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ABSTRACT

Exchange Rate Arrangements between the Ins and the Outs*

This paper analyses several issues. First, it describes the main features of ERM II and compares them with those of ERM I as it evolved during the 1980s and 1990s. Second, it analyses whether, and under what conditions, ERM II will be more successful than its predecessor in avoiding disruptive speculative crises. To do so, it uses both new theoretical insights about the factors that affect the occurrence of speculative crises and an historical analysis of the turbulence within ERM I.

JEL Classification: F33, F36, F42
Keywords: monetary integration, Maastricht Treaty, exchange rate

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Submitted 18 April 1997

NON-TECHNICAL SUMMARY

This paper analyses future exchange rate relations between the Ins and the Outs (assuming there will be Ins and Outs). It asks whether ERM II, which will guide these relations, will be stable. This issue is analysed by studying two subsidiary questions.

First, how likely it is that classical ('first generation model') speculative crises will erupt in the future ERM II. At first sight the risk of these speculative attacks is small since the Outs are most likely to have converged significantly in terms of underlying fundamentals (e.g. inflation rates). The nature of ERM II as a stepping stone to access into EMU may interfere in two ways, however. First, since countries have to 'pass a convergence exam' small changes in some fundamentals can make all the difference. As a result, speculators may become very sensitive to small movements in these fundamentals. Second, the structure of real exchange rates between the Ins and the Outs may not correspond to an equilibrium. In particular, there is some evidence that the Deutsche mark is overvalued (in 1997) mainly against the 'peripheral' countries. This may necessitate exchange rate adjustments. If the 'peripheral' countries are the Outs, this may generate speculative pressures within ERM II.

The second question is whether ERM II will be subject to self-fulfilling ('second generation model') speculative crises. The paper argues that the convergence dynamics may indeed lead to such attacks especially against currencies of countries with a large government debt. The probability that this happens depends on a number of factors. First, if the authorities are perceived to take the next 'entrance exam' very seriously, the probability of such attacks will be low. If, however, the perception is that the authorities take a more relaxed attitude because they can 'take the exam' a year or two later anyway, then the probability of a speculative attack increases. Second, if the commitment to intervene in the foreign exchange market by the European Central Bank is low, the probability of such an attack may be high.

A factor that will reduce the probability of speculative attacks is the large size of the band of fluctuation. This will significantly reduce the 'one way bet' situation which typically attracts large speculative activity. This feature of ERM II, together with a willingness for timely realignments may eliminate the danger of large-scale speculative crises of the type that erupted in 1992/3 in the context of ERM I.

The paper's conclusions should be handled with care. The new monetary regime taking shape in Europe is without historical precedent. This makes the analysis difficult, and forecasts of what may happen very hazardous.

It is assumed in this paper that from 1999 on, the monetary regime will consist of a core group of countries forming the EMU and a second group which has been refused access into EMU. It should be emphasized that it is not clear at all that such a scenario is realistic. Many of the peripheral countries will fight very hard to obtain access right from the start, and as a group they will have the power to force the issue, given that the entry decision will have to be taken by qualified majority. It is more likely, therefore, that EMU will start with all potential candidates, or that it will be postponed. If this is the final situation, there will be no ERM II worth analysing. But even if the scenario of a core group of countries forming EMU and another group waiting outside is realised, it will have been preceded by great political conflicts that may destabilize the foreign exchange markets. It would then be very difficult to start ERM II smoothly on 1 January 1999.

1. INTRODUCTION

At the European Council Meeting of Florence in June 1996 the broad outline of a new exchange rate mechanism (ERM II) was agreed upon. This new mechanism will guide the exchange rate relations between the countries inside (the "ins") and the countries outside the euro-area (the "outs"). It will be set in place at the start of stage three of EMU, i.e. on January 1, 1999 (assuming that EMU starts on time).

In this paper we analyse several issues. First we describe the main features of the ERM II and compare them with those of the ERM I as it evolved during the 1980s and the 1990s. Second, we analyse the question whether and under what conditions the ERM II will be more successful than its predecessor in avoiding disruptive speculative crises. In order to do so, we will use both new theoretical insights about the factors that affect the occurrence of speculative crises and an historical analysis of the turbulence within the ERM I.

2. THE ERM II: A DESCRIPTION

The main features of the ERM II can be described as follows.

First, the agreement is a voluntary one. This principle was introduced at the insistence of the United Kingdom. It is to be understood, however, that those countries who have committed themselves to participating in the EMU at some later stage should join this ERM II if they want to qualify for entry into EMU. In addition, the agreement is seen as a mechanism that should help countries in converging towards the Maastricht norms.

Second, the new exchange rate mechanism is based on central rates using the euro as the anchor currency. Around these central rates a band of fluctuation will be defined. No number on the exact size of that band was decided upon. The agreement only stipulates that this band "is expected to be relatively wide". It is generally understood that this means that the band would be comparable in magnitude to the normal band of 2 x 15% in the present ERM I.

