

Directorate-General for Research

WORKING PAPER

**OPTIONS FOR THE
EXCHANGE RATE MANAGEMENT
OF THE ECB**

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Executive Summary

1. In its “stability-oriented monetary policy strategy” the ECB has paid very little attention to the task of exchange rate policy. Thus, for the case of a massive real depreciation or appreciation of the euro vis-à-vis the dollar very little **conceptual preparations** have been made. This deficit is especially problematic as the Treaty the field of exchange rate management is not in the sole responsibility of the ECB (Article 111 of the Treaty). Thus, already now a clear conceptual framework is needed in order to avoid conflicts between the **Council** and the ECB in the situation of a currency crisis.
2. The experience with flexible exchange rates since 1973 shows that such a system is prone to strong instability. All empirical studies come to the conclusion that there exists no systematic relationship between the so-called **fundamentals** (e.g. inflation rates, real GDP growth, current account balances) and the path of exchange rates. Therefore, stability-oriented domestic policies cannot guarantee exchange rate stability. The deflationary situation in Japan shows that even an economy with a relative low share of exports and imports can suffer heavily from a persistent currency misalignment.
3. Thus, the ECB should be in a position to avoid major misalignments of the euro/dollar exchange rate. In this paper I especially analyse whether the ECB would be able to limit an **increase** of the euro/dollar rate that goes beyond 1.20 dollar by **publicly** announcing a ceiling for this rate.
4. To many observers the sheer **size of foreign exchange markets** (with a **daily** turnover of \$ 1,741 billion) prohibits any attempt by central banks to target certain exchange rate levels against the markets. However, due to the “market-maker-principle” by which the foreign exchange market is organised, these figures heavily overstate the underlying changes in internationally held assets. In addition, the effectiveness of central bank interventions depends very much on the direction in which they are applied. If a central bank tries to stop a **depreciation** of its currency, it has to operate under the budget constraint of a given amount of exchange reserves. This makes it very vulnerable to speculative attacks by the markets. If a central bank wants to fend off an **appreciation** of its currency, it can purchase foreign assets for domestic assets that it can supply without any quantitative limitation.

5. Articles 105 and 111 of the Treaty clearly give priority to the target of **price stability** in all actions of the ECB. Therefore, the impact of foreign exchange market operations on short-term interest rates in the euro area has to be analysed very carefully. With the newly created instrument of the **deposit facility** the ECB is able to sterilise unlimited amounts of liquidity so that the domestic monetary base and thus domestic short-term interest rates can completely be insulated from the effects of interventions. Thus, the instrument of sterilised interventions gives the ECB an additional degree of freedom: it can pursue a stability-oriented policy for the euro area and at the same time avoid a major real appreciation of the euro.
6. The literature on the **effectiveness** of sterilised interventions is not very conclusive. It is based on relatively half-hearted interventions (executed on a rather small scale and mostly in secrecy) by the Bundesbank, the Fed and the Bank of Japan in the last 25 years. The important difference between an intervention against an appreciation or a depreciation of the domestic currency is totally neglected in this literature. Thus, for the approach of a publicly announced ceiling for the euro/dollar rate this literature seems not very relevant.
7. For the sustainability of an intervention policy the **costs** of sterilised interventions have to be limited. In the case of an intervention against an appreciation of the euro these costs depend on three factors: domestic and foreign money-market rates and the valuation profit or losses on the foreign assets that are purchased by interventions. At the moment interest rates in the euro area are lower than in the United States. Thus, if the ECB were to buy large amounts of (higher yielding) dollar assets and increases simultaneously the volume of its (lower yielding) deposit facility, it would make profits. If the dollar is prevented from depreciating, no valuation losses are incurred. For the – hypothetical - case of euro area interest rates that are higher than the dollar rates the ECB would have to adjust its exchange rate target according to the interest rate differential. By engineering a slight dollar appreciation it would be compensated it for the loss created by the interest rate differential.
8. The framework presented in this paper is mainly designed for an unilateral intervention policy of the ECB preventing an excessive appreciation of the euro vis-à-vis the dollar. The potential of the ECB to defend a depreciation of the euro is much more limited.

However, the logic of sterilised interventions could be used for a **bilateral arrangement** between the United States and the euro area. Under such an arrangement the ECB would set and defend an upper limit, say at 1.20 dollar per euro, while the Fed would set and defend a lower limit, say at 1.00 dollar per euro. As both central bank would come into play only in a situation in which the home currency is appreciating they would always be able to defend their exchange rate targets successfully against speculative attacks by the markets. Again the margins would have to be adjusted according to the prevailing interest rate differential. The experience since 1973 shows that this would have led to a very sensible exchange rate path. Compared with situation in the early 1970s such a co-operation in the field of exchange rate management would have the advantage that both central banks clearly follow stability-oriented monetary policies at home.

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1. Introduction

While there has been an intensive discussion on the overall monetary policy of the ECB in the last few months, the academic and political discussion has so far almost completely neglected the ECB's concept for exchange policy. In its „stability-oriented monetary policy strategy” the ECB has also paid very little attention to this important topic. Thus, for the not unlikely event of a major appreciation of the euro's exchange rate vis-à-vis the dollar very little conceptual preparations have been made.

In this paper I develop a possible framework for the ECB's exchange rate policy. I will focus on the euro's exchange rate vis-à-vis the dollar; but the main arguments are also applicable to the exchange rate of other currencies, above all the pound sterling and the yen. The paper is structured as follows: After a short description of the ECB's views on exchange rate policy I will address the question why it is important to target the euro's dollar exchange rate. Chapter 4 addresses two key questions of intervention policy:

- Are central banks able to defend exchange targets against the pressure of foreign exchange markets?
- Is it possible to combine massive exchange rate intervention with a stability-oriented monetary policy?

For a situation of a strong depreciation of the dollar the paper proposes a framework which allows to set an effective upper limit for the dollar exchange rate without jeopardising price stability in the euro area. This can be achieved by making use of the technique of “sterilised interventions”. With this instrument the ECB obtains an additional degree of freedom in its monetary and exchange rate policy: While maintaining price stability, it can avoid the negative impact of a major euro appreciation on profits, growth and employment in the euro area. Thus, the strategy developed in this paper helps the ECB to comply with the requirements of Article 105 of the Treaty by which it is obliged to support other macroeconomic targets if this is compatible with the target of price stability.¹ Chapter 5

¹ Article 105 (1) : “ The primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2.”

shows how this framework could be extended for a bilateral exchange rate Cupertino with the United States.

With its focus on the dollar exchange rate the paper does not address other important issues of the ECB's exchange rate policy, above all the exchange rate relations with EU countries that are not yet participating in EMU and with the accession countries and the countries in Eastern Europe and in the CIS. The paper makes also no attempts to estimate an equilibrium dollar/euro rate, it uses calculations that are available in the literature.

2. The ECB's approach to exchange rate policy

In the ECB's detailed "stability oriented monetary-policy strategy"², the role of exchange rate policy is addressed in two sentences only:

"In the present circumstances – in which there is neither a formal exchange rate agreement nor a general orientation – the euro exchange rate is the outcome of current and expected monetary and other policies in both the euro area and elsewhere, and of the perception of these policies by market participants. As the Eurosystem's monetary policy strategy does not embody an exchange rate target for the euro, the task of focusing on the maintenance of price stability in the euro area is facilitated." (*ECB 1999, p. 42*)

Thus, as a general strategy, the ECB explicitly rules out „an implicit or explicit exchange rate target for the euro“ (Duisenberg 1999, p.1). Consequently, the ECB has adhered to a policy of "benign neglect" during the phase of euro's depreciation vis-à-vis the dollar in the first seven months of 1999.³

In speeches by President Duisenberg and also the members of its executive board⁴ the reasons for this approach are made somewhat more explicit:

- "(...) gearing monetary policy decisions on such an exchange rate target may, at times, conflict with goal of price stability." (Duisenberg 1999, p. 1)
- "(...) stability-oriented macroeconomic policies pursued in a transparent manner are the best contribution that can be made by policy-makers to foster exchange rate stability. In other words, misalignments and excessive volatility should be contained by addressing their underlying causes." (Duisenberg 1999, p. 1)
- "(...) in a world characterised by integrated and highly liquid international financial markets, there is serious doubt as to whether pegging or targeting exchange rates is feasible." (Duisenberg 1999, p. 2)

In other words, the ECB's exchange rate strategy is based on the assumption that an explicit or implicit exchange rate management by the ECB is in general neither feasible nor necessary. In addition, in the ECB's view interventions on the foreign exchange would entail

² See ECB (1999). For a comprehensive analysis and discussion of this strategy see Bofinger (1999).

