Euro vs dollar
Will the euro replace the dollar as the world currency?

SUMMARY

Will and should the euro become an international currency? Previous work has noted that measuring size by GDP, role in international trade or even financial markets, Europe matches the USA. On these grounds, the euro is expected to challenge the dollar's supremacy. Cost–benefit analyses have looked at seigniorage, benefits for home financial institutions, relaxation of the external constraint, influence on international institutions, effects on macroeconomic policy co-ordination, and the wider consequences of exercising or sharing 'currency hegemony'. This paper revisits these issues with a new framework that stresses the role of financial asset markets and uses new data to evaluate scenarios. 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 in trade will expand; the asset and trade effects interact. A welfare analysis reveals potential benefits for the euro area of the same order of magnitude as international seigniorage – at the cost of the USA and the 'Asian bloc'. If policy-makers wish to promote the international role of the euro, they 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 too will private market initiatives (e.g., in establishing benchmark interest rates and securities).

— Richard Portes and Hélène Rey

The emergence of the euro as an international currency

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1. INTRODUCTION

After nearly a century of domination in world monetary affairs, the dollar is about to face stiff competition when the euro is created. Political calculations and national symbolism will undoubtedly play a part: they already shape current debates. The international status of the euro will have substantial implications for the international monetary system, the composition of portfolios, exchange rates and monetary policies. Economic efficiency and welfare are also at stake. The rapidly growing literature on the potential international role of the euro typically fails to specify a clear analytical framework, resorting mostly to comparing the sizes of economic areas and financial markets, and making guesses about possible changes in the use of currencies for both trade invoicing and asset denomination.

Here we offer a discussion and specific estimates based on a new and explicit analytical framework as well as on new data. The key determinant of the extent and speed of internationalization of the euro will be transaction costs in foreign exchange and securities markets. We emphasize that synergies between these markets imply the existence of different possible configurations, including the status quo and a very diminished role for the dollar. Given the euro's fundamentals – the EU's economic size, the liberalization and integration of its financial markets, and confidence in its international creditor status and stability-oriented monetary policy – we find that the most likely outcome is that the dollar will have to share the number-one position.

With few exceptions, such as Bergsten (1997), observers in the United States tend to underplay this possibility. Frankel (1995), for example, argues that '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.' Similarly, Deputy Treasury Secretary Lawrence Summers said, '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' (speech to Euromoney Conference, New York, 30 April 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. Perhaps they disregard future challenges 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, now apparently conquered. But then they should take into account another macroeconomic source of long-run dollar weakness: the US current account deficits that have led to massive accumulation of external debt. Our point, however, is that the euro will be a competitor to the dollar simply because of a size effect, which will be more than proportional to the sum of the currencies that will go into the euro.

Does it matter whether the euro achieves the status of international currency? Policy-makers and academic writers have long regarded currency hegemony as a source of political as well as economic benefits. For instance, Kunz (1995) writes: 'Geopolitical power depends on financial power, each of which supports the other. To ignore the real benefits of controlling the international currency system is [unfortunate] … The death of the dollar order will drastically increase the price of the American dream while simultaneously shattering American global influence.' Even the recent east Asian currency crises, which led to the demise of dollar pegs, is sometimes interpreted as an alarming example of the impending decline of the 'dollar order' (e.g., *Los Angeles Times*, 22 July 1997). 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 key currency status and the historical decline of great powers.

The economic advantages from currency hegemony include a comparative advantage for markets and institutions of the issuing country, the advantage for trade of having other countries peg their exchange rates to one's own (elimination of exchange rate uncertainty), and 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. De Gaulle went too far in 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 US Treasury securities – but there was some substance in his basic insight. Still, under Bretton Woods 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 (see the Introduction to Alogoskoufis *et al.*, 1991). Yet, in the short and medium run, the USA has been able to build up international liabilities in dollars at a lower interest rate than it would otherwise have had to pay (see below and Artus, 1997a). Moreover, it has the option to eliminate some of this debt with a surprise inflation. McKinnon (1993) states that 'The "privilege" of going into international debt so heavily in your own currency is one that is open only to the centre … country.'

Some of the debt is indeed 'free of charge'. Foreign residents hold US currency in large quantities (the conventional estimate is 60% of the total stock outstanding, but elsewhere in this issue Rogoff puts it closer to 50%). 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% of GDP (Alogoskoufis and Portes, 1991; Commission of the European Communities, 1990; Frankel, 1995; Rogoff, this issue). 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 (see Table 7 below). This international currency effect reduces the real yields that 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 $2000 billion, this $5–10 billion annual flow is of the same order of

magnitude as international currency seigniorage. Furthermore, efficiency gains arise from the deepening of exchange and financial markets. We estimate that for the EU these gains 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.

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 2002–3 onwards. We assume also that the European Central Bank (ECB) will quickly establish its credibility and reputation, and that it will conduct a neutral monetary policy relative to the initial exchange rate of the euro. Its monetary policies 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 co-ordination. International institutions such as the G7, the IMF and the OECD will have to adapt (see Alogoskoufis and Portes, 1991; Begg *et al.*, 1997; Henning, 1997).

In section 2, we propose alternative 'steady-state' scenarios for the roles of the euro as an international means of payment and a store of value, and we discuss the process that generates each scenario. In section 3, we use foreign exchange and securities market data to assess the plausibility of these scenarios. 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. The extent to which the euro may take on some of the current roles of the dollar will depend on policy decisions and on the beliefs of market participants. In section 4, we find potentially significant economic efficiency and welfare benefits for the euro area, at the cost of the USA and Japan. Section 5 focuses on the transition from the current configuration towards the new role of the euro, and the implications of that process for the exchange rate between the dollar and the euro, both in the short and in the medium run. Private asset demand 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. Such excess demand for euro-denominated assets would favour an appreciation of the new currency *vis-à-vis* the dollar and the yen. Finally, we consider the policy implications of these developments. If they wish to promote the emergence of the euro as an international currency, European authorities must make the domestic euro financial markets more efficient, more integrated and cheaper for participants. If pressures for euro appreciation materialize, the authorities will have to eschew rigid monetary or inflation targeting. And if the euro does challenge the dollar's hegemony, the result may be instability in the international monetary system, which appropriate policy co-ordination could mitigate.

2. SCENARIOS FOR THE INTERNATIONALIZATION 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. The view that public (state) use of a currency precedes and dictates private use (Goodhart, 1996) is not valid in the international domain. 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. But here the market may not function well. Because of economies of scale and externalities in the use of currencies, considerable 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.

History matters, however. 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). 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 (Yeager, 1976; Kindleberger, 1984). The possible existence of multiple equilibria and threshold effects gives a role to history and institutions. Moreover, if the shocks are big enough to overcome inertia, expectations will be important in determining which equilibrium will prevail, and that may create considerable instability. Our framework allows us to estimate the potential for internationalization of the euro using foreign exchange and securities market data. 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.

2.1. The current configuration and potential changes

2.1.1. Foreign exchange markets and trade invoicing. 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). This is despite the fact that the EU accounts for a higher proportion of world trade than the USA (even netting out intra-EU trade): in 1992, the EU accounted for 17% of world exports, the USA 12% and Japan 9%. But the dollar intermediates in the financing of trade between the EU and third countries, as well as trade of third countries among themselves, partly because of lower transaction costs in the inter-bank market. The lower transaction costs in all markets involving the euro will make some

substitution likely (Kenen (1996) reaches a similar conclusion). We do not believe that changes in invoicing practices are driving forces behind internationalization of currencies; rather, they are accompanying phenomena. Still, invoicing could introduce some additional inertia when we switch to the euro, but could then strengthen the externality.[1]

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 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 DM, 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 (see Tavlas, 1991; Tavlas and Ozeki, 1992).