Third, since the band of fluctuation of a non-euro currency with the euro will be relatively wide, the fluctuation margin between two non-euro currencies participating in the ERM II will be even larger, being twice that size. Therefore, the agreement foresees that the countries of these non-euro currencies can make ad-hoc arrangements to limit the fluctuation margins of their bilateral exchange rates.

Fourth, the commitment by the ECB to intervene in the foreign exchange market in order to support a particular non-euro currency is limited. The agreement stipulates explicitly that interventions by the ECB should not be undertaken if these would interfere with the main objective of the ECB, i.e. the maintenance of price stability. The agreement adds (rather academically) that this constraint also holds for the intervention commitment of the non-euro countries participating in the ERM II.

Finally, adjustments in the central rates shall be done in a timely fashion so as to avoid significant misalignments. All parties to the agreement, including the ECB, will have the right to initiate a confidential procedure aimed at reconsidering the central rates.

When comparing these features of the ERM II with the ERM I, as the latter evolved after 1993, the resemblance is striking. First, the band of fluctuation of the ERM II is likely to be of the same order of magnitude as the one in the post-1993 ERM I. This should allow for a significant amount of flexibility in exchange rate movements. Second, the ERM II will have an anchor currency, the euro, very much like the ERM I has an (informal) anchor de German mark.

In some sense, however, the ERM II is quite different from the ERM I. First, the ERM II will have more flexibility than the ERM I in that it is very explicit on allowing speedy realignments of the central rates if the need to do so arises. Second, the formal intervention commitments of the central banks in the ERM II appear to be weaker than those in the ERM I. In the latter, central banks have an obligation to intervene when an exchange rate reaches the limit of the band. In practice this difference may not be significant, however. As is well-known, despite the formal commitment of the Bundesbank to intervene in unlimited amounts to support other ERM currencies, the Bundesbank stopped its interventions when it felt that these were interfering with its domestic monetary policy objectives[1]. Third, the ERM II is very much seen as a temporary arrangement for countries

[1] There is some dispute whether the Bundesbank was bound by a formal commitment to intervene. The so-called Emminger letter seems to indicate that the Bundesbank did perceive to be bound by such a commitment.

which want to join the third stage of EMU. Whether this rather unique feature will help to stabilise the exchange rates is one of the issues we want to analyse in this paper.

The most important issue confronting the future ERM II is whether and how it can be made robust and resistant to speculative crises. One thing we have learnt from history is that almost all fixed exchange rate arrangements utlimately collapse. The question then is whether the ERM II will experience the same fate. In order to shed some light on this question we analyse the collapse of the ERM I and we relate it to recent theoretical insights about collapsing fixed exchange rate regimes.

3. THE COLLAPSE OF THE ERM I

Broadly speaking two stories have been told about the collapse of the ERM I. One is based on the idea that when fundamentals (e.g. price levels) diverge, a fixed exchange rate cannot be sustained and ultimately will come under attack. This view has found a theoretical expression in so-called first generation models of speculative attacks (Krugman (1979) and Flood and Garber (1984)). A second story stresses the fragility of fixed exchange rate regimes because of the self-fulfilling nature of speculative attacks. This story has been given a strong theoretical foundation in so-called second generation models of speculative attacks (Obstfeld (1986), (1995)).

There appears to be some consensus that the collapse of the ERM I can be seen as a combination of these two stories. There is less consensus, however, on the relative importance given to these two explanations.

There is little doubt that the lira and peseta crises of September 1992 should be seen as examples of speculative attacks triggered by increasing divergencies in some important fundamentals. We present evidence in figures 1 and 2. These show the evolution of the real exchange rate of the lira and the peseta with the German mark (the anchor currency in the ERM I). We also show the yearly inflation differentials between Italy and Spain on the one hand and Germany on the other. The remarkable thing is that the inflation differentials steadily declined. However, since the nominal exchange rate was fixed since 1987[2], the

