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International Currency a
Transactions Perspective**

By

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The Future of the Euro as an International Currency

A Transactions Perspective

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I. Introduction

No later than in July 2002 all currencies of countries participating in full monetary union will have to be completely replaced by the single European currency, the euro. This is the bottom line of the changeover scenario, as adopted by the Madrid Summit last year (European Council, 1995). The currency unification, which is planned to start on January 1999 with the irrevocable fixing of exchange rates among the qualifying European Union (EU) members, will cause a major shock to the international monetary system. Recent history has seen the break ups of important currencies, like those related to the disintegration of the Soviet Union and the Austrian-Hungarian Empire after World War I. However, the introduction of a common currency by a number of previously separate important trading and investment nations has not happened at any rate on this scale.¹

Some numbers - summarised in Table 1 - help illustrate the importance of the countries involved in European Monetary Union (EMU) for the global economy. All 15 EU nations together build a larger economic unit than any other country in the world, whether

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¹There have been important monetary unions between independent states earlier in history, like for example the Latin Monetary Union (1865-1914/27) and the Scandinavian Monetary Union (1873-1914/31). In none of these cases, though, were national moneys replaced by a common currency (Cohen, 1993).

measured by GDP, exports, or money supply. At current market exchange rates the European Union alone accounts for 30 percent of world GDP, while the United States account for roughly a quarter of world GDP. When exchange rates are corrected for deviations from purchasing power parity, then the EU share shrinks to 22 percent, which is still slightly larger than the US share (21.7 percent). Concerning the EU's weight in international trade, the 15 countries together constitute a larger export region than the US or Japan, even after deduction of intra-EU trade which alone accounts for more than a quarter of world exports. Last, but not least, EU money in circulation accounts for roughly 40 percent of the world money supply. In this sense, swapping all the EU currencies into a single one would create the largest "*national*" currency of the world.²

The present paper is mainly concerned with the future role of the euro as an *international* currency, i.e., the use of the single European currency for the realisation of transactions where at least one side is non-EMU. At the present time the US dollar is still the most important and clearly dominant international currency in almost all respects on the global level (next section; Tavlas, 1991, 1992; Fratianni, 1992; Alogoskoufis and Portes, 1993; ECU Institute, 1995). The second most important currency is the German mark with a strong regional role within Europe. The Japanese yen's place is at number three.³ Will the euro be able to become a serious rival to the dollar?

In order to give some new answers to that question, I shall first review the different dimensions of an international currency. I shall then focus on two of these functions more specifically and try to estimate the potential use of the euro with respect to these functions, distinguishing between immediate effects and follow-up effects. The two functions considered here are the use of the euro in international trade invoicing and its use in foreign exchange trading. These two dimensions are particularly important, because they refer to the transaction

²It has to be emphasised here that financial innovations in the US and differences in payments systems have the effect that M1, the measure employed in the table, is biased downwards compared to Germany or Japan. However, I found that the relatively low number for the US survives for broader money aggregates (e.g. M2). Adding funds invested in money market funds to M1 would increase US money supply by 557 bn. USD (or 30.4 percent of world M1) still lower than aggregate EU M1. Moreover, the ratio of Japanese to US M1 was of the same order at the end of the two preceding years as well, such that the US credit crunch in 1992 alone cannot be held responsible for the relative low figure in the United States.

³The yen's position is disputable for foreign trade invoicing though (see section III and Table 3).

role of money - here in international transactions - the basic case of money use. Other recent studies in the field, like Alogoskoufis and Portes (1993) as well as Emerson et al. (1992), have taken a broader but less deep approach.⁴ One important contribution of the present paper is the explicit quantification of EU-internal transactions eliminated through EMU from the international sphere.

Table 1: The European Union in the World Economy

	Gross domestic product ¹				Exports ²		Money stock ³	
	(at market rates)		(at PPP)		(at market rates)		(at market rates)	
	bn USD	%	bn USD	%	bn USD	%	bn USD	%
EU-15 (intra-EU trade)	6,877	30.1	5,688	22.0	1,579 (963)	43.2 (26.3)	⁴ 1,800	37.8
United States	5,611	24.5	5,611	21.7	448	12.3	⁵ 1,059	22.2
Japan	3,346	14.6	2,360	9.1	340	9.3	1,091	22.9
Germany	1,687	7.4	1,304	5.0	430	11.8	398	8.4
World total	22,885	100.0	25,883	100.0	3,656	100.0	4,760	100.0

Source: United Nations Statistical Yearbook (CD-ROM, 1995), United States Federal Reserve Board (1996), own calculations.

Notes: (1) 1991 data (more recent global data unavailable), GDP at purchasing power parity (PPP) exchange rates calculated according to Summers/Heston methodology.

(2) f.o.b. 1992 data.

(3) M1 data, end of 1992 (Algeria, Ecuador, Greece, Italy, Kenya, Liberia, Malaysia, Morocco, New Zealand, Nigeria, Turkey, Zambia, Zimbabwe: 1991; Belgium, Saudi Arabia, South Africa: 1990).

(4) Excludes Sweden, for which no information available.

(5) Incorporating US money market funds the figure increases to 1,616 bn USD (30.4 percent of total world M1).

II. The Dimensions of International Money

Most textbooks of monetary economics describe money by the three functions it performs. Money serves 1) as a medium of exchange, 2) as a store of value and 3) as a unit of

⁴Another recent paper addresses the potential role of the euro as a pegging currency (Bénassy-Quéré, 1996).

account. These three functions are not independent. Any medium of exchange must be a store of value - or temporary abode of purchasing power (Friedman, 1971) -, and also implies a unit of account - or standard of value. In contrast many stores of value, like 10-year Treasury bonds or real estate, do not circulate as media of exchange and other value standards than implied by the circulating medium of exchange can be published and used for the denomination of goods or asset prices as long as there is some (possibly floating) exchange rate relating the former to the latter (Cohen, 1971).

One might conclude that the medium of exchange function is the single function characterising money alone. Therefore, in the present paper I shall mainly focus on that function. This is not to say that the other functions are unimportant or unrelated to it. For example, separating the unit of account from the medium of exchange imposes additional computational costs on the exchanging agents and will have little benefit, except in special circumstances like a hyperinflation or the replacement of an old currency by a new one. There is, indeed, some tendency for all three functions to stay together in one medium.