EMU is likely to bring almost exclusive invoicing in euros by EU firms. Economies of scale in use of the euro will induce firms from other areas that trade mainly with the EU to start invoicing in euros (e.g., central and eastern Europe, the Middle East and north Africa), as will many multinational Japanese and US firms. Some imports from the USA and Japan will remain exceptions, as will some primary commodities. But there will be an initial one-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. The euro's role will grow at a rate determined by its ability to capture more of the dollar's vehicle currency position in non-US trade. The process will also depend on the stability of exchange rates between the dollar, the yen and the euro. If the 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) substituting 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.

If trade relations become concentrated in regional blocs (e.g. Europe–Africa–Middle East, Japan–south-east Asia, USA–Latin America), we might end up with at least three vehicle *cum* unit of account currencies. But in so far 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

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[1] We are grateful to Seppo Honkapohja for this insight.

change in the fundamentals will favour the euro, but history (inertia) will favour the dollar.

2.1.2.   Securities markets. The share of US dollar bonds in the international bond market has fallen substantially 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 $3200 billion), with a corresponding sharp rise in the share of yen-denominated bonds to 16% (BIS, 1997). According to McCauley and White (1997), 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, close to having a common reference yield curve (McCauley and White, 1997). With outstanding stocks of $2948 billion, it is two-thirds the size of the American market. The segmentation that one observes in this market appears to derive primarily from the effect of different currencies. In the pricing of government debt, prospects for integration in trading debt of the most creditworthy governments look brighter than is generally acknowledged (McCauley and White, 1997). Total public sector domestic debt in the EU15 amounts to $4618 billion, two-thirds of that in the USA (BIS, 1997). Moving to the euro will promote the integration of the EU15 government debt markets, so that their breadth, depth and liquidity will become comparable – if not for some time equal – to those of the United States.[2] This will be partly the consequence of policy and institutional changes in the markets (see section 6), and partly an endogenous response, arising from the inverse relation between transaction volumes and costs that is the key to our argument.

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 currently show very high home preference – are likely to find the new euro financial market attractive as they diversify (Artus, 1997b), 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.

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[2] 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.

2.1.3.   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 (Kenen, 1995), and that this in turn determines use as a reserve currency (Krugman, 1984). But reserve holding and currency pegging by governments deserve some attention. Pegging 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 overwhelmingly higher than the share of any other single currency.[3] From 76.1% of total official currency reserves in 1973, the 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.[4] The trend decline in the share of dollar reserves in the portfolios of central banks is likely to be somewhat reinforced by the EMU process (McCauley (1997) carefully assesses the arguments). But this will not necessarily make the euro a major reserve currency outside the EU, unless foreign exchange intervention by non-EU countries is also in euros; that, we suggest, will follow trends in the financial markets.

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 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 east 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.)

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

The use of the euro in financial services will depend on transaction costs: that is, how efficiently those services are provided. Transaction costs (typically measured by

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[3] See Alogoskoufis and Portes (1991, 1992), Bénassy-Quéré (1996).
[4] 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.

bid–ask spreads) in financial markets are normally very low for liquid assets, but the volumes to which they apply are huge (e.g., well over one trillion dollars daily in the foreign exchange markets), so their incentive effects are 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. In monetary transactions, 'network' or 'thickness' externalities are very important. The more agents who use a given money, the more attractive it will be for other agents to use it. The more transactions in that currency, the easier and quicker they are, and the less resources needed to find a match for any given supply or demand. The entry of any trader into the market therefore confers a positive externality on all other traders. The 'thickness' externalities may cause dealers to prefer indirect exchange, through a vehicle currency, to direct exchange of one currency for another. 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 (see Hartmann (1996b) for a recent discussion with full references).

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). We assume 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.

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

The internationalization 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 internationalization 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 for both financial assets and foreign exchange market transactions, becomes unsustainable. There is a shift towards a new equilibrium where the euro either replaces the dollar completely in its major international roles, or 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. But if transaction costs on euro securities markets remain higher than on dollar securities markets, only very limited changes in the pattern of world payments will occur.

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

2.3. A simplified story of the pattern of world payments

Consider a three-country world with a European, an American and an Asian bloc. The demand for a currency comes from two sources: trade in goods and trade in financial assets. Demand for financial assets denominated in a given currency derives from the pattern of cross-border bond and equity flows and from savings. We assume that sellers of goods and financial assets are paid in their own currency predominantly, but that a fraction of the denomination of the transactions depends on the international status of the currency. This assumption is in line with the evidence presented in Table 1.

Purchases and sales of financial assets as well as foreign exchange transactions involve the intervention of financial intermediaries. These financial intermediaries

Table 1. Share of exports invoiced in domestic currency (%)

|	1980	1992
USA	96	92
Germany	82	77
Japan	29	40
UK	76	62
France	60	55

Source: ECU Institute (1995).

choose on which foreign exchange and bond markets to operate by minimizing transaction costs. Exchange rate and interest rate volatility are assumed to be of the same order of magnitude before and after the introduction of the euro, so that changes in transaction costs reflect only changes in the liquidity of the different markets. Thus risk–return trade-offs, which in theory also affect portfolio investment decisions, are not taken into account, so that demands for equities and for some bond transactions are invariant with the currency regime. Consequently, real returns are unaffected.

Some other bond transactions, however, such as the ones made for hedging purposes, vary with the international status of the currency. 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 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 existence of thick market externalities. Thus turnover on the different markets is determined partly by the underlying real trade fundamentals, equity and bond trading, and savings behaviour, but also partly by history. Transaction costs reflect the liquidity of the different markets, but they also pick up other effects. In particular, more liquid markets tend to be institutionally better organized.

2.4. The present situation: the dollar as international currency

A stylized three-bloc description of the current world system of payments is shown in Figure 1. The dollar dominates in transactions linked to trade in goods and financial assets between the three blocs. (As we focus on *inter-bloc* exchanges, we ignore *intra-European* trade.) Because of a complete home portfolio bias, we consider that, inside each bloc, savings are invested in domestic financial assets. This is not too far-fetched: pension funds hold only 9.6% of foreign assets in the USA, 6.6% in Japan and 4.9% in Germany (Miles, 1996; PDFM (1997) estimates 13% for the USA, 10% for Japan). Data on foreign exchange market turnover by currency pairs are presented in Table 2. There are virtually no direct bilateral transactions between the yen and EU currencies.[5] Thus Japanese traders who may pay for imports in