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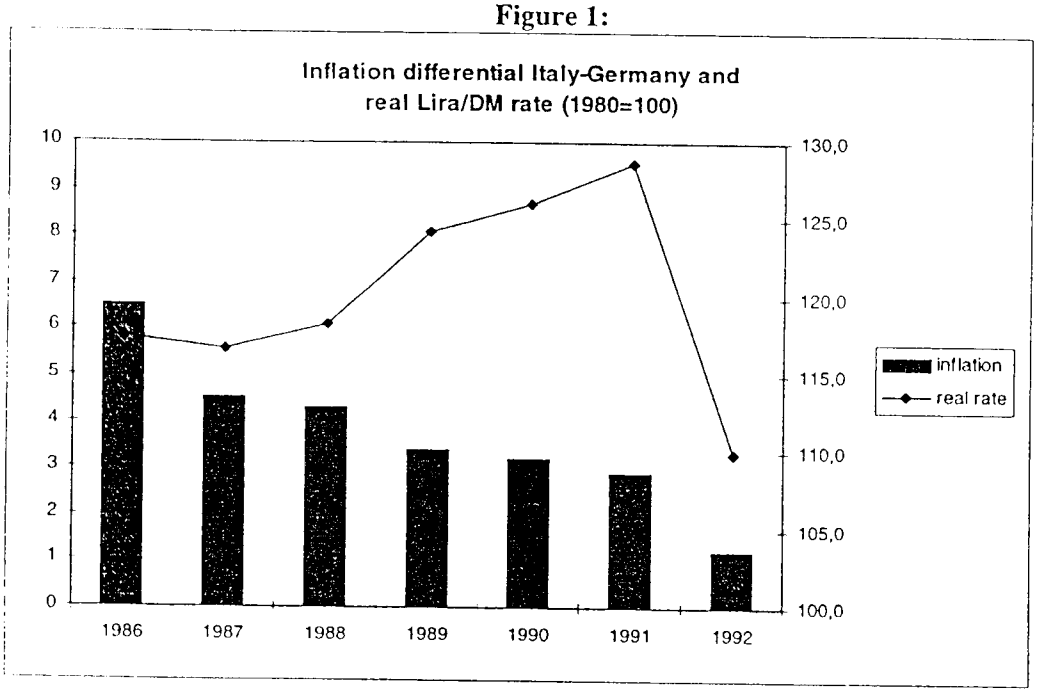
[2] In the case of the peseta there was in fact a nominal appreciation during part of the period.

positive, albeit declining, inflation differentials accumulated into increasing price level divergencies when converted into the same currency. Put differently, the lira and the peseta experienced an increasing real appreciation relative to the German mark (and also relative to the other ERM currencies). This also led to increasing current account deficits that became unsustainable and that led to a speculative crisis in September 1992. The lira dropped out of the ERM and depreciated substantially. The peseta, together with the escudo, devalued several times.

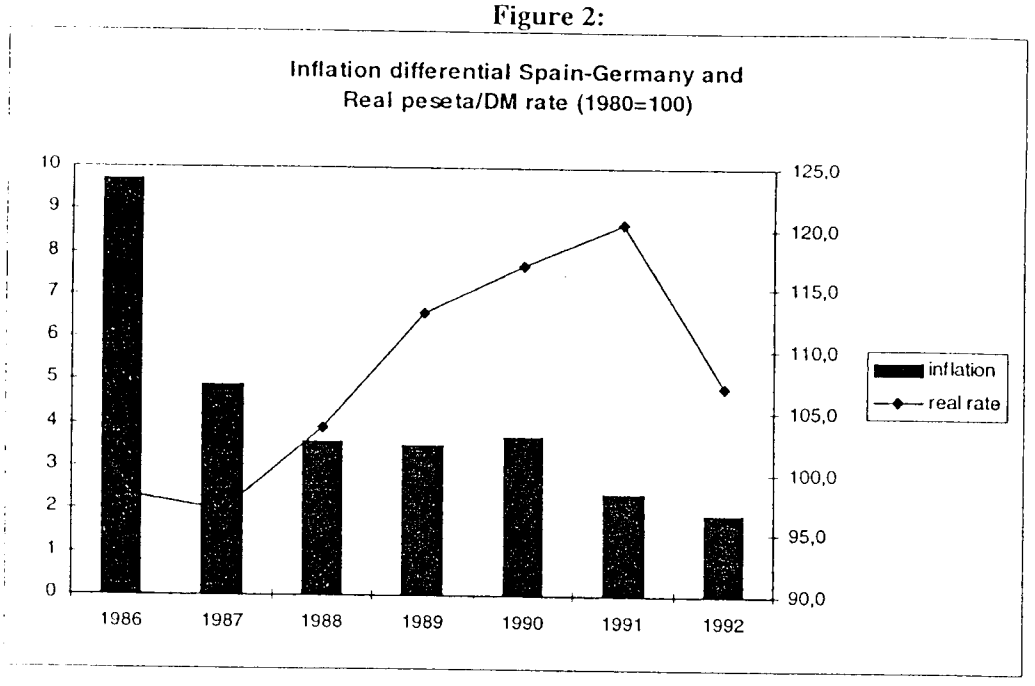
Figure 1:



Source: IMF, International Financial Statistics.

Note: The real lira/DM rate is defined as the nominal lira/DM rate times the ratio of the Italian and the German CPI.

Figure 2:



Source: IMF, International Financial Statistics.

Note: The real peseta/DM rate is defined as the nominal peseta/DM rate times the ratio of the Spanish and the German CPI.

Whereas one can find divergent fundamentals to explain the lira and peseta crises of September 1992, it is much more difficult, if not impossible, to identify fundamental variables responsible for the sterling crisis of September 1992 or the crisis of August 1993 which involved the French franc and other ERM currencies, and which led to the dramatic widening of the band of fluctuation (see Eichengreen and Wyplosz (1993) and Eichengreen, Rose and Wyplosz (1996), Masson(1996)). Thus, the most severe speculative crises during 1992-93 cannot easily be explained in the context of the first generation models of speculative behaviour. Rather one has to rely on second generation models stressing the role of self-fulfilling speculative attacks and multiple equilibria. It is clear, however, that these models can easily become black boxes. In these models, trivial events ("sunspots") can trigger a speculative attack. This is not a very interesting explanation because it leads to new unresolved questions, i.e. why did it take speculators so long to make their attack; why have some currencies never been attacked (e.g. the guilder).