In the case of international money the description becomes more complex. Table 2 summarises the four medium of exchange functions of international money. The first two (from the left) refer to goods markets and the second two to currency markets. Beginning with goods markets, a clear case of internationalisation is the use of one country's currency for the *local* transactions in another country. This is the phenomenon of direct currency substitution, often observed in countries with strong inflationary policies (Brand, 1993; Giovannini and Turtelboom, 1994). Another case is the choice of the invoicing currency in international trade. A currency becomes a *foreign trade vehicle* in the *narrow* sense, when residents of two different foreign countries use it to invoice (and settle) their foreign trade contracts with each other. It becomes a trade vehicle in the *broad* sense, when the currency of one of the two counterparties is used for the invoicing (and settlement) of their foreign trade contracts. Foreign trade vehicles are further discussed in section III.

Table 2: Medium of exchange functions of international currencies

	Private use			Official use
Int. medium of	Substitution	Foreign trade	Forex vehicle	Intervention

exchange funct.	currency	vehicle		currency
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A somewhat different but not unrelated phenomenon of internationalisation is the role of currencies in foreign exchange markets. Turnovers in these markets appear much larger than those "justified" by trade and capital flows. In particular, many transactions originally intended to exchange one currency against another are actually executed through two interbank transactions, exchange of currency one against *foreign exchange vehicle* and then exchange of the forex vehicle against currency 2. This medium of exchange function in the foreign exchange market is analysed in section IV.

So far I have described the use of international transaction media in private use. However, official bodies - usually central banks - do also act on foreign exchange markets. They may buy or sell foreign currencies to influence their exchange rate. Foreign currencies used for this purposes are called *intervention currencies*. Obviously, international currencies also serve as stores of values and unit of accounts. In official use they may serve as reserve and pegging currencies; in private use as investment and quotation currencies. Nevertheless, for the purpose of this paper I shall focus on foreign trade and foreign exchange vehicle currencies. General discussions of the international money functions can be found in Cohen (1971), Kenen (1983), Krugman (1984), Klump (1985), Tavlas (1991), and others.

III. The Future Use of the Euro in Foreign Trade

In this section I want to review the current theoretical and empirical knowledge about the choice of foreign trade vehicles in order to draw some inferences about the use of the euro in international trade invoicing after its introduction as the single European currency.

1. Theory of Trade Invoicing Behaviour

A number of regularities have been observed in the choice of currencies for the invoicing of international trade (Grassman, 1973; Page, 1977, 1981; Scharrer, 1981; Black, 1990; Tavlas, 1991).

- 1) For trade in manufactured goods between industrial countries the major part of contracts are denominated in the exporter's currency and most of the remaining contracts are denominated in the importer's currency, while third-currency invoicing is relatively rare ("Grassman's Law")⁵.
- 2) For trade between industrial and developing countries the industrial country's currency or a third currency (usually the US dollar) is used in most cases.
- 3) Inflationary currencies are used less in their country's foreign trade than less inflationary currencies.
- 4) Trade in primary products is usually invoiced in dollars (and sometimes in sterling).
- 5) The US dollar is the only currency for which the share of foreign trade invoiced in that currency *substantially* exceeds the share of the respective country in world trade. German mark invoicing is particularly important within Europe, but invoicing in mark only slightly exceeds the Germany's trade share.

This list suggests that the invoice currency decision is mainly related to the type of good considered and monetary stability.

There have been few attempts to give a rigorous theoretical explanation to these regularities. A first step was taken by McKinnon (1979), who advanced that international trade in relatively homogenous goods ("tradables II", like primary goods) is highly competitive. In their case potential buyers benefit most from efficiency enhancing price comparisons and therefore tend to use a single currency (in a centralised market place). Several large commodity exchanges are in the US and the UK. In contrast, exporters of "tradables I", differentiated manufactured goods, usually have the market power for price stabilisation. Demand shocks can be absorbed with inventory changes at constant sales prices. This policy can be completed with international trade denomination in the exporter's home currency. If most inputs are paid in local currency as well, the exporter can eliminate additional price risk from exchange rate fluctuations.

⁵Grassman's Law highlights the home-currency preference in international trade. However, there are some important exceptions to Grassman's Law, like Finland, Italy or Japan.

Bilson (1983) develops a model of bilateral bargaining between an importer and an exporter over price and invoicing practice, which highlights incentives for exporters *and* importers to seek or accept invoicing in the exporter's currency. If the importer's price risk in the domestic market is more highly correlated with the exchange rate (through approximations of purchasing power parity (PPP)) than the exporter's cost risk, then the former will have a natural hedge when accepting invoicing in the latter's currency. This asymmetry in "exchange risk hedging" can be justified with the evidence that importers' exposures to exchange rate risk seems to be clearly longer than exporters' exposures to it (Magee, 1974). In this model a high variability of the domestic inflation rate also increases the incentive for any side to accept the other's currency.

In opposition to Bilson, Viaene and de Vries (1992) derive the dominance of invoicing in the exporters' currencies' from a bilateral bargaining model with random matching of exporters and importers, with complete forward cover but without referral to PPP. Based on the observation that import companies usually outnumber export companies, they infer that higher bargaining power of the exporters should lead to more invoicing in their currencies.⁶

Another factor influencing foreign traders' invoicing decisions are *monetary network externalities* (or "thick-market" externalities). The basic idea is analogous to the theory of communication networks (Rohlf's, 1974), which - applied to (domestic) exchange media - implies that additional users of a medium of exchange increase the utility of its incumbent users, because the latter's transaction costs diminish.⁷ These network externalities imply some circularity in the use of exchange media and, *ceteris paribus*, a certain tendency towards concentration. They are also responsible for an important degree of inertia in the use of exchange media; once a medium is established it becomes all the more difficult for another medium to take its place.

⁶Rao and Magee (1980) establish an irrelevance proposition in foreign trade invoicing. They argue that in equilibrium trade prices should incorporate exchange risk premia because of the absence of arbitrage possibilities between goods and bond markets together with covered interest rate parity. Risk neutral agents should therefore be indifferent with respect to currency invoicing and differences in invoicing behaviour (in equilibrium) can only reflect differences in attitudes towards risk. However, this result and the assumptions on which it relies are controversial (Goeltz, 1980).