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[5] The exception is the DM/yen market, but even this market has a low turnover compared to the major markets as well as compared to the size of the trade and financial flows between Japan and Europe.
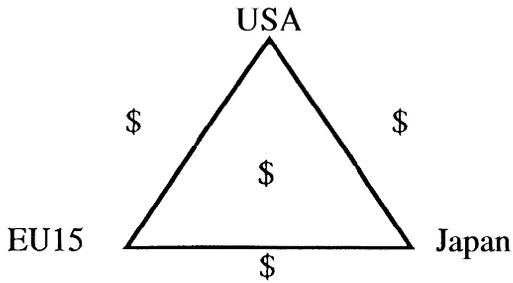
Figure 1. Present situation, status quo: dollar vehicle
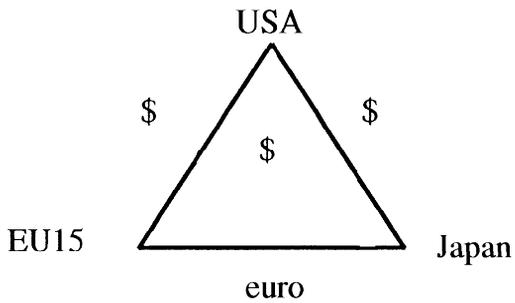
Figure 2. Quasi status quo: dollar vehicle
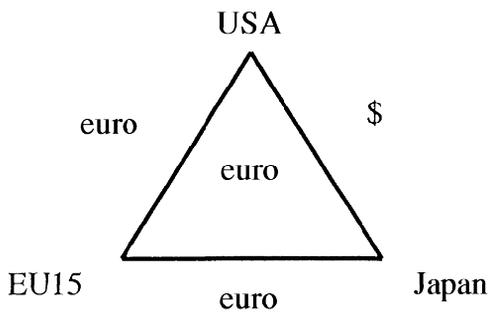
Figure 3. Big euro: euro vehicle
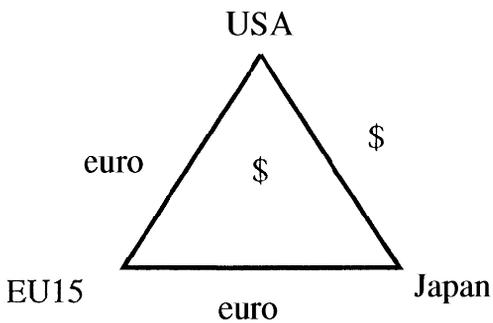
Figure 4. Medium euro: dollar vehicle

Note: 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.

Table 2. Average daily foreign exchange market turnover ($bn), 1995

	Spot, forward and swaps	Spot	Swaps
DM/$	254	143	93
$/yen	242	88	133
Yen/DM	24	19	2
DM/EU	99	82	14
Yen/all others[a]	8	2	2
DM/all others[b]	1.5	1	0.2
FF/all others[c]	5	1	2

[a] Excluding $ and DM.
[b] Excluding $, yen, EU and Swiss francs.
[c] Excluding $ and DM.
Source: BIS (1996).

DM, and who would therefore wish to exchange yen for DM, will tend to use dollar-denominated assets for intermediate financial transactions such as hedging. Some transactions that would add to the yen/DM market turnover (or the yen/FF market turnover) are actually performed on the yen/$ and $/DM or $/FF markets.

2.5. The emergence of the euro zone: alternative scenarios

Is the EMU shock big enough to induce a shift in the equilibrium structure of payments described in Figure 1? If transaction costs in euro-denominated securities remain higher than those in dollar-denominated securities, two cases may arise. One is the *status quo*, the other is the *quasi status quo* described in Figure 2. While the dollar is still the vehicle currency on the foreign exchange markets, the euro becomes the dominant currency for exchanges between Europe and the Asian bloc.

If transaction costs in euro-denominated securities fall below those in dollar-denominated securities, three other equilibria may emerge. In the *pan euro* scenario, the euro replaces the dollar as the currency used for financial asset transactions between blocs and as the vehicle currency on the foreign exchange market. The use of the euro in all financial transactions leads to its use as a vehicle on the foreign exchange markets, and there are no direct transactions between the dollar and the yen. Transaction costs are low on the euro/$ and euro/yen markets, now enhanced by the vehicle currency use of the euro. This scenario is unlikely to happen as the post-euro $/yen market should be at least as liquid as the pre-euro yen/DM market.

Figure 3 shows the *big euro s*cenario: the euro takes the role of vehicle currency on the foreign exchange markets and replaces the dollar as the main international currency for financial asset transactions, but transactions between the dollar bloc and the Asian bloc are still in dollars. Transaction costs on the $/yen exchange market are high compared to transaction costs on the $/euro and euro/yen markets,

where volumes have risen following the vehicle currency role of the euro. Not all transactions between the yen and the dollar are intermediated by the euro. Some are direct and some are indirect because of the 'double coincidence of wants problem' on the bilateral foreign exchange markets (see Krugman, 1980).

In the final alternative, the *medium euro s*cenario, represented in Figure 4, the euro replaces the dollar as the main international currency for financial asset trans-actions, but transactions between the dollar bloc and the Asian bloc are still dominated by the dollar. The euro is not the vehicle currency on foreign exchange markets. As before, however, some transactions between the euro and the yen are intermediated through the dollar, others through the euro.

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 Europe and Asia are (the higher the transaction costs on the euro/yen market), the more the dollar is likely to keep its vehicle currency role. Note that 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, although major institutional changes could enhance the prospects of the yen in the long run.

3. NUMERICAL ESTIMATES

In this section, we determine which equilibria are indeed possible. To do so, we use data on trade, equity and bond flows for each of the bilateral foreign exchange and bond markets to estimate the size of the relevant markets under each scenario. Using plausible estimates of the response of transaction costs to transaction volumes, we can reject some scenarios, but we find that multiple equilibria are likely.

3.1. Estimates for the foreign exchange markets

3.1.1. The market fundamentals. Foreign exchange market turnover can be divided into inter-dealer and customer–dealer transactions. Lyons (1995, 1997a) describes inter-dealer transactions as a 'hot potato' game. Imagine ten risk-averse dealers, each of whom starts with a zero net position. A customer now wants to sell $10 million worth of DM and contacts one of the dealers. The dealer does not want to carry the full open position. He keeps his share – one-tenth of $10 million – and calls another dealer to sell the remaining $9 million worth of DM. And so on until each dealer has a $1 million position. The inter-dealer transactions will have represented 90% of all the transactions carried out throughout this process. This proportion roughly matches the actually observed shares. Table 3 shows that the shares of inter-dealer transactions are remarkably similar on all the bilateral markets. The huge predominance of inter-dealer transactions over customer–dealer

Table 3. Share of inter-dealer trading, spot foreign exchange, 1995 (%)

	DM	Yen	Pound	FF	Swiss F	Can $
$	85	81	85	80	83	79
DM		90	92	88	88	84

Source: Authors' computations based on BIS (1996).

transactions is a feature that differentiates the foreign exchange markets from all other financial markets.

The volume of customer–dealer transactions on the foreign exchange market can be decomposed into four different components:

$$v \quad = \quad T \quad + \quad E \quad + \quad B \quad + \quad I \quad\quad (1)$$

v	$=$	T	$+$	E	$+$	B	$+$	I
volume of		trade		cross-border		cross-border		international
customer–dealer		transactions		flow of		flow of		use as
transactions				equities		bonds		vehicle

Because of the inter-dealer transactions, the total volume of exchange transactions is a multiple of the volume of customer–dealer transactions:

$$V \quad = \quad v \quad \times \quad m \quad\quad (2)$$

V	$=$	v	$\times$	m
total volume		volume of		multiplier
of exchange		customer–dealer		
transactions		transactions		

The size of the multiplier is inversely related to the share of customer–dealer transactions (it is 10 in our example, since each trader has a share of one-tenth of the market).

