No. 1741

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INTERNATIONAL MACROECONOMICS

CE PR

Centre for Economic Policy Research

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ABSTRACT

The Emergence of the Euro as an International Currency*

*The European Union will enter Stage Three of Economic and Monetary Union (EMU) in 1999. The development of euro financial markets and thickness externalities in the use of the euro as means of payment will be the major factors determining the importance of the euro as an international currency. As euro securities markets become deeper and more liquid and transaction costs fall, euro assets will become more attractive, and the use of the euro as a vehicle currency will expand; the two effects interact, as we demonstrate. We use a three-region world model as a framework for alternative steady-state scenarios. With forex and securities market data, we assess the plausibility of those scenarios and the implications for economic efficiency (welfare). We find that the euro may take on some of the current roles of the dollar, but the extent to which it does will depend on policy decisions and on the beliefs of market participants. The welfare analysis reveals potential quantitatively significant benefits for the euro area, at the cost of the United States and (to a lesser degree) Japan. During the transition to the new equilibrium, the main effect of the introduction of the euro will come through portfolio shifts that are likely to favour an appreciation of the new currency *vis-à-vis* the dollar (and the yen). Whatever the likely long-run outcome, the dollar will remain quantitatively dominant for some time because of inertia and hysteresis – with multiple equilibria and likely threshold effects, we would not expect a quick transition to a new equilibrium. The early period could see considerable instability associated with the emergence of the euro, especially if the United States were to resist any decline in the international status of the dollar.

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excellent research assistance. The current preliminary and incomplete draft is not to be cited without permission.

Submitted 21 October 1997

NON-TECHNICAL SUMMARY

The European Union will enter Stage Three of Economic and Monetary Union (EMU) in 1999. There has been extensive discussion of the potential international role of the euro, most without any underlying analytical framework. We propose here an analytical basis for this discussion and offer specific estimates of the consequences.

Previous studies of the likelihood, costs and benefits of a European international reserve currency, such as Alogoskoufis and Portes (1991, 1992, 1997), have considered a wide range of issues: seigniorage, benefits for 'home' financial institutions, relaxation of the 'external constraint' on macroeconomic policy, the role of the region in international institutions, effects on macroeconomic policy coordination, and the wider consequences of exercising or sharing 'currency hegemony'. Our contribution here is to assess whether the euro will take on this role, and to what extent; to measure the effects of alternative scenarios on welfare in the main world regions; and to consider carefully the transition period as the international monetary system adjusts to the creation of the euro.

We assume that the euro will be launched on 1 January 1999. Indeed, we go further and assume that not long thereafter, the euro area will cover the entire existing EU, and in particular the United Kingdom (important because of London's financial markets), although it will take longer to bring in the countries expected to join the EU from 2002–2003 onwards. We assume also that the European Central Bank (ECB) will quickly establish its credibility and reputation, and our arguments are conducted supposing a neutral monetary policy relative to the initial exchange rate of the euro.

The development of euro financial markets and network ('thickness') externalities in the use of the euro as a means of payment will be the major factors determining the importance of the euro as an international currency. As euro securities markets become deeper and more liquid and transactions costs fall, euro assets will become more attractive, and the use of the euro as a vehicle currency will expand; the two effects interact, as we demonstrate. We argue that private invoicing behaviour, official reserve holding behaviour, and the use of the euro as an anchor currency (pegging) will all be secondary to these financial and forex market interactions.

In Section 2, we propose alternative 'steady-state' scenarios for the roles of the euro as an international means of payment and store of value, and we

discuss the process that generates each scenario. We use a three-region world model (Europe, United States, Asia) as a framework for the scenarios. In this model, the choice of a vehicle currency and demand for bonds denominated in different currencies are jointly determined. The medium of exchange function of money is characterized by transaction costs that decrease with transaction volumes, i.e. with the liquidity of the market in question (forex or securities). The 'network' or 'thickness' externalities that generate these increasing returns to market size are also responsible for the multiplicity of possible steady states – there are several possible equilibrium scenarios.

We label the most likely as 'quasi status quo', 'medium euro', and 'big euro'. In the first, the euro replaces the dollar as the dominant currency for exchanges between Europe and the Asian bloc, but the dollar remains the vehicle currency on the forex markets. In the 'medium euro' scenario, the euro replaces the dollar as the main international currency for financial asset transactions, but transactions between the United States and the Asian bloc are still dominated by the dollar, and the dollar is still the vehicle currency on the forex markets. In the 'big euro' scenario, the euro also takes on the vehicle currency role.

With forex and securities market data, we assess the plausibility of those scenarios and the implications for economic efficiency (welfare). Initially, we find the quasi status quo to be most likely; but if financial market integration in Europe progresses sufficiently, then the overall size of European securities markets could bring transaction costs down to the point at which the key will be the transaction costs in forex markets. And in this case, the fundamentals would support either the medium euro or the big euro scenario.

Thus we find that the euro may take on some of the current roles of the dollar, but the extent to which it does will depend on policy decisions and on the beliefs of market participants. The welfare analysis reveals quantitatively significant potential benefits for the euro area, of the same order of magnitude as international seigniorage – at the cost of the United States and the 'Asian bloc'.

During the transition to the new equilibrium, the main effect of the introduction of the euro will come through portfolio shifts. We conjecture that private asset shifts into the euro (supplemented by some rebalancing of official reserves) may initially outweigh the expansion of new liability issues in euros, which will also be encouraged by the development of euro financial markets. This excess demand for euro-denominated assets would favour an appreciation of the new

currency *vis-à-vis* the dollar (and the yen). To illustrate this analysis, we provide some historical evidence from the inter-war and post-war periods regarding the transition from sterling to the dollar.

Our welfare conclusions provide a new economic argument for policy-makers who wish to promote the international role of the euro. We therefore consider possible countervailing arguments, such as those that have motivated the Bundesbank and the Bank of Japan in discouraging international use of their currencies. If the balance favours internationalization of the euro, policy-makers should focus their efforts on integrating the European capital markets: increasing their liquidity, breadth, and depth. Here both (de)regulation and various aspects of policy harmonization across Europe will be important; so also will be private market initiatives (e.g. in establishing benchmark interest rates and securities).

Whatever the likely long-run outcome, the dollar will remain quantitatively dominant for some time because of inertia and hysteresis – with multiple equilibria and likely threshold effects, we would not expect a quick transition to a new equilibrium. The early period could see considerable instability associated with the emergence of the euro, especially if the United States were to resist any decline in the international status of the dollar. The European authorities will have to take account of these instabilities and exchange-rate pressures in setting their monetary policies, and this may make simple policy rules inadvisable at least in the early years. Moreover, improvements in international macroeconomic policy coordination may be necessary to mitigate the effects of the forces that we analyse.

1. Introduction

The Maastricht Treaty process should lead the European Union economies to full monetary unification by the year 2002. We argue that this will have substantial implications for the international monetary system; for the currency composition of portfolios; for exchange rates, and hence monetary policies; and for economic efficiency and welfare. The key determinant of the extent and speed of internationalisation of the euro will be transaction costs in foreign exchange and securities markets. There has been extensive discussion of the potential international role of the euro, most without any underlying analytical framework. We propose here an analytical basis for this discussion and offer specific estimates of the consequences.

Some observers, particularly economists in the United States, may underestimate the importance of these developments (but not Bergsten, 1997). Perhaps the wish is father to the thought, or this assessment is influenced by scepticism about the likelihood or desirability of monetary unification in Europe. Whatever the explanation, we query assertions such as, "there is little likelihood that some other currency will supplant the dollar as the world's premier reserve currency by 2020. One national currency or another must occupy the number-one position, and there is simply no plausible alternative" (Frankel 1995, p. 9).[1] If the euro does go ahead, it will become 'plausible' long before 2020, based on the fundamentals: the EU's economic size, the liberalisation and integration of its financial markets, and confidence in its international creditor status and stability-oriented monetary policy. Moreover, we find that the 'number-one position' could actually be shared, and this might be the most likely outcome.

Even if the euro does achieve the status of an international currency rivalling the dollar, does it matter? Indeed it does, say historians and specialists in international political economy. Kunz (1995), writing in the premier American journal of international relations, is an example of the former:

"Geopolitical power depends on financial power, each of which supports the other. America's general indifference to the fate of the dollar is extremely unfortunate. To hang on too long to a currency whose value is beyond one's resources, like

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[1] A similar view was expressed recently by Deputy Treasury Secretary Lawrence Summers: "The dollar will remain the primary reserve currency for the foreseeable future .... We expect the impact of the euro on the monetary system to be quite limited initially and to occur only gradually ... The relative position of the dollar ... is likely to depend more on developments in the United States than in Europe or Japan." (Speech to Euromoney Conference, New York, 30 April 1997.)

the British, is one thing. To ignore the real benefits of controlling the international currency system is another...The death of the dollar order will drastically increase the price of the American dream while simultaneously shattering American global influence."

Some observers of the recent East Asian currency crises interpret them as an alarming example of precisely this decline of the 'dollar order'.[2]

According to Cohen [1997], monetary supremacy "confers substantial political benefits on the hegemon. At home, the country should be better insulated from outside influence or coercion in formulating and implementing policy. Abroad, it should be better able to pursue foreign objectives without constraint as well as to exercise a degree of influence or coercion over others. The expansion of its currency's authoritative domain, in principle, translates directly into effective political power." Frankel (1995) also notes the "benefits to political power and prestige" which, though "nebulous", reflect the association between the loss of the key currency status and the historical decline of great powers.

Currency hegemony is supposed to bring specific economic benefits to the hegemon. We cannot measure the supposed benefits of international currency status to the financial markets and institutions of the issuing country, nor the possible advantages for trade of having other countries peg their exchange rates to one's own (elimination of exchange-rate uncertainty). Nor can we value the ability to finance balance-of-payments deficits with liabilities denominated in the international money, which other countries will accept without effective limit. This does weaken a constraint on economic policy, although the possible resulting overhang of liquid liabilities may ultimately pose problems.[3] De Gaulle went too far in

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[2]"Central to the American economic success story ... is the omnipresence abroad of the almighty dollar. Anything that erodes America's international currency ... is alarming. Asia may now be moving from a dollar to a yen zone. Does anyone care?" T. Plate, "US Won't Go to Baht for Asian Economies", *Los Angeles Times* 22 July 1997.

[3]Under the Bretton Woods exchange-rate regime, other countries had to accumulate dollars or threaten to break up the system. With a floating dollar (and flexible exchange rates, in general), the nature of the external constraint has changed, for both the United States and other countries (see the Introduction to Alogoskoufis, Papademos and Portes, 1991). A solvency constraint does apply to the United States, but in the short and medium run, it can nevertheless build up international liabilities in dollars (and at a lower interest rate than it would otherwise have to pay - see below). Moreover, it has the option to eliminate some of that debt with a surprise inflation. McKinnon (1993, p. 28) states that "The 'privilege' of going into international debt so heavily in your own currency is one that is open only to the center...country". From a European standpoint, Artus (1997a) remarks that "It is clear that at least until 1994, the United States has benefited from a considerable privilege, permitting it to finance a continuous

claiming that the power of the dollar "enabled the United States to be indebted to foreign countries free of charge" (quoted by Kunz 1995) - if only because foreigners hold most of that debt in interest-bearing U.S. Treasury securities - but there was some substance in his basic insight.

Some of the debt is indeed "free of charge" - foreign residents hold U.S. currency in large quantities (the conventional estimate is 60 per cent of the total stock outstanding, but Rogoff 1997 puts it closer to 50 per cent). This is the source of seigniorage to the issuer of the international currency, the ability to obtain real resources (net imports) in exchange for almost costless notes. The flow of this international seigniorage to the United States is around 0.1 per cent of GDP (Alogoskoufis and Portes, 1991; European Commission, 1990; Frankel, 1995; Rogoff, 1997).

