign exchange traders now look as closely at 'euro crosses' as they do at 'dollar crosses' to interpret exchange-rate movements.

While transaction costs have fallen in other industrial countries' markets as well, the evidence suggests that investing in euro-denominated securities is not more expensive than investing in similar US assets. Coeurdacier and Martin (2007) find that the transaction costs of buying assets from the euro zone are substantially lower than they would be without the single currency.[22] In the same spirit, Hartmann *et al.* (2007) show that the euro area has improved its performance across a variety of proxy measures of

[22] The fall in transaction costs for non-euro-zone investors is estimated at 17% for equities and 14% for bonds (it is roughly twice as large for cross-country investments within the euro zone). Coeurdacier and Martin point out that the impact on cross-border holdings is much greater for bonds than for equities, because bonds are much closer substitutes.

financial development. While there are still non-negligible differences in financial market sophistication and efficiency across euro-area countries, at the aggregate level the euro area's financial development is comparable to that of the US and the UK, probably superior to Japan.

Moreover, the euro area equity markets and both government and corporate bond markets show very considerable evidence of integration since the late 1990s (Jappelli and Pagano, 2007; Lane, 2006; Lane and Wälti, 2007). The comovement of asset returns across euro-area countries has risen significantly. Countries' common membership of the euro area raises their bilateral bondholdings and portfolio equity holdings very substantially.

There are, however, still yield differentials across euro government bonds issued by the various euro area countries. This will continue until and unless there is joint issuance and liability. This limitation on government bond market integration is a significant disadvantage in the competition with the US Treasuries market. On the other hand, there is a single hedging instrument for the entire euro-denominated government bond market: the 10-year German bond (Bund). This is the highest-volume futures contract in the world.

The fall of transaction costs, financial development and financial integration, and the enlargement of the euro area have all increased the attractiveness of euro-area securities. As the euro area enlarges it offers foreign and domestic investors a larger variety of financial claims (in imperfectly correlated assets) and thus makes the euro area more attractive for diversifying risk (Martin and Rey, 2005). But the euro-area bond market is overall only a little more than half the size of that in the US (the corporate bond market, in particular, is much smaller), and euro-area equity market capitalisation is also half that of the US (data from end-2006, European Central Bank, 2008). UK adoption of the euro would bring a substantial increase in the size of the euro-area securities markets.

Global investors also take into account the hedging properties of international stocks, bonds, and currencies. Campbell *et al.*(2007) consider the optimal currency hedging allocation of a global equity and (alternatively) bond investor over the past 30 years, with a portfolio in the currency, bond, and equity markets of the US, the UK, the euro zone, Canada, Australia, Japan, and Switzerland. They build their empirical (regression-based) analysis on an international CAPM model that stresses the benefits of diversification in hedging. Given the unpredictability of currency returns they just examine the variance-covariance properties of currency returns with the equity and (separately) with the bond markets.

They identify the currencies with good hedging properties in periods of bond and equity market turmoil. In this framework, global investors want to hold long positions in currencies that have low (or even negative) correlation with bond or equity returns. Their analysis yields interesting results on the international role of the euro and the dollar as hedging instruments in global portfolios. First, the risk-minimization problem of global bond investors (particularly relevant for central banks) leads to long positions in the dollar, which has desirable hedging properties: while currency and bond returns are only weakly correlated, the dollar appreciates when global bond prices fall (especially in the short-run). The optimal currency hedging strategies of equity investors, however, are to go long in the euro, the dollar and the Swiss franc and hold short positions in the other currencies. This is because the euro, the Swiss franc and the dollar are all negatively correlated with global equity returns, while the Australian dollar, the Japanese yen and the Canadian dollar are positively correlated with equity returns.

The dollar has in the past been viewed as a ‘safe haven’ currency. Geopolitical, financial and economic disturbances supposedly prompt investors to switch into the dollar because of its dominant international role and the political and economic stability of the US. Behaviour from the beginning of global financial turmoil in early August 2007 to summer 2008 did not support this hypothesis. There was a very brief upward movement of the dollar exchange rate in mid-August 2007, but the currency then followed a

downward trend, in particular against the euro (and the Swiss franc). This may be because the markets see the disturbances as emanating from the US – but that too would suggest lack of confidence in the currency. In the very recent period, however, when instability became extreme, the dollar exchange rate has risen significantly. It is difficult to distinguish here between the safe-haven effect and the unwinding of carry trades as well as the repatriation of funds as part of deleveraging.

Currency (notes and coins) is also a store of value, and private agents hold dollars outside the United States and euros outside the euro area. The value of euro bank notes in circulation globally (both inside and outside the euro area) was close to the value of dollar bank notes in circulation in 2006. But the US Treasury estimates (2006) that around 450 billion dollars in bank notes circulate outside the US (about 60% of the total outstanding), whereas the ECB (2007) estimates that only 60-100 billion euros in bank notes were in circulation outside the euro area in late 2006. Even the upper estimate for the euro is somewhat less than one-third the value of the dollar estimate. But there is a high share of euro-denominated bank deposits in new EU member states not yet in EMU, as well as in the UK (22.5% of total deposits!); even Sweden (10%) and Switzerland (9%) have significant shares of euro-denominated deposits (ECB, 2007).

3.3. Quotation currency

The euro has increased its status as a unit of account in international markets. As Figure 8 illustrates, since 1999, the euro has come to surpass the dollar as an issuing currency in international debt markets.[23] While in the initial years following euro's introduction its share in international debt markets was about half of that of the dollar (the share of euro-denominated international debt securities was around 25%, while that of the dollar around 45%-50%), nowadays the amounts outstanding in euro- and dollar-denominated international debt securities (bonds and notes) are roughly the same; if anything the share of the euro is slightly higher (Figures 8-10). The share of total claims of BIS reporting

[23] In the judgment of Bertuch-Samuels and Ramlogan (2007), "The euro has experienced phenomenal growth as a currency of issue for international bonds and notes."

banks denominated in euros rose from 34% to 41% during 1999-2003, but has since fallen back to 39% (losing ground to sterling).[24]

Bobba *et al.* (2007) formally examine the impact of the euro in international debt markets in an event study framework. Using BIS data on debt issuance for 64 developing countries and 42 developed countries and the five major currencies, namely the US dollar, the euro, the yen, the pound sterling and the Swiss franc, the authors examine the liquidity effects of the euro.[25] To test for these effects, the authors include individual currency dummies taking the value of one from 1999 onwards for each currency to pick up liquidity effects throughout the sample period. Their regressions show that conditional on various other factors and unobservable country characteristics, the euro has brought a significant increase in the liquidity of international debt markets. In addition an increased number of countries 'tipped' or suddenly switched to issuing euro-denominated securities.

In spite of the euro's rising role in international debt markets, the dollar is still the dominant international currency as a unit of account in private transactions, since most commodities are traded in dollars. The key example is of course oil, but almost all of the main commodities are currently indexed and invoiced in dollars. Theories of network externalities and trade invoicing suggest that the dollar's dominance will most likely continue in highly homogeneous goods (such as oil). Yet the euro might still play a role, mainly in differentiated goods. The euro's status as a unit of account in international markets will be affected significantly by whether the currently developing natural gas market will use the euro.[26] The euro area is geographically well-positioned in realizing this opportunity, as it is almost in the middle of the Russian and North African natural gas reserves; and it is the largest importer of Russian natural gas.

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[24] McGuire and Tarashev (2007).
[25] The authors have aggregated all the data on the currencies of the pre-euro period that came to form the euro and aggregate the economic data on the countries, so that the euro zone is considered as one country.
[26] The recent decline of the dollar is putting pressure on oil-producing countries to index oil in alternative currencies. According to the *Financial Times* (November 19, 2007), some OPEC member countries are considering quoting oil in other currencies.

3.4. Vehicle currency in foreign exchange markets

The latest BIS Triennial Survey (2007) shows little change in the dominance of the dollar in the foreign exchange markets. 86.3% of all transactions had the dollar on one side (down slightly from 88.7% in 2004). The corresponding figure for the euro was 37.0% (37.2% in 2004). Dominguez (2006, p. 68) says, 'the euro is less widely used than the combination of European currencies that it replaced.' She gives no data, but she must be comparing the BIS forex market surveys for 1998 and 2004; as we have shown, there is no other domain in which this could be true. But it is not true here, either, because these data do not adjust for the disappearance of trading between the pre-euro EMU currencies. The forex market role of the euro exceeds that of the 'legacy currencies' when those trades are netted out.

The dollar also takes precedence in the market for OTC foreign exchange derivatives, with 233 billion dollars traded daily as opposed to 119 billion dollars in euro FX derivatives (110 billion and 61 billion, respectively, in 2004). On the other hand, the euro exceeds the dollar in the market for OTC interest rate derivatives, where 656 billion dollars' worth were traded daily in euro-denominated trades and 552 billion dollars in dollar-denominated interest rate derivatives. There is an interesting analogy here with the markets for government bonds in the US and the euro area. The US Treasuries market is dominated by cash transactions – the cash market is about twice the size of the combined futures and interest rate swaps market. In the euro area, the position is reversed: the derivatives markets are twice the size of the cash market, and price discovery takes place primarily in the interest rate swaps market (Dunne *et al.*, 2006).

3.5. The liquidity premium

The early analysis of Portes and Rey (1998) pointed to what they called a 'liquidity discount' accruing to the issuer of the international currency, deriving from the additional demand for its bonds from foreign residents. This demand comes from both official and

non-official sources: foreign central banks wish to keep a large share of their foreign exchange reserves in low-risk securities denominated in the major international currency or currencies; and private-sector foreign residents, primarily firms engaging in international trade, need to keep substantial short-term balances in liquid form and again denominated in international monies. This international currency effect reduces the real yield paid by bond issuers in the country of the international money. The primary effect will be in the government bond market.