⁷This externality is present, for example, in the monetary search model of Jones (1976) or the random-matching model of Kiyotaki and Wright (1989).

In the case of international trade denomination exporters and importers will agree on a currency for invoicing and settlement, which can be bought or sold at low transaction costs in the foreign exchange market (see next section) or has a relatively high degree of acceptability for other transactions. The latter aspect explains the wide-spread home-currency preference in international trade (see also Grassman's Law above).⁸ If there is *no* home-currency preference, an already important international currency with a deep and broad foreign exchange market and a high degree of international acceptability will be preferred to other "third" currencies, even though these others might have other attractive characteristics, like lower inflation rates. History shows that dominant international currencies, as e.g. the pound sterling, continue to be used for quite a long time after the economic fundamentals having brought these currencies into that position have already vanished (Cohen, 1971; Krugman, 1984). It also shows that, although most of the time there were several international currencies (though a limited number), often a single one dominated all the others on the global level (Klump, 1986; Fratianni, 1992).

Further factors in invoicing decisions in international trade, which have not been considered in the analytical literature, suggest that potential international currencies should not be affected by capital controls and have deep and broad financial markets (beyond that for foreign exchange). Capital controls obviously increase transaction costs for international traders and financial markets are important for the efficient management of foreign exchange exposures acquired through international trade activity. Finally, tax rates and ownership structures may play a role (Goeltz, 1980).

2. The Status of the Euro After EMU

a) The direct impact of EMU

In a first step to determine the future role of the single European currency in trade invoicing one can compute potential euro use on the basis of historical data on invoicing practices and international trade flows. A useful data set of invoicing practices in 7 industrial

⁸This aspect is emphasised in the monetary random-matching model of Matsuyama et al. (1993), in which a domestic and a foreign agent are assumed to meet with lower likelihood than two domestic agents.

countries and OPEC has been recently collected by the European Commission and published by a study group of the ECU Institute (1995). Although estimations of invoicing practices outside these 7 countries rely on some drastic simplifications, this source together with statistics specifying regional breakdowns of international trade flows (United Nations, 1995) can be used to make some predictions about approximate invoicing currency use after EMU. The results and how they were got are summarised in Table 3.⁹

[TABLE 3]

The left-hand side of the table shows the evolution of the importance of the major currencies in export invoicing since 1980, as reported by the ECU Institute (1995). The dollar (USD) remains the clearly dominant currency in international trade, whose share in global invoicing in 1992 still exceeded the US' share in international trade (Table 1) by almost a factor of 4.¹⁰ The second most important currency in international trade is the Deutsche mark (DEM). Although slightly up compared to 1980 its share in trade denomination in 1992 was only 4 percentage points higher than Germany's share in world exports in the same year (11.8 percent). This reflects the fact that the mark plays a much more limited role as a trade vehicle currency in the *narrow* sense than the dollar. Finally the Japanese yen (JPY) is surprisingly weak in international trade invoicing (4.8 percent in 1992), which is only about half of Japanese exports (9.3 percent) and even less than the roles of the French franc (6.3 percent) or the British pound (5.7 percent).

On the right-hand side of Table 3 I present estimates of the part of currency uses which would be erased if EMU would have happened in 1992 and those which would remain. Here it is assumed that national invoicing practices and world trade outside the EMU area would remain unaffected. However, intra-EMU trade "disappears" as *international* trade and becomes *regional* trade denominated in the "domestic" currency, the euro. This implies a substantial "reduction" in total world trade of up to 26 percent (if all EU countries were "in";

⁹The trade figures reported in this paper relate to total merchandise trade, because first figures on services trade are unreliable and very incomplete and second the available information on currency invoicing in international trade relates to merchandise trade alone.

¹ The drop in dollar invoicing between 1980 and 1987 can be explained to a large extent by a drop in export value from OPEC countries, whose exports are denominated by more than 90 percent in dollars (ECU Institute, 1995).

last row and Table 1). EMU-to-rest-of-the-world (ROW) trade also remains unchanged except that all trade that was denominated in an EMU currency before now switches to the euro. Rows EU-5 and EU-4 report the trade vehicle currency uses (erased or remaining) for all EMU currencies together for which invoicing data are available; in the first case including the United Kingdom and in the second case excluding it.¹¹ Thus, on the right of these rows one finds estimates of the future use of the euro in international trade in absolute terms, in percent of pre-EMU world trade and in percent of post-EMU world trade.

It appears that, with UK participation in EMU, a sum amounting to at least 17 percent of pre-EMU world exports would be "lost" for euro invoicing, because it is now regional trade. This is about half of the total amount of EU-currency invoicing and more than the total share of Deutsche mark invoicing before EMU. (Without the UK this number reduces to 14 percent.) Hence one can infer that total euro invoicing will be 16.4 percent (13.5 percent) of pre-EMU world trade or 22.2 percent (18.3 percent) of post-EMU world trade.

These estimates may be imprecise for two reasons. On the one hand, they could understate the likely starting level of the euro in international trade, since the Commission data only cover the 5 *major* European Union currencies. On the other hand, the available data do not contain information on differences between intra-EU trade invoicing and EU-to-ROW trade invoicing. Therefore the assumption had to be made that the currency distribution of trade invoicing is the same in both cases. This assumption probably leads to an overestimation of future euro use.

Addressing the former problem first, a back-of-the-envelope estimation based on the assumption of 50 percent home-currency invoicing of exports from the remaining 10 EU countries results in an additional 80.8 bn. USD of euro invoicing (row EU-15 in Table 3).¹ The main reasons why the inclusion of these countries has only a minor impact on future euro invoicing (about 2 percent of world trade) are that, first, their weight in international trade is

¹¹I do not address the problem of which countries will be "in" EMU and which will be "out" in greater detail. This is mainly because a greater variety of scenarios would not change anything fundamental for the conclusions drawn below. For discussions of the "ins" and "outs" problematic in general see e.g. Arrowsmith (forthcoming), Goodhart (1996) and Gros (1996).