There is another, often neglected source of seigniorage accruing to the issuer of the international currency: a liquidity discount. Non-resident holdings of US government securities are 25% of the total stock, compared with 17% in other major markets (J.P. Morgan, 1997b), and the volume of transactions in US government bonds is an even more disproportionate share (relative to the size of stocks outstanding) of the global bond markets. This international currency effect reduces the real yields the United States government has to pay. From J.P.Morgan (1997a) estimates, we calculate that this is worth 25-50 basis points; applied to non-resident holdings of US government debt of approximately $2,000 bn., this $5-10 billion annual flow is of the same order of magnitude as international currency seigniorage.

There are also efficiency consequences of the switch from one to another (or more than one) international currency, and these may bring real gains or losses in economic welfare. Our analysis yields estimates of these welfare implications, and we find that they are of the same order of magnitude as both sources of seigniorage (Section 4). These results provide a new economic argument for policy-makers who wish to promote the international role of the euro.

The American authorities may be relatively unconcerned about any future challenge to the dollar because they believe that the limited decline in its dominance after the break-up of the Bretton Woods exchange rate regime came mainly from relatively high US inflation. If so, the achievement of an apparently stable low-inflation environment will suffice to safeguard the currency's international status. This argument ignores another macroeconomic source of long-run dollar weakness, the US current account deficits that have led to massive accumulation

external deficit without having to give a yield premium on dollar-denominated assets."

5

of external debt. But we shall disregard both of these factors and focus only on size: the euro zone will be a competitor to the dollar zone simply because of a size effect, which will be more than proportional to the sum of the currencies that will go into the euro.

We assume that the euro will be launched on 1 January 1999. Indeed, we go further and assume that not long thereafter, the euro area will cover the entire existing EU, and in particular the United Kingdom (important because of London's financial markets)[4], although it will take longer to bring in the countries expected to join the EU from 2002-2003 onwards. We assume also that the European Central Bank (ECB) will quickly establish its credibility and reputation, and our arguments are conducted supposing a neutral monetary policy relative to the initial exchange rate of the euro.

The new currency will be issued on behalf of a large economic area, by a new central bank which will be responsible for the joint monetary policy of the European Union. International institutions such as the G-7, the IMF and the OECD will have to adapt (see Alogoskoufis and Portes 1991, Begg et al. 1997, Henning 1997). There will also be a major shock to the existing international monetary and exchange-rate system. The monetary policies of the new ECB will have far more important international spillovers than those of any of the existing EU central banks. These spillovers will affect exchange rates and the process of international policy coordination.

More important, however, is the likely status of the euro as a major international currency. In Section 2, we propose alternative 'steady-state' scenarios for the roles of the euro as an international means of payment and store of value, and we discuss the process that generates each scenario. In Section 3, we use forex and securities market data to assess the plausibility of those scenarios. As euro securities markets become deeper and more liquid and transactions costs fall, euro assets will become more attractive, and the use of the euro as a vehicle currency will expand; the two effects interact.We find that the euro may take on some of the current roles of the dollar, but the extent to which it does will depend on policy decisions and on the beliefs of market participants. In Section 4, we evaluate the implications for economic efficiency (welfare). The welfare analysis reveals potentially significant benefits for the euro area, at the cost of the US and Japan.

Our analysis then shifts to the transition from the current configuration towards the new role of the euro and the implications of that process for the exchange

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[4]Recent reports (*Financial Times*, 26 September 1997) support this assumption. But we shall discuss how the absence of the UK would affect our scenarios.

rate between the dollar and the euro, both in the short and in the medium run. In Section 5, we conjecture that private asset shifts into the euro (supplemented by some rebalancing of official reserves) may initially outweigh the expansion of new liability issues in euros, which will also be encouraged by the development of euro financial markets. This excess demand for the euro-denominated assets would favour an appreciation of the new currency vis-a-vis the dollar (and the yen). To illustrate this analysis, we provide some historical evidence from the interwar and postwar periods regarding the transition from sterling to the dollar.

Finally, we consider the policy implications of these developments. First, if the European authorities wish to promote the emergence of the euro as an international currency, as suggested by the welfare analysis in Section 4, they must focus on making the domestic euro financial markets more efficient, more integrated, and cheaper for participants. Second, the authorities are likely to face pressures for appreciation of the euro which can only be moderated if monetary policy can respond to those pressures, i.e. if they are not bound to rigid monetary or inflation targeting. Third, if the euro does challenge the dollar's hegemony, this is likely to create instability in the international monetary system, which appropriate policy coordination could mitigate.

2. Scenarios for the internationalisation of the euro

Within national borders, the sole use of one currency is usually imposed by government fiat. Only in exceptional circumstances, such as very rapid inflation, is a national currency replaced in one or more of its functions by other currencies or commodities. In the international economy, demand factors play a much more important role in the determination of which currencies are used. Since there is no supranational authority that can impose the use of a single currency, these issues are decided in the market place, by the behaviour of private and public agents of all countries. Because of economies of scale in the use of currencies, the externalities involved and the considerable degree of uncertainty and asymmetric information, there is no guarantee that the world will end up with the best monetary system, let alone a single international currency. There is, however, an important lesson from the models of international money: history will matter. Once an exchange structure is established, it will persist unless the system experiences a shock large enough to shift it from one equilibrium to another (Krugman 1980, Rey 1997a).

7

History does indeed suggest that many of the institutions and modes of behaviour from previous regimes do not change overnight, or do not change at all. We observe inertia and hysteresis. There has been considerable continuity in the international monetary system, even after the breakdown of coordination and major changes in regime, following shocks to the fundamentals or the preferences of governments.[5] And in a world with many equilibria and likely threshold effects, history and institutions also play a key role in determining which equilibrium will prevail, or in determining the transition path from one equilibrium to another.With multiple equilibria, however, there may be considerable instability, as the expectations of agents are among the major factors that will determine which equilibrium will prevail.[6]

Here we propose a framework for estimating the potential for internationalisation of the euro using foreign exchange and securities market data. Underlying the analysis is a general equilibrium model where the use of vehicle currencies and demand for financial assets denominated in different currencies are driven by and themselves affect the liquidity of the different bilateral foreign exchange and bond markets. This same framework enables us to assess the consequences of such shifts for economic welfare.

2.1. Synergy between the medium of exchange and store of value functions

The use of the euro in financial services will depend on transaction costs, i.e., how efficiently those services are provided. Transaction costs (typically measured by bid-ask spreads) in financial markets are normally very small in percentage terms for liquid assets, but the volumes to which they apply are huge (e.g., well over one trillion dollars daily in the forex markets), so their incentive effects are

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[5] See Yeager (1976) for a comprehensive history of the international monetary system since the 19th century. Kindleberger (1984) provides a history focused on Western Europe.

[6] There is a theoretical literature investigating the emergence of media of exchange when there are are more than two traders, such as Jones (1976) and Kiyotaki and Wright (1989). The random matching models are hard to use for open economies and a world of more than one money. Matsuyama et al. (1993) do so, but focusing only on currency substitution and with only two countries, so there can be no indirect exchange, nor any vehicle currency. Recently, however, Rey (1997a) has modelled the emergence of vehicle currencies in relation to the pattern of trade in goods, with a central role for the thick market externalities that we believe underlie the evolution of international money. In her model as well as in the earlier literature, multiple equilibria are an essential feature, as they are in the model of this Section (and Appendix 1).

in fact considerable. Moreover, the pattern (ranking) of transaction costs gives a qualitative differentiation among markets that drives choices in the international market place.

Whereas international transactions in goods markets are arranged between importers and exporters, eventual payment is intermediated through commercial banks. Thus we consider the "thickness" externalities that cause dealers to prefer indirect exchange, through a vehicle currency, to direct exchange of one currency for another. These externalities have to do with transactions costs that fall with the use of the currency. Such network externalities are very important in monetary transactions. If there are many dealers prepared to exchange dollars (the dollar market is "thick"), then a dealer wishing to exchange pesetas for rupees finds it less costly to go through two exchanges, one of pesetas for dollars and one of dollars for rupees, than to go through a direct exchange of pesetas for rupees[7].

The key parameter in our analysis is the elasticity of transaction costs with respect to volumes. "Numerous studies have related bid-ask spreads to trading activity and price volatility for a variety of financial markets. These studies generally find a negative relationship between volume and bid-ask spreads and a positive relationship between price volatility and bid-ask spreads. The volume-spread relationship probably reflects decreasing order-processing costs, decreasing inventory-carrying costs, and increasing market maker competition as volume increases" (Fleming, 1997, p. 21). Throughout the paper, we are making the assumption that volatility on the different markets will remain of the same order of magnitude as before the introduction of the euro, so that liquidity is the main driving force behind change in the pattern of transaction costs[8].

There is a synergy between the vehicle currency role on the foreign exchange markets and trading of financial assets denominated in this currency. An efficient domestic financial system encourages capital inflows, which increase the liquidity of the bilateral foreign exchange markets involving that domestic currency, so making it more likely that the currency becomes a vehicle. Conversely, being a vehicle currency enhances foreign exchange market liquidity and lowers the cost of portfolio substitution, which feeds back into foreign exchange market turnover.

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[7]Hartmann (1996b) has recently discussed the vehicle currency phenomenon in foreign exchange markets and cites the substantial previous literature.

[8]This seems to be a reasonable assumption, in view of evidence reported in Fleming (1997) on the US bond markets, which provide an excellent benchmark, since one can compare the trade of the same securities in New York (high level of volatility, high volume), London and Tokyo (with both lower volatility and volumes). It is found that transaction costs are lower in New York despite higher volatility.

These 'circular' forces leave scope for multiple equilibria[9], which, we believe, are a necessary feature of any convincing model of the medium of exchange function of money.

As explained below with the triangles, we find that the internationalisation of the euro will depend mainly on the liquidity of the euro financial markets (the analysis is made under the assumption that the ECB has established its anti-inflationary credentials and that monetary policy is 'neutral' in all the countries). The driving force towards internationalisation will come from the financial market side and then will expand the vehicle currency function.

If financial transactions inside the new euro zone enhance the liquidity of the euro securities markets above a critical level, then the "old" equilibrium, where the dollar is the international currency both for financial assets and foreign exchange market transactions, becomes unsustainable. There is a shift towards a new equilibrium where either the euro replaces the dollar completely in its major international roles or where it replaces it only in some dimensions. In the latter case, the economic links between the 'dollar bloc' and the 'Asian bloc' would still be dominated by the dollar.

The internationalisation of the euro therefore hinges critically on the speed of integration of euro financial markets, on the willingness of the ECB not to hinder internationalisation, and on the number of participants in the monetary union (especially on UK participation). Since the turnover on the UK bond market is particularly high by European standards, the participation of the UK in EMU can tilt us from one equilibrium to another.

2.2. A simplified story of the pattern of world payments

We place ourselves in a three-country world with a European, an American and an Asian bloc. Demand for financial assets denominated in a given currency derives from the pattern of cross-border bond and equity flows and from domestic savings. The demand for a currency comes in turn from two sources: money is needed to buy financial assets and to buy goods. We make the (convenient) assumption that

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[9]That is why our model cannot be used to 'predict' the internationalisation (or non-internationalisation) of the euro *stricto sensu*. Nevertheless, it restricts the range of possible equilibria in the different parameter domains, which allows a rigorous description of the scenarios of internationalisation (or non-internationalisation) and outlines the key variables.

sellers are paid in their own currency[10].

Purchases and sales of financial assets as well as foreign exchange transactions involve the intervention of financial intermediaries. These financial intermediaries choose on which foreign exchange and bond markets to operate by maximizing profit. For example, a financial intermediary who carries some cash in currency j at date t and who wants some currency i at date t+1 has several possibilities. He can either change his currency j against currency i on the spot foreign exchange market at date t and then buy bonds denominated in currency i which will be redeemed in currency i at date t+1. He can also buy bonds denominated in currency j at date t and go to the spot foreign exchange market at date t+1. But he could also go to the spot foreign exchange market at t, exchange currency j against currency k, buy bonds denominated in currency k and change currency k against currency i at t+1. His choice will depend on the structure of the transaction costs on the different markets, which will depend on the strategies of all the other agents through the thick market externalities.