Table 4 presents data on these various components, including the direction of flows. The two first components, trade and equity flows (panels b and c), account for a small fraction of the global turnover (panel a) on each bilateral market. We assume that these are pure customer–dealer transactions, which generate a cascade of inter-dealer transactions but are invariant with the currency regime. This is why we call them 'fundamentals'. Cross-border bond flows (panel d) can be decomposed into two parts, inter-dealer and customer-dealer transactions, each of which accounts for roughly 50% of the total.[6] The customer–dealer part of the bond flows (*B*) is also assumed to be invariant with the currency regime, whereas the inter-dealer part will vary with the scenarios and the international currency. There is ample evidence that the most liquid bonds (such as the 5- or 10-year US Treasuries) are widely used by financial intermediaries for hedging practices. This is why the turnover ratio of these bonds is much higher than for the other securities. We

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[6] We find that inter-dealer transactions represented 47% of the global transactions of both the US and UK bond markets in 1994 (another remarkable similarity). The remainder is customer–dealer transactions.

Table 4. Bilateral foreign exchange market transactions ($bn)

(a) Total foreign exchange turnover (April 1995)

	Yen	EU15
US$	1753	3966
Yen		377

Source: BIS (1996).

(b) Trade transactions (monthly average, 1993)

	USA	Japan	EU15
USA		5	11
Japan	11		6
EU15	11	4	

Source: IMF, *Direction of Trade Statistics*.

(c) Cross-border equity transactions (monthly average, 1993)

	USA	Japan	EU15
USA		8	29
Japan	3		2
EU15	25	11	

Source: Cross Border Capital.

(d) Cross-border bond transactions (monthly average, 1995)

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

Sources: BIS, personal communication and authors' estimates.

(e) Cross-border transactions in bonds and equities (annual, $bn)

	USA	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.
Note: Panels (b) to (d) show direction of bilateral flows, *from* country indicated in row *to* country indicated in column.

consider this to be a direct consequence of the dollar's dominance as the inter-national currency. In our perspective, the more liquid markets are those that are the most likely to be affected by the switch to the euro.

Summarizing, we define the fundamentals of a bilateral exchange market as:

$$\text{Fundamentals} = \underset{\substack{\text{trade}\\\text{transactions}}}{T} + \underset{\substack{\text{cross-border}\\\text{flow of equities}}}{E} + \underset{\substack{\text{cross-border}\\\text{flow of bonds}}}{B} \tag{3}$$

Note that B is only the customer–dealer part of global cross-border bond flows, set at 50% of the total. The remaining transactions $(I = V/m - T - E - B)$ are those due to the international use of a currency. Unlike the 'fundamentals', they vary with the scenario. Note that I can be positive or negative.[7] If I is positive, it means that the currency considered is used beyond what the real fundamentals would give: the currency is internationalized. For example, the turnover of the \$/DM market is likely to exceed what would have been predicted by the fundamentals of the USA and Germany. This is 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.[8]

Our breakdown of transactions into fundamentals and customer–dealer transactions is presented in Table 5. The turnover on the yen/DM market is smaller than suggested by the fundamentals, while turnovers on the \$/DM or \$/yen markets are higher. This corresponds to the international currency role of the dollar.

3.1.2. Effects of EMU. In order to assess the effect of EMU we proceed as follows. Each scenario specifies which currency is being used on each financial market. This allows us to estimate the size of each market. Knowing how costs are related to market size, we can derive the corresponding cost structure. Then we can verify that the cost structure is compatible with the assumed scenario. Compatibility is assessed

Table 5. Decomposition of foreign exchange transactions: fundamentals versus customer–dealers (monthly averages, \$bn, 1995)

	Fundamentals			Customer–dealer transactions	
	Japan	EU15		Yen	EU15
US\$	160	570	US\$	333	595
Yen		167	Yen		38

Source: Authors' computations.

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[7] 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.

[8] We ignore speculation. Recent empirical papers (Lyons, 1997b; Ammer and Brunner, 1997) argue that the share of speculative profits is negligible compared to the profits generated by financial intermediation.

by considering the triangles in Figures 1–4. For example, the *big euro* scenario asserts that the euro is used when Europe deals with Japan and the USA, while the dollar remains the currency of choice for US–Japan relationships. This implies, for example, that it is cheaper to change yen into euros directly rather than via the dollar, and conversely. Does this match our new cost estimates? If so, the *big euro* scenario is a possible equilibrium; if not, we can rule it out. The appendix presents all the transaction cost restrictions implied by each scenario as well details of the calculations performed to estimate transaction volumes.

To find how changes in transaction volumes affect transaction costs, we need an estimate of the corresponding elasticity. For the foreign exchange markets, we adopt the estimate of −0.03 carefully derived by Hartmann (1996b). He stresses 'the apparent stability of [his] parameter estimates, not only between the different estimators but over time' (1997). In all cases, we start from the current transaction costs on the different foreign exchange markets, derived from Hartmann (1997), as presented in Table 6; then we apply the elasticity to the estimated change in volume to obtain new cost estimates.[9] For bond markets, we use a similar procedure (Table 8). We start from the current transaction costs on the different bond markets (Salomon Brothers dealers' survey) and apply the only estimate that we know of: Takagi (1989) finds a value of −0.11 for the Japanese government bond market. We also present a sensitivity analysis.

3.2. Bond market estimates

To decide between *status quo* (or *quasi status quo*) on the 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. As we see from Table 4, trading in bonds dominates trading in equities and real trade flows ($B > E > T$). Do we believe that the financial markets of the euro bloc will be more liquid than those of the dollar bloc? Table 7 clearly shows that, relative to their underlying stocks, US government bonds

Table 6. Unit transaction costs (US cents, basis points)

Exchange market	Current	Exchange market	Quasi status quo	Medium euro	Big euro
$/DM	4.06	euro/$	4.02	4.02	4.02
DM/yen	4.37	euro/yen	4.33	4.33	3.43
$/yen	4.16	$/yen	4.17	4.17	4.27
FF/$	4.61				
£/$	4.27				

Source: Authors' calculations from Hartmann (1997).

[9] Hartmann's estimation allows transaction costs to depend on both transaction volumes and market price volatility. To obtain comparability across markets, we set the volatility level to 0.

are much more traded than others. Table 8 provides another measure of liquidity: the average bid–ask spreads on 10-year government bonds.[10] This measure can be used as a proxy for global transaction costs for each government bond market considered. These securities are used as a benchmark because they are usually the most widely traded, and they account for a very large part of the turnover.

Today's transaction costs favour the dollar as the currency of denomination for financial assets. However, turnovers and therefore transaction costs are endogenous and depend on the international status of a currency. Even if we control for this effect and bring in additional turnover in euro-denominated bonds stemming from foreign demand, the transaction costs we compute using the elasticity estimate still favour dollar financial markets. The gap is such that, in the absence of institutional changes or market participants' initiatives on the European bond markets, the dollar-denominated securities market will remain the most efficient one.

Consequently, the most likely scenarios based on bond market transaction costs seem to be either the *status quo* or *quasi status quo*. Estimates of the transaction costs on the foreign exchange market discriminate then in favour of the *quasi status quo* scenario: 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 pre-eminence for all the other types of transaction, and in particular as the main vehicle currency.

Table 7. Government bond markets, 1995 ($bn)

	USA	Europe	Japan	
Annual turnover domestic bonds	35843	45635	20625	
Stock outstanding	2547	4618	3303	
Ratio turnover/outstanding	14.0	9.9	6.2	

Sources: McCauley and White (1997); Salomon Brothers, dealers' survey.