¹ The average of home-currency invoicing for the 5 EU currencies explicitly reported in Table 3 is 49.8 percent of their exports.

comparatively small and, second, the larger part of their trade becomes "domestic" trade after EMU. Including them in the estimations implies that roughly a quarter of world trade would be invoiced in euro, right from the start of EMU. It is also apparent from this result that - apart from the EMU core countries and the UK - the fact that a particular country is "in" or "out" does not have an important impact on the potential of the euro to become an important international trade vehicle currency.

In order to check against the possible overestimation of euro use in Table 3 I compare four scenarios of euro invoicing in EU exports (assuming that all countries participate), which are reported in descending order in Table 4. The most optimistic scenario (from a European perspective) assumes that 92 percent of EU exports after EMU will be denominated in euro, which is the share of dollar invoicing in US exports. The most pessimistic scenario hypothesises a share of 55 percent euro invoicing, corresponding to the current fraction of franc invoicing in French trade. The other two cases correspond to the export invoicing shares as implied in Table 3 (82 percent) and to the current mark-invoicing share in German exports (77 percent). ROW trade invoicing is left unchanged compared to Table 3. Grosso modo the results from Table 3 are confirmed. Under the new scenarios total euro invoicing will be between 19 and 28 percent of (post-EMU) world trade. The most likely scenario, that the invoicing of EU foreign trade will roughly resemble current invoicing of German trade, results in a share of 24 percent of world trade denominated in euro.

[TABLE 4]

Concerning the impact of EMU on non-European currencies, *absolute* dollar invoicing will diminish, while the change for the Japanese yen is negligible (Table 3). This is due to the fact that the dollar still plays some role as a trade vehicle currency (in the narrow sense) within Europe and the yen plays hardly any such role at all.¹ Nonetheless, the dollar will be able to maintain its dominant role in international trade directly after completion of EMU, with a fraction of 44 percent of pre-EMU trade and 59 percent of post-EMU trade being denominated in the US currency. This is more than twice as much as the likely initial level for the euro.

¹³However, the reduction of total dollar invoicing by about 4 percent of world trade reported in Table 3 might be a little bit too high, due to the assumption that the currency distribution of European trade invoicing is the same for EU-internal as well as EU-external trade.

b) Follow-up effects

The numbers for euro invoicing found above have to be interpreted as estimates of the *starting level* of the new European currency. Two different aspects can indicate more about the evolution of international euro use *after* the original switch. One aspect concerns structural changes in international trade flows, the other relates to fundamental changes in invoicing practices due to network effects and future monetary policies.

At the beginning of this section evidence was cited showing the importance of the type of good traded and the origin of counterparties for the use of invoicing currencies. For example, trade in manufactured goods among industrial countries is mainly denominated in the exporter's currency. Hence by extrapolation of trends in manufactured goods trade among these countries it may be possible to say more about the evolution of the future rivalry between dollar and euro. Table 5 summarises the relevant developments in the 1980s and early 1990s. It shows that manufactured trade among industrial countries (adjusted for intra-EU trade) rose by a cumulative 149 percent between 1980 and 1992. While Japan's trade grew overproportionally (204 percent), the US lagged behind, by less than the EU though. Looking at the average annual growth rate it appears that (lately) the US has expanded manufactured trade quicker than the EU or Japan. Which impact do the different regional growth rates have on the respective shares in total intra-industrial-country manufactured goods trade? Since 1980 the EU's share seems to be slightly down, from 32 to 29 percent, while Japan's share rose from 16 percent to 20 percent. In more recent times no important changes in the regional decomposition of trade among these countries occurred. Taken together these numbers do not indicate a trend for an increase in euro use.¹

[TABLE 5]

In Table 6 I use the same measures as in Table 5 in order to analyse the development of trade flows from industrial countries to developing countries. Based on the observations cited at the beginning of the section an increase in a country's market share of exports to

developing countries implies an increase in that country's domestic currency's use in international trade. The table shows, again, that Japan's exports expanded most, while the EU's trade growth to developing countries was relatively low, both in the long and in the short

present weakness of the Japanese yen as a foreign trade vehicle currency, a continuation of these trends would imply a growing role for the euro together with a reduction of the dollar's dominance in Asia. It is still unclear though, whether the recent increases in yen invoicing, in particular in Southeast Asia, signal a shift to a significant trend towards a more important role for the Japanese currency (Tavlas and Ozeki, 1992; Frankel, 1993; Iwami, 1994).

[Table 8]

It remains to consider possible changes in invoicing behavior after full EMU. Since EMU would not go ahead without France or Germany, the euro will certainly be a larger "domestic" money than any single national European currency (see section I). In addition, if enough countries participate in the common European currency, then total exports of EMU countries and total international euro use will be higher than total German exports or total use of the Deutsche mark before EMU (Table 3). Non-European traders will therefore be confronted more often with counterparties preferring euro invoicing to any other currency. If these advantages of the euro with respect to the mark are big enough, i.e., reach a *critical mass*, networks dynamics could be put in motion increasing the share of euro invoicing in total world trade. For example, the first scenario in Table 4 suggests that euro invoicing in European exports could increase to the level of dollar invoicing in US exports, leading to a strengthening of the euro's position by several percentage points of world trade.

However, in the presence of circular forces from network externalities - the more people use a currency the more attractive it becomes for others to use it as well, leading to even more use of that currency - several equilibria of euro invoicing may exist; some with high euro use and others with low euro use. The incumbent international currency is favored by inertia. In such a situation it is extremely difficult to tell in advance, which of these equilibria will be established by the market. The information collected in the present section does not hint at dramatic changes in the currency composition of international trade after full monetary union. What one might expect is a rather gradual increase of euro invoicing after a start from a relatively low level compared to the importance of the US dollar. Whether - in the long run - the euro will be able to replace the dollar will depend to a large extent on whether it can extend its importance in non-European trade, in particular challenging the dollar's position in non-US trade (vehicle currency use in the narrow sense).

The theoretical discussion at the beginning of this section underlined another important factor in trade invoicing practices, domestic inflation rates and variabilities. Whether the euro becomes more attractive than the dollar on this level very much depends on the future monetary policy conducted by the European Central Bank (ECB). Assuming that US monetary policy remains unchanged, an ECB establishing an inflation record like that of the German Bundesbank in the past would foster euro invoicing in international trade. If the ECB would rather conduct a monetary policy which is some weighted average of historical policies in the EU, then the euro could become less attractive than the dollar in terms of price stability.