³ The Eurosystem's exchange reserves even increased in that period: from euro 230 billion on 1 January 1999 to euro 245 billion on 30 July 1999. The maximum intervention amount per week was between 21 May 1999 and 28 May 1999 with a decline of the foreign exchange reserves by euro 3 billion.

⁴ See also Issing (1999).

risks for price stability. However, contrary to these rather clear statements, President Duisenberg does also not completely rule out that exchange rates fluctuations could lead to serious economic problems for the euro area:

“Clear exchange rate misalignments, although difficult to identify, would be a cause of concern for the Eurosystem. If prolonged, they might affect inflation expectations and distort economic activity as they hamper the efficient allocation of financial resources.”⁵
(Duisenberg 1999, p. 2)

But this statement leaves it open what the ECB regards as a “prolonged” and “clear exchange rate misalignment” and how it would react if such a situation occurs. This deficit is especially problematic as the Treaty the field of exchange rate management is not in the sole responsibility of the ECB. Article 111 (2) of the Treaty - which was formerly Article 109 (2) – states:

“In the absence of an exchange-rate system in relation to one or more non-Community currencies as referred to in paragraph 1, the Council, acting by a qualified majority either on a recommendation from the Commission and after consulting the ECB or on a recommendation from the ECB, may formulate general orientations for exchange-rate policy in relation to these currencies. These general orientations shall be without prejudice to the primary objective of the ESCB to maintain price stability.”

Given this prominent role in the Treaty, it is somewhat astonishing that the relationship between exchange rate management and the maintenance of price stability has so far not been discussed in a systematic way. An early clarification of these issues seems needed above all in order to avoid conflicts between the Council and the ECB in a period of exchange rate instability.⁶

⁵ Of course, it is not only financial but also real sector resources that are allocated inefficiently in situations with major misalignments.

⁶ In the Hearing at the European Parliament's Sub-Committee on Monetary Affairs on 19 April 1999 President Duisenberg has stated: “The European Council in Luxembourg in December 1997 decided and announced that general orientations on the exchange rates will only be issued in exceptional circumstances such as a serious misalignment of the currencies.” However, this leaves still open how a “serious misalignment” is defined.

3. Is foreign exchange market intervention necessary at all?

For a discussion of the ECB's exchange rate policy it is necessary to discuss very shortly the theoretical basis and the empirical evidence of flexible exchange rates. In addition, the impact of serious exchange rate misalignments on the euro area has to be analysed.

3.1 Flexible exchange rates and macroeconomic fundamentals

The theoretical starting point for a discussion of the ECB's exchange rate strategy is the fundamental question of how exchange rates are determined under a system of floating exchange rates. According to many economists the exchange rate is mainly the result of underlying macroeconomic factors – the so-called fundamentals (above all: inflation rates, interest rates, current account balances, fiscal deficits, growth rates of real GDP or the money stock). Thus, the exchange rate is mainly regarded as a stabilising force in the world economy. This view was the main theoretical basis of the proponents of flexible exchange rates in the 1960s:

“Flexible exchange rates would allow each country to pursue the mixture of unemployment and price trend objectives it prefers, consistent with internal equilibrium, equilibrium being secured by appreciation of the currencies of ‘price-stability’ countries relative to currencies of ‘full-employment’ countries.” (Johnson 1972, p. 210)

However, according to some economists flexible exchange rates are only very little influenced by “fundamentals” and can thus become a genuine source of macroeconomic instability:

“If the foreign exchange market behaved as it is assumed to do in economics textbooks, with ubiquitous rational expectations the driving force, it is indeed difficult to imagine why anyone would not want to allow the exchange rate to float (at least for countries that do not satisfy the conditions to be part of an optimum currency area). (...) The case for rejecting floating is based on the evidence that asset markets in general, and the foreign exchange markets in particular, are driven by herd behaviour rather than rational expectations.” (Williamson 1999, p. 1)

President Duisenberg has obviously a preference for the first view on flexible exchange rates:

“(...) stable exchange rates of the euro are best served by stability-oriented policies that are consistent with economic fundamentals.” (Duisenberg 1999, p. 2)

The main problem with this view - which is shared by most central bankers (Tietmeyer 1999) - is that it is in general not consistent with reality. In the last 25 years numberless econometric studies on the determinants of flexible exchange rates have been published. Almost all of them have come to the clear result that „fundamentals“- however defined - have no systematic impact on the exchange rate under a floating system - at least over time horizons of up to four or five years. Isard (1995, p. 138) summarises the evidence as follows:

“In short, neither the behavioural relationships suggested by theory, nor the information obtained through autoregression, provided a model that could forecast significantly better than a random walk. And furthermore, while the random walk model performed at least as well as other models, it predicted very poorly.”

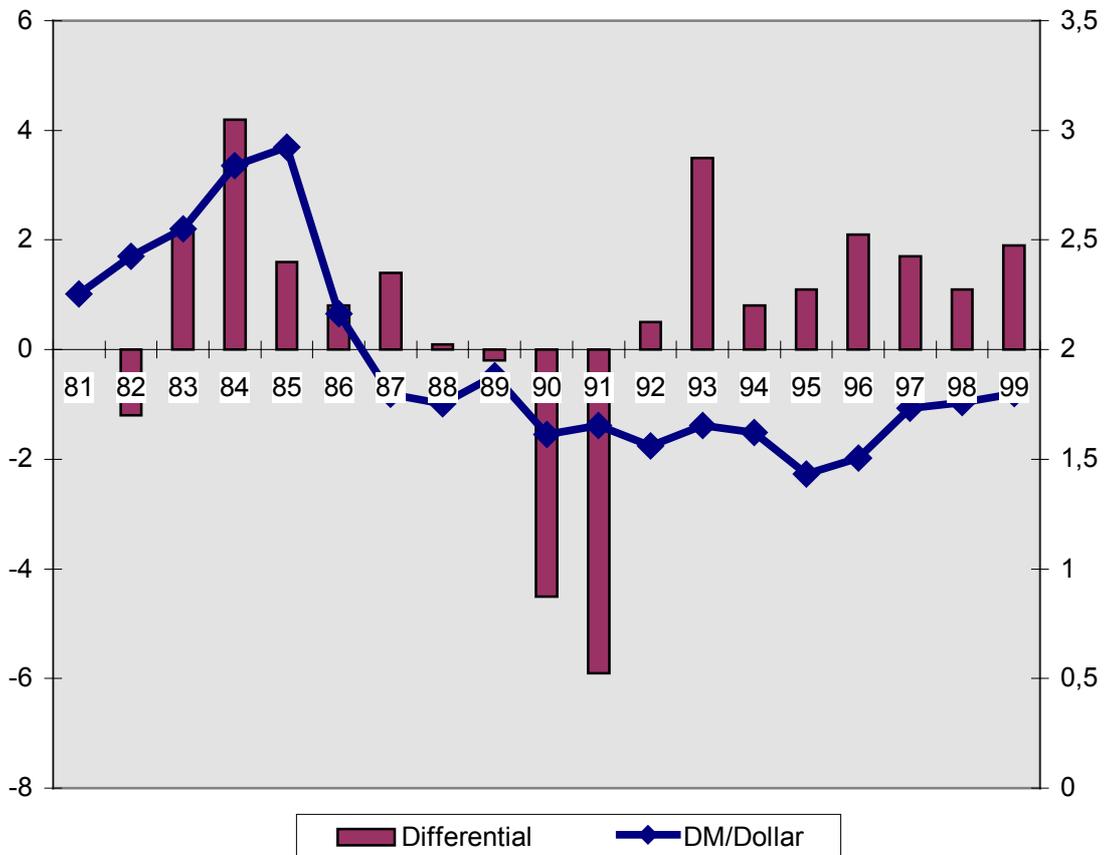
In other words, the best way to forecast the exchange rate of tomorrow, of one month or one year ahead is simply to take the exchange rate of today. Although this so-called „random-walk“ method⁷ is far from perfect, it at least as good as any sophisticated model based on “fundamentals” or other factors.