Portes and Rey offered 'back of the envelope' estimates of a 25-50 basis point effect. When applied to the then outstanding stock of $2000 billion of US Treasuries, this gave a supplementary source of seigniorage, in the amount of $5-10 billion dollars, at that time very close to their estimates of the conventionally defined seigniorage: about 0.1% of GDP.

We now prefer to use the term 'liquidity premium' rather than 'discount'. Krishnamurthy and Vissing-Jorgensen (2007) (KVJ) attribute the premium to the 'convenience yield' from holding US Treasuries, which in turn they believe is derived from three factors: (i) a liquidity motive; (ii) a 'neutrality' motive, insofar as some investors may not wish to privilege any issuers and therefore choose the largest issuer, with no sectoral associations; (iii) a risk-minimising motive. They estimate the convenience yield econometrically, and they then specifically consider the effect of foreign official demand on Treasury yields. They find that the demand for Treasuries from the foreign official sector is highly inelastic. Based on their estimated aggregate demand curve, they calculate that if foreign official investors were to exit the Treasury market entirely, the sale would raise Treasury yields relative to corporate bond yields by an amount between 19 bps and 55 bps.

This effect would certainly be significant, but the estimates of Warnock and Warnock (2006) (WW) are substantially higher. Part of the difference seems to be that WW use a much higher estimate of the share of foreign ownership in the US Treasury market. WW find that 'if foreign governments did not accumulate US government bonds over the twelve months to end-May 2005, our model suggests the [10-year] Treasury yield would have been 90 bps higher.' Note that this supposes only that the net inflow would stop, rather than that all holdings would be sold! So on the latter (KVJ) hypothesis, the effects

would be very much greater. WW find also that the impact on corporate bond yields as well as the 30-year Treasury yield is of similar magnitude (but not on two-year Treasuries, whose yields are much more strongly influenced by the Fed's policy rate). We find the WW hypothesis more realistic in the context of a shift from the dollar towards the euro in the international currency role. It seems unlikely that foreign official holders would exit entirely from the US Treasury market, or indeed divest any substantial proportion of their existing holdings, if only because of the potentially huge capital loss on remaining holdings that would result from the consequent dollar depreciation. But as discussed above, we might expect the foreign official sector to wind down their net acquisitions of US Treasuries, in part because even to the extent that they stay in dollar-denominated assets, they will be seeking portfolio diversification and higher yields.

A 90 bps effect is nevertheless quite large. Applied to the US outstanding government debt of USD 4000 bn in mid-2005, the liquidity premium would be USD 36 bn – a significant loss to the United States, if the net inflows were to cease. On the (heroic) assumption that a corresponding inflow into euro-denominated government bonds would bring an equal liquidity premium to the euro area, applied to the euro area outstanding government debt of 4600 bn euros, the liquidity premium would be 41.5 bn euros, slightly over 0.5% of GDP.

4. The euro area as 'world banker'

In 1965, Valery Giscard d'Estaing criticized the 'exorbitant privilege' accruing to the issuer of the international currency. He was referring to the 'automatic' way in which other countries financed US balance-of-payments deficits by semi-involuntarily accumulating dollar-denominated assets, typically US government securities. The 'exorbitant privilege' has also been interpreted as the ability of the issuer of the international currency to earn excess returns on its gross foreign assets relative to the returns non-residents earn on gross US liabilities. This can have two components: higher

returns within each asset class; and relatively high portfolio weights on high-yielding asset classes and low-yielding liabilities.

A recent paper by Gourinchas and Rey (2007) presents a disaggregation of the 'exorbitant privilege' into these 'return' and 'composition' effects by performing a detailed analysis of the historical evolution of US external assets and liabilities at market value since 1952. They find strong evidence of a sizeable excess return of gross assets over gross liabilities. Interestingly, this excess return increased after the collapse of the Bretton Woods fixed exchange rate system. It is mainly due to a return discount: within each class of assets, the total return (yields and capital gains) that the US has to pay to foreigners is smaller than the total return the US gets on its foreign assets. They also find evidence for the composition effect: the US tends to borrow short (low yield) and lend long (high yield). Interestingly, the composition effect plays a smaller role over the entire period, but its relevance has increased significantly over time. Between a quarter and a third of the current excess return can be explained by the asymmetry in the US external balance sheet and the fact that the US earns an equity premium. They then conclude that as financial globalization accelerated its pace, the US transformed itself from a world banker into a world venture capitalist, investing greater amounts in high-yield assets such as equity and FDI.

Until now, no comparable data have been published for the euro area. We are fortunate that the ECB has now provided quarterly data for several years that permit some comparisons with Gourinchas and Rey estimates for the US. This is also important as we can have an early assessment of the intertemporal evolution of the euro area's international balance sheet.

We have gathered data on total returns on gross assets and liabilities of the euro area in two broad categories: direct investment and portfolio investment.[27] These returns have two components: a flow of investment income (net of reinvested earnings[28]); and a valuation effect, which includes asset price changes, exchange-rate changes, and 'other

[27] Unfortunately there are no data on government and corporate bond returns and other non-traded assets.
[28] Including them would be double counting, since they should show up in equity price changes, which enter the valuation effect (see below).

adjustments'. The US data have a similar 'other adjustments' category, which includes omitted income flows, omitted capital gains and losses, and errors in initial external positions.[29]

Figures 11 graphs the differential ('excess') returns for the portfolio asset class for both the euro-zone and the US. It is evident that far from exhibiting any exorbitant privilege, euro-zone investors on the whole do not do particularly well in comparison with non-residents investing in the euro area. In fact, differential returns for portfolio investment have been oscillating from positive to negative values with a reduction in the amplitude of these cycles in the last four years. For the US, we see the expected positive excess returns for both components of the portfolio investments: debt and equity. The valuation effect in the US external positions has been particularly important in the last period.

One extension of the analysis, if the data were available, would be to compare gross asset returns between the EU and the US, for each asset class. If, for example, gross portfolio asset returns are similar for the EU and the US, then the smaller excess return for the EU is indicating something about covariances: assets and liabilities are better hedged on the EU side, or (equivalently) there is more risk-taking (and implicit intermediation) on the US side. If the gross returns are different, could it possibly be that US investors are better at 'picking winners'? Or is there an alternative, more plausible explanation?

A major difference between the EU and US data is in the exchange-rate component of valuation effects. For each year of EU data we have, this effect has the same sign for both assets and liabilities (negative in all years except 2005, when the euro exchange rate was not appreciating). The absolute values are lower for liabilities than for assets. This suggests that although assets are indeed denominated mainly in foreign currencies, a significant share of euro-area liabilities to foreigners is also still foreign-currency-denominated, rather than euro-denominated (whereas a very high share of US liabilities is dollar-denominated). This is confirmed by the European Central Bank, which states that 'the euro area's external assets are mostly denominated in

[29] The flow data are reconciled annually with a survey of positions, and it is believed that the quality of these survey data rises over time.

foreign currencies and its external liabilities in euro.' [30] We should expect the share of liabilities denominated in euros to rise as internationalization of the euro proceeds.

Another aspect of the 'world banker' role is maturity transformation. We cannot get at this directly from the data, but we can look at the relationship between 'liquid' and 'illiquid' assets, and similarly for liabilities, and compare the two. We treat portfolio assets (equity and debt) as liquid, in addition to 'other', which we believe to be primarily inter-bank loans[31];.

Figure 13 depicts the evolution over time of the share of illiquid assets and liabilities over the total for both the US and the euro zone. We can make three remarks on these data. First, the euro-area illiquid asset ratio has risen over time – but the illiquid liability ratio has risen more. Second, this is not so for the US, where the illiquid asset ratio has risen but the illiquid liability ratio has fallen. Third, the euro area ratio is only a little more than half that of the US, indicating that the US economy does more maturity transformation than the euro area, and this may partly explain the observed difference in excess returns shown above.

Banks borrow short, lend long – typically, their liabilities are liquid, their assets are illiquid. In that sense, the first two of our three remarks suggest that the US has actually become more a 'world banker' over the recent period, whereas the euro area has not yet taken on this role. And that is consistent, too, with the observation that the US does more maturity transformation. Moreover, we saw that the US does enjoy the 'exorbitant privilege' (in the Gourinchas-Rey sense of excess returns), especially since 2002, whereas the euro area does not. So in these respects, the dollar has so far maintained its unique role in asset markets.

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[30] Press release at http://www.ecb.int/press/pr/stats/bop/2008/html/ba081106.en.html . Unfortunately, the ECB does not give the data underlying this statement.

[31] It can be argued that equity and long-term debt (at least) both carry substantial liquidity risk. According to this view, portfolio assets should be treated as illiquid. We have performed the same analysis using this alternative definition and results do not change significantly. Results available upon request.

5. Political economy and institutions

5.1. Historical evidence and the 'hegemonic stability' theory

Charles Kindleberger (1973) argued that the instability of the world economy between the wars reflected the absence of a dominant power willing and able to stabilize the international system. But both theoretical and historical analyses indicate that the relationship between the power of the leading economy and the stability of the international monetary system is considerably more complex than suggested by simple variants of hegemonic stability theory. Economic theory can in fact explain the "Manias, Panics and Crashes" of financial markets with rational agents that exhibit behaviour adapting to that of other market participants (*i.e.* rational herding), which in turn provokes self-fulfilling crises and the financial instabilities of the type emphasized by Kindleberger, as well as the more recent episodes of financial turmoil.

Indeed, there seems to be little causal relation between periods of financial instability and the degree of market power in the world economy. From the second half of the 20th century onwards, the global economy has been unambiguously dominated by the United States. During this period of 'hegemonic stability', we have witnessed a historically high frequency and severity of financial crises. According to Bordo (2007), crises appear to be growing more frequent in the recent era than ever before. Crisis frequency since 1973 exceeds even the unstable interwar period and is three times as great as in the pre-1914 earlier era of globalization in which Britain was the international hegemonic power.