Table 8. Bid–ask spreads on the benchmark bonds (10-year) (US cents, basis points)

		Bond market	Quasi status quo	Medium euro	Big euro
USA	1.56	Dollar	1.57	1.57	1.57
Germany	4	euro	4.0	1.57	1.57
Japan	3.5	Yen	3.5	3.5	3.5
UK	3.12				
France	4				

Source: Salomon Brothers and authors' calculations.

[10] 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.

On the other hand, there are important institutional differences between US and European corporate bond markets. 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. Of course, this is 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.

3.3. The potential effect of institutional changes

The introduction of the euro carries with it the potential for creating the largest domestic financial market in the world, as suggested by Table 9. Current costs indicate, however, that this potential will probably require policy decisions. If, within five to ten years, financial market integration is completed within Europe, then euro transaction costs may indeed fall below dollar transaction costs. This is all the more likely if the UK joins EMU, because of the size of the UK financial market. To examine the effect of action by policy-makers to encourage the internationalization of the euro, we now assume that institutional changes, such as those discussed in section 6, lower the costs of trading in euro financial assets to the level that applies to dollar-denominated financial assets. Under these circumstances, the fundamentals support both the *medium euro* and the *big euro* scenarios, but exclude the *pan euro* scenario.

In the *medium euro* scenario, the dollar retains its 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. Our estimate of the corresponding transaction costs is shown in Table 6. In the *big euro* scenario, the euro takes up the vehicle currency role. Consequently, there is much more turnover on the euro/yen foreign exchange market and much less turnover on the $/yen foreign exchange market. Again, we show the corresponding transaction costs in Table 6. In both cases, the costs on the euro/$ and euro/yen markets decline in comparison to the DM/$ and DM/yen markets, especially when the euro becomes the international

Table 9. Stock market capitalization *plus* debt securities *plus* bank assets, end-1995 ($bn)

EU15[a]	27270
EU11[b]	21084
UK	4658
USA	22865
Japan	16375
USA + Canada + Mexico	24711

[a] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
[b] Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.
Source: Prati and Schinasi (1997).

currency. There is in both cases, however, an increase in the transaction cost on the $/yen market due to lower liquidity of that market. These results confirm that several equilibria are possible. Which one will emerge depends on the agents' beliefs.

3.4. Sensitivity analysis

The elasticity of costs to volumes plays a crucial role in our calculations.[11] The bigger the elasticity (in absolute value), the bigger the economies of scale and therefore the bigger the incentives to pool transactions. If transaction costs in euro-denominated assets fall sufficiently, the likelihood of a *big euro* or a *medium euro* scenario rises. It is necessary, therefore, to examine how sensitive our conclusions are to the value of this 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 bond markets. But the frontier between the *big euro* and *medium euro* scenarios varies with the elasticity parameter. For a very high elasticity (when its absolute value exceeds 0.16), the *medium euro* scenario can be ruled out, leaving the *big euro* scenario as the only possible one. For a low elasticity (absolute value less than 0.006), on the contrary, the *medium euro* scenario is the only possibility. Both scenarios are possible in the intermediate range, where the empirical estimates lie.

4. WELFARE ANALYSIS

The transaction costs on the foreign exchange and bond markets are obviously small and are expected to decline further, in particular with the introduction of the Electronic Brokerage Service (EBS). Does this mean that economic effects of cost reductions are too trivial to warrant attention? To start with, we have shown that even small changes may have powerful effects on the patterns of international monetary transactions. In this section we look at the effects on market efficiency, when small costs are applied to truly enormous flows. The European Commission's study *One Market, One Money* (1990) reports microeconomic efficiency gains ranging between 0.1% and 1% of GDP per year, depending on the size of the country under consideration. These estimates are found by simply setting to zero all the foreign exchange transaction costs within EU countries. This approach ignores the monopolistic margins (now falling) as well as the impact of EMU on foreign exchange transaction costs between EU countries and the American and Asian blocs. Our approach provides estimates for efficiency gains from forex transactions outside the euro area and on the bond markets.

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[11] Hartmann's (1997) estimate is in the range −0.03 to −0.045 (with *t*-statistics around 1.7).

In principle, there is a direct relationship between economic welfare and global transaction costs. Because transacting involves real resource costs in terms of labour, transaction efficiency gains translate into savings in the use of labour. The bigger the share of labour in production, the more labour can be freed to perform other duties, raising aggregate consumption and welfare. Thus estimates of cost reductions can be interpreted as welfare gains. In this section we compute for each bloc and under each scenario the real resources going into financial intermediation, by multiplying transaction costs by volumes exchanged on each market and summing across markets.

Using the transaction costs and trade volumes calculated in section 3, one can rank the different possible scenarios (*quasi status quo*, *big euro* and *medium euro*).[12] The results are summarized in Table 10. From the point of view of Europe, the *big euro* scenario is the best one, ahead of *medium euro* and *quasi status quo*. For the USA the best scenario is obviously the *quasi status quo*, and welfare declines as we move to *medium euro* and *big euro*. Japan should favour the *medium euro* scenario, ahead of *quasi status quo* and *big euro*. The *medium euro* case is the best for the world as a whole, followed by *big euro* and *quasi status quo*, in that order.

The logic of these results should be clear. Efficiency gains and losses are mainly determined by bond market transactions. The dollar and euro bond markets are both very efficient in the *big* and *medium euro* cases, while in the *quasi status quo* case, the euro bond market is far less efficient than its dollar counterpart. Europe, therefore, strongly benefits from an enhanced usage of the euro. The US situation is symmetric: the more people use the euro, the less people use the dollar, and hence the welfare ranking is reversed. The USA 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. Japan does, and this is why it is better off in the *medium euro* case. However, since Asia is more integrated with the USA 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 when the euro becomes an international currency. For the world as a whole, transaction costs on the euro bond market matter less, while given the pattern of integration of the three blocs, there are increasing returns in using the dollar as the international currency. The rankings are insensitive to the elasticity used for bond market transactions for any reasonable values (between -0.0001 and -1). Takagi's (1989) estimate of -0.11 falls well within that range.

How big are the micro efficiency gains and losses? When we compare the *quasi status quo* and the *big euro* cases, our estimates indicate a (flow) gain worth 0.2% of

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

Table 10. Welfare rankings of the various scenarios

	Europe	USA	Japan	World
Quasi status quo	3	1	2	3
Medium euro	2	2	1	1
Big euro	1	3	3	2

Note: 1 is best outcome, followed by 2 and 3.

GDP for Europe, a loss of 0.04% of GDP for the USA, 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 USA 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, but such a policy would go against the interests of both Japan and the USA.

5. THE TRANSITION: THE EURO AND THE DOLLAR

How can we characterize the transition to the plausible case where the Euro partly displaces the dollar? Such a shift will initiate a dynamic process that could affect the euro/dollar exchange rate. McCauley (1997) considers a wide variety of influences, which add up to an ambiguous conclusion. One of the important questions that arise is whether the expected higher demand for euro-denominated assets will be matched by a corresponding higher supply. 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.

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 about $700 billion (McCauley and White, 1997): that is, 15–20% of the total outstanding stock of international assets. Henning (1997) estimates a private portfolio shift of $400–800 billion as well as a shift in official reserve holdings of $75–150 billion. Bond suppliers will respond endogenously to the increase in demand – liability managers will increase their offerings denominated in euros. But 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 1990–5. In the most unlikely event that *all* were to shift to euros, it would still require *five years*

to absorb a stock increase in demand of $700 billion. Two cases can be fruitfully examined.