This finding also shows that it was very ad-hoc to explain the euro’s weakness vis-à-vis the dollar until July 1999 with real GDP differentials.⁸ As chart 1 demonstrates for the period from 1982 to 1999, there exists absolutely no systematic relationship between the real GDP growth differential and the D-mark/dollar exchange rate. This becomes especially clear in the period from 1990 to 1993 in which the growth differential (real GDP of the United States minus real GDP of Germany) switched from -5.9 to +3.5, while the exchange rate remained remarkably stable - in a band between 1.55 and 1.65 mark per dollar.

⁷ See also Williamson (1999, p. 2): “It is still true that a random walk outperforms any of the structural models of exchange rate determination for time horizons of less than a year, but there is now pretty conclusive evidence that a floating rate will revert slowly toward relative purchasing power parity (PPP), with half the adjustment being completed in something under 5 years (...)”. However, as the exchange is also a major determinant of the inflation rate it is not clear whether the exchange rate adjusts to the inflation rate or the other way round.

⁸ See e.g. Duisenberg (1999): “It appears, therefore, that the recent developments of the euro exchange rate primarily reflect the previously unexpected strength of the US economy.”

Chart 1: GDP growth differential and DM/Dollar rate



Thus, the theoretical framework on which the ECB seems to base its exchange rate policy is not very well supported by empirical evidence.⁹ Stable fundamentals are a necessary but not a sufficient condition for exchange rate stability. This means that a major appreciation or depreciation of the euro vis-à-vis the dollar cannot be excluded even if stability oriented-policies are followed in the United States and in the euro area. A look into the not so distant past gives two important examples for very large „misalignments“ in the relationship among the three major reserve currencies:

⁹ This applies also to the experience with floating rates in the interwar period which was carefully analysed by Nurkse (1944, p. 211): “The dangers of such cumulative and self-aggravating movements under a regime of freely-fluctuating exchange rates are clearly demonstrated by the French experience of 1922-26. Exchange rates in such circumstances are bound to become highly unstable, and the influence of psychological factors may at times be overwhelming. French economists were so much impressed by this experience that they developed a special ‘psychological theory’ of exchange fluctuations, stressing the indeterminate character of exchange rates when left to find their own level in a market swayed by speculative anticipations. (...) Self-aggravating movements of this kind, instead of promoting adjustment in the balance of payments, are apt to intensify any initial disequilibrium and to produce what may be termed ‘explosive’ conditions of instability.”

- From 7 January 1980 to 25 February 1985 the D-mark depreciated vis-à-vis the dollar from 1.7080 mark per dollar to 3.4525 mark per dollar.
- From 27 April 1990 to 19 April 1995 the dollar depreciated vis-à-vis the yen from 158.9 yen per dollar to 81.12 yen per dollar.

In both cases the country with the depreciating currency (Germany in the 1980s, United States in the 1990s) was clearly following „stability-oriented policies“. Of course, in the early 1980s the U.S. macroeconomic policies were too lax and the Japanese economy was suffering from the fall-out of an burst asset-price bubble at the beginning of the 1990s, but in both cases this would have required a depreciation and not an extreme appreciation of their currencies.

3.2 Do exchange rate changes still matter for the euro area?

One of the main advantages of the European monetary union is that it makes the euro area less vulnerable to overall exchange rate instability. The GDP share of the euro area's trade with other countries is now about 13 percent and is less than half of the aggregate figure for the eleven countries before EMU. This ratio is comparable with the figures for the United States (10 percent) and Japan (9 percent). If the remaining four EU countries join EMU, the share of external trade will fall to 10 percent. (AMUE 1999)

But this relatively low share of extra-EMU trade does not mean that major exchange rate changes could be neglected in the ECB's monetary policy:

“(...) through its effect on economic activity and prices, the exchange rate affects the outlook for price stability and thus still undoubtedly plays an important role in the monetary policy of the Eurosystem.” (Duisenberg 1999, p. 1)

Japan's deep economic problems are the most obvious example for the vulnerability of even a relatively closed economy to a persistent and strong currency misalignment of its currency:

“Incessant pressure – implicit and explicit – from the United States to make the yen appreciate from 360 to the dollar in 1971 to just 80 in 1995 is the historical origin of Japan's deflationary psychology today.” (McKinnon 1999, p. 77).¹⁰

¹⁰ For a more detailed analysis see McKinnon and Ohno (1997).

Therefore, under flexible exchange rates even a reverse causation is possible, in a way that the “fundamentals” are determined by the developments of the exchange rate.¹¹ The deflation in Japan can clearly be attributed to the extreme appreciation of its currency. It forced Japanese firms to reduce prices and/or profit margins considerably (or even to incur losses) in order to stay somehow competitive vis-à-vis foreign producers.

In the present state of the world economy, the main risk is a major devaluation of the dollar vis-à-vis the yen and the euro. Estimates of the IMF (1999, p. 41) come to the result that the underlying current account deficit¹² of the United States is presently 3.3 percent of its GDP. This situation will lead to growing stocks of external liabilities of the United States – according to IMF estimates from about 20 percent of GDP in 1999 to somewhat less than 30 percent in 2004. With this high and growing amount of US liabilities held with foreigners – mainly by Japanese investors – the US currency will become more and more vulnerable to all kinds of shocks for the time being.

Especially problematic in this context is the so-called “J-curve-effect”. It is based on the observation that the price effects of a devaluation materialise faster than the quantity effects. Thus a strong depreciation of the dollar would temporarily increase the US trade deficit – by making imports more expensive – which could induce an even stronger devaluation. Of course, after some time US exports would increase in volume and import volumes would decrease, but in the intermediate period such an exchange rate shock would have very negative consequences for the world economy.

A return of the dollar-euro rate to about 1.20 dollar per euro can be regarded as a movement towards what a consensus regards as an “equilibrium rate” (Table 1). Of course such a rate is extremely difficult to identify, especially after the regime change of EMU. However, a depreciation that goes beyond that level could be very dangerous for the world economy. In the United States, a strong dollar depreciation would lead to more inflation which would

¹¹ The literature very often overlooks this reverse causation. See, for instance Eijffinger and Verhagen (1997, p. 27) who come to the conclusion that “sterilised interventions cannot systematically affect the exchange rate (...). This result stems from (...) inability of the central bank to systematically pursue a target that differs from the underlying fundamental trend (...)”.

¹² The IMF defines the underlying current account deficit “as the balances that would prevail if all countries were operating at full output, and after the lagged effects of past exchange rate changes have worked through. They are the balances that would prevail in the medium to long run at current exchange rates and with zero output gaps.” (IMF 1999, p. 40)

require an even more restrictive interest rate policy. As a result, the US economy would be driven into a strong recession. In the euro area and Japan, a major appreciation of their currencies would weaken the still somewhat anaemic upswing of their economies. Thus, taken together, an uncontrolled depreciation of the dollar could lead into a major world recession.