Economic leadership goes hand in hand with monetary leadership.There is of course an important historical precedent. The pound sterling was the premier international currency of the gold standard period. That Britain was an imperial power reinforced sterling's role. From the early 18th century, a conscious effort was made to encourage the use of the pound throughout the empire as a way of simplifying and regularizing transactions. British financial institutions established branches in the colonies, and colonial banks

opened offices in London. These banks maintained assets and liabilities in London and issued bank notes for the colonies, maintaining a fixed exchange rate between those notes and sterling. Historians estimate, for example, that 60 to 90 per cent of the world's trade was invoiced in sterling in the 19th century.

In order to explain the remarkable phenomenon that usually only a few currencies dominate the international scene, economists have suggested that transaction costs act as an invisible hand, leading decentralized agents to coordinate on the cheapest currency or currencies. This general agreement covers two alternative emphases. One treats transaction costs as essentially exogenous and relates them to intrinsic properties of the candidate currencies. According to this view of currency competition, monetary instability increases transaction costs, so agents use those currencies with the best prospects of holding their value. The other emphasizes that transaction costs are determined by size. An international currency is valuable because a lot of other people are using it. This creates room for strategic complementarities and externalities, in the sense that the unit transaction cost is a decreasing function of the volume of transactions, and this can lead to the conclusion that there is scope in the market for only one international currency.

While this argument carries some weight in the choice of currency for invoicing trade or denominating foreign debt securities, and indeed for financial markets more generally, it is less obviously valid for the currency of denomination of reserves, in which market liquidity is not all that matters and the benefits of diversification may play a role (Eichengreen, 2005). In addition, the diversification and hedging properties of currencies are of primary importance for private agents, such as investment banks, pension funds, corporations, etc. Moreover, the formal models with network externalities (including a calibrated version like that of Portes and Rey 1998) and the search models both typically yield multiple equilibria. While a major event is needed to shift expectations, this possibility, even if it is remote, should push governments and private agents to hedge this risk.

In fact, if we focus on the store of value role of an international currency, historical evidence suggests that there need not be a single dominant currency. At the end of 1913, at the peak of Britain's world economic leadership, sterling balances accounted for less than a half of the total official foreign exchange holdings whose currency denomination is known, while French francs accounted for perhaps a third and German marks a sixth. Over the preceding quarter century, sterling's share had in fact been falling, not rising, mainly in consequence of the growing share of the French franc. In Europe itself, sterling was a distant third as a form in which to hold official reserves behind both the franc and the mark (Eichengreen (2005), Lindert (1969)). Flandreau and Jobst (2005) show that sterling was not that far ahead of the franc and the mark in terms of the number of currencies quoted against each of these in the foreign exchange markets (the *vehicle currency* role). The historical survey of Dwyer and Lothian (2003) reinforces these observations.

The conventional wisdom that one currency denominates *reserve holdings* worldwide thus derives mainly from the second half of the 20th century alone, when the dollar accounted for as much as 85 percent of global foreign exchange reserves. The post-World War II reign of the dollar was institutionalized at Bretton Woods and subsequently reflected the exceptional dominance by the United States of global trade and payments, in a period when Europe and Japan had not yet fully recovered from the war and modern economic growth had yet to spread to what we now refer to as emerging markets. In addition, it reflected the efforts of the governments of other potential reserve centers to discourage international use of their currencies. Germany saw the internationalization of the deutschemark as a threat to its control of domestic monetary conditions and of inflation (a view that continues to have weight in the ECB). Japan saw the internationalization of its currency as incompatible with its system of directed credit. France had seen more than once how allowing private foreign funds to move in also allowed them to move out if investors concluded that the government's macroeconomic policy aspirations were incompatible with its putative commitment to currency stability.

These and other considerations led the countries whose currencies were potential alternatives to the dollar to maintain significant capital controls well into the post-World War II period, in some cases until the end of the 1980s. Controls limited the liquidity of their securities markets. Thus it is not simply the unusually large size of the U.S. in the world economy or the admirable liquidity of U.S. financial markets but also the maintenance of controls by other potential reserve centers that explains why the dollar was so dominant in reserves for so long after World War II.

There is no reason why in future, two or three reserve currencies could not share the market, not unlike the situation before 1914. The two obvious candidates are the euro and the dollar, although the yen (and maybe the pound sterling) cannot be excluded. The US and euro zone economies are likely to be of equal size, to engage in similar levels of external trade and financial transactions, and to have comparably liquid securities markets. The advent of the euro has done much to increase the liquidity of European bond markets, which considerably enhances the attractiveness of the euro as a reserve currency. A key question is whether sound macroeconomic policies will be maintained in the United States or whether the dollar's reserve currency status could be impaired by an extended bout of inflation or a very substantial depreciation. Recall that the analysis of Triffin (1960) suggested that currency dominance itself can generate forces that lead to currency decline.

5.2 Is the euro area capable of managing an international currency?

There are institutional features of EMU that may be seen as constraints on the development of the euro's international role. The following seem particularly important:

- Ambiguity in the Maastricht Treaty regarding authority over exchange-rate policy
- A related potential weakness in euro-area representation in international fora (IMF, G3, G7, …) and bilateral discussions

- Fragmentation of financial supervision and regulation and unclear lender-of-last-resort (LLR) authority
- ECB monetary policies
- ECB attitudes towards the euro as an international currency

Each has given rise to an extensive literature, but we can treat them only briefly here.

Article 111 of the Maastricht Treaty gives finance ministers (now the 'Eurogroup') power to prescribe 'general orientations' for euro exchange-rate policy. Any currency market intervention is conducted by the ECB, however, whose price stability objective takes priority (for a discussion of exchange-rate policy, see Alesina, *et al.*, 2001). This ambiguity, or indeed conflict, may have inhibited intervention as the euro depreciated from $1.16 to $0.83 in the period January 1999 to September 2000 (one of the authors of this study publicly advocated intervention at the time). Intervention did finally come, and although the scale and duration were limited, it did have some effect. The underlying conflict has recently resurfaced as the euro has risen against the dollar, with some senior politicians calling on the ECB to intervene or relax monetary policy in order to stop or even reverse the appreciation. This makes good headlines in the press, while academics and officials can argue at length about the effectiveness of sterilized intervention. If the divided authority does inhibit intervention, and if intervention could help to stabilise the currency's value, then resolving the ambiguity might indeed enhance the euro's international attractiveness in the various roles we have discussed. But neither premise is fully established. And a member of the ECB Executive Board has argued that the divided authority is indeed 'efficient', because both the central bank and finance ministries should be involved in policy formulation (Bini Smaghi, 2007).

On the broader question of euro-area international representation, it is hard to deny that there are structural weaknesses. As long as euro-area countries cannot even agree to take a single seat (and quota) in the IMF Executive Board, they cannot exert their due influence over international financial affairs. This does limit their ability to exploit the

advantages of the growing international role of the euro, but it does not clearly constrain that role.[32]

Financial supervision and regulation are indeed national responsibilities in EMU, although there are EU-level committees composed of the national regulators (for banks, securities markets, and insurance). Many observers have argued that the growing cross-border activities of banks and cross-border integration of financial markets require more unified supervision and regulation. Posen (2007a, 2007b) and Cohen (2007) see the fragmentation as a major obstacle to the euro's development as an international currency.

There are clear dangers in the current structure (for an early critique, see Begg, *et al.*, 1998). Committees without executive authority are not well suited to discover or deal with solvency or even liquidity problems arising for a large complex financial institution (LCFI) present throughout the euro area. Yet there is an ECB responsibility for financial stability, and in particular for the payments system. And the unfavourable comparison with the US has less weight in view of recent events, which have exposed deep weaknesses in American financial supervision and regulation.[33] Indeed, there too we find fragmentation and lack of coordination, starting with the division of authority among the Federal Reserve, Office of the Currency Controller, Securities and Exchange Commission, Office of Thrift Supervision, Federal Deposit Insurance Corporation, Commodity Futures Trading Commission, and 50 state-level insurance regulators. It is likely that we shall see some rationalisation, unification, and strengthening of financial supervision and regulation on both sides of the Atlantic.

Equally problematic and potentially serious is the ill-defined locus of LLR responsibility for euro-zone financial institutions. The ECB is clearly the sole guarantor of financial

[32] "As long as no 'single voice' has the political authority to speak on behalf of the euro area…the pre-eminence of the US in international monetary matters…is likely to remain unchallenged." (McNamara and Meunier, 2002, p. 850).
[33] Cf. Cohen (2007): 'The euro area is remarkably unprepared to cope with any major disruption in banking or financial markets.' No worse prepared than the US, it would seem.

market liquidity, and it appears to have exercised that authority rather better than either the US Federal Reserve or the Bank of England since 7 August 2007.[34] But if an LCFI were in difficulty, who would decide whether and how to provide assistance, and whose taxpayers would be liable if illiquidity turned into insolvency? EU ministers and the ECB have resolutely opposed any *ex ante* rules for 'burden sharing', on the (indefensible) ground that they would create moral hazard. On this count, the US structures are clearly superior. Again, however, financial turmoil may motivate some improvement.

Criticism of the ECB's monetary policies has stressed its supposedly restrictive bias or alternatively its inability to meet its inflation target (for the latter, see Gali, *et al.*, 2004); its slow responses to changing data, which some regard however as desirable stability; the muddle of its 'two-pillar strategy'; its governance (too many Council members, supposedly acting by consensus); and its lack of transparency (Geraats, *et al.*, 2008), which makes it hard to assess whether any of these criticisms is justified. On the whole, however, the actual policies followed by the ECB seem to have been fairly successful, and the comparison with US monetary policy since 1999 does not seem unfavourable to the ECB.