5.1. Case 1: Immediate quantity adjustment

A first scenario considers that the additional demand for euros arises slowly enough to 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 need 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 by assets denominated in euros. Quantities adjust without price adjustments.

5.2. Case 2: Slow supply response

A second scenario envisions the case where demand for euro assets increases quickly, but the supply of euro liabilities initially trails behind. For equilibrium, the price of the euro against the dollar has to rise: that is, we have a real euro revaluation. How large could it be? Again for illustration, we assume a zero supply response and we consider 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%! In due course, the effect would be a current account deficit for the euro area, so that the initial excess demand for euros would partly be met through the capital account, just as the United States has created dollar liabilities to finance its current account deficits. 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. Eventually, the euro will weaken (in real terms) towards its long-run equilibrium. This process may not start immediately, if a J-curve effect initially provokes a narrowing rather than a widening of the current account. In this case, the euro would overshoot its long-run equilibrium level even more, causing expectations of a future devaluation that would lead to even higher real interest rates in Europe. In the new equilibrium, the real euro/dollar rate may not differ much from its initial level. Moreover, the ECB may always choose to moderate the temporary appreciation, although this may conflict with early efforts to establish a strong anti-inflationary reputation.

6. CONCLUSIONS

The scenario in which the euro shares international currency status more or less

equally with the dollar is plausible. This outcome would generate substantial increases in European Union real incomes (welfare). 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 internationalization of their currencies. Henning (1994) 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 post-war 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 sterling. 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 destabilise 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.

Suppose, however, that the ECB agrees – with other EU and national authorities – to promote the internationalization of the euro, recognizing the welfare gains, some extra seigniorage revenue and the other 'nebulous' benefits that international currency status provides. It may have first to mitigate some undesired pressures for exchange rate appreciation. Section 5 has highlighted the uncertainties regarding the supply of and demand for euro-denominated *assets*. From the viewpoint of monetary and exchange rate policy, one must distinguish between euros as money and as interest-yielding assets. Kenen (1995) argues that 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.'

Next, we have shown that, to move beyond the *quasi status quo*, European authorities will have to introduce structural reforms. The prime objective must be to integrate the European capital markets. Our analysis highlights the key role of transaction costs and hence of the liquidity, breadth and depth of financial markets. The extent to which transaction costs in euro financial markets may be reduced 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) stresses: (1) redenomination of all existing debt; (2) harmonized market rules and conventions; (3) continuity in price sources (e.g., benchmark interest rates); (4) informal co-ordination 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). Private market initiatives are already under way in several of these areas: the co-ordination 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 co-ordination 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. The interwar experience of rivalry between sterling and the dollar, with the French franc on the sidelines (Eichengreen, 1987), suggests that such an attitude could be dangerous. Even without 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), there is room for concern. This would justify better monetary policy co-ordination at the international level, as noted by Alogoskoufis and Portes (1991, 1992, 1997), Bergsten (1997) and Begg *et al.* (1997).

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 may make the transition to a new equilibrium much faster than in our historical examples.

Discussion

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This paper provides the ideal framework to analyse issues relating to the future role of the euro. In order to comment on the paper, it is useful first to summarize it. The two main conclusions are as follows. First, the euro is likely to become a major currency in the world. It may even challenge the dollar as the other major international currency, creating significant welfare gains. Second, during the transition to becoming a (or the) major international currency, the euro is likely to appreciate. I discuss these two points consecutively.

It is clear that the euro will become an important currency in the world. Will it become a serious challenger of the dollar? The authors provide a deep analysis of the factors that affect the emergence of an international currency. They use quite an attractive framework to study the problem. The basic idea behind their theoretical framework is that increasing size reduces transaction costs, thereby creating new possibilities for currencies to emerge as international currencies. Since the euro area will suddenly merge national financial markets into one, it may well become the largest financial market in the world, reducing transaction costs sufficiently to allow the euro to become the major currency in the world. This story sounds plausible and it certainly belongs to the possible future outcomes. Let me, however, play the devil's advocate, and argue that there exist compensating forces that may prevent this from happening. The basic equation that the authors use in their analysis is as follows:

$$V = m(T + E + B + I) \tag{4}$$

where V is the volume of euro in the foreign exchange markets transaction, T is trade, E are the cross-border equity flows in euro, B are the customer–dealer cross-border bond flows in euro, and I is the international use. The authors concentrate on the bond market and stress that, by merging the national bond markets, one obtains a market that will rival the US bond market. Although it will still be smaller than the US market, the competitive pressures that exist in EMU are likely to lead to further disintermediation from banks. These, in turn, will give a further boost to the euro bond markets, creating the conditions of increasing size that, by reducing transaction costs, may give the euro a competitive edge. Fair enough. We must, however, also consider E and T. Let's consider E first. Different national regulations will continue to prevent a full integration of the stock markets in Europe. In addition, low capitalization of European business will have to be overcome to make the European stock markets equal in size to the American market. Thus, in this area, the USA is likely to maintain its preponderance in providing a sophisticated and large stock market for world-wide investment. When one adds up bond and

equity markets, it seems clear that the USA will maintain its lead for a while. As a result, in the logic of the paper, transaction costs in dollar financial markets will continue to be lower for a while, preventing the euro from overtaking the dollar in financial transactions. What about *T*? The authors recognize that the US dollar is likely to maintain its dominant role in international trade. One of the reasons may be that the area of largest trade growth in the world is Asia, where the dollar is relatively well established.

I see two more reasons why the euro may fall short in taking over or even approaching the dollar as the major international currency, so that the most likely scenario will be that the euro, like the yen, will be restricted to a regional (European) role without acquiring the status of a global currency. First comes the importance of growth: the dollar overtook the pound sterling because of a sustained higher growth rate of the USA relative to the UK. This led to a US economy that became much larger than the UK economy, leading also to larger financial markets in the USA than in the UK. To the extent that Europe remains a low growth area of the world (as it was in the 1990s), it will have a handicap. Its financial markets may be relatively large in 1999, but they will become progressively smaller in relative terms afterwards. Put differently, it is difficult to see how Europe can provide for a leading international currency when its relative size in the world continues to shrink. Typically, currencies became world currencies in the past because the nations supplying them increased their relative economic importance in the world. The second reason for scepticism is the authors' assumption that the ECB will be able to conduct stable and predictable monetary policies, producing low inflation and low nominal interest rates. There exists an equally plausible alternative scenario. Due to the heterogeneity of the euro area, there will be frequent asymmetric shocks. These will produce chronic conflicts in the ECB about the desirable monetary policy. Shifting coalitions in the ECB will then lead to erratic behaviour, and a lot of volatility in the interest rate. As a result, risk premia will be high. This will not make the euro attractive. It will also prevent the development of a large and liquid euro bond market.

To conclude this part of the authors' analysis, it is worth stressing that the scenario presented by the authors in favour of the euro emerging as the major currency is a plausible one. However, uncertainty remains considerable. There is an equally plausible scenario that the euro will not be able to challenge the role of the dollar, and will acquire only a regional importance.

The second important conclusion reached by the authors is that the euro may appreciate in real terms during the transition. The argument is that the increased desire to hold euro assets will raise the price of the euro. If, as they recognize, euro liabilities increase at the same pace, one should not expect that the emergence of the euro as an international currency will lead to an appreciation. To the extent that the internationalization of the euro leads to a simultaneous increase in euro assets and

euro liabilities, we simply do not know whether the euro will appreciate or depreciate. In order to strengthen their view that the first scenario (appreciation) is more plausible than the second one (simultaneous increase in demand and supply), the authors contend that the issue of euro liabilities will lag behind the increased demand for euro assets. It is unclear why this should be. Why does it take longer for borrowers to issue euro liabilities than for investors to hold more euro assets? The authors give no arguments to support this claim.