Table 1: Estimates for the euro/dollar equilibrium exchange rate

Purchasing power parity (OECD)	1.05
Trend PPP (Warburg Dillon Read)	1.15
Fundamental equilibrium exchange rate (Institute for International Economics)	1.15-1.40
Purchasing power parity (Deutsche Bank)	1.16
Sticky price model (Deutsche Bank)	1.16
Real interest rate and M1 (Deutsche Bank)	1.16
Nominal Monetary Growth (Deutsche Bank)	1.15

Source: BIS (1999), Deutsche Bank Research (1999), Wren-Lewis (1999)

3.3 An ambitious intervention strategy

Therefore, it seems useful that the ECB develops a comprehensive framework for its exchange rate policy in good time. For the following I will propose and analyse a very far-reaching intervention strategy. I assume that the ECB tries to stop an appreciation of the euro by publicly announcing an upper limit for its dollar exchange rate. This implies that the ECB is willing and able to intervene without limit on the foreign exchange market.

This approach relies both on the “**portfolio balance channel**” and on the “**signalling channel**” of interventions.¹³ According to the portfolio balance channel the exchange rate is stabilised as the central bank is willing to accommodate portfolio adjustments of the private sector by buying or selling foreign exchange. According to the signalling channel exchange rate expectations can be stabilised as the central bank provides the market information on its future monetary policy or on its exchange rate targets in the future. The effect of the

¹³ See Eijffinger and Verhagen (1997, p. 2).

signalling channel depends on the credibility of the announced exchange rate target. With a high credibility of such an announcement the amount actual interventions can be very limited.

Focusing on a rather ambitious exchange rate strategy has the advantage that it allows to identify the main problems of the ECB's exchange market interventions in a very clear way. If necessary less comprehensive strategies can be developed.

4. Exchange targeting by the ECB: fields of application and limitations

Any proposal for an active exchange rate policy of the ECB is confronted with two very difficult questions:

- Is the ECB at all in a position to defend an exchange rate target against a potentially very strong pressure of foreign exchange markets?
- Is such an exchange rate management compatible with the ECB's main target, safeguarding price stability in the euro area?

The second question is also very important for the definition of role of the Council in the ECB's exchange rate management.

4.1. *The size of foreign exchange markets*

To many observers it is the sheer size of foreign exchange markets that excludes any systematic management of exchange rates - even by the central bank of a large currency area.¹⁴ According to calculations by the Bank of International Settlements (1999, p. 117) in 1998 the average **daily** turnover¹⁵ on foreign exchange markets vis-à-vis the dollar has been dollar 1,741 billion. Even taking into account that these data report the turnover in which a given currency appears on one side of a transaction so that consequently each transaction is counted twice, the figures look impressive. Compared with the gold and foreign exchange reserves of the whole Eurosystem of about 350 billion euro, the ECB seems to have very little fire power against an attack by foreign exchange markets.

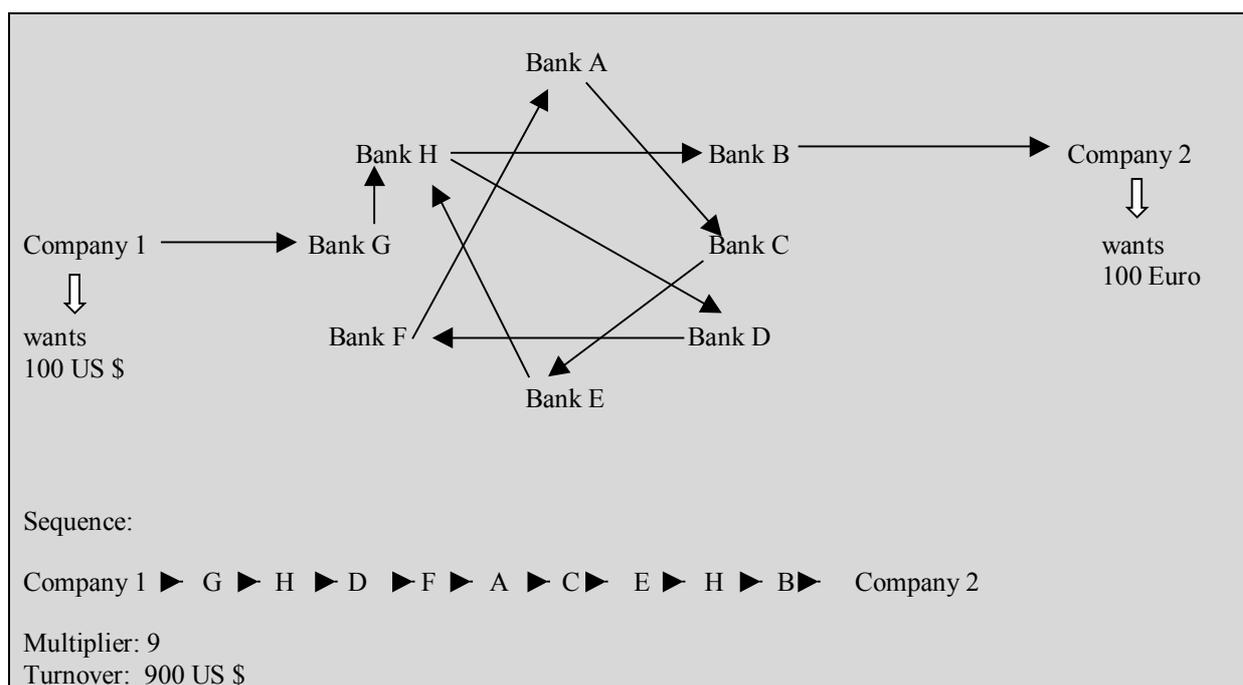
But for a clear understanding of these turnover figures is important to know how foreign exchange markets are organised. One of the most important features is the “**market-maker**” principle. It means that all participants at the interbank foreign exchange market are ready to buy and sell foreign exchange without limit at any moment, irrespective whether they are actually in need of additional positions in foreign or domestic currency. As each participant is

¹⁴ See for instance Eijffinger and Verhagen (1997, p. 2): “It is not likely, however, that central banks can induce a significant imbalance in investors portfolios since the amount of official reserves is dwarfed by the daily turnover in the foreign exchange markets.”

¹⁵ Net of local inter-dealer double counting.

able to get rid of an unwanted position immediately, the risks of being a market maker is very limited. This organisation of the foreign exchange market has the effect that it blows up the total turnover. As chart 2 shows, the order e.g. of a German firm that wants to sell 100 euro for dollars can lead to many intermediate transactions between the market makers until this position reaches a bank that needs euro deposits for its customer.

Chart 2: Market Maker Principle



Because of the speed with which the intermediate transactions are carried out, the multiplier between an outside transaction and the internal transactions can be very high. By the same token, any foreign exchange intervention by a central bank will also have a strong multiplier effect.¹⁶ Thus, it makes very little sense to compare the stock of foreign exchange reserves with daily turnover on foreign exchange markets.

¹⁶ See Vitale (1997): "In the week 3-7 August 1992, in which particular events were not reported in the press, the average daily volume of transactions with clients of Merrill Lynch in D-marks for dollars was around \$ 1 billion, while their average size was about \$ 4 million. These figures indicate that with a relatively small market order the central bank can affect the quotes of a single market maker. Then, if this market maker has the reputation of receiving market orders from the central bank, inter-dealer transactions will propagate this effect on the quotes of other dealers."

4.2. Two directions of the intervention policy

Nevertheless, even taking into account the specific logic of foreign exchange markets, one cannot exclude that the ECB would sooner or later run out of reserves. For an assessment of the effectiveness of foreign exchange market intervention it is thus also very important in which direction an intervention is carried out:

- A central bank can try to defend a certain level of its currency in the situation of a **depreciation** of its currency. Such a defence against market pressure has to be performed under the budget constraint of a given amount of foreign exchange reserves (and of existing credit lines with other central banks and international institutions). Thus, in such a situation a central bank is always confronted with the risk that its exchange rate policy will run out of ammunition. As the foreign exchange markets are able to anticipate such a situation, the central bank becomes vulnerable to “speculative attacks” which tend to accelerate the running out of reserves.
- The situation is completely different if a central bank tries to limit an **appreciation** of its currency. In this situation, the central bank buys foreign exchange against central bank deposits (denominated in its own currency) that it can supply without any quantitative limit. As there exists in principle no budget constraint, speculative attacks by the markets are no longer a real threat.