Despite the lack of transparency, there are evidently strong voices within the ECB seeking to limit the euro's international role. There are counterweights too, and the result is the oft-repeated mantra, 'The Eurosystem neither promotes nor hinders the development of the euro as an international currency.' But the ECB has never published an analysis of the costs and benefits of internationalisation of the euro, so one cannot know whether its 'neutrality' reflects an explicit judgment that there is no clear positive or negative balance.

[34] Another comment which could not be published today: 'The US Federal Reserve has proved itself able to calm financial markets…even in the face of dramatic financial market turbulence…It is less clear what role the European Central Bank would play…' Dominguez (2006, p. 86). That is clearer now.

The international currency status of the dollar confers upon the United States both power and responsibility in the international financial system. The responsibility for international financial stability goes well beyond the international lender of last resort function. The euro has in fact already taken on some of this responsibility. For example, since August 2007, the ECB has played a major role in dealing with problems of liquidity in financial markets. This role was doubtless not desired, but when it appeared necessary, the ECB responded. The response affected global markets, not just those in the euro zone. Indeed, partly because of the importance of large, complex financial institutions with global reach, partly because of the size of international financial flows and cross-border assets, we see that *liquidity pools are now global*. And euro-denominated financial assets and markets are now a major feature of the system. Thus the new international status of the euro has made liquidity in euro markets important around the world. It is not evident that this imposes any costs on the euro area. It is an open question, however, whether sharing this international currency dimension with the United States is stability-enhancing at the global level. Answering positively requires that the euro zone authorities consider their responsibilities for the configuration of exchange rates and associated global imbalances. Sharing international currency status with the United States means sharing this responsibility as well.

6. Conclusions

Although we still have insufficient data to quantify precisely the implications of the euro's introduction in international markets and the global economy, the evidence suggests a steady rise in the euro's status as an international currency. Early fears that the euro might destabilize the European economy and cause political disintegration seem unwarranted today. Subsequent scenarios in which a crisis-stricken euro-zone country gives up the euro[35] are equally unjustified, if only because the economic and political

[35] These stories typically come from UK and US authors, it has to be said – see Tilford (2006) and Dominguez (2006). The latter says, 'Leaders of a number of euro-zone countries including Germany,

costs of doing so are likely to exceed by far any possible benefits (Eichengreen, 2007). The euro has not so far achieved the dollar's status as an international currency, although its international role has notably increased since 1999. The euro's first decade has been marked by incremental, yet noticeable, steps towards becoming an equal to the dollar as an international currency.

Some fairly clear conclusions emerge from the discussion above.

- Even ignoring the geopolitical implications, international currency status is important. It affects exchange rates and the distribution of the benefits and costs associated with the international currency or currencies.
- 'Global imbalances' threaten the dollar's status as the major international currency – the 'exorbitant privilege' now appears in foreign central banks financing the US current account deficit (net private capital inflows into the US have been negative)
- An international currency performs multiple roles, and these are interconnected – in particular, the reserve currency role, though most studied, is closely related to choice of vehicle currency, investment currency, and invoicing.
- Perhaps the most underrated determinant and measure of international currency status, however, is the 'anchor currency' (peg) function.
- The dollar is still the dominant reserve currency, but the share of the euro in central bank reserves appears to be significantly higher than that which mean-variance portfolio optimization would yield.
- The data indicate a narrowing of spreads and enhanced liquidity of the euro, a rising share of the euro area in trade, an increasing number of non-EU governments and firms issuing euro-denominated assets, some shift away from the dollar towards the euro in the anchor currency role, and little change in their relative importance in the foreign exchange markets.

France and Italy have…hinted that an exit strategy might be needed under certain economic conditions…[this] leaves…a nagging sense of doubt about the longevity of euroland.' (p. 86) No specific 'leaders' are named.

- The euro has displaced the dollar as the reserve currency of (non-euro-area) Europe, including non-EU countries, as well as some countries in the geographical hinterland of Europe.
- The data also suggest increasing private-sector substitution of the euro for the dollar in various functions, as the level of financial development of the euro area has risen and transaction costs in euro-denominated markets have fallen.
- The United States retains, however, the role of 'world banker', to which the euro area has yet to accede.

Looking forward is difficult. The dollar has the advantage of incumbency, but diversification motives favour the euro as an asset currency. A sufficiently strong shock could move the international financial system to a new equilibrium. This would likely be parity between the euro and the dollar (a version of the 'middle euro' scenario of Portes and Rey, 1998). Plausible shocks could be a shift to the euro in invoicing of oil and perhaps other commodities; a massive portfolio shift into euro-denominated assets; a substantial rise in US inflation; a major loss of confidence in the US economy and financial system.

Chinn and Frankel (2008) run simulations in which the euro's share of international reserves exceeds that of the dollar by 2015, without any such shocks. The shift is due primarily to an assumed continuing dollar depreciation and the rising financial depth of the euro area, because of London's growth as a financial centre and its key role in euro-area finance.[36] As we have stressed, however, reserve currency status is only one dimension of the international role of a currency.

At the time of writing, the euro appears to have an overall advantage on the criteria of financial stability (inflation, exchange rate). Its institutional framework now seems less

[36] The UK is on all measures the most important international banking centre (von Peter, 2007).

inferior to the US financial sector and regulatory system than was previously thought. The US current account deficit makes the dollar vulnerable.

Another important factor may be the progressive elimination of the existing asymmetry between global trade and global finance. The BRICs and other emerging markets are global in trade but not in finance. They will catch up. They are perhaps just as likely to go for euro-denominated as for dollar-denominated financial instruments.[37] But all this is conjectural.

The major disadvantage of the euro is clear: it is the currency of a group of nation states rather than of a single country. The euro area is much less a unitary actor than the US. That must have some negative effect – that we believe unjustified – on confidence in the euro's stability over the very long term, as it does on the euro area's weight in international monetary affairs – fully justified. But these effects must be balanced against the growing strains on the dollar and indeed on American geopolitical and economic dominance.

[37] Some have suggested that the Chinese yuan could become a third major international currency. But it will take several decades to remedy the underdevelopment of the Chinese financial sector.

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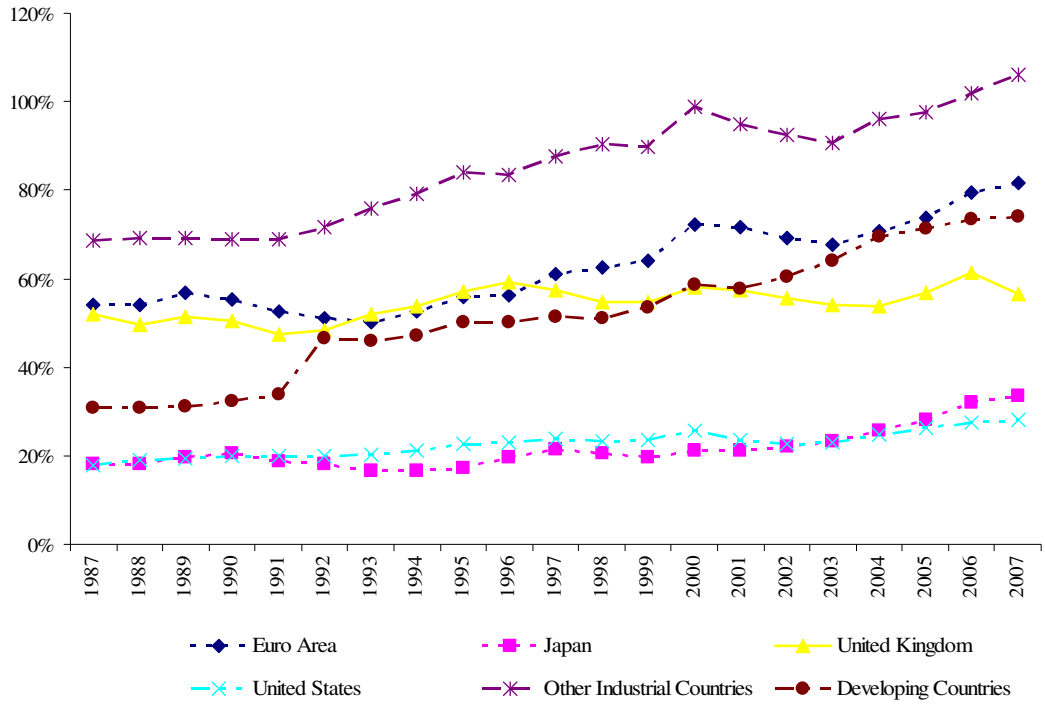
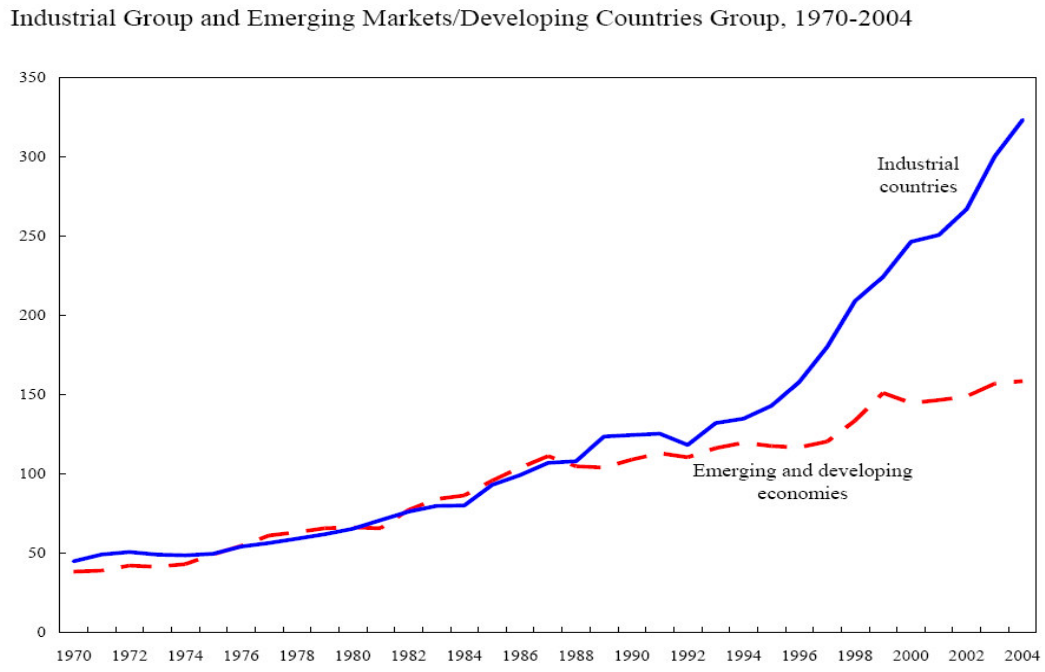
Figures and Tables

Figure 1: Trade (exports plus imports) as percentage of GDP



Source: IMF World Economic Outlook Database (2007).