IV. The Future Role of the Euro in Foreign Exchange Trading

This section addresses the question of future euro turnover in the foreign exchange market. Again, the theory of forex trading volume is reviewed first. Then potential future euro volumes are estimated for the spot currency markets.¹

1. Theory of Foreign Exchange Volumes

There are two complementary sources of foreign exchange (forex) trading volumes. The first one could be named the underlying fundamentals, the second one forex microstructure. Fundamentals-based explanations of currency trading would argue that international trade and capital flows create the demands and supplies for currencies. This line of argumentation has been attacked, because the order of magnitude of currency trading seems to be much larger than international trade and investment flows. For example in 1992, total *daily* spot trading amounted to 393.7 bio USD and total daily forward (outright forwards including futures but not currency swaps) trading to 68.0 bio USD (BIS, 1993). Hence, spot currency trading alone is about 40 times larger than world exports (10 bn. USD per day, Table 3). Spot and forward currency trading together is 46 times larger than international trade. Unfortunately, at the present time there are no reliable data of total world capital flows

¹ This section partly draws on Hartmann (1996b).

available. Most sources seem to hopelessly underestimate the actual amount of cross-border financial investments.¹ However, global capital flows would need to exceed trade flows by a factor of 38 (45) in order to explain the remaining part of spot (plus forward) currency trading.

Microstructure explanations of forex volumes refer to 4 basic aspects of currency trading. The first one is pure speculation. Banks' trading departments, hedge funds, and other financial and corporate institutions take short-term positions in currency markets to bet on exchange rate movements. Second, the sharp growth in derivatives sales in the last couple of years (BIS, 1996) can, on the one hand, create additional trading activity in the underlying markets, including forex markets, for example through the dynamic hedging strategies of the writers of options. On the other hand, speculation in derivatives may also divert investors away from currency markets thereby reducing forex trading activity. The third aspect relates to forex dealers' inventory management practices. It happens that a dealer who is hit by a big customer order keeps only a small slice of the initial position and passes the major part of it on to another dealer, who does keep only a fraction of that position himself and so on, creating a chain reaction of transactions. Lyons (1996) argues that this "hot-potato trading" could make up for an important part of "excess volume" in forex trading. Finally the forex market has a quite particular exchange structure through the phenomenon of forex vehicle currencies, which show overproportional trading volumes. Since the euro might become such a vehicle currency in the future, I look at this factor in forex trading volumes in more detail.

Figure 1: Structure of exchange in the interbank forex market before the late 1980s

A vehicle in currency trading functions very much like a usual medium of exchange in goods trading (Swoboda, 1969). Instead of exchanging currencies x and y directly a vehicle transaction goes through a third currency, say z . Therefore the originally desired exchange of x against y is undertaken in two transactions in the

¹⁷The IMF (1994) gives a number of 1400 bn. USD for cross-border *equity* trading in 1992. Issues of international bonds, euronotes, syndicated loans, and equity offerings amount to 612 bn. USD. Changes in banks' cross-border claims and liabilities are 262 and 168 bn. USD respectively. For the same year trading volume in emerging market debt has been estimated at 734 bn. USD (Denton, 1996). Even the sum of all these items, which is smaller than the amount of world exports in 1992, can be expected to underestimate the actual global capital flows to an important extent.

interbank market, first x against z and then z against y. To illustrate such an exchange pattern look at Figure 1. Currencies are nodes and *liquid* bilateral markets are arcs in that picture. Two currencies which do not have a liquid direct bilateral market are not connected through an arc. In the case illustrated in the figure the forex market is entirely monetised through the dollar as a vehicle currency. All other currencies do not have liquid direct interbank markets among each other. For example, a transaction DEM against Hongkong dollar (HKD) is actually undertaken DEM/USD, USD/HKD. Since all bilateral "cross-currency" turnovers pass through the vehicle markets, the USD's volume is much higher than "justified" through the fundamentals. For example, in a market with 5 currencies and an original trading volume of 1 in each bilateral market, the original total trading volume in each money would be 4. But with full monetisation through a single vehicle this currency's turnover increases to 16, which is more than the original aggregate turnover of 10.

The exchange pattern outlined in Figure 1 roughly describes the basic structure of the foreign exchange market in the 1960s, the 1970s and, at least, the early 1980s (Aliber, 1969; Swoboda, 1969; Kenen, 1983; Black, 1991). The dollar is the sole vehicle currency. "Cross-currency" transactions are a small residual. For example, Kenen (1983) estimated that between 90 and 99 percent of all interbank foreign exchange turnover in 1980 had the dollar on one side of the transaction. Since then the picture has changed through the emergence of the DEM as a second vehicle currency (Danmarks Nationalbank, 1992; Banque de France, 1993; Hartmann, 1994; Menkhoff, 1995; BIS, 1996). The current exchange structure is illustrated in Figure 2. The dollar has liquid interbank markets with practically all other currencies - serving as a global vehicle currency -, the mark's role as a vehicle is largely limited to trading between European currencies. For example, Belgian francs (BEF) against French francs (FRF) is mainly exchanged through the DEM, while BEF against Australian dollar (AUD) goes through the USD. In contrast the Japanese yen (JPY) does not play any role as a foreign exchange vehicle currency, even not between Asian currencies where the dollar is still dominant.

Microstructure theories of foreign exchange markets can explain exchange structures like that in Figure 1 (Krugman, 1980; Black, 1991) and that in Figure 2 (Hartmann, 1994) with transaction costs of currency exchange, as measured by bid ask spreads. A vehicle currency emerges, if the sum of transaction costs of the two transactions through the vehicle is smaller than the transaction costs of the direct exchange. Therefore,

the determinants of forex bid-ask spreads have an important influence on which currency becomes a forex vehicle. The models of Black (1991) and Hartmann (1994) identify predictable volatility and predictable trading volume as the major factors in the determination of spreads. The empirical analyses of Bessembinder (1994), Hartmann (1996a,b), and Jorion (1996) confirm that predictable volatility increases spreads, due to inventory risk, and predictable volume decreases spreads, due to economies of scale in market making.