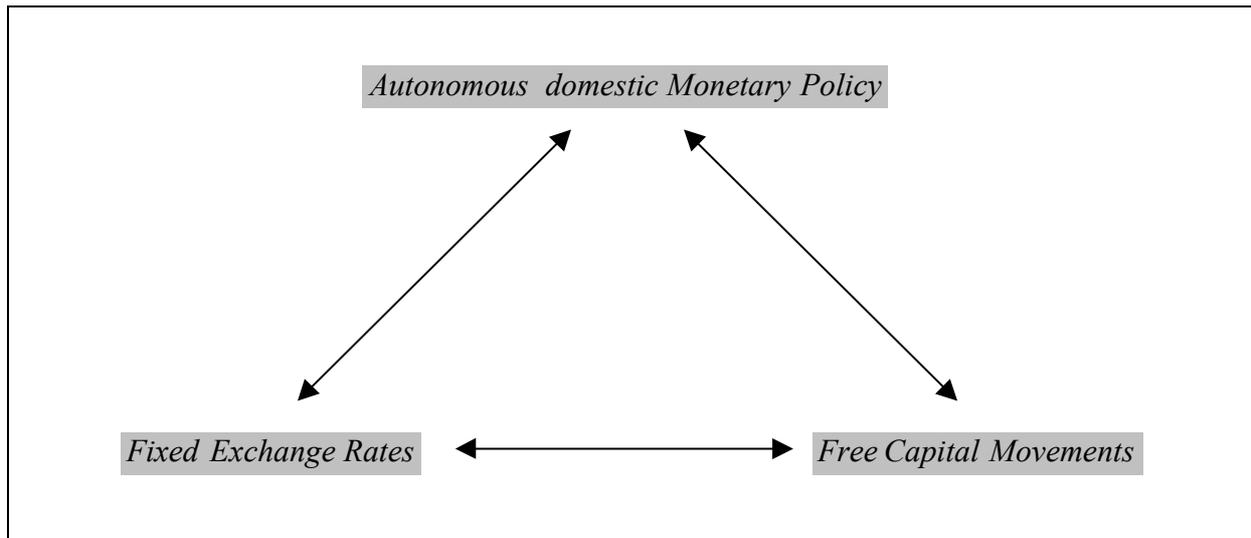
Thus, from the perspective of the ECB, it makes an important difference whether it tries to defend an appreciating or depreciating euro. In the situation that prevailed in the first seven months of 1999 it would have been much more difficult to stabilise the euro/dollar rate than in the still hypothetical situation of a sharp depreciation of dollar.

4.3 Foreign exchange market intervention and domestic monetary policy

The mere fact that the ECB could prevent the dollar from depreciating against the euro does not yet mean that such a policy is desirable. Given the ECB’s main responsibility for price stability, it is important to analyse how such an intervention policy affects the price level in the euro area.

To many economists and also to the ECB an active intervention policy is incompatible with an autonomous monetary policy. This view is represented by the so-called “**inconsistency triangle**”, which means that it is not possible to combine fixed exchange rates with free capital movements and autonomous monetary policies (Chart 3) .

Chart 3: Inconsistency triangle



At first sight, this sounds very convincing as interventions on the foreign exchange market have a direct impact on the monetary base (i.e. the sum of commercial banks reserves with the central and currency in circulation).

- If the ECB buys foreign exchange from a commercial bank, it credits the equivalent to the bank's ECB account.¹⁷ As a result the euro area monetary base increases.
- If the ECB sells foreign exchange from a commercial bank, it debits the equivalent to the bank's ECB account. As a result the euro area monetary base decreases.

As the monetary base can be regarded as the main input factor of the domestic money supply (or credit supply) process¹⁸, such intervention-induced changes in the monetary base would have far-reaching consequences on the euro area's economy. For instance, an attempt to limit

¹⁷ This is not completely correct as the commercial banks in the euro area have their accounts with national central banks and not directly with ECB.

¹⁸ See Bofinger et. al (1999).

an appreciation would be associated with an increase of the domestic monetary base. Taken in isolation, such an intervention policy would indeed have inflationary consequences.

In practice, however, most central banks try to neutralise – or “sterilise” – the effect of interventions on the monetary base - with the aim of keeping domestic money market rates constant. This can be done:

- in the case of an **increase** of the monetary base: by reducing the credits that the central bank offers to commercial banks or/and by offering commercial banks interest-bearing deposits with the central bank that cannot be used for domestic credit expansion. The ECB has the newly created instrument of a “deposit facility” at its disposal for that specific purpose. In the case of massive interventions the interest rate of the deposit facility will determine money market rates in the euro area.
- in the case of a **decrease** of the monetary base: by providing additional credits to the commercial banks. If a central bank operates with refinancing facilities (in the case of the ECB: “marginal lending facility”) this compensation is provided automatically.

It is important to note that in this paper **sterilisation** is defined as a policy that leaves the domestic money market rate unchanged.¹⁹ This is in line with the widely-held view that domestic short-term rates are the main operating target of monetary policy and thus the decisive lever for the whole transmission process of monetary policy.²⁰ With this definition of sterilisation it is possible that the money stocks in euro and dollar change. For instance, in the case of an speculative move in the euro international investors would hold higher stocks of short-term euro deposits and smaller stocks of dollar deposits (or they would even have incurred short-term debts in dollar). These changes in money stocks have no effect on the domestic economy as the assets are held for speculative purposes only.

The experience of the **Deutsche Bundesbank** shows that a big central bank can sterilise even very large intervention volumes. In the crisis periods of the ERM in autumn 1992 and summer

¹⁹ An alternative definition can be found in Dominguez and Frankel (1993, p. 1356): “The academic literature is predicated on the distinction between intervention operations that are sterilised and those that are allowed to affect the money supply.”

²⁰ See for instance Chapter 10 in Walsh (1998).

1993 the Bundesbank sterilised amounts of DM 92 billion (September 1992) and DM 60 billion (July 1993; with more than half of this amount on 30 July 1993). Thus, in spite of these heavy interventions the short-term rates could always be kept at the levels that were set by the Bundesbank's repo and discount rate.²¹

For the case of an ECB intervention preventing the euro from appreciating vis-à-vis the dollar, the ECB disposes with its deposit facility of an instrument that allows to keep domestic money market rates exactly at the level that is required for maintaining price stability in the euro area. As there are no limits to this facility, such interventions cannot affect the monetary conditions in the euro area. This leads to the important conclusion that foreign exchange market interventions preventing an excessive euro appreciation would not threaten the aim of price stability in the euro area.

The mechanics of sterilised interventions are shown in Tables 2 and 3 for a very simplified ECB balance sheet. It is assumed that the amount of the interventions (4,000 euro) is higher than the credits that the ECB has provided to commercial banks (1000 euro). As a result of the sterilisation, these credits go to zero and the excess liquidity has to be deposited with the deposit facility. It is important to note that the monetary base and, thus, the domestic money market rates remain completely unchanged.

Table 2: Simplified ECB balance sheet before sterilised intervention

Exchange reserves	1,000	Reserves of commercial banks	500
Credits to domestic commercial banks	1,000	Currency in circulation	1,500

Table 3: Simplified ECB balance sheet after sterilised intervention (4,000 euro)

Exchange reserves	5,000	Reserves of commercial banks	500
Credits to domestic commercial banks		Currency in circulation	1,500
		Deposit facility	3,000

Thus, one can conclude that the ECB is always able to prevent the euro from **appreciating** vis-à-vis the dollar even if there is a very strong market pressure:

- As it is buying dollar assets and supplying euro central bank deposits, there exists no budget constraint for its interventions.
- With its (unlimited) deposit facility it can always mop up the excess liquidity that is created by such interventions. The interest rate of the deposit facility allows to determine money market rates in the euro area independently of the intervention policy.