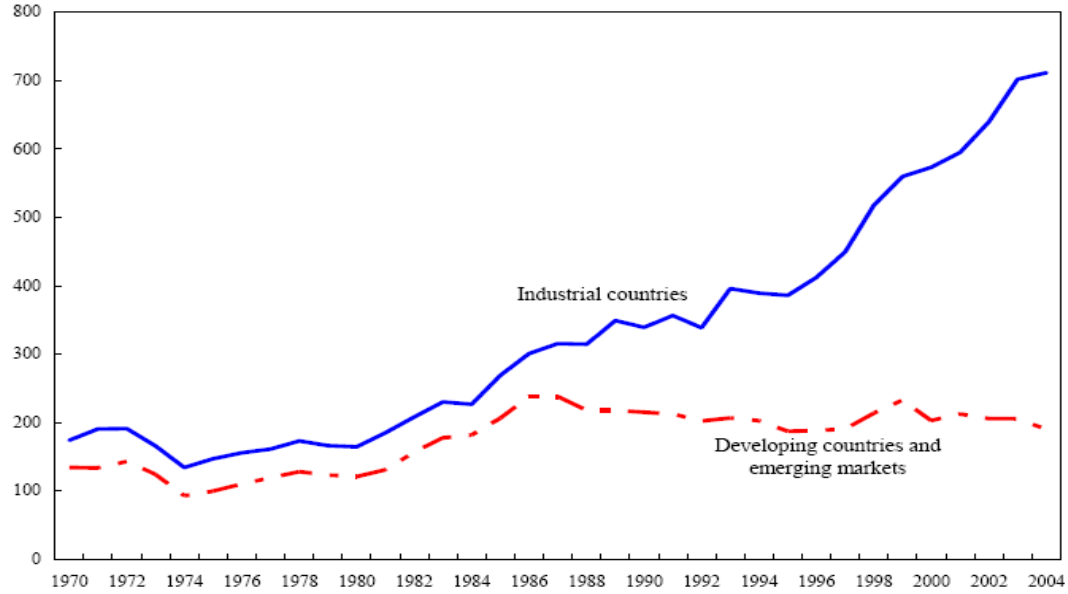
Figure 2: Foreign assets and liabilities as share of GDP



Note: Ratio of sum of foreign assets and liabilities to GDP, 1970-2004.

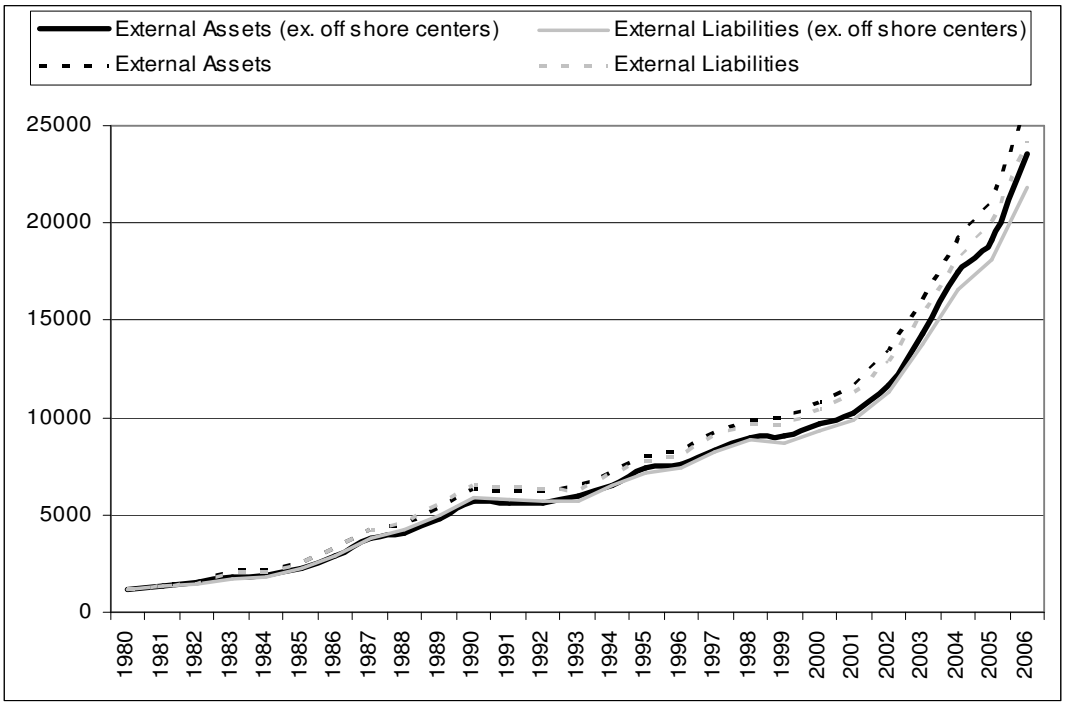
Source: P.Lane and G.M. Milesi-Ferretti, 2006, The External Wealth of Nations (Mark II), CEPR Discussion Paper

Figure 3: External assets and liabilities as percentage of exports plus imports



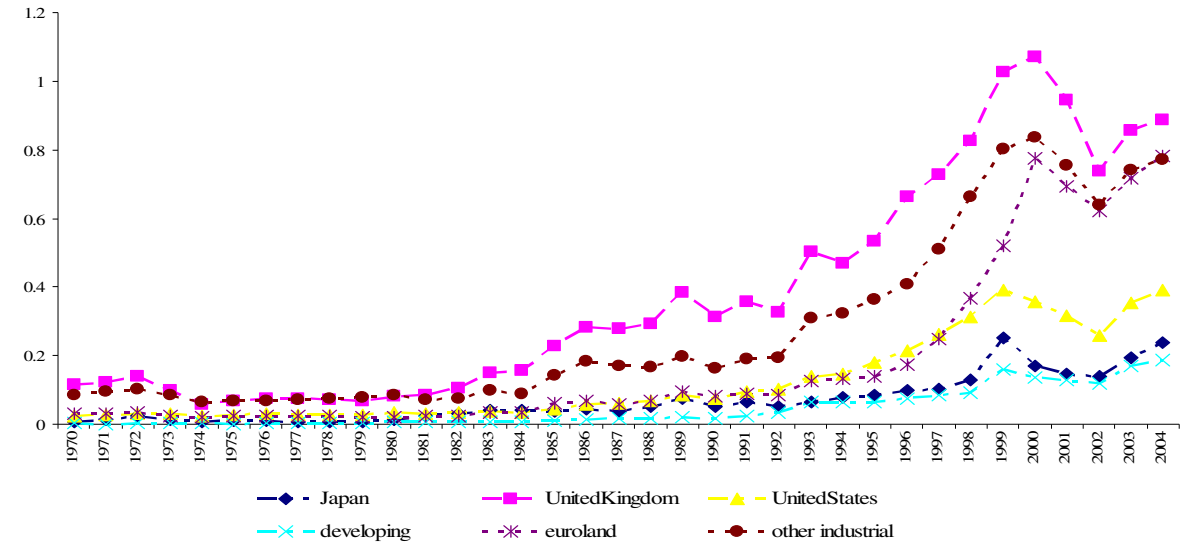
Source: P.Lane and G.M. Milesi-Ferretti, 2006, The External Wealth of Nations (Mark II), CEPR Discussion Paper