We denote by T_{ij} the transaction costs on bilateral market ij, i.e. the cost of exchanging one unit of currency i into currency j ($T_{ji} = T_{ij}$). T_{ii} will be the transaction cost on the bond market ii, i.e. the cost of exchanging currency i against a bond denominated in currency i. We derive an expression for these transaction costs which falls with the volumes exchanged (Appendix 1). This relation is corroborated by empirical evidence (for example, see Bessembinder 1994, Hartmann 1996b and 1997 for the foreign exchange markets[11] and Amihud and Mendelson 1991 as well as Fleming and Remolona 1997 for the US Treasury securities markets).

The levels of turnover on the different markets are therefore partly determined by the underlying real trade fundamentals (preferences), equity and bond trading, savings behaviour, and history[12].

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[10]This is the best first-order assumption we could make for the set of countries we consider: in 1992, 92% of US exports were denominated in dollars, 77% of German exports in DM, 62% of UK exports in sterling, 55% of French exports in FF, for example. Only 40% of Japanese exports were denominated in yen, but this figure has been increasing rapidly, from only 29% in 1980 (Ecu Institute 1995).

[11]Both Hartmann papers stress that transaction costs (bid-ask spreads) are a decreasing function of expected or predictable volume, whereas they increase with volatility.

[12]Strictly speaking, the transaction costs reflect the liquidity of the different markets. But it is possible that they 'pick up' other effects as well: more liquid markets also tend to be institutionally better organized.

In the following, S stands for the US with s for the dollar, D for EU countries with d for a basket of European currencies (DM, FF, Lira, Pound), Y for Japan with y for the yen.

2.3. The present situation: the dollar as international currency (graph 1)

Our view of the current world system of payments is the following:

The dollar s dominates in the transactions linked to trade in goods, services and financial assets between the three blocs[13]. Inside each bloc, savings are invested in domestic financial assets: there is a huge home portfolio bias. For example, for the pension funds, foreign assets amount to only 9.6% in the US, 6.6% in Japan, 4.9% in Germany (Miles 1996; PDFM 1997 estimates 13% for the US, 10% for Japan) .

This gives us already some indications on the pattern of transaction costs. The savings side gives for the US:

$$T_{ss} \leq T_{sd} + T_{dd} + T_{ds} \tag{1}$$

$$T_{ss} \leq T_{sy} + T_{yy} + T_{ys} \tag{2}$$

and similar equations for EU and Japan. These equations mean simply that it is cheaper to save in domestic assets than to save in foreign assets and therefore to go twice on the foreign exchange market. T_{dd} is a weighted average of the transaction costs of the EU country bond markets.

The international trade side gives:

$$T_{ds} + T_{ss} \leq T_{dd} + T_{ds} \Leftrightarrow T_{ss} \leq T_{dd} \tag{3}$$

$$T_{ys} + T_{ss} \leq T_{yy} + T_{ys} \Leftrightarrow T_{ss} \leq T_{yy} \tag{4}$$

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[13]Note that our view would have been different if we had considered *intra-european* trade (between Germany and France for example); but here we focus on *inter-bloc* exchanges.

These two equations state only that the markets involving US dollar denominated financial assets are the most liquid ones (more liquid than those involving the yen, the DM, or any other European currency).

In our extreme case, as the two following equations show, it is in general even cheaper for Japan and EU countries to buy assets denominated in dollars when they deal with each other.

$$T_{ys} + T_{ss} + T_{sd} \leq T_{yy} + T_{yd} \tag{5}$$

$$T_{ds} + T_{ss} + T_{sy} \leq T_{dd} + T_{yd} \tag{6}$$

Note that equation (6) is not verified empirically for the DM alone (see numerical estimates in Section 3) since DM-denominated bond markets are quite liquid, but it does hold for all the other EU currencies because of the thinness of the markets against the yen. In this equilibrium, the pattern of financial asset purchases leads to the emergence of the dollar as the vehicle currency on the foreign exchange markets. Data on foreign exchange market turnover by currency pairs (BIS, 1996) show that there are virtually no direct transactions on the bilateral foreign exchange markets between the yen and EU currencies except for the DM/yen market (but even this market has a low turnover compared to the major markets). The total daily average turnover on the \$/DM market was \$192 bn in 1992, \$254 bn in 1995; the corresponding figures were \$155 bn and \$242 bn for the \$/yen market. They were only \$18 bn and \$24 bn for the DM/Y market. Foreign exchange swaps between the DM and the Yen in 1995 amounted to a mere \$2 bn, compared to \$93 bn for the \$/DM market and \$133 bn for the \$/yen market.This case of total indirect exchange (almost all the transactions between the yen and EU currencies are intermediated through the dollar) corresponds to

$$T_{ds} + T_{sy} \leq T_{yd}$$

2.4. The emergence of the euro zone.

EMU represents a shock to the fundamentals of our world economy. We will replace a set of EU currencies, d, with the euro, denoted e. Is this shock big

13

enough to induce a shift in the equilibrium structure of payments we have just described?

The model shows that the key element for the internationalisation of the euro will be the depth of the financial markets denominated in euro. Therefore, the number of countries joining EMU as well as the speed of financial market integration in the euro zone will play major roles. The future of the euro will be determined on the financial markets rather than on the goods markets.

Obviously if

$$T_{yy} \geq T_{ee} \geq T_{ss}$$

the dollar keeps most of its prerogatives. And two subcases can realistically arise: one is the *status quo* (graph 1), where no shift occurs and equations (1) to (6) are still verified with e replacing d. EMU has no impact on the international monetary order, and the euro is nothing but a big DM.

In the other subcase, the euro replaces the dollar as the dominant currency for exchanges between Europe and the Asian bloc, but the dollar is still vehicle currency on the foreign exchange markets[14]. We will denote this the *quasi status quo* case, in which (6) is replaced by:

$$T_{es} + T_{ss} + T_{sy} \geq T_{ee} + T_{ye} \tag{7}$$

This case is represented in graph 2.

On the contrary, if

$$T_{ee} \leq T_{ss}$$

three types of "new" equilibria could realistically emerge. Equations analogous to (1) and (2) regarding savings behaviour (home portfolio bias) will still hold. Therefore we consider only the three equilibria described below.

The Pan Euro Scenario

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[14]This implies

$$T_{es} + T_{sy} \geq T_{ye}$$

and

$$T_{es} \leq T_{ye}$$
$$T_{sy} \leq T_{ye}$$

14

Here the euro replaces the dollar as the currency used for financial asset trans-
actions and as the vehicle currency on the foreign exchange market, where all
transactions between the dollar and the yen are intermediated through the euro.

In this equilibrium, the use of the euro in all financial transactions leads to
its use as a vehicle on the foreign exchange markets (last inequality), and there
are no direct transactions between the dollar and the yen. T_{se} and T_{ey} are low
since these markets are swollen by the vehicle currency use of the euro, and the
above inequalities hold. This scenario is self-enforcing; assessing rigorously its
plausibility would involve looking at the dynamics along the transition paths,
which is beyond our means[15]. It seems, however, that this scenario is unlikely to
happen, since we expect the post-euro \$/yen market to be at least as liquid as
the pre-euro yen/DM market. In that case, the above transaction costs structure
cannot be verified (see numerical estimates in Section 3).

The Big Euro Scenario (graph 4)

The euro replaces the dollar as the main international currency for financial
asset transactions, but the transactions between the dollar bloc and the Asian bloc
are still dominated by the dollar (second inequality below). The euro has taken
the role of vehicle currency on the foreign exchange markets (the two bottom
inequalities). The transaction costs supporting this equilibrium are the following:

$$T_{ee} \leq T_{ss} \leq T_{yy}$$

$$T_{se} + T_{ee} + T_{ey} \geq T_{ss} + T_{sy}$$

$$T_{se} \leq T_{sy}$$

$$T_{ey} \leq T_{sy}$$

T_{sy} is high compared to T_{se} and T_{ey}, since vehicle currency use of the euro has
raised volumes in the se and ey markets. Contrary to the previous case, not all
transactions between the yen and the dollar are intermediated by the euro; some

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[15] In an informal way, we think about the dynamics along the lines of Matsuyama et al. (1993):
agents encounter similar situations repeatedly and use simple rules of thumb which they revisit
occasionally. There is inertia in this process because changing behavioural patterns may be
costly (for example changing unit of account is costly). Given this inertia, only a fraction of
agents change their behaviour each period and adopt the strategy which is today's best response
to the global economic environment.

are direct and some are indirect[16]. The latter use the euro as the vehicle currency. Indirect transactions are necessary because of the 'double coincidence of wants problem' on the bilateral foreign exchange markets (see Krugman [1980]).

The Medium Euro Scenario (graph 3).

In the final alternative scenario, the euro replaces the dollar as the main international currency for financial asset transactions, but transactions between the dollar and the Asian bloc are still dominated by the dollar (second inequality below). The euro, however, has not taken the role of vehicle currency on the foreign exchange markets (bottom two inequalities).

The transaction costs supporting this equilibrium are the following:

$$T_{ee} \leq T_{ss} \leq T_{yy}$$

$$T_{se} + T_{ee} + T_{ey} \geq T_{ss} + T_{sy}$$

$$T_{se} \leq T_{ey}$$

$$T_{sy} \leq T_{ey}$$

The third equation states that the dollar is the vehicle currency on the foreign exchange markets. But again, it does not mean that all the transactions between the euro and the yen are intermediated through the dollar; some are direct and some are indirect[17]. For the latter, the dollar is used as the vehicle currency.

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[16]Otherwise, one would have

$$T_{se} + T_{ey} \leq T_{sy}$$

which would not be compatible with the above structure of transaction costs.

[17]We will assume

$$T_{se} + T_{sy} \geq T_{ey}$$

The inequality

$$T_{se} + T_{sy} \leq T_{ey}$$

could also be consistent with the pattern of transaction costs but would imply no turnover on the foreign exchange market between the euro and the yen (everything would be exchanged through the dollar), which we do not find very plausible (the euro/yen market should be at least as deep as the DM/yen market).

Which of the *big* or *medium euro* scenarios is more likely depends mostly on the degree of symmetry of the trade relations between the blocs. From the structure of transaction costs, it is apparent that the less integrated are Europe and Asia (the bigger T_{ey}), the more the dollar is likely to keep its vehicle currency role.

3. Numerical Estimates

What can we say about the likelihood of the five alternative scenarios - two status quo (or quasi) and three different degrees of internationalisation of the euro?[18]

The model discussed in Appendix 1 predicts a negative elasticity between transaction costs and volumes exchanged on foreign exchange and bond markets. We use estimates of this elasticity and data on fundamentals (real trade, equity and bond flows) for each of the bilateral foreign exchange and bond markets to derive jointly equilibrium transaction costs and turnovers for the different scenarios. We will see that the data reject some scenarios but that for sensible elasticity values, multiple equilibria are likely.

First, however, it is helpful to review the existing characteristics of the current system of world payments and to discuss the trends.We draw from the existing, voluminous literature that tries to make informed guesses (without support from any formal analysis) about potential changes in the pattern of world payments. Second, we present our numerical estimates.

3.1. The current configuration (status quo) and potential changes

Foreign exchange markets

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[18]We do not consider here the existence of other equilibria in which the yen could be a competitor for the dollar or the euro. Given the present data, this seems unlikely; and there are institutional rigidities that reinforce this view: "Japan's continued failure to deregulate and modernise its capital and financial markets is likely to remain a major barrier to such an [international] role for the yen." (Bergsten, 1997). This fits well with our stress on the primacy of asset markets.