In this specific situation sterilised interventions provide an additional degree of freedom for the ECB's policy. It can target the domestic interest rate simultaneously with an upper limit for the euro's exchange rate vis-à-vis the dollar. In the situation of a **depreciating** euro the ECB's intervention policy would be much more difficult, as it is limited by a given amount of foreign exchange reserves. Thus, the credibility of such interventions is from the very outset much weaker.

It is important to note that in this framework the "signalling effect" of sterilised interventions as it is often discussed in the literature is not relevant:

"According to this 'signalling hypothesis' operations in the foreign exchange market by the central bank may be used to signal future changes in monetary policy." (Vitale 1997, p. 2)

As sterilised interventions allow to operate domestic monetary policy independently of exchange rate policy, they can only have a signalling effect for the future exchange rate but not for future domestic monetary policy actions of the central bank. However, if the signalling effect is understood as a signal on the future exchange rate (Dominguez and Frankel 1993, p. 1356), the strategy of sterilised interventions can have very strong effects if it is applied in a situation where the domestic currency is appreciating. In this situation the ECB could credibly demonstrate that it is able to absorb unlimited amounts of foreign assets via the portfolio channel. With such a strong signalling effect it seems likely that very little intervention via the portfolio channel would be required.

²¹ See Deutsche Bundesbank (1993a, p. 23) and Deutsche Bundesbank (1993b, p. 17).

4.4 The costs of sterilised interventions

A main problem of sterilised interventions is that they are not always a “free lunch”. The costs of sterilised interventions have direct effects on the profits of a central bank. They are determined by three factors.²²

- the **interest rate of the foreign assets** that the central bank purchases with the intervention. As central banks invest their reserves usually in a very liquid form, this interest rate will be more or less identical with the foreign money market rate.
- the **interest rate of deposit facility** where the domestic commercial banks invest their excess liquidity. As the interest rate of the deposit facility is used to target the domestic money market rate, this rate is very close to or identical with the domestic money market rate.
- the **valuation loss or gain** caused by exchange rate appreciation or depreciation of the assets that the central bank purchases with its interventions.

In the following I will focus on the situation of a central bank that buys foreign exchange in order to avoid an excessive appreciation of its currency.

It is obvious that the interest rate differential between domestic and foreign market rates is a major determinant of the costs or profits of sterilised intervention. Two cases have to be differentiated:

If the domestic money market rate is **lower** than the foreign rate, a central bank profits from sterilised intervention. The interest income that it obtains from its foreign assets is higher than the interest costs of the deposit facility. As long as the exchange rate remains constant, valuation profits or losses can be neglected. For the near future an intervention policy by the ECB setting an upper limit for the euro’s dollar rate would be faced with this – quite attractive – situation. As the ECB could always prevent a depreciation of the dollar, the risk of valuation

²² A different definition of the costs of sterilised interventions is given by Eijffinger and Verhagen (1997, p. 6): “This cost can be explained by transaction costs and the fact that the central bank may incur a loss on its purchases (sales) of foreign exchange if these turn out to be unsuccessful in preventing the domestic currency from appreciating (depreciating)”. It seems obvious that this definition is not adequate.

losses would be very small. And if its intervention would eventually lead to an appreciation of the dollar, the ECB would even make valuation profits.

The situation is more difficult if the domestic interest rate is **higher** than the foreign rate. Sterilised intervention is now associated with permanent losses of the central bank. In the past many central banks, for instance the Czech National Bank until the koruna crisis in May 1997, were confronted with this problem. As such costs cannot be borne without limit, sterilised intervention is again confronted with a budget constraint. Like the budget constraint of a limited amount of reserves it could render an intervention policy vulnerable to speculative attacks.

The solution to this problem is relatively simple as the interest rate loss can always be compensated by a valuation profit. This requires that the central bank targets the exchange rate in a way that the home currency is depreciated vis-à-vis the foreign currency according to the prevailing interest rate differential. The logic of this strategy can be explained for the situation in the first half of 1999. Let us assume the Fed would have tried to prevent the euro from depreciating against the dollar by sterilised intervention setting a limit of 1.00 dollar per euro.²³ With an interest rate differential of 1.75 % to 2.25 % in favour of the dollar the Fed would have incurred losses. This could have been avoided by adjusting the exchange rate target in a way that it allows an depreciation of the dollar vis-à-vis the euro which exactly corresponds to the interest rate differential. For instance with an assumed limit of 1.00 dollar per euro the Fed would have had to announce that it will adjust this limit after one year to about 1.02 dollar. Such an exchange rate path would have been possible as a central bank is always able to depreciate its own currency with sterilised interventions. Thus, sterilised intervention can always be free of charge, but also profitless, if a central bank targets the exchange rate along a path that is determined by the prevailing interest rate differential.

In the first case which is characterised by domestic rates that are higher than foreign rates, such a rule would not be needed. However, it seems advisable even under such conditions. Assume that the ECB would set its upper intervention limit to 1.25 dollar per euro. If this target is regarded as credible for a longer period of time, higher interest rates in the United States than in the euro area would drive the spot rate below this limit by exactly the interest

²³ From the perspective of the Fed this would have also been an upper *limit*. With a limit of 1.00 euro per dollar, it would have prevented rates of *less* than 1.00 dollar per euro, which from the perspective of the dollar are rates of *more* than 1.00 euro per dollar.

rate differential.²⁴ With the present interest rate differential of about 2.75 basis points the spot rate would be 1.2165 dollar. Thus, the actual limit would be lower than the targeted level. This could be avoided if the ECB announces that it will adjust its upper limit over time according to the interest rate differential.

4.5 The effectiveness of sterilised interventions

The analysis of this paper shows that it is not possible to make a general assessment on the effectiveness of sterilised interventions. There is an important difference whether a central bank tries to defend an upper limit (avoiding an appreciation of its currency) or a lower limit (avoiding a depreciation). Any attempt to fight against a devaluation is jeopardised by the budget constraint of a given amount of reserves which has negative signalling properties. This is completely different in the situation of an appreciation of the domestic currency. In this situation the signalling effect is very strong and reduces the need to buy larger amounts of the foreign currency.

This assessment is not completely compatible with the earlier literature on sterilised interventions which is summarised by Dominguez and Frenkel (1993, p. 1356) as follows:

“Until recently, there was an unusual degree of consensus among economists that intervention by central banks in the foreign-exchange market did not offer an effective or lasting instrument for affecting the exchange rate, at least not independently of monetary policy.”

However, this view has not only been disputed in more recent publications (e.g. Dominguez and Frenkel 1993, Vitali 1997, Fatum and Huttchison 1999), it is also based on the specific way of how such interventions had been carried out. Instead of publicly announced exchange rate targets, most of these interventions had mainly been carried out secretly so that the signalling effect could not be used.²⁵ In addition, the central banks had only been willing to

²⁴ This is due to the logic of the “uncovered interest parity theory”. According to this theory the difference between the expected and the actual exchange rate (divided by the spot rate) equals the difference between the home and the foreign interest rate.

²⁵ Dominguez (1998, p. 161) comes to the conclusion: “Overt interventions in the mid-1980s appear to have reduced exchange rate volatility (...).”

intervene with rather small amounts.²⁶ The literature also suffers from the fact that it does not differentiate whether interventions were made in a situation of a depreciation or an appreciation of the domestic currency.

²⁶ See Dominguez and Frenkel (1993, p. 1357): “(...) the average co-ordinated intervention operation in support of the dollar during the period from January 1985 to December 1988 involved \$ 278.5 million, while the average co-ordinate sale of dollars involved \$ 373.2 million.”