Figure 4: External bank assets and liabilities



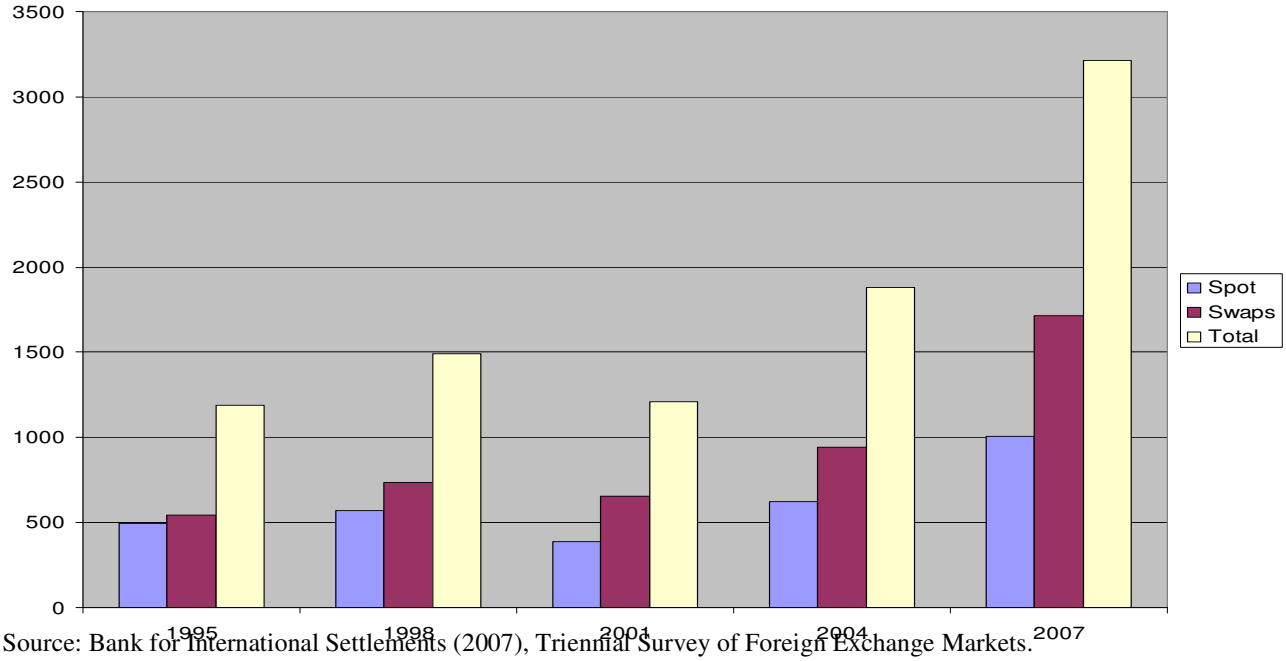
Notes: External assets/liabilities "ex. off shore centres" exclude financial centres (Bahamas, Bermuda, Cayman Islands, Isle of Man, Jersey and Netherlands Antilles). The data cover banks' unconsolidated gross international on-balance sheet assets and liabilities. They are based on the residence of the reporting institution and measure the activities of all banking offices residing in each reporting country. Such offices report exclusively on their own unconsolidated business, which thus includes international transactions with any of their own affiliates. BIS reporting banks include banks residing in Australia, Austria, the Bahamas, Bahrain, Bermuda, Brazil, the Cayman Islands, Chile, Denmark, Finland, Greece, Guernsey, Hong Kong SAR, India, Ireland, Isle of Man, Jersey, Korea, Luxembourg, Macao SAR, Mexico, the Netherlands Antilles, Norway, Panama, Portugal, Singapore, Spain, Taiwan and Turkey. Detailed information on breaks in series is available on the BIS website under http://www.bis.org/publ/breakstables.pdf. Source: Ferguson *et al.* (2007), Ch. 6.

Figure 5: Gross portfolio flows relative to GDP, major countries



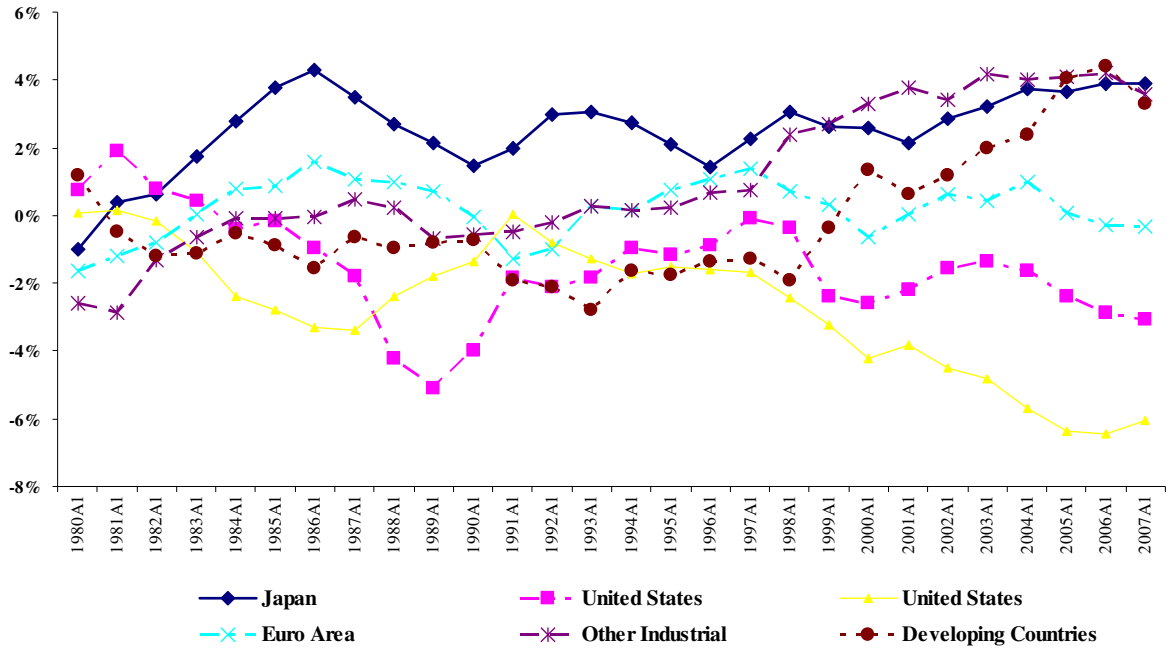
Source: P.Lane and G.M. Milesi-Ferretti, 2006, The External Wealth of Nations (Mark II), CEPR Discussion Paper

Figure 6: Foreign Exchange Market Turnover



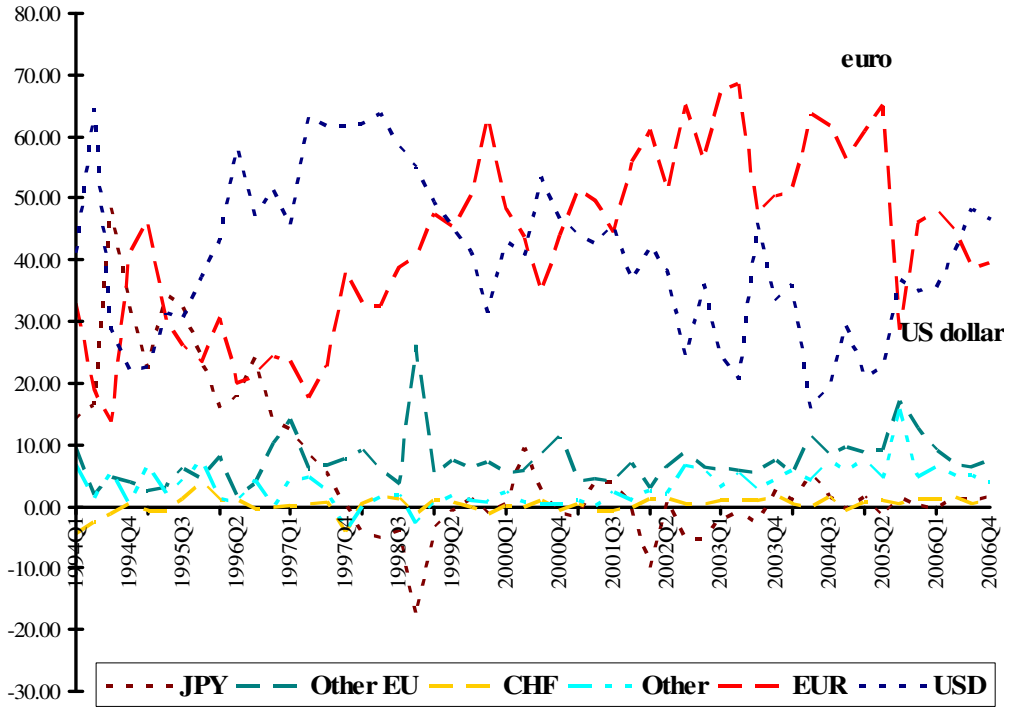
Source: Bank for International Settlements (2007), Triennial Survey of Foreign Exchange Markets.

Figure 7: Current Account Positions



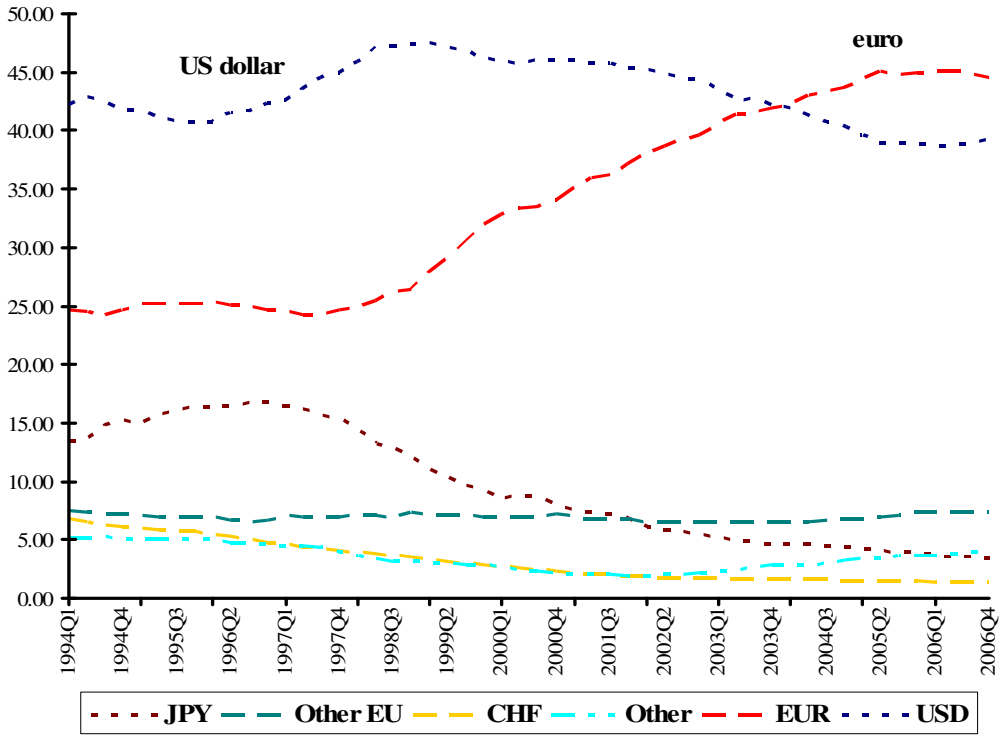
Source: IMF World Economic Outlook Database (2007).