The dollar is currently used in 83% of two-way transactions in foreign exchange markets, while the DM is used in only 37%; other EMS currencies are used in 21% of transactions, and sterling in 10%; the yen is used in 24% of transactions (BIS 1996).

The EU accounts for a higher percentage of world exports and imports than the US, even when intra-EC trade is netted out: In 1992, the US share of world exports was 12.3%, versus 9.3% for Japan and 16.9% for the EU.

The dollar also intermediates in the financing of trade between the EU and third countries, as well as trade of third countries among themselves. One of the reasons is again lower transaction costs in the inter-bank market. The euro will not necessarily substitute for the dollar in these other markets. But the lower transaction costs in all markets involving the euro will make some substitution likely (Kenen 1996, p. 24, reaches a similar conclusion).

We do not believe that changes in invoicing practices are driving forces behind internationalisation of currencies; rather, they are accompanying phenomena. Nevertheless, it is useful to consider how invoicing might develop as a function of the changes in financial markets. Invoicing could introduce some additional inertia when we switch to the euro, but could then strengthen the externality.

Whereas European firms invoice a very large proportion of their exports in their own currencies, the proportion of their imports invoiced in other currencies, and especially dollars, is quite significant. Japanese firms invoice mainly in dollars, while LDCs invoice overwhelmingly in dollars. The share of Japanese exports invoiced in dollars has been falling over time, while the share denominated in yen is rising; and the share of US trade denominated in foreign currencies is rising (Black 1985, 1989). In 1992, according to the ECU Institute (1995), 48% of world exports were invoiced in dollars, 15% in deutsche marks, 18% in other major European currencies, and still only 5% in yen. Meanwhile, the Japanese and European shares of world exports have also been rising, while the share of US exports seems to have been stagnant.[19]

Thus there is a trend decline in the share of dollar-denominated world trade. EMU is likely to bring almost exclusive invoicing in euros by EU firms. Economies of scale created by the substitution of one for a number of European currencies will induce firms from other areas that trade mainly with the EU to start invoicing in euros (e.g. Central and Eastern Europe, Middle East and North Africa). Many multinational Japanese and US firms may follow suit, as they will also benefit from such economies of scale. Some imports from the US and Japan will remain

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[19]These trends have also been examined by Tavlas (1990) and Tavlas and Ozeki (1991).

18

exceptions, as will some primary commodities. Again, however, there will be an initial once-off 'arithmetic' effect raising the share of dollar-denominated trade, when intra-EU trade becomes domestic. Hartmann (1996a) estimates that the initial post-EMU position would see 59% of world trade denominated in dollars and, on his 'euro-optimistic' scenario, 28% in euros. But the trend will be for an increase in the euro's role, at a rate determined by its ability to capture more of the dollar's vehicle currency position in non-US trade.[20]

If trade relations become concentrated in regional blocs (e.g. Europe-Africa-Middle East, Japan-Southeast Asia, US-Latin America), we might end up with at least three vehicle cum unit-of-account currencies. But insofar as trade is more uniformly distributed geographically and multilateral, there will still be powerful forces behind the use of a single dominant currency for these roles. In that case the change in the fundamentals will favour the euro, but history (inertia) will favour the dollar.

Securities markets

US dollar bonds make up a significant proportion of the international bond market, but the data suggest a substantial decline since the early 1980s: from 62% of the stock of bonds outstanding in 1985 to only 38% at end-1996 (of a total stock amounting to $3,200 billion), with a corresponding sharp rise in the share of yen-denominated bonds to 16% (BIS 1997, p.11). Shares in new issues fluctuate substantially from year to year - for example, dollar-denominated bonds accounted for 24% of total issues in 1995 and 43% in 1996 (some of this reflects the appreciation of the dollar in 1996).

According to McCauley and White (1997, p. 11), the euro money market is likely to prove a very liquid market from its inception (see also European Commission 1997a). Even a 'narrow' monetary union (essentially France and Germany) would have a market in derivative transactions larger than that for the yen and a larger market than the dollar for futures on longer-dated government securities (Prati and Schinasi, 1997).

The domestic market in Europe for private bonds is already fairly unified[21],

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[20]The process will also depend on the stability of exchange rates between the dollar, the yen and the euro. If the US dollar were to display high volatility against the yen and the euro, while their bilateral exchange rate was relatively stable, it would boost the chances of the euro (and the yen) to substitute for the dollar as an international unit of account. Tavlas (1997) argues that firms will seek to invoice in a currency that has relatively low inflation risk and real exchange rate risk.

[21]According to McCauley and White (1997), pricing private credits in euros almost already

and with outstanding stocks of $2948 billion, it is two-thirds the size of the American market. The segmentation that one does observe in this market appears to derive primarily from the effect of different currencies. In the pricing of government debt, prospects for integration in the trading of the most creditworthy governments look brighter than is generally acknowledged. (McCauley and White 1997, p. 9). Total public sector domestic debt in the EU15 amounts to $4618 billion, two-thirds of that in the US (BIS 1997, p. 47). Moving to the euro will promote the integration of the EU15 government debt markets, so that their depth and liquidity will become comparable - if not for some time equal - to those of the United States[22].

Major European institutional investors are currently very little diversified into foreign assets, except those in the UK and the Netherlands (Artus 1996; Miles 1996; PDFM 1997). But they may initially prefer to diversify across countries, in the newly integrated European capital markets, without incurring exchange risks. Meanwhile US institutional investors - who also show very high home preference currently - are likely to find the new euro financial market attractive as they diversify, especially if euro bond interest rates are less correlated with US bond yields than are current European government bond rates. We might expect this, if the ECB is a more independent actor - if only because of the size of its economy - in monetary policy.

Artus (1997b) presents both a theoretical analysis of the diversification motive and reasons why long-term interest rates in Europe will be low. Both analyses conclude that "non-residents will hold fewer euro-denominated bonds than bonds in different European currencies today". But in practice, he argues, there are several reasons why the balance is likely to go the other way: (i) the current strong home bias of investors is likely to erode; (ii) most investors have suffered from the trend depreciation of the dollar since 1985 and will wish to reduce their exposure to that risk; (iii) the unified European market will be more attractive than fragmented markets to those managing very large portfolios; and (iv) until now, poor understanding of EMU and European integration has deterred non-Europeans from investing in European bonds.

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enjoys a common reference yield curve (p. 9).

[22]Robert McCauley suggests (in correspondence) that there is evidence from derivatives markets that the prices of bonds from smaller European countries should be more integrated with valuations elsewhere under a single currency. The data suggest that the purchase by non-residents of bonds denominated in 'lesser' European currencies is inhibited by the costs of managing exchange-rate risk and by the greater difficulty of managing duration and volatility of the portfolio in these countries. Moving to the euro will eliminate these cost differentials.

The initial share of international assets denominated in euros will be much lower than the size of the EMU bloc in world GDP and trade. A private sector portfolio shift to bring the share of euro asset holdings close to parity with the economic size of the EMU bloc might involve increasing euro asset stocks by on the order of $700 billion (McCauley and White, 1997, pp. 23-24), i.e., 15-20% of the total outstanding stock of international assets.[23]

Bond suppliers will respond endogenously to the increase in demand - liability managers will increase their offerings denominated in euros. But changing debt issue denominations is likely to be a slower process than the portfolio shifts. A recent survey of 300 major issuers of securities in the EU found that although almost all expected the euro to arrive on 1 January 1999, 83% had not even decided when they would move to redenominate their issues. (*Les Echos*, 10 September 1997). And the likely shift in stock demand will be large relative to the flow of new issues. For illustration, *total* new dollar issues of international bonds averaged $140 billion annually during 1990-95. In the most unlikely event that *all* were to shift to euros, that would still require *five years* to absorb a stock increase in demand of $700 billion.

The Official Sector

We have focused so far on private-sector behaviour, because we believe that financial market use of an international currency takes the lead, that use as a vehicle currency is the main determinant of use by the monetary authorities as an intervention currency, and that this in turn determines use as a reserve currency[24]. It is nevertheless important, if only for completeness, to consider reserve-holding and currency pegging by governments. Pegging too, we believe, either follows the establishment of a currency as an international currency or is dictated by international politics (e.g. the CFA franc zone, the prospective incorporation of at least some of the 'Associated Countries' of Central and Eastern Europe in the Exchange Rate Mechanism Mark 2).

The share of the US dollar in official reserves, although declining, is over-

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[23] Henning (1997, p. 22) estimates a private portfolio shift between $400 bn and $800 bn as well as a shift in official reserve holdings of $75-150 bn.

[24] Kenen (1995, p 110) states that "because the dollar is still the main vehicle currency in foreign exchange markets, it remains the most important intervention currency." Krugman (1984) among others suggests, "Probably the most important reason for holding reserves in dollars is that the dollar is an intervention currency" (p. 273). Contrast Goodhart (1996), who argues that public (state) use of a currency precedes and dictates private use - this may be correct at the level of a country, but not in the international domain.

whelmingly higher than the share of any other single currency.[25] From 76.1% of total official currency reserves in 1973, the share of the US dollar fell to 63.3% in 1994. The share of major European currencies shows a steady increase, from 14.3% in 1973 to 21.9% in 1994 (the share of the DM has risen from 7.1% to 15.5%). The Japanese yen rose from almost zero in 1973 to 8.5% of the total in 1994.

Despite significant efforts (e.g. Dooley et al., 1989), we do not have a satisfactory empirical account of the determinants of reserve-holding behaviour and these observed trends.[26] Nevertheless, the trend decline in the share of dollar reserves in the portfolios of central banks is likely to be reinforced by the EMU process. The reduced need for exchange market intervention in dollars by EU central banks will curtail the use of the dollar as an international means of payment by official bodies (see the evidence in Frenkel and Sondergaard 1996). But this will not necessarily make the euro a major reserve currency outside the EU, unless foreign exchange intervention by non-EC countries is also in euros; that, we suggest, will follow trends in the financial markets.

The euro will substitute for the dollar in the portfolios of EU central banks that do not participate in the final stage of EMU, or in the portfolios of non-EU central banks that decide to peg their exchange rate to the euro. On the other hand, there will be a once-off, arithmetic reduction in non-dollar reserve holdings when European currencies going into the euro that are held by euro-area central banks become converted into euros - and hence are no longer international reserves. But this will not affect the trend displacement of the dollar.

Additional demand would arise if the European Bank for Reconstruction and Development (EBRD) were to conduct most of its borrowing and lending in euros rather than dollars or yen. That would also cause an even higher increase in the demand for euro reserves by the central banks of the Central and Eastern European economies.[27]

The unit of account role of an international currency, in regard to the official sector, is related to whether there are countries that peg their own currency against

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[25] See Alogoskoufis and Portes (1991, 1992), Bénassy-Quéré (1996), Frenkel and Sondergaard (1996), Ilzkovitz (1996),

[26] Most recently, Eichengreen and Frankel (1996) find that the elasticity of a currency's share in official reserves with respect to the corresponding country's share in world output is in the range 0.5-1.33.

[27] The capital of the EBRD is denominated in ECUs, and many Central and Eastern European economies are already using the ECU as a unit of account and currencies such as the DM as intervention currencies.

it. Of the 47 countries that either pegged their currency or maintained limited flexibility against a single other currency in March 1994, 25 did so against the US dollar and 14 against the French franc. All these economies are small, however, and even jointly they do not amount to a significant share of the world economy. The growing integration of the Central and Eastern European economies with the EU will enhance the euro's role as an international unit of account. (Bénassy-Quéré 1996 stresses the potential anchor role for the euro, going beyond pegging strictly defined, at the regional level.)

3.2. Foreign exchange estimates

Foreign exchange market turnover can be divided into two parts:
1) interdealer transactions
2) customer-dealer transactions
The shares of inter-dealer transactions we compute (using BIS 1995) are roughly of the same magnitude on all the bilateral markets and show a huge predominance of inter-dealer transactions. This feature differentiates the foreign exchange markets from all other financial markets.