The latter effect, in turn, implies that there are positive *network externalities* in the use of forex vehicles (as there can be for trade vehicles, see section III). The more markets switch to the vehicle currency, the lower the transaction costs of exchange through the vehicle, the more likely that even more markets switch to indirect exchange through the vehicle. Frictions like set-up costs to open new markets and differences in volatilities can explain, why the system does not necessarily converge to a completely centralised exchange structure like that illustrated in Figure 1. The most likely candidates for the vehicle function are currencies where high predictable trading volume is coupled with low predictable volatility. This makes clear why the mark could replace the dollar as the vehicle currency in intra-European forex trading.

2. The Status of the Euro After EMU

a) The direct impact of EMU

Figure 2: Current exchange structure in the spot interbank forex market

Scenarios on volumes after full EMU can be derived from the three-annually BIS (1993, 1996) turnover surveys, which measure the trading activity in the 26 most important forex centres in the world. In what follows I shall focus on spot trading, both inter-dealer and dealer-customer. Similar to the case of trade invoicing it is useful to decompose trading volume into three components; the first one being pure intra-EMU trading, the second one turnover between EMU currencies and currencies of the rest of the world (ROW), the third one intra-ROW trading. Total world forex trade is the sum of intra-EMU, EMU-ROW and intra-ROW turnover. I assume that the switch to the euro is done at current exchange rates with the euro at par with its predecessor, the ecu (European Council, 1992, 1995). The first component is simply erased by EMU. The second one switches from EMU-ROW currencies to euro-ROW currencies. The last bit remains unchanged.

I shall compute post-EMU forex turnovers for 4 different scenarios about the "ins" and the "outs", which are listed in the first columns of Tables 9 and 10. "No EMU" stands for the status quo in April 1992 or April 1995 (no "ins"). "Core EMU" assumes that only countries, which perform reasonably well, as measured by their success to meet the Maastricht criteria (except maybe the budget criterion), are "in". The remaining two scenarios assume that all European Union (EU) countries are "in", in one case excluding the UK and in the other case including the UK.

[TABLE 9, TABLE 10]

The tables contain levels of daily spot trading volumes in USD, DEM, JPY as well as their shares in total spot volume. In columns 4 and 5 I estimate the level of intra-EMU trading volume eliminated through the currency unification and the hypothetical spot trading volume in euro after the switch. Trivially, the first impact of EMU is an overall reduction of world spot forex trading. This reduction is most important (88 bn. USD for 1995, 52 bn. USD for 1992) when the whole EU participates in EMU. It is the lowest (61 bn. USD, 20 bn. USD), when only core countries qualify. Although the *levels* of USD and JPY volumes remain unaffected, the reductions in global volumes imply increases in their share of total spot volume from 71 (1992: 72) percent to 81-87 (76-83) percent for the USD and from 20 (22) percent to 25-27 (21-23) percent for the JPY.

Before EMU 54 (1992: 53) percent of overall spot trading had the DEM on one side of the transaction and the ecu accounted for only 2 (3) percent of trading. After EMU euro trading covers a larger *percentage share* of the whole market than DEM trading before. With all EU countries in EMU euro trading would be highest with 61 (62) percent, while with a core EMU euro trading (55 or 54 percent) would have only a slightly larger share than the DEM before EMU. Based on these estimations, the *absolute levels* of euro trading would not be very different from those of the DEM before EMU. Under full EMU it would be slightly higher, in the other cases it would be lower. In other words, the elimination of intra-EMU trading offsets most of the EMU-external volume "gained" for the euro through the currency unification. In the foreign exchange market this effect is stronger than in international trade invoicing (section III).

The fact that intra-EMU trading lost largely offsets the increase in EMU-external trading switching to the euro has to do with the importance of the DEM as a forex vehicle for European currencies. For example, a bank having French francs (FRF) and needing Belgian francs (BEF) usually exchanges its FRF against DEM and the DEM against BEF. Therefore, joining BEF, DEM, and FRF into one currency implies a double reduction in intra-European trading. In contrast, practically all USD vehicle transactions remain since they happen in the trading of non-EU currencies. USD turnovers in Tables 9 and 10 contain much vehicle volume, while euro turnovers contain very little vehicle volume as "inherited" from the DEM. Altogether it appears that in absolute terms the advantage of the euro compared to the mark will be weaker in spot foreign exchange trading than in international goods trade. However, in relative terms the euro will be clearly more important than the mark, if the UK joins the common currency.

The fact that a particular non-core country is "in" or "out" has only a minor impact on the starting level of the euro in spot foreign exchange trading (rows 3 and 4 in the tables).¹ This result is similar to the case of international trade, but more pronounced. Again the only exception to this rule is the participation, or not, of the UK. There do not appear any important differences between the results for the 1992 data and those for the 1995 data.

¹⁸More scenarios for the 1992 data are discussed in Hartmann (1996b).

b) Follow-up effects

Of course the scenarios in Tables 9 and 10 all make use of the drastic simplification that the international structure of payments remains unchanged through EMU. Moreover, it is assumed that there are no qualitative changes in the structure of exchange outside of the EMU area, except the unification of several bilateral markets. That is to say, although the volumes in EMU-ROW currency pairs switch all to the euro, no prediction is made whether this will lead to any secondary switches in the exchange structure, such as the establishment of, say, a liquid CAD/euro market or euro vehicle use replacing bilateral ROW markets.