To conclude, I want to stress again that the authors provided us with the right framework to think about the future role of the euro. Not surprisingly, this framework can still lead to divergent conclusions.

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This paper takes up the key question of the future role of the euro in the world monetary system. While various opinionated writings already exist in this area, analytical studies on the subject are very scarce. The paper is among the very first such pieces and it is therefore most welcome. Most importantly, it tries to shed light on the question by means of explicit modelling, based to a large extent on the work of one of its authors (see Rey, 1997a, b). The topic is obviously both challenging and difficult, and the paper is bold and provocative. It provides a few alternative scenarios, of which the medium euro case is perhaps most likely on the basis of the numerical estimates provided in the paper. In this scenario the euro becomes of equal importance to the dollar as an international currency. If that is the case, the euro can become a reserve currency in the portfolios of both public and private institutions throughout the world. It is therefore important to consider the impact of this on the external value of the euro. The paper also takes up this issue and argues that there is a tendency for the euro to be relatively strong. My discussion will focus on some methodological aspects of the analysis.

I start with the modelling of the emergence of the euro as an international currency. The model of Rey (1997a) is quite stylized. One could obviously criticize the various simplifications and ask for additional features. I refrain from this and instead focus on its main theoretical feature: namely, that the model has multiple steady-state equilibria as a result of the externalities in transaction costs. The authors duly point out that multiple equilibria can result in possible inertia and hysteresis, or what is perhaps more commonly called path- or history-dependence. It is surprising that the paper does not make use of these implications. Instead the different scenarios are considered on the basis of empirical data on transaction costs and their elasticities with respect to transaction volumes. This is a possible first approach to use, since the alternative equilibria can be characterized in terms of sets of inequalities on transaction costs. The problem is that simply listing different

outcomes is just a first result and one should try to go further into dynamic aspects. Indeed, history-dependence or inertia and hysteresis are inherently dynamic phenomena.

Although transaction costs are endogenous, the paper does not relate the data and elasticity estimates to the underlying structural parameters of the model. Had that been done, part of the way would have been cleared for possible sharper conclusions. Recent economic theory suggests that some equilibria are more plausible than others when there are multiple equilibria. Certain selection criteria for finding the plausible equilibria have been suggested. Some of these are based on dynamic stability analysis, and their use in this model could provide an explicit description of the emergence – or non-emergence – of the euro as an international currency, and of history-dependence in this process. While one can accept the paper as a first attempt, further work focusing on dynamics would be most interesting. This would be a major undertaking, since even the Rey model is rather complex. Nevertheless, I think it should be done.

The second part of the paper considers the possibility of a strong euro. I have two comments. First, I am worried about the change of the model. While the standard macroeconomic model implicitly used in this section can perhaps provide a first answer, it is potentially in direct conflict with the Rey model used in sections 2–4. For example, the macro model does not have multiple equilibria. Should one not try to use the same model for both questions? This is not done in the paper, partly because, as noted above, the Rey model cannot distinguish between dynamic scenarios. Second, if one thinks that the macroeconomic model is usable, it should be stressed that the analysis is based on continuous rational expectations. While rational expectations are the standard assumption in macroeconomics, one can raise doubts about this assumption when one is studying the adjustment of an economy to a change as fundamental as the introduction of the euro. As an alternative, one could use an approach based on transitorily non-rational expectations and learning in expectations formation. This kind of approach is becoming common, and it may provide a better account of the transition (for a recent survey, see Evans and Honkapohja (1997)). While I have not done the formal analysis, I would like to conjecture here that it would make the prediction about overshooting in the value of the euro much less pronounced, or even suggest monotone appreciation in the adjustment from the old equilibrium to the new. However, the long-run prediction about steady-state appreciation would not change.

Finally, I want to emphasize that the welfare predictions in the paper are very important. The result that the EMU area appears to gain and that the USA loses with the relative decline in the use of the dollar is most interesting. In practice, much can be at stake here. The paper is certainly very valuable in bringing out this implication in analytical terms. The implications for international policy making ought to be considered in future research, for which the sharper analytical approach suggested above might be useful.

General discussion

Rudi Dornbusch thought that the transaction cost approach used in the paper was useful as it stresses economies of scale in the use of an international currency. However, we must also consider the countervailing effect of exchange rate risk. Incorporating diversification in the analysis would rule out corner solutions, which are unrealistic. He wanted the authors to identify the determinants of the costs of international transactions. It was not so much the sheer volume of trade but its denomination in a single currency that would reduce transaction costs. Another important cause of low transaction costs was a competitive and deregulated market. Jacques Le Cacheux felt it was important to determine whether supply or demand effects are the real driving force in making the euro an international currency. He observed that supply-side factors may be quite important as many countries, especially in central and southern Europe, would soon issue bonds and equities denominated in the euro. What policies would speed up the internationalization of the euro? Robert McCauley suggested that the ECB could use an active strategy to transfer business from New York to London, in order to strengthen the role of the euro in international transactions. For instance, the Federal Reserve Act had exempted banks from reserve requirements early in the century to make the New York money market more attractive.

Marc Flandreau argued that the transaction cost approach misses an important feature: namely, the lender of last resort function in the creation of international or regional currencies. For instance, the Reichsmark was created because there was strong political support to repatriate the banking business from London to Germany. This move was motivated by the 1866 crisis in London, when German banks were left without lender of last resort facilities. Friedrich Schneider thought that monetary and political strength went hand in hand. The history of fiscal federalism in the USA, Germany and Switzerland shows that the importance of a currency as an international transaction vehicle always had strong effects on a country's political influence.

Maurice Obstfeld was doubtful about the welfare assessment in the paper, as it was very difficult to allocate welfare gains and losses geographically. For instance, a lot of dealing was done in London by non-US banks. If the transaction costs of dealing dollars increased, the welfare loss would accrue only partially to the USA.

Rudi Dornbusch argued that the anticipated portfolio shift towards the euro will not necessarily result in its appreciation. First, the ECB is likely to sterilize the portfolio demand for euro. Second, as the entire European public debt will be denominated in the euro, there would also be an immediate supply effect on the euro bond market. Alternatively, the US Treasury could make a one-time big issue of euro-denominated bonds to avoid a hard landing. Kenneth Rogoff felt that concern about the appreciation of the euro was understandable, but it was difficult

to assess the likely extent of appreciation without an explicit portfolio model. It was important, for instance, to include the endogenous shift in the supply of other euro-denominated assets. Robert McCauley conjectured that this supply response is likely to be pretty rapid and would not lag behind the shift in demand. Given that many international assets were short term, there was no need to wait for a bond to mature to shift denomination. Patrick Honohan suggested that the authors estimate the elasticity of demand for high-powered money in response to changes in the volume of transactions in foreign exchange markets. Such estimates could help to obtain a better understanding of the likely pressure on the exchange rate due to the portfolio effect. Jürgen von Hagen argued that even the possibility of real appreciation is very relevant for policy making. For instance, the risk that the DM might become a reserve currency had been a recurrent theme in the protocols of the Bundesbank council during the 1970s, triggering concerns that the resulting appreciation would put German industry at a disadvantage. This suggests that, even when the economic reasoning is questionable, the fact that many people are concerned about appreciation may nevertheless make it a relevant issue. The importance of this argument for the ECB will depend largely on the degree to which the ECB responds to pressure from industry.