Figure 8: Net Issues of International Debt Securities (Bonds, Notes and Money Market Instruments)
including home currency issuance ("broad" measure)



Source: BIS

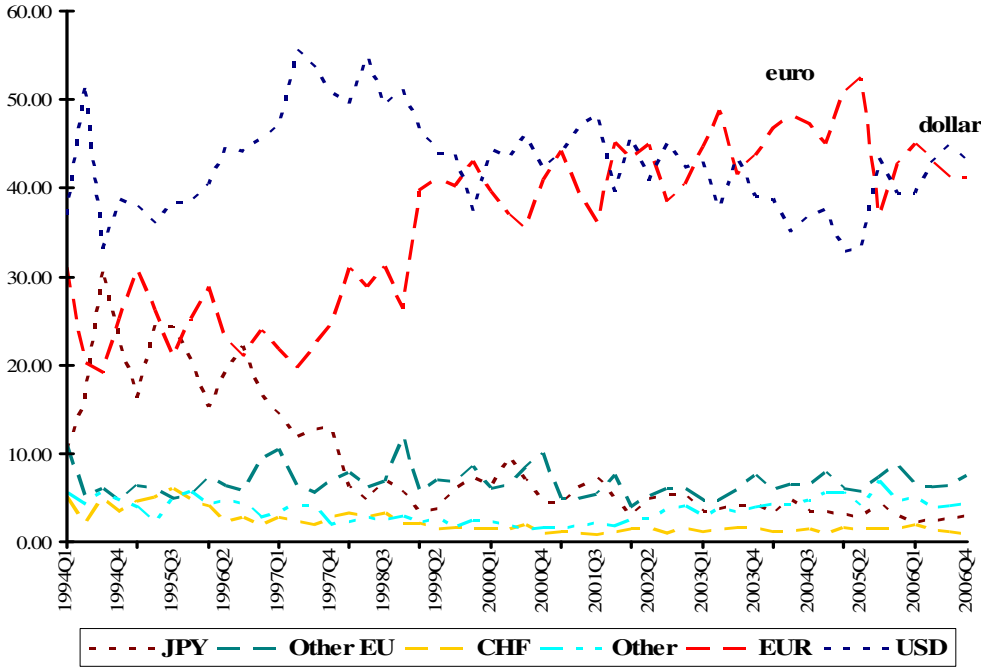
Figure 9: Amounts Outstanding International Debt Securities (Bonds, Notes and Money Market Instruments)
including home currency issuances ("broad" measure)



Source: BIS

Figure 10: Amounts Outstanding International Long-Term Debt Securities (Bonds and Notes)

including home currency issuances ("broad" measure)



Source: BIS

Figure 11: Differential Returns for the euro and the dollar (quarterly, 1999-2007)

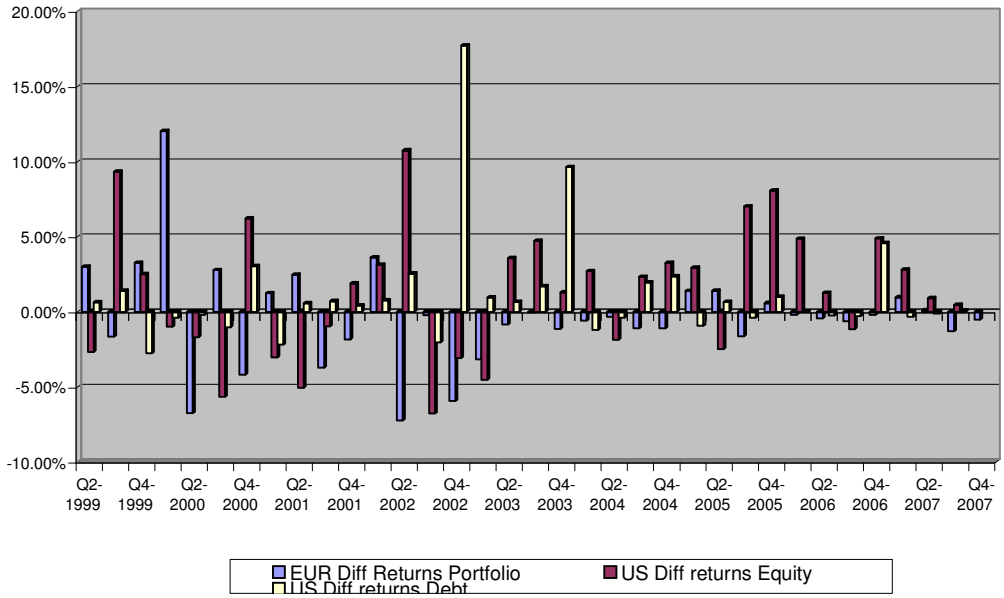


Figure 12: Differential returns for USD, quarterly, 1990-99

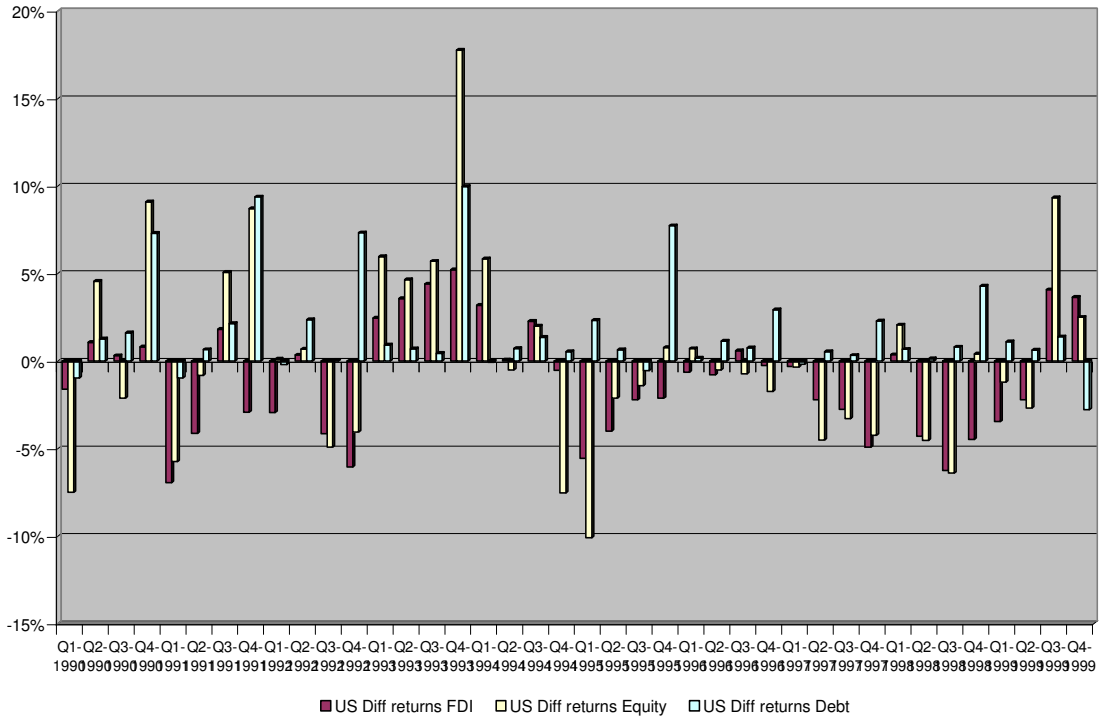
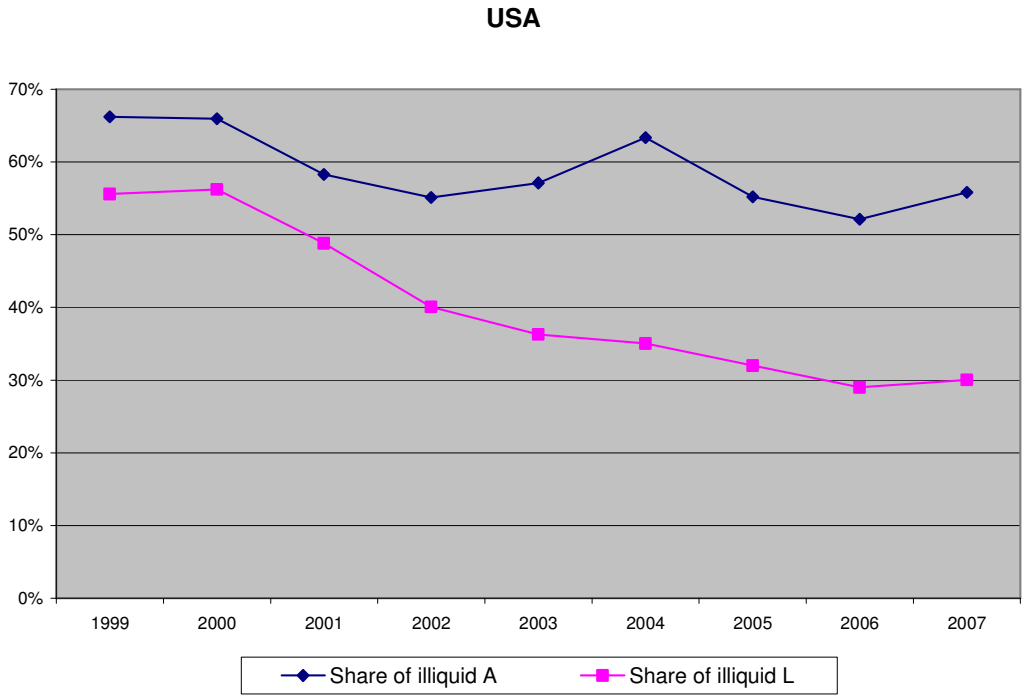