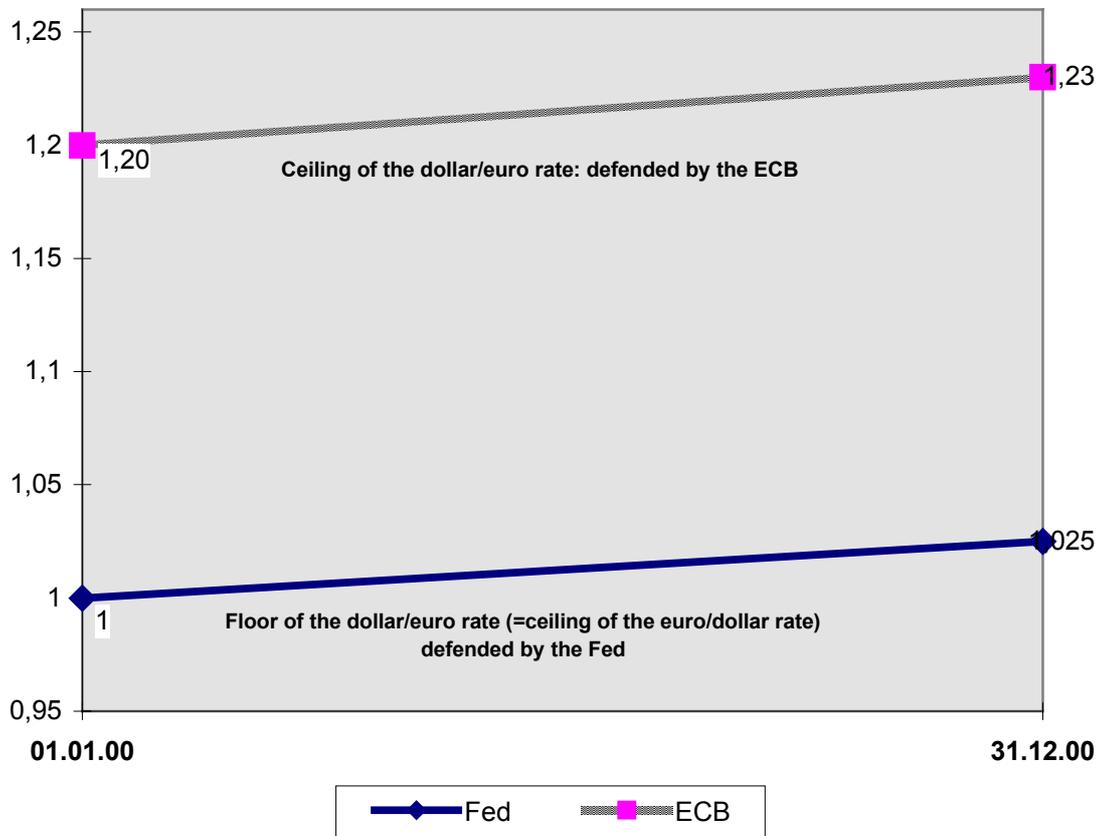
5. Bilateral arrangements for intervention policy

The paper has demonstrated that the ECB would be always able to avoid an unwarranted appreciation of the euro vis-à-vis the dollar (but also vis-à-vis currencies like the pound sterling or the yen). It has been shown that such a unilateral exchange rate policy could contribute to growth and employment in the euro area without threatening the target of price stability. In the situation of an uncontrolled **depreciation** of the euro the ECB's room for manoeuvre is much more limited. Thus, a more comprehensive schema would comprise a bilateral agreement between the United States and the euro area that aims at an exchange rate band limiting excessive swings of the euro/dollar rate. The margins would be set by

- the ECB at an upper limit of the euro's dollar exchange rate, say at 1.20 dollar per euro and
- the Fed at a lower of the euro's dollar exchange rate, which is equivalent to an upper limit of the dollar's euro exchange rate, say at 1.00 dollar per euro.

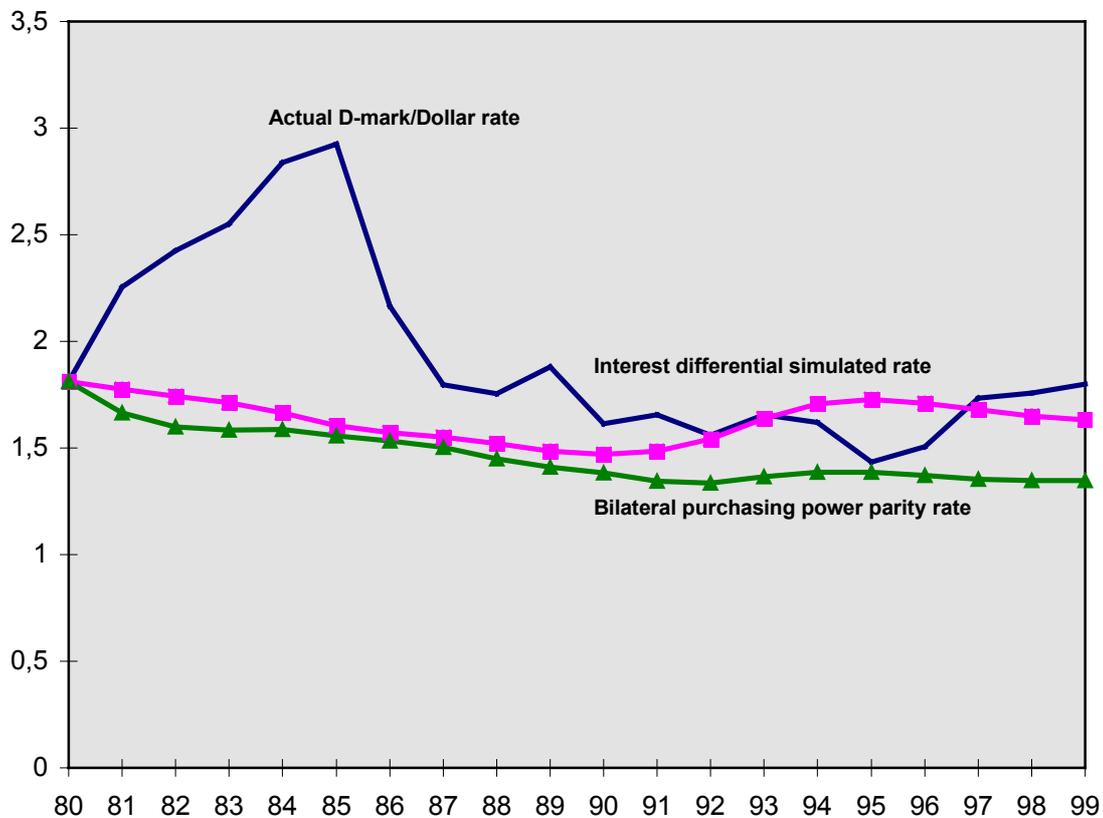
The width of the band would take into account the conceptual difficulties of identifying equilibrium exchange rates. As this paper has shown, both central banks would be able to defend the respective limits even against very strong attacks of the foreign exchange markets. In order to avoid costs of such interventions, the limits would have to be adjusted over time according to the prevailing short-term interest rate differential. This would lead to a path of the bilateral euro/dollar exchange rate band that is determined by the prevailing interest rate differential. For a hypothetical bilateral arrangement starting on 1 January 2000 this is demonstrated in Chart 4.

Chart 4: Hypothetical exchange rate band for the dollar/euro rate



Charts 5 and 6 show what such a rule would have implied for the D-mark/dollar and the yen/dollar rate in the past. Above all, it would have avoided the most serious misalignments and led to a path that is very close to a path that can be calculated from the bilateral inflation differentials. As inflation rates are one of the most important determinants of nominal interest rates, this outcome is not surprising. The prominent role of the Taylor-rule shows the cyclical position as measured by the output gap, which is another important determinant of short-term interest rates in the euro area as well as in the United States (Bofinger 1999). Thus, the exchange rate band would show a certain fluctuation according to the differences in the cyclical position of the United States and the euro area.