Share of inter-dealer trading:

Bilateral Spot Forex (1995)	DM	yen	pound	FF	Swiss F	Can $
$	85%	81%	85%	80%	83%	79%
DM		90%	92%	88%	88%	84%

Following Lyons (1995, 1997a), we interpret these inter-dealer transactions from the perspective of the "hot potato" approach. Foreign exchange dealers pass onto each other idiosyncratic inventory imbalances following an innovation in customer order flow. Suppose there are ten risk-averse dealers, each currently with a zero net position. A customer sale of $10 million worth of deutsche marks is accommodated by one of the dealers. The dealer, who does not want to carry the open position, calculates his share of the inventory imbalance - say one-tenth of $10 million - calls another dealer and unloads $9 million worth of deutsche mark. And so on. This very simple example would produce an interdealer share of 90% of the transactions, which roughly matches the empirical shares. The global volume traded on a given foreign exchange market is a multiplier of the customer order flow. This multiplier, resulting directly from the optimizing behaviour of

risk-averse traders, should be stable across regimes. All the shares given in the above table were found to be virtually the same in 1992 (previous BIS survey).

We now decompose customer-dealer transactions on the foreign exchange market into four different components:

i) real trade T, ii) cross-border equity flows E , iii) cross-border bond flows B, iv) international use of a currency (vehicle) I

$$v = V(1 - m) = T + E + B + I$$

where v is the volume of customer-dealer transactions on a given market, V is the global turnover on the same market, and m is the share of interdealer transactions as presented in the above table.

Global turnovers V on foreign exchange markets by currency pairs (Table 1) are available from BIS (1996).

i) Bilateral currency flows due to real trade have been computed with the Direction of Trade Statistics import and export data (Table 2).

ii) Bilateral cross-border gross equity flows (which include Mergers and Acquisitions as well as portfolio investment) are taken from Cross Border Capital (Table 3).

iii) Bilateral cross-border gross bond flows were given by BIS (1997b and private communication) and own estimates based on global cross-border gross transaction volumes and bilateral shares for equity transactions (Table 4).

The first two components account for a small fraction of the global turnover on each bilateral market. We will assume that all the real trade transactions and equity transactions are pure customer-dealer transactions (even though they will of course generate afterwards a cascade of inter-dealer transactions through the inventory adjustment process described above). Real trade flows and equity flows will be invariant with the currency regime. This is why we call them "fundamentals".

Cross-border bond flows can be decomposed into two parts, inter-dealer transactions on the one hand and customer-dealer transactions on the other, each of which account for roughly 50% of the total turnover.[28] The "customer-dealer" part of the bond flows (just like the real trade and equity flows) will be invariant with the currency regime whereas the interdealer part will vary with the scenarios

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[28] We find that interdealer transactions represented 47% of the global transactions of both the US and UK bond markets in 1994. The remainder is customer-dealer transactions.

24

and the international currency. This choice is made because there is ample evidence that the most liquid bonds (such as the 10-year US Treasuries) are widely used by financial intermediaries for hedging purposes. This is why the turnover ratio of these bonds is much higher than for the other securities. And we consider that this function is a direct side-effect of the dollar being the international currency.

By definition, we have:

$$fundamentals = T + E + B$$

where B is only 50% (the customer-dealer part) of global cross-border bond flows.

We then isolate the proportion of customer-dealer transactions due specifically to the international use of a currency (vehicle currency use). Unlike the 'fundamentals' which remain the same across the different scenarios considered, the transactions due to international currency use vary with the scenario.

Therefore:

$$I = V(1 - m) - T - E - B$$

Note that I can be positive or negative[29]. If I is positive, it means that the currency considered is used beyond what the real fundamentals would give: the currency is internationalised. For example, the turnover of the $/DM market is likely to exceed what would have been predicted by the fundamentals of the US and Germany. This is so because some Central European economies, for example, use the DM for international trade settlements. If I is negative, on the other hand, it means that the currency is less used than fundamentals would predict. For example, the major part of Japanese exports are invoiced in dollars.

In our estimations we ignore speculation. Recent empirical papers (Lyons 1997, Ammer and Brunner 1997) argue that the share of speculative profits is negligable compared to the the profits generated by financial intermediation.

For Japan, the US and Europe, the matrix of fundamentals we find is presented in Table 5, and the corresponding observed customer-dealer transactions are presented in Table 6. It is apparent that the turnover on the yen/DM market is smaller than suggested by the fundamentals, and on the contrary, turnovers on $/DM or $/yen markets are higher. This suggests indeed a strong vehicle currency role of the dollar. We shall now derive joint estimates of volumes exchanged and transaction costs under the alternative scenarios.

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[29]I is likely to overstate the international use of a currency since we have omitted some variables such as real estate transactions; but the volumes involved are small.

Presented below are the existing transaction costs on the different foreign exchange markets (Hartmann 1997). The volatility level has been set to 0.

Current unit transaction costs (x 10^4):	
$/DM	4.06
DM/Yen	4.37
$/Yen	4.16
FF/$	4.61
£/$	4.27

Suppose we are in a given scenario, e.g., the big euro. Then we know which financial assets are used when Europe deals with Japan (euro financial assets), when the US deals with Japan ($ financial assets), when Europe deals with the US (euro financial assets) and we also know that the euro is the vehicle currency. Therefore, the transactions due to the international role of a currency will occur on the euro/yen and euro/$ markets (no longer on the $/yen and $/DM markets). Moreover, there will be fewer bond transactions involving some operations on the $/yen market and more on the euro/yen market. From the "fundamentals", the international use and the corresponding multipliers, we can derive the volumes exchanged under this scenario on the different bond and bilateral foreign exchange markets. We can then derive the transaction costs corresponding to these volumes and check that the pattern of transaction costs is compatible with the way financial exchanges are performed in the economy. For that, we need to use data on current transaction costs and empirical estimates on the elasticities of transaction costs with respect to volumes for forex . Hartmann (1996b) provides a careful estimate of such a parameter.[30]

3.3. Financial market estimates

To decide between status-quo (or quasi-status quo) on one hand and big, pan or medium euro on the other, the key criterion is the depth of the European bond market compared to the US bond market.

Do we believe in $T_{ee} \leq T_{ss}$ (the financial markets of the euro bloc will be more liquid than those of the dollar bloc)?

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[30] And he stresses "the apparent stability of [his] parameter estimates, not only between the different estimators but over time." (1997, p.16).

To have a good measure of the liquidity of the different markets we are considering, we should look primarily at turnover, not at new issues or outstanding stocks. We have data on turnover for the different government bonds. It is readily apparent that the relation between outstanding stocks and liquidity is highly non-linear. Some government bonds (US) are much more traded than others, relative to their underlying stocks.

Billions of US dollars, 1995	US	Europe	Japan
Annual turnover domestic bonds	35843	45635	20625
Stock outstanding	2547	4618	3303
Ratio turnover/outstanding	14.0	9.9	6.2

Source: McCauley and White (1997) and Salomon Brothers (1997).

We use as a proxy for a 'global' transaction cost average bid-ask spreads on 10-year government bonds for each of the currencies considered. These securities are used as a benchmark because they are the most widely traded (Fleming, 1997), and they account alone for a very big part of the turnover.

Bid-ask spreads on the benchmark bonds (10-year) x$ 10^4

US	1.56
Germany	4
Japan	3.5
UK	3.12
France	4

Source: Salomon Brothers[31].

Today data on transaction costs favour the dollar as currency of denomination for financial assets. The above table shows that the gap between transaction costs in dollar-denominated benchmark bonds are significantly lower than for any other currency. From the model we know that the turnovers and therefore these transaction costs are endogenous and depend on which currency is international. But even if we control for this effect and bring in additional turnover in euro-denominated bonds stemming from foreign demand, transaction costs still favour dollar financial markets.

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[31]Since most of the trade in bonds is done OTC, a dealers' survey is the most reliable source for transaction costs. We are grateful to Kermit Schoenholtz and Zoeb Sachee for providing this information.

So the most likely scenarios seem to be either the status quo or quasi status quo.

The estimates on the foreign exchange market presented above discriminate then in favour of the quasi status quo scenario[32]: the euro will be more widely used than any european currencies for transactions involving Europe and the Asian bloc, but the dollar will keep its preeminence for all the other types of transactions and in particular as the main vehicle currency.

One could object, however, that there are important institutional differences between US and European corporate bond markets and that in the end transaction costs on the euro market will depend also on policy decisions and regulations. US firms tend to rely much more on debt financing than their European counterparts. This is of course partly due to the greater liquidity of the US bond markets, and one can expect a process of financial disintermediation in Europe with the arrival of the euro.

As reported in Schinasi and Prati (1997), at end-1995 the sum of stock market capitalization, debt securities and bank assets amounted to $27,270 bn for EU 15 countries[33], $21,084 bn for EU 11[34] and $16,091 bn for EU 8[35]. The contribution of the UK amounted to $4,658 bn. The corresponding figures were $22,865 bn for the US and $16,375 bn for Japan. An American bloc including the US, Canada and Mexico came to $24,711 bn.

In September 1996, the outstanding amounts of international debt securities denominated in dollars were $1,139 bn. The corresponding figures for EU coun-

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[32]If we assume we are in the status quo case, we should have:

$$Tes + Tss + Tsy \leq Tee + Tye$$

for the values of the transaction costs derived from the volumes exchanged under the status quo. But this inequality does not hold. So this equilibrium is not supported by the fundamentals of the world economy. On the other hand, if one computes the volumes exchanged under the assumption of quasi status quo, we have

$$Tes + Tss + Tsy \geq Tee + Tye$$

which supports the equilibrium.

[33]Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

[34]Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

[35]Austria, Belgium, Finland, France, Germany, Ireland, Luxembourg, and the Netherlands.

tries[36] and Japan were \$1,056 bn and \$ 521 bn respectively. Note that with the likely increase in financial integration between the EU and Central and Eastern European countries, the trend is bound to favour international euro issues.

It is apparent from the figures that the introduction of the euro could have the potential for creating the largest domestic financial market in the world, but this outcome is partly a policy decision (see Section 6 below). If we believe that within a time horizon of five to ten years, financial market integration will be completed within Europe, then we may have $T_{ee} \leq T_{ss}$. This is all the more likely if the UK joins EMU because of the size of the UK bond market. Thus if policy makers indeed encourage the internationalisation of the euro, then we have to turn to foreign exchange estimates to determine which of the medium euro or big euro scenario is the more likely.

We will work here under the assumption that the costs of trading in euro financial assets become equal to the costs of trading in dollar denominated financial assets. We take as a benchmark the value -0.03 (Hartmann 1997) for the elasticity parameter of the foreign exchange market but we will see that the results derived here hold for a very wide range of parameter values. We find that the fundamentals support both the medium euro and the big euro scenarios.

For the case of the medium euro, where the dollar keeps the vehicle currency role but there is some additional turnover on the euro/yen foreign exchange market and less turnover on the \$/yen foreign exchange market, we find the following transactions costs:

euro/\$	4.02
euro/Yen	4.33
\$/Yen	4.17

For the case of the big euro, where the euro has taken up the vehicle currency role and there is some additional turnover on the euro/yen foreign exchange market and less turnover on the \$/yen foreign exchange market, we find the following transactions costs:

euro/\$	4.02
euro/Yen	3.43
\$/Yen	4.27

There is a decline of the transaction cost on the euro/\$ market compared to the DM/\$ because of a mere size effect. In both cases there is also a decrease of

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[36]Currencies of Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the U.K. and ECU.

the transaction costs on the yen/euro market compared to the DM/yen market. This decline is very pronounced if the euro becomes the international currency. There is in both cases, however, an increase of the transaction cost on the \$/yen market due to a lower liquidity of that market.

Since there are multiple equilibria, which equilibrium would prevail depends on the beliefs of the agents.