Figure 13: Shares of illiquid assets and liabilities in the US and eurozone



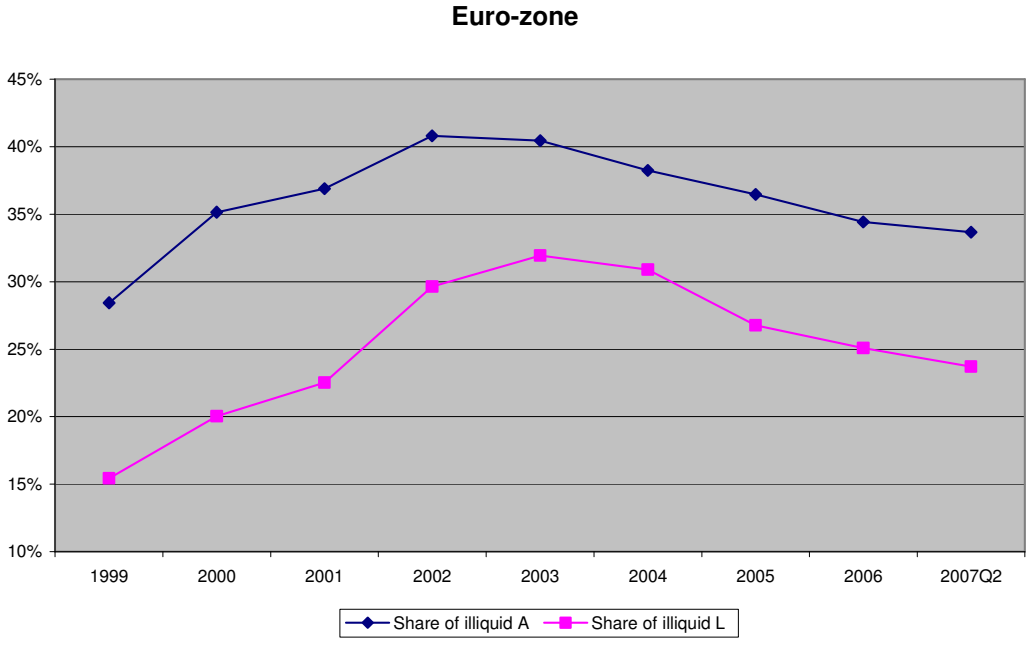


Table 1: Share of Main Currencies in Total Identified Official Holdings of Foreign Exchange

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
US dollar	59.02%	62.07%	65.16%	69.30%	70.98%	71.10%	71.48%	67.04%	65.90%	65.81%	66.75%	64.75%
UK pound sterling	2.12%	2.69%	2.58%	2.66%	2.89%	2.76%	2.71%	2.82%	2.77%	3.38%	3.62%	4.43%
Deutsche mark	15.77%	14.69%	14.49%	13.80%	—	—	—	—	—	—	—	—
French francs	2.36%	1.85%	1.44%	1.62%	—	—	—	—	—	—	—	—
Japanese yen	6.78%	6.72%	5.78%	6.24%	6.38%	6.07%	5.05%	4.36%	3.95%	3.85%	3.61%	3.19%
Swiss francs	0.33%	0.30%	0.35%	0.33%	0.23%	0.27%	0.28%	0.41%	0.23%	0.17%	0.15%	0.18%
Netherlands guilder	0.32%	0.24%	0.35%	0.27%	—	—	—	—	—	—	—	—
ECUs	8.54%	7.09%	6.08%	1.30%	—	—	—	—	—	—	—	—
euros	—	—	—	—	17.91%	18.31%	19.21%	23.82%	25.18%	24.91%	24.21%	25.80%
Other	4.78%	4.34%	3.76%	4.47%	1.61%	1.50%	1.28%	1.56%	1.97%	1.88%	1.67%	1.65%

Source: IMF

Notes: Country coverage changes every year, especially before 1997 (so the observations are not fully comparable across years). ECU reserves held by the monetary authorities existed in the form of claims on both the private sector and the European Monetary Institute (EMI), which issued official ECUs to European Union central banks through revolving swaps against the contribution of 20 percent of their gross gold holdings and U. S. dollar reserves. On December 31, 1998, the official ECUs were unwound into gold and U.S. dollars; hence, the share of ECUs at the end of 1998 was sharply lower than a year earlier. The remaining ECU holdings reported for 1998 consisted of ECUs issued by the private sector, usually in the form of ECU deposits and bonds. On January 1, 1999, these holdings were automatically converted into euros. All shares are estimated at the end of year.

Table 2: Currency breakdown of the total foreign exchange reserves of selected countries (in percentages)

	Month-Year	Euro	Dollar	Yen	Other
Australia (inc. SDR & gold)	Dec 06	22	55	19	4
Canada	Dec 06	51	47	1	0
United Kingdom	Sept 06	58	33	9	0
United States	Dec 06	61	0	39	0
Bulgaria	Dec 06	100	0	0	0
Latvia	Dec 06	46	44	10	0
Lithuania	June 05	100	0	0	0
Romania	Nov 06	68	28	0	4
Slovakia	Dec 06	69	26	0	5
Algeria	Dec 06	60	40	0	0
Croatia	Dec 06	85	15	0	0
Iceland	June 05	40	40	5	15
Norway	June 05	54	38	0	5
Switzerland	Dec 06	47	33	5	15
Chile	June 06	26	67	n.a.	7
Colombia	March 06	12	85	n.a.	3
Peru	Dec-05	n.a.	79.1	n.a.	n.a.
Uruguay	Dec 06	1	99	0	0

ECB (2007); based on various primary sources

Table 3: De facto dollar and euro pegs (Cobham (2007) classification)

Number of Countries	1994-1998	1999-2000	2001-2004	2005-2006
$$$ - Very strong dollar peg	18	20	20	28
$$ - Strong dollar peg	3	4	3	6
$ - Aligned to the dollar	6	17	60	17
0 - No dollar or no euro peg	94	48	22	52
€ - Aligned to the euro	39	35	20	7
€€ - Strong euro peg	0	7	4	8
€€€ - Very strong euro peg	0	21	21	21
euro member countries	0	11	12	12

Source: Cobham (2007)

Table 4: International Trade Invoicing Patterns in Japan

Panel A: Imports

	From Asia				From the US				From the EU			
	Euro	JPY	USD	Pound	Euro	JPY	USD	Pound	Euro	JPY	USD	Pound
2001	0	24.2	74.5	0	0.2	20.5	78.8	0	12.3	48.1	16.9	4.3
	0	24.2	74.5	0	0.2	19	80.3	0	16.9	49.7	14.8	4.4
2002	0	25.5	73.2	0	0.2	19.4	80	0.1	28.7	49.3	15	3.9
	0	27.5	71.2	0	0.2	19.8	79.7	0	31	50.5	13.4	3.7
2003	0	27.8	71	0	0.2	19.3	80.2	0.1	32	49.4	13.2	3.7
	0.2	28.1	70.6	0	0.8	19.1	79.9	0	32.3	50.9	12	3.5
2004	0.2	28.4	70.2	0	0.4	21.6	77.8	0	32.4	51.3	11.8	3
	0.3	27.2	71.4	0	0.6	20.7	78.5	0	34.1	49.5	11.7	3.2
2005	0.2	28.2	70.4	0	0.4	21.9	77.5	0	33.9	50.2	11.4	3.2
	0.2	26.7	71.9	0	0.4	22.8	76.6	0	32.4	50.7	12.4	3.2
2006	0.3	25.9	72.6	0	0.5	21.8	77.6	0	32.5	50	13.2	3.1
	0.3	26	72.4	0	0.7	23.6	75.6	0	34	49	12.5	3.2
2007	0.4	28.6	71.8	0	0.7	22.2	76.9	0.1	34.6	47.7	13.6	3

Table 4 (cont.): International Trade Invoicing Patterns in Japan

Panel B: Exports

	To Asia				To the US				To the EU			
	Euro	JPY	USD	Pound	Euro	JPY	USD	Pound	Euro	JPY	USD	Pound
2001	0	49	48.9	0	0	12.5	87.4	0	42.6	30.4	12.8	6.9
	0.3	50.1	47.9	0	0.1	12.2	87.7	0	45	31.3	12.8	7.3
2002	0.4	49.4	48.6	0	0.1	11.8	88	0	52.2	28.4	11.7	7.1
	0.5	51.3	46.6	0	0.1	12	87.9	0	53.5	28.5	10.4	7
2003	0.5	53.3	44.7	0	0.1	13.4	86.4	0	54.4	27.4	11.2	6.6
	0.4	53	44.9	0	0.1	12.5	87.3	0	54.1	27.3	11.4	6.6
2004	0.4	53.4	44.6	0	0.1	13.3	86.5	0.1	54.8	27.5	11	6.3
	0.4	52.8	45.5	0	0.1	12.9	86.9	0	53.9	29.3	10.3	6
2005	0.2	51.6	46.6	0	0.1	13	86.9	0	53.6	29.3	10.2	6.6
	0	49.5	48.8	0	0.1	12.3	87.6	0	52.2	29.3	11.9	6.3
2006	0	50.7	47.5	0	0.1	11.9	88	0	51.5	28.5	13.8	5.9
	0	48.8	49.5	0	0.1	10.8	89.1	0	54	26.6	13.4	5.6
2007	0	49.9	48.4	0	0.2	11.5	88.3	0	54.6	26.4	13.6	5.7

Source: Ministry of Finance, Japan (2007)