Chart 5: Simulation of the D-mark/Dollar rate by the interest rate differential

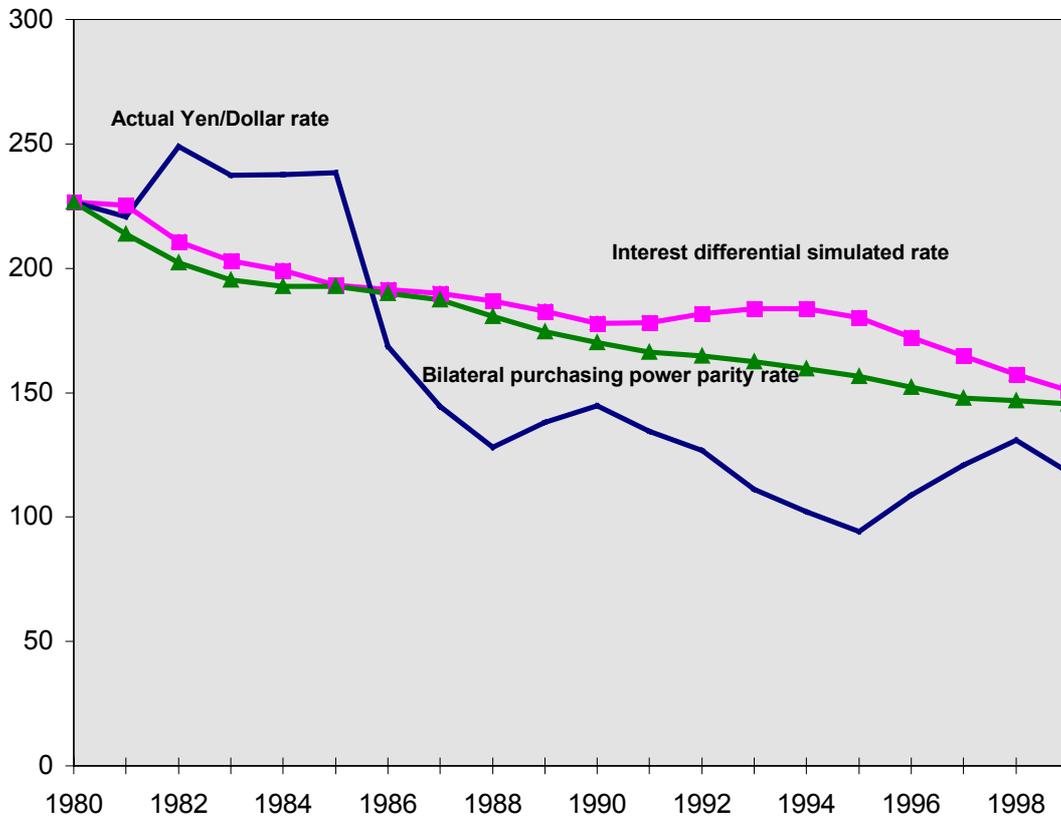


Applied as a bilateral arrangement the proposed scheme would have the advantage of avoiding serious misalignments of the dollar/euro rate. At the same time it would allow the Fed and the ECB setting short-term interest rates according to the inflation rate (actual or expected) and the output gap in their economies. Of course, a main precondition for any bilateral agreement on exchange rate stabilisation is a **stability-oriented fiscal and monetary policy** in both currency areas. While this precondition was not met in the late 1960s and early 1970s, today it is granted in the United States as well as in the euro area.

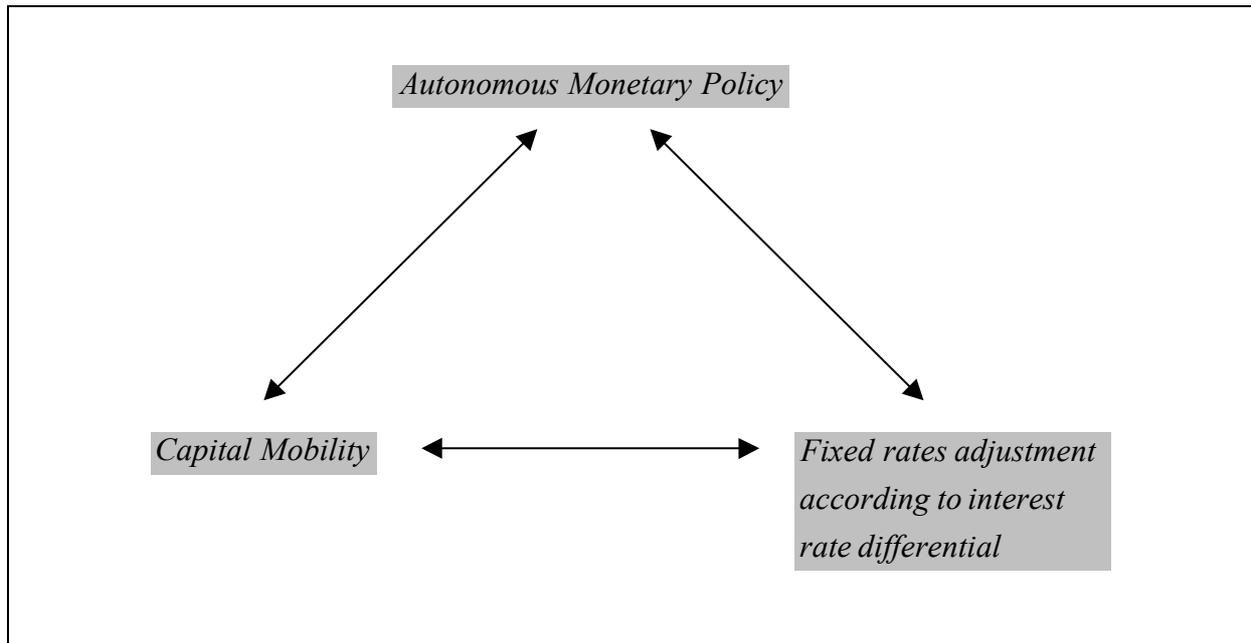
Such a bilateral arrangement could also be applied in the relationship between Japan and the United States. A credible limit for the yen's appreciation vis-à-vis the dollar would provide a simple, but very effective means for stabilising the confidence of Japanese firms and households.²⁷

²⁷ See also Wolf (1999).

Chart 6: Simulation of the Yen/Dollar rate by the interest rate differential



If the proposed framework is applied in a bilateral setting, it offers a way-out of the “inconsistency triangle”. The only modification concerns the corner of “fixed exchange rates”. If “fixed rates” are defined as “fixed rates that are adjusted according to the interest rate differential”, the “inconsistency triangle” becomes a “consistency triangle”. It allows a combination of autonomous monetary policies, free capital mobility with exchange rates that are adjusted only according to the interest rate differentials which are normally quite small.

Chart 7: Consistency triangle

6. Summary

The paper shows that there is a clear potential for an active exchange rate policy of the ECB without threatening price stability. With the instrument of sterilised interventions the ECB is able to avoid a major real appreciation of the euro while at the same time following an interest rate policy that is geared to price stability in the euro area. Of course, the proposal presented in this paper provides only a first blueprint for such a policy, but it makes clear that the overall issue of the ECB's exchange rate management deserves much more discussion and analysis than before. This is especially the case, as there are unclear responsibilities of the ECB and Council in this area. Only a timely clarification of the interrelationships between price stability and intervention policy will avoid difficult and possibly damaging discussions in a period of crisis.

Because of its focus on the mechanics of intervention the paper has not tried to develop new estimates for an equilibrium dollar/euro exchange rate. Before implementing an active exchange rate policy, a thorough empirical analysis of this question would be clearly needed.

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