Sensitivity analysis

We perform here some sensitivity analysis on the elasticity parameter. The frontier between "quasi status-quo" and "medium or big euro" is independent of the foreign exchange market elasticity. It depends only on the transaction costs on bonds markets. But the frontier between "big euro" and "medium euro" varies with the elasticity parameter. We find that the fundamentals of the world economy support the existence of a "big euro" or a "medium euro" for a wide range of parameter values and in particular for the elasticity value pinned down by Hartmann (1997). For a very high elasticity, the medium euro cannot emerge and only the big euro is plausible. For a low elasticity, the medium euro is the only possibility.

elasticity η	$\eta \leq -0.16$	$-0.16 \leq \eta \leq -0.006$	$\eta \geq -0.006$
	big euro	medium or big euro	medium euro

Intuitively, the bigger the elasticity (in absolute value), the bigger the economies of scale and therefore the bigger the incentives to pool transactions.

4. Welfare Analysis

It may be argued that since the size of the transaction costs on the foreign exchange and bond markets is small and declining (in particular with the introduction of EBS, Electronic Brokerage Service), welfare estimations are pointless. We hope to have demonstrated by now that even if in absolute values transaction costs are small, their patterns have been shaping international monetary relations from sterling to the dollar and beyond.

But one can also ask for a crude evaluation of the efficiency gains (or losses) accompanying the potential shifts in the world structure of payments due to the introduction of the euro, as described in the different scenarios presented above. In the European Commission's study *One Market, One Money* (1990), the microeconomic efficiency gains accompanying EMU were estimated by setting to zero

30

all the foreign exchange transaction costs within EU countries. These estimates did not take into account monopolistic margins[37] nor the impact of EMU on the foreign exchange transaction costs between EU countries and the American and Asian blocs. Efficiency gains were found to be between 0.1% and 1% of GDP per year depending on the size of the countries.

The estimates performed here are based on the model presented above. The benchmark scenario is the status quo, where the euro is nothing more than a big DM which is not internationalised.[38] The model gives a direct mapping between welfare and global transaction costs. This is so because transacting involves real resource costs in terms of labour. The more efficient the transaction technology, the less labour it requires, and the bigger the share of labour in production, with consequent higher consumption. To do welfare computations, it is therefore enough to compute for each country the real resources going into financial intermediation. This is estimated by multiplying transaction costs by volumes exchanged on each market and by summing across markets.

Using the transactions costs and volumes exchanged calculated in Section 3, one can rank the different possible equilibria (quasi status quo, big euro and medium euro). From an aggregate point of view, world welfare is maximized in the medium euro case, which is better than the big euro scenario and the quasi status quo, in that order. From the point of view of Europe alone, however, the welfare-maximizing scenario is the big euro, which dominates the medium euro and then the quasi status quo. For the US the ranking differs from Europe: welfare is maximized in the quasi status quo case and decreases with the medium euro and the big euro scenario, in that order. For Japan, welfare is maximized in the medium euro scenario and decreases with the quasi status quo and the big euro scenario.

These results are fairly intuitive. Welfare gains and losses are mainly determined by bond market transactions. For the world as a whole, either the big or medium euro scenario is better than the quasi status quo since transaction costs on the euro bond market are significantly smaller ($T_{ee} = T_{ss}$ in the first case, $T_{ss} \leq T_{ee}$ in the latter). For Europe, the more people use the euro, the better, since there are microeconomic efficiency gains in transactions. For the US, the

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[37]But the increasing competition among financial intermediaries makes this point less and less relevant.

[38]The internationalisation of the euro does not necessarily mean efficiency gains for EU countries. Indeed, depending on which of the degrees of internationalisation is actually realised, the fragmentation of the currency system into different poles can decrease the efficiency of the global payments mechanism.

situation is symmetric: the more people use the euro, the less people use the dollar. Therefore the welfare rankings are reversed: quasi status quo is the best, and then medium euro and big euro. The US does not suffer from higher transaction costs on the euro bond market in the quasi status quo case, because its residents use mainly financial assets denominated in dollars. The US and Europe are very integrated. But since Asia is more integrated with the US than with Europe, there are increasing returns in using the dollar as a vehicle currency for exchanges involving Asia and Europe. This explains why Japan is made worse off by a shift to the euro as international currency (big euro) but better off by the medium euro because of smaller transaction costs on euro bond markets.

These qualitative results are insensitive to the elasticity used for bond market transactions for any reasonable values (between -0.0001 to -1). The value estimated by Takagi is -0.11. The results given below will be based on that value.

How big are the micro efficiency gains and losses?

When we compare the quasi status quo case and the big euro case, our estimates indicate between 0.2% of GDP gain (as a flow) for Europe, a loss of 0.04% GDP for the US, and a loss of 0.07% for Japan. The gains for Europe come mainly from decreasing costs on the bond markets. The losses for the US and Japan come from foreign exchange market transactions: both countries are better off when the dollar is the vehicle currency.

These results suggest that Europe would gain by promoting the use of the euro as a rival international currency to the dollar.

5. The Euro and the Dollar

5.1. The transition

From the examination of the fundamentals, it appears that the euro will partly displace the dollar. Understanding the transition to this new equilibrium of the international monetary system is very important. The tendency to substitute the euro for the dollar in international transactions and international portfolios will initiate dynamic processes that can be studied with standard macroeconomic models. One can derive implications about the process of accumulation of euro balances and the likely trends in the euro/dollar exchange rate.

One of the important questions that arise is how the higher demand for euros after the creation of the new currency will be translated into a higher supply of the currency internationally.

Euro-denominated assets will be supplied even before the year 2002, as banks and financial intermediaries will be allowed to issue liabilities denominated in euros. No later than the first half of 2002, the stock of financial assets denominated in the existing EU currencies will be denominated in euros. Most government debt stocks are likely to be redenominated on 1 January 1999. These stocks will of course include assets held by the rest of the world. There are two possible cases here.

Case 1: Immediate Quantity Adjustments

The additional demand for euros will be met by a corresponding increase in supply, through the creation of euro liabilities in sufficient quantities by commercial banks and other financial intermediaries. In such a case, the creation of the euro will have no exchange rate implications. Private financial markets, with a little help from central banks, will ensure a smooth transition to a new equilibrium, in which assets denominated in dollars and yen will be replaced at a stroke by assets denominated in euros. Quantities will adjust immediately and no price adjustments will take place.

Case 2: Slow Adjustment in Quantities

A second, and in our view more likely, case is that of slow adjustment in quantities. In such a case, the shift in the demand for euro assets in international financial markets will not cause a matching supply of euro liabilities immediately. For equilibrium, there will need to be a rise in the price of the euro against the dollar, i.e. a real euro revaluation.

In the extreme case of no supply adjustment, how much euro appreciation relative to the initial position vis-à-vis the dollar might we expect? Again for illustration, note that the $700 billion stock shift suggested above would convert about 20% of existing dollar assets into euro assets - if the initial levels of the two are about the same, and if the values of the two debt stocks and of interest rates were held constant, the dollar would have to depreciate by 40%! (Note that when Japan permitted its financial institutions to invest abroad at the beginning of the 1980s, about $230 billion of their portfolios moved into foreign, mainly dollar assets from 1981 to 1985. The dollar appreciated by 25 per cent against the yen and much more against a basket of major currencies during that period [Bergsten, 1997]. More recently, in 1996, capital flows into the US were $395 billion [$123 billion official, $272 billion private], and the dollar appreciated by 30% with respect to the DM.)

The euro revaluation will bring the euro area into current account deficit. The

excess demand for euros would start to be met through the capital account[39]. By supplying additional euros or disposing of dollar holdings through the capital account, the European Union would facilitate the process of establishing the euro as an international currency[40]. The increased inflow of capital into the European Union will create higher euro holdings internationally. European real interest rates will fall, as the euro will start weakening towards long-run equilibrium.

In any event, the euro should not be expected to be chronically strong on this analysis. As the excess demand for euros is reduced through the accumulation of euro assets, the euro appreciation will be reduced and the current account deficit of the EU will be reduced as well. In the new equilibrium the real euro/dollar rate may not be too different from the initial real exchange rate. Moreover, the monetary authorities may always choose to moderate the appreciation, although this may conflict with the new ECB's efforts to establish its anti-inflationary reputation.

The question is ultimately empirical, and our data come from the past. Does history suggest that the emergence of new international currencies is accompanied by real appreciations or not? Do international assets and liabilities in newly emerging international currencies move in parallel, in a way that necessitates no exchange rate changes? The emergence of the dollar as an international currency may have some lessons to offer here.

5.2. Lessons from History

It is true that there are no close historical parallels to the creation of a major international currency like the euro, in conditions of free capital mobility and floating exchange rates. In part, however, our analysis does not depend on the exchange rate regime, since the issues are real not nominal. Thus we look for some insights into the two phases of the establishment of the dollar as an international

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[39] As Bergsten (1997) points out, "the chief key currency countries have in fact traditionally run overall balance-of-payments deficits that added to world liquidity."

[40] This process may not start immediately, however, because of the J-curve. The immediate reaction of the current account to a revaluation could be sluggish and even perverse. Thus, in the short term we may see a narrowing rather than a widening of the current account of the European Union following a revaluation of the euro. This possibility suggests that the euro may have to overshoot its long-run revaluation in the short run, causing expectations of a future devaluation that will cause European real interest rates to rise temporarily. A model that can be used to analyse such shifts is Krugman (1989), a variant of a portfolio balance model of the exchange rate, which is presented in Appendix 2.

currency, namely the periods after the first and second world war. In the period after World War I, the process of substitution of the dollar for sterling in the international monetary system was one of the few historical examples we had of a shock similar to the creation of the euro. After World War II, the position of the dollar was strengthened further, because of the effects of the war on the international position of the United Kingdom.

We shall start by looking at the substitution of the dollar for sterling during the interwar period.

5.2.1. The Dollar and Sterling in the Interwar Period

Before World War I, sterling had no serious rivals in its role as the main international currency, and London was by far the most important financial centre in the world. World War I brought about many changes in the fundamentals underlying the position of sterling in the international monetary system. The convertibility of sterling into gold became doubtful, Britain's role in international trade diminished, and British foreign assets were depleted during the war. Most importantly, the position of London as a international financial centre was challenged by New York, both because of the capital controls that prevailed during the war and also because of the emergence of new forms of international settlements. Thus one may use evidence from that period to examine the effects of the emergence of the dollar as an international currency on exchange rates and interest rates.

The first prediction of the portfolio balance model is that the portfolio shift in favour of a new international currency would cause a reduction in interest rate differentials between the emerging and the receding international currency. In Figure 1, we present evidence on short term interest rates (call money rates) for dollar and sterling for the 1890-1939 period. The narrowing of interest rate differentials is evident after World War 1. Real US interest rates, relative to those in the UK, also fell substantially. In the period 1890-1913, real short term interest rates in the US were on average higher than the corresponding UK rates by about 2 percentage points. After the war the picture changed. In the 1920-1932 period, real interest rates in the US were on average lower by 0.7 percent than those in the UK. These developments are clearly not inconsistent with a portfolio shift in favour of the dollar after the war.

Did this portfolio shift cause an appreciation of the dollar as our model would predict? In Figure 2, we plot the (log of the) real exchange between the dollar and sterling for the period 1890-1939. Note the relative stability of the dollar-sterling

real exchange rate in the pre-war gold standard period. During the war, the dollar depreciated in real terms against sterling, as the nominal exchange rate was held roughly constant, and British inflation was much higher than US inflation. In March 1919, the US terminated support for sterling, and sterling depreciated sharply. It is worth noting that the real exchange rate of the dollar overshot the prewar levels, something that persisted almost throughout the interwar period, irrespective of the exchange rate regime. In the 1920-1933 period, the dollar was on average 8% higher in real terms than in the period 1890-1913.