For the same reason as given in the section about foreign trade vehicles concrete predictions about these secondary switches are difficult, because it is not known when a critical mass is reached such that the exchange structure changes. However, in cases of currencies where currently a liquid USD as well as a liquid DEM market exist, the higher bilateral turnover through the changeover to the euro is apparent. For example, total Swiss franc (CHF)/DEM spot trading was 11.5 bn. USD per day in 1992, total CHF/euro trading would have been 13.8 bn. USD with full EMU. Norwegian kroner (NOK)/DEM trading was 0.3 bn. USD and NOK/euro would have been 0.4 bn. USD. These examples may illustrate the potential of the euro to become a forex vehicle for ROW currencies, and therefore challenge to some extent the USD's role. This potential is of course highest for trading between Western European non-EMU currencies. Central and Eastern European as well as African currencies may also be exchanged through the euro, given that they develop free private markets for foreign exchange. Knowing the current strength of the dollar in the Americas and Asia the chances of the euro as a forex vehicle in these two regions look rather slim though. However, at least some direct markets between the euro and several of these currencies may emerge.¹

An issue not yet addressed is the attractiveness of the euro in terms of volatility. High volatility is an obstacle for a currency to become a forex vehicle, because it increases transaction costs. Euro volatility will, in part, depend on the exchange rate regime with respect to other currencies. Under floating one could expect a higher volatility of the euro exchange rates as compared to ecu exchange rates, since the character of the ecu as a basket

¹⁹Trading volumes in South and Middle American, Eastern and Central European as well as African foreign exchange markets (except South Africa) are currently not covered by the BIS (1993, 1996) surveys.

of different currencies implies some diversification effects which would vanish with the disappearance of these currencies. But whether its volatility (with respect to non-USD currencies) would become "worse" than that of the dollar in this regime is, again, difficult to predict in advance. The DEM experience suggests that a credible fixed-rate system and a stability-oriented ECB monetary policy could counter increased euro volatility.

Benassy and Deusy-Fournier (1994) report a measure of relative exchange rate volatility with respect to the dollar, the mark and the yen for 66 countries (excluding the franc zone and many Eastern European countries) over the period 1989 through 1993. The data show that volatility advantages for the dollar exist with Australia, Canada, Ghana, Jordania, New Zealand, most East Asian and many South American currencies. Volatility advantages for the mark exist with all Western European currencies and several African currencies, but not with Hungary, Poland or Romania. With no changes in exchange regimes these might also become the areas of low euro volatility in the future. The yen does not seem to have any regional volatility advantages.

It goes without saying that the introduction of capital controls impairing the convertibility of the euro would reduce its prospects to become a foreign exchange vehicle currency close to zero.

V. Conclusions

In the present paper I have discussed the potential of the euro, the future common European currency, to become a medium of exchange, or a vehicle currency, in international commercial trade and foreign exchange trading. It turned out that the euro would immediately become the second most important international currency in the world. However, the direct advantages of the euro compared to the current role of the German mark would be limited, since "gains" in EMU-external transactions are - to a large extent - offset by "losses" of EMU-internal transactions. An increasing role of EU exports in trade with Eastern Europe and Asia as well as network externalities due to the increased size of the "domestic monetary habitat" (potentially bigger than that of the dollar) and bilateral foreign exchange markets will

probably result in a gradual extension of the euro as a vehicle currency after the European changeover. Nonetheless, at present it does not look as if the euro could challenge the dominant role of the US dollar on a global level in the near future.

The theoretical arguments and empirical facts discussed imply that the following policies can enhance the potential of the euro to extend its role as an international transactions medium. 1) A stability-oriented monetary policy resulting in low inflation and low exchange rate variability, 2) avoidance of capital controls, 3) policies allowing for a further deepening and broadening of European financial markets. Although not discussed in this paper, these measures would also foster the euro's potential as an international investment currency. If investors' confidence in European financial stability can be maintained, a growing importance as international store of value will also have feedback effects on the euro's transactions role.

The paper also showed that the number of countries participating in EMU *beyond* the six core countries (in particular France, Germany and the Netherlands) will have little consequences for the immediate importance of the euro as an international transactions medium, with the notable exception of the United Kingdom. Whether the UK is "in" or "out" makes a non-negligible difference for euro trade invoicing and foreign exchange trading. The importance of UK participation will be further enhanced if one takes into account the role of London as an international financial centre.

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Table 3: Trade invoicing in major currencies before and after EMU

	1	1987	World 1992		Intra-EU 1992 ¹		Extra-EU 1992 ¹		
	%	%	bn. USD	%	bn. USD	%	bn. USD	% ²	% ³
USD	56.1	47.9	1,740.5	47.6	141.1	3.9	1,599.4	43.7	59.4
JPY	2.1	4.0	175.5	4.8	4.3	0.1	171.2	4.7	6.3
DEM	13.6	16.1	559.4	15.3	296.6	8.1	262.8	7.2	9.8
FRF	6.2	6.5	230.4	6.3	116.8	3.2	113.6	3.1	4.2
GBP	6.5	5.5	208.4	5.7	103.0	2.8	105.4	2.9	3.9
ITL	2.2	3.2	124.3	3.4	61.9	1.7	62.4	1.7	2.4
NLG	2.6	2.8	102.4	2.8	48.3	1.3	54.1	1.5	2.0
EU-5 ⁴	31.1	34.1	1,224.9	33.5	626.6	17.1	598.3	16.4	22.2
EU-4 ⁵	24.6	28.6	1,016.5	27.8	523.6	14.3	492.9	13.5	18.3
EU15 ⁶	-	-	-	-	-	-	679.1	16.6	25.2
Exports	100.0	100.0	3,656.1	100.0	963.0	100.0	2,693.1	100.0	100.0

Sources: ECU Institute (1995), United Nations Statistical Yearbook (1995), own calculations.

Notes: (1) Estimated from national export figures and invoicing practices.

(2) Percent of pre-EMU world exports.

(3) Percent of post-EMU ("extra-EMU") world exports.

(4) France, Germany, Italy, Netherlands, United Kingdom.

(5) Excluding UK.

(6) Euro invoicing resulting from EU currencies not included in rows above estimated from those countries' exports to non-EU countries assuming 50 % home-currency invoicing: 80.8 bn. USD (2.2 %/3 % of world exports).