In order for these second generation models to be instructive the process that leads to the speculative trigger must be specified. Recent theoretical progress has been made to do this

(see Obstfeld (1995), Flood and Marion (1996), and Masson(1996)). These models make clear that the trigger that leads to a speculative attack is most likely related to (observable or not yet observable) fundamental developments. The Sterling and French franc crisis can be used to illustrate this point.

The major event that can be invoked as the trigger mechanism is the German unification and the ensuing strongly unsynchronised business cycle in the ERM. Countries like the UK and France experienced a deep recession during 1991-93[3]. Germany on the other hand had just experienced its unification. This had created a booming economy and inflationary pressures. Figures 3 and 4 illustrate this. In figure 3 we exhibit the growth rates of GDP in France, the UK and Germany. It can be seen that in 1991 France and the UK had already moved into a serious recession while Germany still experienced a healthy boom. On the inflation front (figure 4) the reverse was true. Germany saw its inflation rate increase while the other EMS countries experienced a decline in their inflation rates which in the case of France even dropped below the German level in 1991.

These differences in economic conditions set the stage for the coming conflict. Germany insisted on pursuing an anti-inflationary policy. The other countries like the UK and France were very reluctant to do so. As long as they kept the exchange rate peg with Germany they were forced to follow Germany in its monetary restriction, despite the fact that their problem was one of too much deflation not one of too much inflation. These problems and the merit of continuing fixing the exchange rate with the DM were widely discussed in countries like France and the UK. Well-known academic economists, and also politicians came out against such a policy. This created doubts in the mind of speculators concerning the resolve of the governments in these countries to maintain a fixed exchange rate with the DM. More importantly, speculators realised that a speculative attack would increase the cost of the exchange rate peg because it would force the authorities to raise the domestic interest rate, thereby increasing the intensity of the recession. Speculation acquired a self-fulfilling aspect. In such an environment of weakened credibility of the fixed exchange rate arrangement, trivial events (a pronouncement by ministers or well-known professors) could easily trigger a speculative crisis.

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[3] The recession in the UK was earlier around 1990-92, whereas the recession in France occurred mainly during 1991-93. See figure 3.

Figure 3:

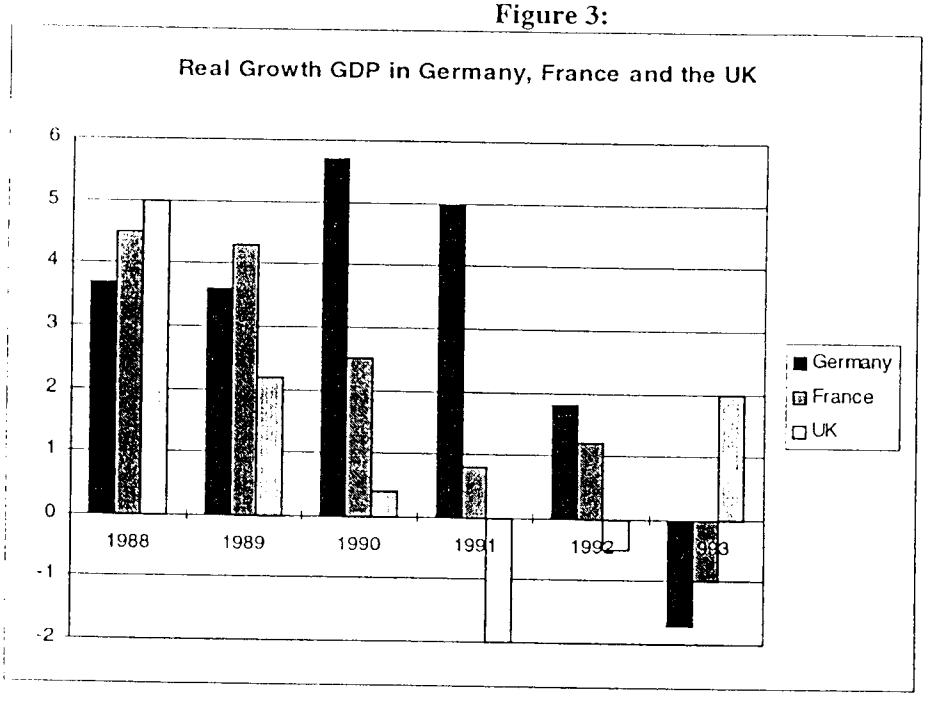
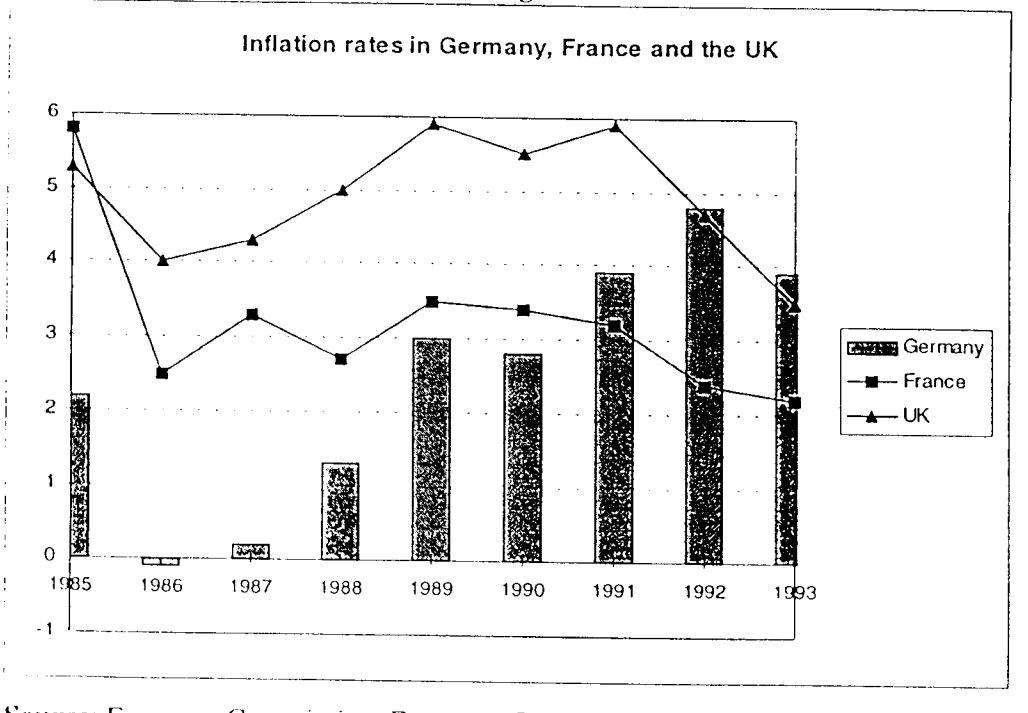