The evidence that we have presented suggests that one can attribute at least part of the real appreciation of the dollar after World War I to its establishment as a major international currency. Without doubt there were cyclical influences, such as the 1920-21 boom and slump, the British deflation of the first half of the 1920s during the attempt of Britain to return to the gold standard in 1925, as well as the exit of sterling from the gold standard in 1931. Irrespective of cyclical influences, however, the first phase of the establishment of the US dollar as an international currency caused the dollar to appreciate significantly in real terms relative to its pre-war level, at the same time as real interest rates in the US fell relative to those in the UK.

It was only in 1933, when the link of the dollar to gold was abandoned, that the dollar fell against sterling.

5.2.2. The Dollar in the Immediate Post War Period

The second phase of the dollar's establishment as an international currency was the immediate post war period. The war further eroded the international economic position of the United Kingdom, especially vis-a-vis the United States, on which it depended for economic assistance during the war. The position of the dollar at the centre of the international monetary system was recognised formally in the rules of the Bretton Woods system. Apart from this formal recognition, however, the establishment of a system of fixed exchange rates increased the demand for international reserves, and this further strengthened the international position of the US dollar.

This further strengthening of the role of the dollar was one of the major factors behind the tendency of the US dollar to appreciate further in real terms against sterling. There was a series of devaluations of European currencies vis-a-vis the dollar, and exchange controls remained prevalent in Europe for many years. Figure 3 presents the evolution of the dollar-sterling real exchange rate until 1970. There

is a continuous upward trend for the dollar, because of higher British inflation, and two discrete jumps, corresponding to the devaluations of 1949 and 1967.

Because of the widespread use of exchange controls, and the need to maintain fixed exchange rates, one manifestation of the excess demand for dollars was the so-called «dollar shortage». The reserves of gold and dollars of most European countries seemed in continuous danger of running out, unless protected by direct controls over international trade and payments, or by resort to loans and grants from the US or international agencies financed by the US (Yeager 1976, pp. 589-94).

The dollar shortage was particularly acute during the first postwar decade. It was gradually corrected through the revaluation of the US dollar and the supply of dollars through the US balance of payments deficit. In Figure 4, we present the evolution of the current and basic balance of the US. The basic balance is defined as the current account plus the long-term capital account. During the 1950s, the average annual basic balance deficit in the US was on the order of $2 billion. There were short-term capital inflows on the order of $300 million per annum, and the rest was financed through official reserve transactions. Thus the balance of payments was an important mechanism through which the excess demand for dollars was met. In the absence of free capital mobility, and in a regime of fixed exchange rates, the balance of payments became the main mechanism through which the dollar's international position was firmly established.

6. Conclusions

Our first conclusion is that scenarios in which the euro does share international currency status more or less equally with the dollar are indeed plausible scenarios. Moreover, they could generate substantial increases in European Union real incomes (welfare). But are there countervailing arguments that might dissuade policy-makers from pursuing this actively as a policy objective?

In the past, central banks outside the United States have sought to avoid internationalisation of their currencies. Henning (1994, pp. 317-319) underlines that "both Germany and Japan vigorously and systematically resisted the international use of their currencies - particularly as a currency for private assets and official reserves - during most of the postwar period...Both governments...wanted to avoid the conflict between the provision of liquidity and the preservation of confidence that had plagued the dollar, and in a different sense, the pound ster-

ling. Because the Bundesbank and Bank of Japan might have to adjust monetary policy in response to capital movements, monetary control would be impaired under both fixed and flexible exchange rate regimes...The Bundesbank remains acutely concerned that the volume of outstanding foreign D-Mark assets and liabilities could destabilize exchange markets." To these considerations one might add a reluctance to act as lender of last resort in international financial crises - as indicated in European resistance to the US-led bailout of Mexico.

The uncertainties highlighted by the exchange-rate scenarios in Section 5 arise from uncertainties regarding the supply of and demand for euro-denominated assets. From the viewpoint of monetary control and monetary and exchange rate policy, one must distinguish between effects on the demand for euros as money and on the demand for euro-denominated claims. As Peter Kenen has argued, the "introduction of the ECU [euro] may reduce the demand for the ECU [euro] as money. By helping to unify capital markets within the EC, however, EMU may produce a long-lasting increase in the demand for ECU-denominated claims. That is why the ECU [euro] is likely to appreciate after Stage Three begins...The ECB can readily offset a once-and-for-all reduction in the demand for ECU [euro] balances by reducing the supply. It will be harder to offset the exchange-rate effects of an ongoing capital flow. (1995, pp. 116-118)."

Suppose that the ECB does accept, indeed - with other EU and national authorities - wishes to promote the internationalization of the euro: take the welfare gains, plus some seigniorage, and whatever other more "nebulous" benefits that international currency status provides; and mitigate insofar as possible any undesired pressures for exchange-rate appreciation.

What policy measures could the authorities use? Primarily, those directed towards integrating the European capital markets. Our analysis highlights the key role of transactions costs - and hence of liquidity, breadth and depth of financial markets. We expect transaction costs in euro financial markets to fall with financial market integration. The extent to which they will fall will depend in part on the success of financial deregulation in bringing down the cost of banking in the EU (Giovannini and Mayer 1991) as well as on the effects of the heightened banking competition that currency unification is likely to bring (McCauley and White, 1997). It will also depend on central bank and regulatory policies determining the costs of using the euro payments mechanism (Folkerts-Landau and Garber, 1992).A working group under the auspices of the European Commission has investigated in detail policies for "creating a euro securities market as broad, liquid, deep and transparent as possible (European Commission 1997b, p. 14)",

among which they stress: (i) redenomination of all existing debt; (ii) harmonised market rules and conventions; (iii) continuity in price sources (e.g. benchmark interest rates); (iv) informal coordination of government debt issuing procedures. To these we might add unifying payments systems in the most efficient manner and not imposing unnecessary taxes or other burdens that would make European financial institutions less competitive (e.g. unremunerated reserve requirements).

We note that private market initiatives are already underway in several of these areas: the coordination efforts of ISDA and ISMA; the decision by DTB and MATIF to bring some aspects of derivatives trading under "one roof" (which is partly intended to enhance their competitive position vis-à-vis LIFFE); and coordination to establish a common benchmark rate to replace LIBOR (although there are currently two separate competing efforts). On the other hand, we cannot expect that within the foreseeable future there will be a large "federal" EU budget, with major EU borrowing, and hence an EU benchmark security; the markets will have to accord this role to one or more of the individual government bonds.

If the ECB does actively promote the international use of the euro, one cannot discount the possibility of an overt tug of war between the euro, the incumbent (the dollar) and the major other contender (the yen) for international monetary supremacy. Some of the recent language of European political leaders suggests that they look forward to this prospect and that they believe the United States - despite its official pro-EMU position - in fact opposes the single European currency precisely because it regards the euro as a threat, in this sense.

We regard such attitudes themselves as a threat and such a prospect as a potentially dangerous development. One might draw this lesson from the interwar experience of the rivalry between sterling and the dollar, with the French franc on the sidelines (Eichengreen 1987). Even without such a potential rivalry, if EMU were to result in large-scale substitution of euro for dollar balances and a quick appreciation of the euro against the dollar (and the yen), along the lines we have analysed, this may be a cause for concern. There may well be an increased need for better monetary policy coordination at the international level to cope with such an eventuality (Alogoskoufis and Portes, 1991, 1992, 1997; Bergsten 1997; Begg et al., 1997).

Throughout our discussion we have contrasted the influences of history, hysteresis, and inertia in the international monetary system with the instability associated with multiple equilibria and threshold effects. Continuity and instability are not necessarily contradictory. Whenever a system is on the border between two equilibria it may exhibit instability, which may be brief or prolonged. The

issue here is the magnitude of the shock that EMU will bring to the international monetary system. We believe it is likely to be substantial and relatively sudden. Market participants as well as the authorities appear now to be taking this possibility more seriously - and the degree of global integration of financial markets now may make the transition to a new equilibrium much faster than in our historical examples.

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44

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Appendix 1

For a full exposition of the basic model and its technicalities see Rey [1997a] and [1997b]. It is a general equilibrium model in which the choice of a vehicle currency and demand for bonds denominated in different currencies are endogenous. The key feature is to represent the medium of exchange function of money through a transaction technology whose costs decrease with the liquidity of the market. In equilibrium, patterns of transaction costs and volumes are determined jointly. High liquidity on a given market lowers the transaction costs on that market, which makes it even more attractive. Labour can be allocated either to production or to financial intermediation. If financial intermediation becomes more efficient because the domestic currency is increasingly used for international transactions (transactions volumes rise and costs fall), then labour is reallocated and production increases in the domestic country. There is no uncertainty and, in the basic model, financial asset transactions are motivated only by real trade and savings behaviour. Financial exchanges are made so as to minimize transaction costs on the foreign exchange and bond markets.

One can solve the model to derive equilibrium consumptions, price levels, exchange rates and transaction costs under different scenarios of currency and bond exchange. Because of the thick market externality, the model exhibits multiple equilibria for some parameter values. One can derive the domains of existence of the different equilibria by checking that the way currency and bond exchanges are made is supported by the pattern of transaction costs. It is possible to show that the unit cost of a transaction service on market ij is T_{ij} proportional to :

$$\frac{1}{(V_{ij})^{\frac{\alpha}{\alpha+1}}}$$

where V_{ij} is the global volume actually exchanged on the market ij and α is the liquidity externality parameter. Such a relation has been estimated in the empirical literature, as discussed in the text. The stronger the positive externality - the bigger α - the bigger the fall in transaction costs as volumes increase.

Here, we supplement this basic model in two ways. First, we embed in our macroeconomic framework a foreign exchange microstructure story which allows us to account for the huge turnovers of foreign exchange markets without altering the underlying framework. Second, we add various exogenous financial flows which we assume to be invariant with the currency regime. These are cross-border transactions in equities and a fraction of cross-border transactions in bonds (customer-dealer transactions). Changes in real rates of return or risk-return trade-offs which

in theory would also affect investment in equities, for example, are ignored. The remaining part of cross-border transactions in bonds (inter-dealer transactions) are still determined by the pattern of financial costs as in the basic model. We take the view that financial intermediaries are the most likely to adjust to change in monetary regimes for all their hedging practices in particular (for which low transaction costs and therefore high liquidity are essential), whereas customer-dealer transactions are usually more based on underlying economic fundamentals. It is therefore the more liquid markets (cash and bonds) which are the more likely to be affected by the switch to the euro.

Table 1. Foreign Exchange Turnover (April 1995, $billion).

	Yen	EU15
US $	1753	3966
Yen		377

Source: BIS 1995.

Table 2. Spot Real Trade Transactions (monthly average, 1995, $billion).

	US	Japan	EU15
US		5.287	11.017
Japan	11.482		6.018
EU15	11.089	4.179	

Source DTS

Table 3. Cross-border Equity Transactions (monthly average, 1993, $billion).

	US	Japan	EU15
US		8.0	28.6
Japan	3.4		1.9
EU15	25.3	10.8	

Source: Cross Border Capital

Table 4. Cross-border Bond Transactions (monthly average, 1995, $billion)

	US	Japan	EU15
US		132	445
Japan	116		49
EU15	497	225	

Source: BIS, personal communication, and authors' estimates.