Table 4: Scenarios of euro invoicing after EMU

Scenarios of invoicing shares	Euro invoicing in EU exports		Euro invoicing in world exports ¹	
	% of EU exports	bn. USD	bn. USD	% of world exports
like USA	92	566	741	28
like EU-15 ²	82	505	679	25
like Germany	77	474	648	24

Table 5: Development of manufactured goods trade among industrial countries (excluding intra-EU trade)

	Export growth rates						Share of total exports					
	1980-92 ¹	1988-89	1989-90	1990-91	1991-92	Average ²	1980	1988	1989	1990	1991	1992
EU(12) ³	119.6	4.0	15.2	-5.9	4.3	4.4	32.0	30.3	29.8	30.4	28.9	28.9
USA	133.9	14.5	18.8	3.9	1.8	9.8	23.0	19.0	20.5	21.6	22.7	22.1
Japan	204.0	3.3	1.1	4.2	4.7	3.3	16.2	22.0	21.4	19.2	20.2	20.3
All IC ⁴	148.8	6.7	16.7	0.3	5.1	7.2	100.0	100.0	100.0	100.0	100.0	100.0

Source: United Nations Statistical Yearbook (1994, 1995), own calculations.

Notes: (1) Cumulative growth rate.

(2) Average of yearly rates between 1988 and 1992.

(3) Data excluding new EU members (Austria, Finland, Sweden).

(4) All industrial countries.

Table 6: Development of industrial countries' trade with developing countries

	Export growth rates							Share of total exports						
	1980-92 ¹	1988-89	1989-90	1990-91	1991-92	Average ²	1980	1988	1989	1990	1991	1992		
EU(12) ³	55.0	8.0	19.0	3.3	11.1	10.4	42.0	35.6	35.6	37.5	35.1	34.9		
USA	101.3	13.4	6.3	15.3	13.5	12.1	26.2	27.0	28.3	26.7	27.9	28.3		
Japan	134.8	5.1	9.7	18.2	13.2	11.6	20.4	25.2	24.4	23.7	25.5	25.7		
All IC ⁴	86.68	8.2	12.9	10.2	12.0	10.8	100.0	100.0	100.0	100.0	100.0	100.0		

Source: See Table 5.

Notes: See Table 5.

Table 7: Development of industrial countries' trade with Eastern Europe and countries of the former USSR

	Export growth rates							Share of total exports										
	1980-92 ¹	1988-89	1989-90	1990-91	1991-92	Average ²	1980	1988	1989	1990	1991	1992	1980	1988	1989	1990	1991	1992
EU(12) ³	87.1	16.4	7.4	29.7	14.7	17.1	56.6	55.5	57.1	60.2	68.6	71.2	56.6	55.5	57.1	60.2	68.6	71.2
USA	36.4	45.0	-19.9	10.6	12.4	12.1	9.1	8.4	10.8	8.5	8.2	8.4	9.1	8.4	10.8	8.5	8.2	8.4
Japan	-48.6	-3.9	-11.9	-13.5	-35.6	-16.2	8.5	9.0	7.7	6.6	5.0	2.9	8.5	9.0	7.7	6.6	5.0	2.9
All IC ⁴	48.6	13.2	1.8	13.8	10.5	9.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: See Table 5.

Notes: See Table 5.

Table 8: Development of industrial countries' trade with Asia (excluding Middle East)

	Export growth rates						Share of total exports					
	1980-92 ¹	1988-89	1989-90	1990-91	1991-92	Average ²	1980	1988	1989	1990	1991	1992
EU(12) ³	243.2	12.8	18.7	1.7	9.3	10.6	20.6	23.6	23.9	25.7	24.2	24.6
USA	142.6	16.1	6.3	6.2	4.8	8.4	34.7	30.5	31.9	30.6	30.1	29.3
Japan	220.9	7.0	8.3	17.9	11.2	11.1	26.5	27.8	26.8	26.2	28.7	29.6
All IC ⁴	186.9	11.0	10.7	7.9	7.6	9.3	100.0	100.0	100.0	100.0	100.0	100.0

Source: See Table 5.

Notes: See Table 5.

Table 9: Level and currency composition of spot foreign exchange trading volume before and after EMU (1992)

EMU scenarios ("ins" / "outs")	USD volume		DEM volume		Elim. EU volume		Euro volume		JPY volume		Global volume	
	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%
No EMU (4/92)	283.8	72.1	209.3	53.2	0.0	0.0	(11.7) ¹	(3.0) ¹	79.2	20.1	393.7	100.0
Core EMU ²	283.8	76.0	0.0	0.0	20.3	-	200.2	53.6	79.2	21.2	373.5	100.0
Full EU (not UK)	283.8	78.3	0.0	0.0	31.4	-	197.7	54.6	79.2	21.8	362.3	100.0
Full EU (w. UK)	283.8	83.1	0.0	0.0	52.1	-	211.9	62.0	79.2	23.2	341.7	100.0

Source: Hartmann (1996b).

Notes: Own calculations from BIS (1993) and national surveys provided by central banks. Numbers based on daily averages over April 1992.

The horizontal sum of currency volumes is larger than 100 percent of global turnover, because for example direct USD/euro volume is counted twice, once in USD volume and once in euro volume. If all other currencies would be included, then the total would amount to 200 percent of global turnover. Global volume, in the last column, has been normalised to 100 percent.

1) Ecu volumes.

2) Austria, Belgium, France, Germany, Luxembourg, Netherlands.

Table 10: Level and currency composition of spot foreign exchange trading volume before and after EMU (1995)

EMU scenarios ("ins" / "outs")	USD volume		DEM volume		Elim. EU volume		Euro volume		JPY volume		Global volume	
	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%	bn. USD	%
No EMU (4/95)	351.4	71.1	268.3	54.3	0.0	0.0	(8.2) ¹	(1.7) ¹	109.0	22.1	494.2	100.0
Core EMU ²	351.4	81.0	0.0	0.0	60.6	-	236.9	54.6	109.0	25.1	433.6	100.0
Full EU (not UK)	351.4	82.8	0.0	0.0	69.8	-	241.4	56.9	109.0	25.7	424.4	100.0
Full EU (w. UK)	351.4	86.6	0.0	0.0	88.4	-	249.9	61.1	109.0	26.9	405.7	100.0

Source: Own calculations from BIS (1996) and national surveys provided by central banks.

Notes: Numbers based on daily averages over April 1995. The horizontal sum of currency volumes is larger than 100 percent of global turnover, because for example direct USD/euro volume is counted twice, once in USD volume and once in euro volume. If all other currencies would be included, then the total would amount to 200 percent of global turnover. Global volume, in the last column, has been normalised to 100 percent.

1) Ecu volumes.

2) Austria, Belgium, France, Germany, Luxembourg, Netherlands.