Figure 4:



Source: European Commission, European Economy.

Two additional points should be made here to understand the timing of the collapse of the ERM. First, at the end of the 1980s the ERM I changed in nature in that the ambition of the authorities of the major ERM countries shifted towards avoiding any realignment. As a result, the ERM evolved into a truly fixed exchange rate system. Up to 1987, realignments were frequent. They were also relatively small in comparison with the size of the band of free fluctuation. As a result, after most realignments the new market rate stayed within the bounds of the previous band so that few discrete jump in the exchange rate occurred. This feature robbed the pre-1987 ERM I of its asymmetric "one-way bet" character which is a major attraction for speculators. After, 1987 as the parities remained fixed for many years, the probability that with the next realignment the latter would be large relative to the size of the band increased over time. This introduced a "one way bet" situation and attracted large speculative funds. With the substantial widening of the band of fluctuation in August 1993, the "one way bet" feature of the ERM I was eliminated. It is, therefore, no surprise that major speculative attacks have not occurred in the ERM I since August 1993.

A second factor increasing the size of the pool of speculative funds was the liberalisation of capital movements which occurred in 1990 in countries like Italy and France. This feature has been very much stressed by Eichengreen and Wyplosz (1993), who have argued that in order to stabilise the ERM, capital controls in the form of compulsory deposits of net foreign asset positions of commercial banks.

4. LESSONS FOR THE ERM II

What can we learn from the experience with the ERM I that is relevant for the future stability of the ERM II? We concentrate first on the role of fundamentals. In a second stage we ask the question whether self-fulfilling speculative attacks are likely to occur in the future ERM II.

4.1. The role of fundamentals in the stability of the ERM II

The recent significant convergence of a number of important fundamental variables (inflation, budgetary policies), if maintained, will reduce the scope for classical speculative attacks of the kind stressed in the first generation models. This increased convergence of

important fundamental variables is often stressed by policy-makers as a condition for the stability of the future ERM II. The question, however, is whether this increased convergence will be sufficient to stabilise the future ERM II. Two points are important in this context. First, although there is now, in 1997, more convergence than in 1992-93, small changes in the fundamentals are likely to trigger large responses of speculators in the future ERM II. The reason is that small changes in, say, inflation or the government budget deficit can lead a country to be disqualified at the next decision round concerning entry into EMU. Thus, the markets are likely to analyse the evolution of inflation, budget deficits and debts with a magnifying glass. In this sense the Maastricht entry conditions are likely to increase the sensitivity of speculative movements with respect to a number of important fundamental variables, especially when moving closer towards the decision about entry into EMU. The ERM II may become quite sensitive to speculative attacks.