48

Table 5. Fundamentals (monthly average, $billion, 1995)

	Japan	EU15
US	160	570
Japan		167

Authors' computations based on the above data

Table 6. Foreign Exchange Transactions between Customers and Dealers (monthly average, $billion 1995)

	Yen	DM
US $	333	595
Yen		38

Authors' computations based on the above data

Table 7.
Cross-Border Transactions in Bonds and Equities (annual, $billion)

	US	Japan	Germany	UK
1992	6658	2674	1677	5396
1993	8440	3326	3258	6485
1994	9088	2814	3244	6777
1995	9812	3357	4142	10318

Source: BIS

[euro7a.tex]
15.10.97

Graph 1
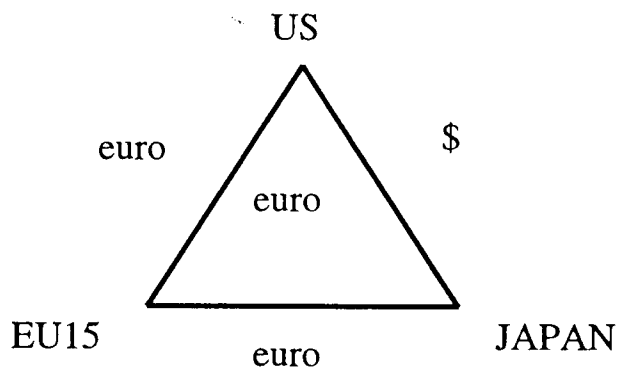**Present situation,**
Status Quo:
dollar vehicle

US

$ $

$

EU15   JAPAN

$
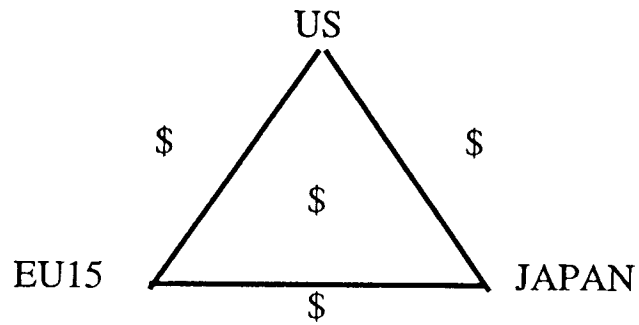
Graph 2
Quasi Status Quo:
dollar vehicle

US

$ $

$

EU15   JAPAN
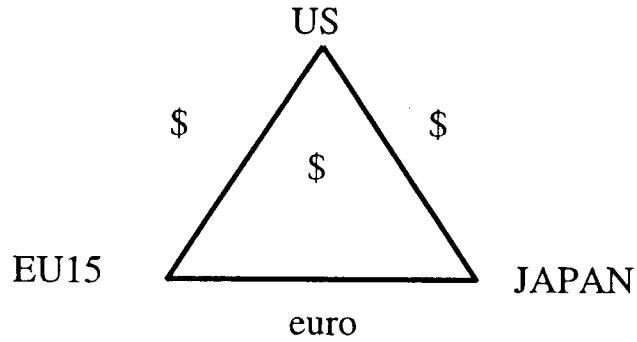
euro

Graph 3
Medium euro:
dollar vehicle

US

euro $

$

EU15   JAPAN
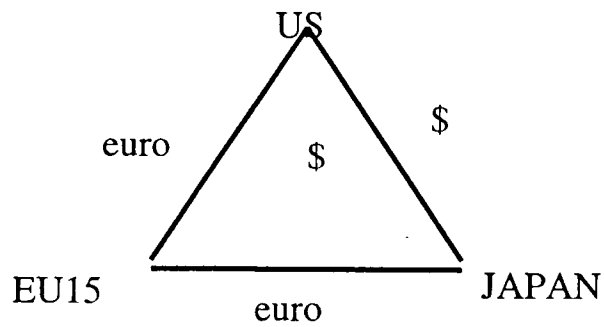
euro

Graph 4
Big euro:
euro vehicle

US

euro $

euro

EU15   JAPAN

euro

The vehicle currency is shown in the middle of each triangle. The dominant currency used for financial exchanges between two blocs appears on the sides of the triangles.

Figure 1
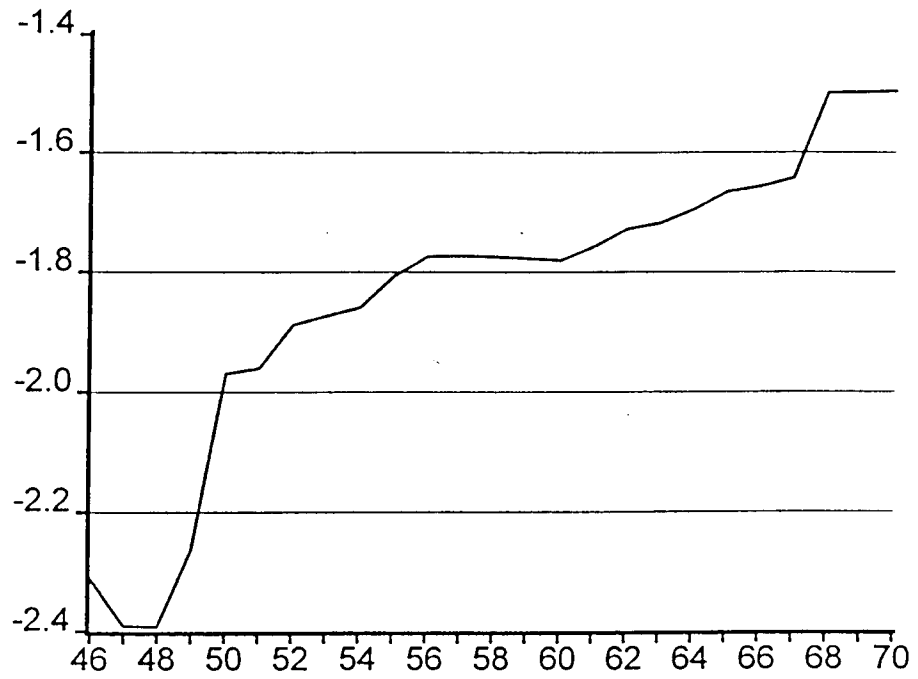**Short Term Interest Rates in the US and Britain**
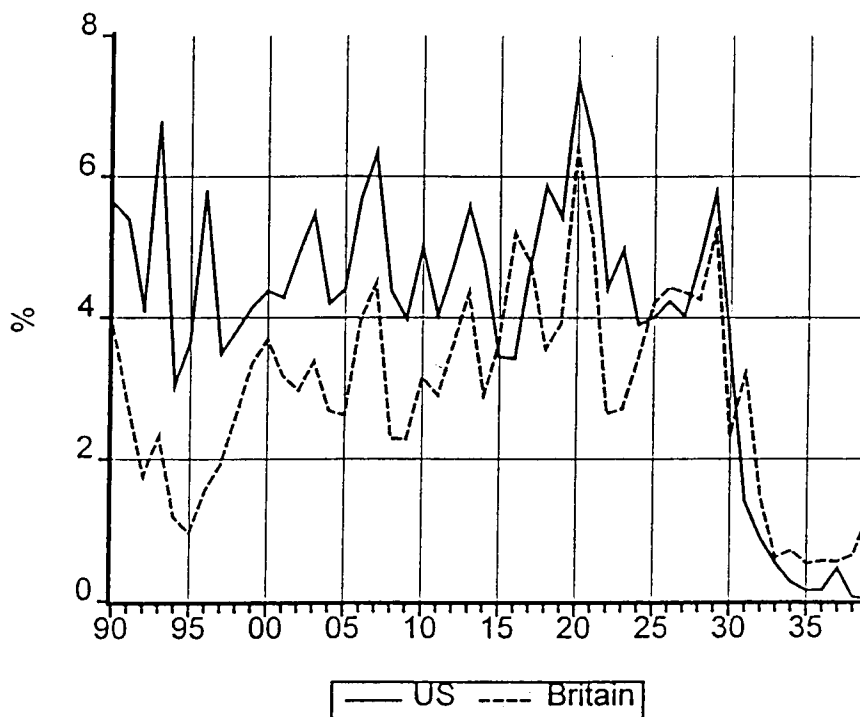
Source: Friedman M. and A.J. Schwartz (1982), *Monetary Statistics in the United States and the United Kingdom*, University of Chicago Press and NBER.

Figure 2
The Dollar Sterling Real Exchange Rate, 1900-1939
(logarithmic scale)

Figure 3
The Dollar Sterling Real Exchange Rate, 1946-1970
(logarithmic scale)

Figure 4
The Balance of Payments of the United States, 1946-1970
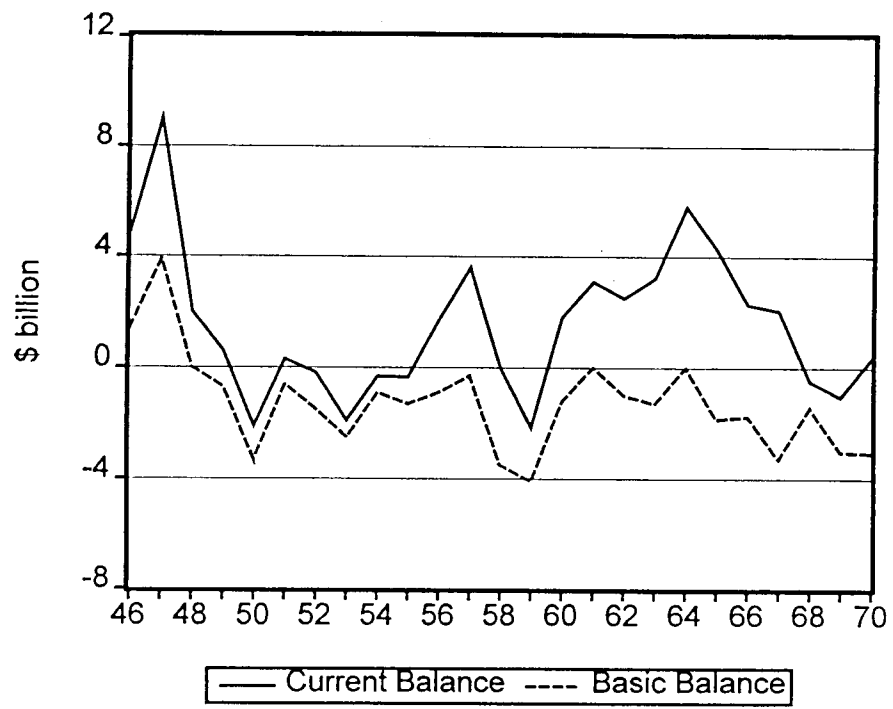
APPENDIX 2

To analyse the effects of the introduction of the euro on its real exchange rate and the balance of payments of the EU, we use a version of the Krugman (1989) model, which is a real, full employment, portfolio balance model. We begin with the savings-investment identity for Europe.

$$S(r)-I(r) = X(E_p)-M(E_p)/E_x \qquad (1)$$

S is savings, I investment, r the real interest rate, M is imports and X is exports. Savings and investment are assumed to depend on the real interest rate, while trade volumes are assumed to depend on the permanent real exchange rate E_p. The permanent real exchange rate is a distributed lag of past real exchange rates:

$$\dot{E}_p = \lambda(E_s - E_p) \qquad (2)$$

where $1/\lambda$ is the mean lag. It is assumed in (1) that the current real exchange rate E_x has a perverse short-run effect on the trade balance, i.e. that there is a J-curve.

Finally we assume that expectations are rational and that covered interest parity holds.

$$r(E_s,E_p)+\frac{\dot{E}_x}{E_s} = r^* + \rho \qquad (3)$$

ρ is the risk premium on European assets, and r^* is the US real interest rate. We have written the European real interest rate as a function of the current and permanent real exchange rate that satisfy savings and investment balance. A rise (appreciation) in E_s raises $(X - M)$, so $(S - I)$ must rise, i.e. r must rise. But (subsequent) appreciation of E_p will reduce $(X - M)$ and will be accompanied by a fall in r.

The dynamic system of (2) and (3) is depicted in Figure 1. We assume that the introduction of the euro will cause a portfolio shift in its favour, which can be represented as a reduction in the risk premium. From the original equilibrium at 1, the euro will appreciate following the portfolio shift. Subsequently there will be convergence to the new steady state, with the euro depreciating towards the new equilibrium, and the current account in the EU deteriorating.

Figure A.2
A portfolio shift in favour of the Euro