APPENDIX. COMPUTING POSSIBLE EQUILIBRIA

Our estimates in section 3 are based on a simplified static version of the general equilibrium model with thick market externalities derived in Rey (1997a, b). The key feature of this model is to represent the medium of exchange function of money through a transaction technology whose cost decreases with the liquidity of the market. In equilibrium, the transaction costs, prices and volumes exchanged are determined jointly.[13] We assume here that the transaction costs on each market are a decreasing function of the volumes exchanged and that volumes exchanged can be decomposed as in section 3.1. The different scenarios are the ones presented in section 2.5 and pictured in Figures 1−4. On each side of the triangles is the preferred currency of denomination of financial assets in which exporters or investors store their wealth when they have to acquire the currency of the other bloc one period hence. In the middle of the triangle is the international currency.

We proceed as follows. First, we make an assumption regarding the scenario we are in. Second, we compute the volumes exchanged under this scenario. Third, we use an assumed elasticity parameter to derive the various transaction costs. Finally, we check that the transaction cost structure we have just derived is compatible with the scenario initially assumed.

In the following, S stands for the USA with s for the dollar, E for EU countries with e for the euro, Y for Japan with y for the yen. We denote by Tij the transaction costs on bilateral market ij: that is, the cost of exchanging one unit of currency i into currency j ($Tij = Tji$). Tii

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[13] When preferences of the three blocs are Cobb–Douglas, price and output effects cancel out, so that computing volumes exchanged becomes easier.

is the transaction cost on the bond market ii: that is, the cost of exchanging currency i against a bond denominated in currency i. In all the scenarios considered, the following inequalities hold, reflecting the home bias in domestic savings:

$$Tee \leqslant Tes + Tss + Tse \tag{A1}$$

$$Tee \leqslant Tey + Tyy + Tye \tag{A2}$$

These equations mean that it is cheaper for Europeans to save in euro assets than to save in foreign assets and therefore to go (at least) twice on the foreign exchange market. Similar equations are verified for the USA and Japan. The structure of fundamentals and the observed structure of transactions between customers and dealers are shown in Table 5.

A1. Quasi status quo scenario (Figure 2)

The following two equations state that the markets involving US dollar-denominated financial assets are the most liquid ones (more liquid than those involving the yen or the euro), so that when a financial intermediary holds euros or yen and needs dollars for a future date, he will use dollar-denominated assets rather than euro or yen securities.

$$Tes + Tss \leqslant Tee + Tes \quad \Leftrightarrow \quad Tss \leqslant Tee \tag{A3}$$

$$Tys + Tss \leqslant Tyy + Tys \quad \Leftrightarrow \quad Tss \leqslant Tyy \tag{A4}$$

The next equations state that the euro has replaced the dollar as the dominant currency for exchanges between Europe and the Asian bloc, but the dollar is still the vehicle currency on foreign exchange markets.

$$Tes + Tss + Tsy > Tee + Tye \tag{A5}$$

$$Tye \leqslant Tes + Tsy \tag{A6}$$

$$Tes \leqslant Tye \tag{A7}$$

$$Tsy \leqslant Tye \tag{A8}$$

The volumes exchanged on foreign exchange markets are the same as those shown in Table 5 (current structure of world payments) except that inter-dealer bond transactions between Japan and the EU are no longer on the yen/$ and $/euro markets, but on the yen/euro market. Let Bo be the inter-dealer share of the cross-border bond flows between Japan and the EU. Now we have $Bo = 274 \times 50\%$. The ms are the corresponding multipliers (they multiply the customer–dealer transactions to get the global volumes exchanged, as explained in section 3).

	euro	Yen
Dollar	$594 \times m - Bo$	$333 \times m - Bo$
euro		$38 \times m + Bo$

The transaction costs are then computed using volume data and the assumed elasticity of -0.03 for the foreign exchange markets and of -0.11 for the bond markets. They are shown

in Tables 6 and 8. Relative to the current situation, costs increase in the dollar bond market because of a decrease in turnover. Euro bond markets are by assumption not integrated in this case, so the transaction costs remain at their DM level. Yen markets are not affected either. These transaction costs verify the above set of inequalities, in particular (A5), meaning that the *quasi status quo* scenario can be an equilibrium, but not the *status quo*.

A2. Medium euro scenario (Figure 4)

The conditions required for this scenario are (A6), (A7), (A8) and:

$$Tee \leqslant Tss \leqslant Tyy \tag{A9}$$

$$Tse + Tee + Tey \geqslant Tss + Tsy \tag{A10}$$

Volumes exchanged on foreign exchange markets are unchanged from the current ones (the structure of world payments is the same as in the status quo) except that inter-dealer bond transactions Bo between EU and Japan no longer appear on the yen/$ and $/euro markets, but appear on the yen/euro market:

	euro	Yen
Dollar	$594 \times m - Bo$	$333 \times m - Bo$
euro		$38 \times m + Bo$

The difference between the *medium euro* and *quasi status quo* cases therefore comes exclusively from the bond markets. The corresponding associated transaction costs are shown in Table 8. Transaction costs on the euro markets are equal to those on the dollar market by assumption (institutional change). Transaction costs on yen markets are unaffected. It is apparent that these transaction costs support the set of inequalities characterizing the *medium euro* case. Therefore this scenario is an equilibrium scenario.

A3. Big euro scenario (Figure 3)

The transaction costs structure must satisfy (A9) and (A10) as well as

$$Tse \leqslant Tsy \tag{A11}$$

$$Tey \leqslant Tsy \tag{A12}$$

For inter-dealer bond trading, the pattern is the same as in the *quasi status quo* and *medium euro* cases. However, the international currency is no longer the dollar, but the euro. Therefore, there is some additional turnover on the euro/yen and euro/$ markets and fewer transactions on the yen/$ market. Transactions on the yen/$ market now reflect only the fundamentals ($F = 144$), and some of the turnover ($I = 128$) is lost to the other two markets involving the euro (the international currency). Symmetrically, the yen/euro market now reflects the fundamentals ($F = 166$) and the additional turnover brought by the international role of the euro ($I = 128$). $I = 128$ is the difference between fundamentals and actual turnover (as explained in section 3).

	euro	Yen
Dollar	$333 \times m - Bo$	$(F - I) \times m - Bo$
euro		$(F + I) \times m + Bo$

These transaction costs verify the set of inequalities defining the *big euro* scenario. Therefore, the *big euro* scenario is also an equilibrium scenario.

A4. Pan euro scenario (Figure 1 with *e* replacing *s*)

The transaction cost structure is defined as follows:

$$Tse + Tee \leqslant Tss + Tse \quad \Longleftrightarrow \quad Tee \leqslant Tss \tag{A13}$$

$$Tye + Tee \leqslant Tyy + Tye \quad \Longleftrightarrow \quad Tee \leqslant Tyy \tag{A14}$$

$$Tye + Tee + Tes \leqslant Tyy + Tys \tag{A15}$$

$$Tse + Tee + Tey \leqslant Tss + Tsy \tag{A16}$$

$$Tes + Tey \leqslant Tsy \tag{A17}$$

Provided that the post-euro \$/yen market is at least as liquid as the pre-euro DM/yen, it is possible to show that this last inequality cannot be verified. Therefore, we can exclude this equilibrium.

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