A second important point to be made here is that it is not clear whether the present structure of real exchange rates corresponds to an equilibrium structure. This can be seen from figures 5 and 6, which show the cumulative real effective appreciations and depreciations of the currencies of the candidate EMU members from 1991 until the end of 1996 according to two different sources. The first one is based on the European Commission, the second one on the IMF. It is striking to find that the structure of real exchange rates has changed considerably since the signing of the Treaty of Maastricht. The "peripheral" countries (with the exception of Portugal) have experienced strong real depreciations of their currencies. Part of these real depreciations should be considered as corrections for the real appreciations that some countries (e.g. Italy and Spain experienced during the late 1980s). There is, however, reason to believe that the subsequent depreciations of these currencies may have overshot their equilibrium values

The experience of the "core" countries is quite different. However, here the two sources tell quite a different story. According to the European Commission data, the countries pegging to the German mark have experienced real appreciations of close to 10%. The IMF data tell a somewhat different story. According to this source, among the core countries, only Germany (together with Portugal) experienced a strong real appreciation. The other core countries stabilised their real exchange rates during the 1990s.

From the preceding analysis one may come to the following conclusions. It is quite possible that the currencies of the "peripheral" EU-countries (with the exception of the Portuguese escudo) are still somewhat undervalued. This conclusion should be considered tentative, of course, because as mentioned earlier, the depreciations of the Southern

European currencies during the 1990 occurred as a correction to the real appreciations experienced during the 1980s. As far as the core currencies are concerned, the situation of the German mark stands out. This currency is most likely to be overvalued by 10 to 20% at the end of 1996. The conclusion has been confirmed by a recent study of Sinn(1996) who arrives at the conclusion that the German mark is overvalued by 15 to 20%, and that this overvaluation is due mainly to the depreciations of the Southern European currencies and the pound sterling since the early 1990s.

The large real appreciation of the German mark may lead to problems of exchange rate management in the future ERM II. The nature of the problem will depend on who will be in and who will be out. Let us consider two scenarios.

*Scenario A: **The core EU-countries are in EMU whereas the peripheral countries stay outside***

In this case the problem arises of whether major exchange rate adjustments should be undertaken between Germany and the other EMU-participants, leading to a depreciation of the German mark vis-à-vis the other in-currencies. Sinn(1996) argues that the present overvaluation of the German mark is mainly due to the overvaluation against the out-currencies, and that the exchange rate relations among the core currencies is more or less in equilibrium. This is also confirmed by the European Commission data. If that is so, EMU can start without a major realignment. A new issue would arise, however. There would still be a need for Germany to correct for the overvaluation against the out-currencies. This need to correct for an overvaluation of the German currency, may lead to pressures towards depreciation of the euro relative to out-currencies. Thus, paradoxically the euro may become the weak currency until the equilibrium exchange rates are restored. Given the relatively large size of the band of fluctuation such an appreciation of the out-currencies versus the euro could most probably be dealt with relatively easily. However, if the ECB were to resist this (driven by an ambition to establish "credibility") the disequilibrium structure of the exchange rates may impart a deflationary bias in the euro area, forcing the ECB to reduce inflation relative to the out-countries.

Figure 5:

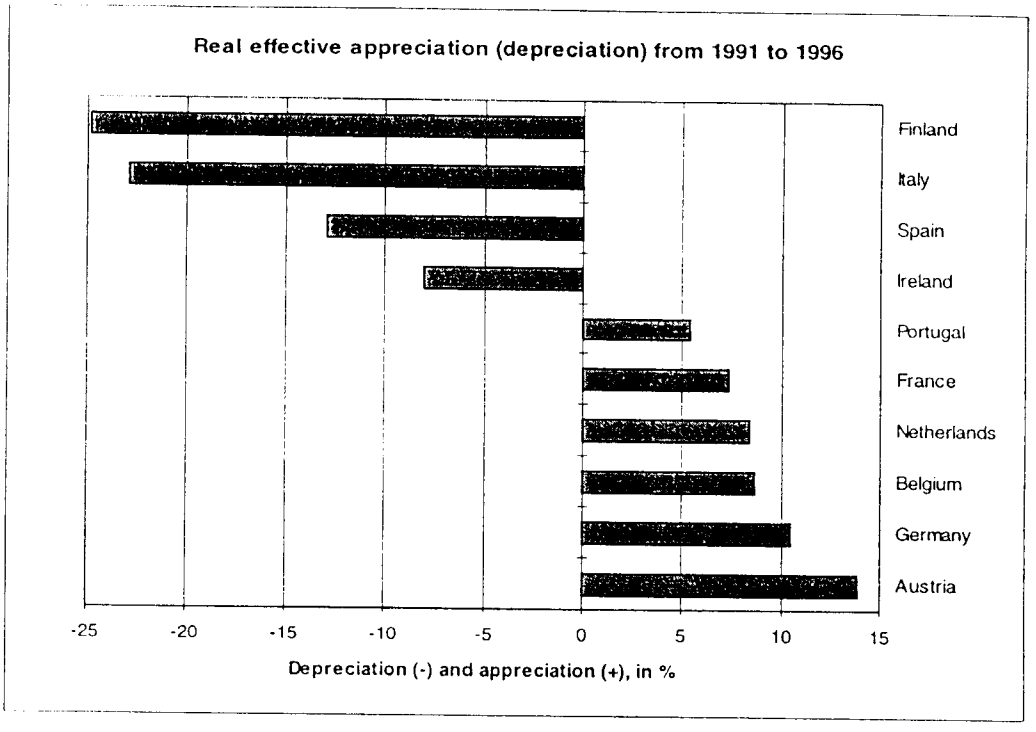
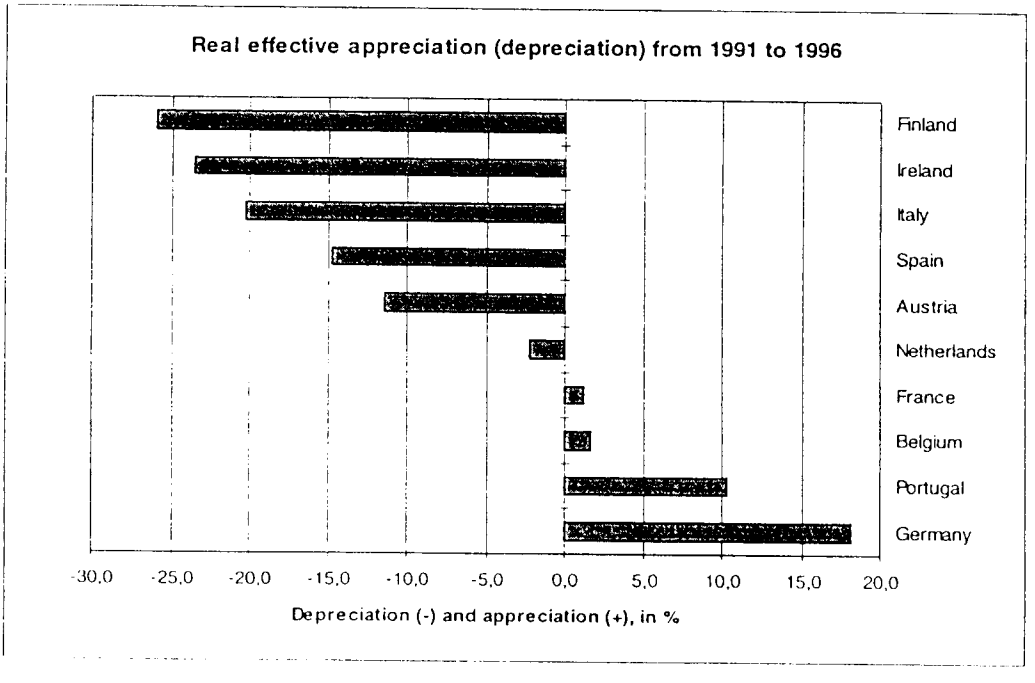


Figure 6:



Source: International Monetary Fund, International Financial Statistics

Scenario B: The core and the periphery form EMU

In this scenario the problem of the disequilibrium structure of exchange rates should be tackled at the moment the decision concerning the conversion rates is made. It would imply that the "peripheral" countries (with the exception of Portugal) accept a revaluation of their currencies as the price to pay to enter in EMU. If this appears to be impossible, the EMU would start with a structural adjustment problem exerting deflationary pressures in the core countries. This would not be a good way to start monetary union in Europe.

4.2. Self-fulfilling speculative attacks in the ERM II

In this section we analyse whether the speculative attacks of the kind analysed in second generation models of speculative crises are likely to occur in the future ERM II. In this connection, there are two opposing features of the ERM II. First, the ERM II will have relatively large bands of fluctuation. In addition, the ERM II agreement is quite explicit on the need for speedy realignments if the need arises. As argued earlier, the size of the band of fluctuation in combination with the expected rate of devaluation (revaluation) is quite important in limiting the scope for self-fulfilling speculative crises. This is usually not taken into account in the existing theoretical models. With a band of fluctuation of close to 30% expectations of devaluations (revaluations) will typically be below the size of the band. This creates an expectation that after the next realignment, if it occurs, the new exchange rate will fall within the old band of fluctuation. Therefore, speculators do not expect a discrete jump in the exchange rate after the realignment. As a result, they expect little profit after the realignment. Large speculative movements of the kind that occurred in 1992-92, therefore, are unlikely. In this connection, the ERM II will resemble the post-1993 ERM I. It will also be closer to the pre-1987 version of the ERM-I during which frequent realignments occurred which remained relatively small in relation to the band of fluctuation. This was especially the case with the currencies using the wider band of 2x6% (e.g Italian lira). We show the evidence in figure 7. We observe that after each realignment of the lira, the new lira/DM rate remained within the old bounds of the fluctuation band. The sharp changes in the lira rate always happened prior to the realignment. As a result, speculators made little profits, and large scale speculative attacks were avoided. In figure 8 we show the case of the French Franc/German mark rate. Here we find that during 1982-83 there were several realignments which were significantly higher than the (smaller) size of the band, producing large jumps after the realignment, and large speculative profits. As a

result, the speculative crises during this period were intense leading to a near-collapse of the ERM I.

Figure 7: German Mark/Lira exchange rate

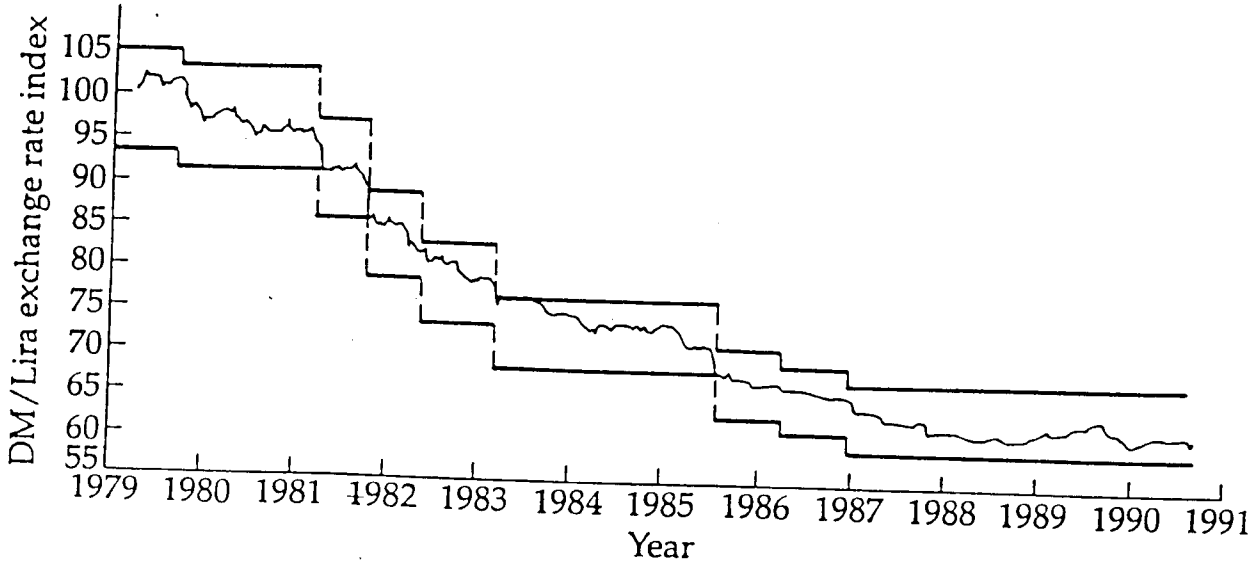
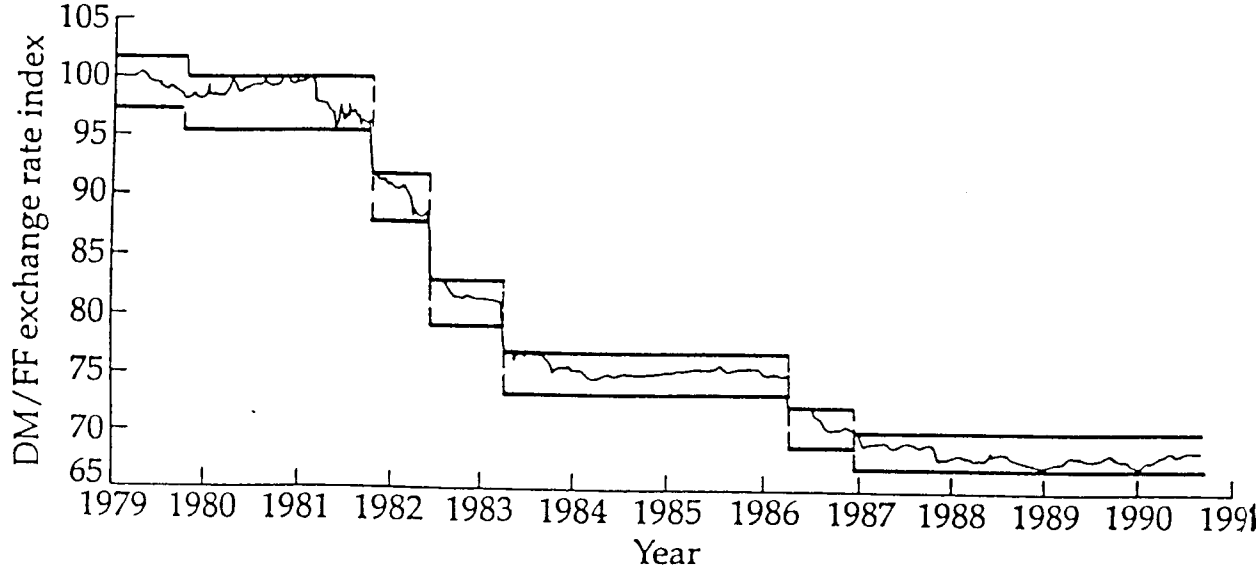


Figure 8: German Mark/French Franc exchange rate



Source: P. De Grauwe (1996).

There is another feature of the ERM II which may increase the probability of self-fulfilling speculative attacks. This can be described as follows. Every two years the out-countries' performance towards convergence will be evaluated. This will be based on the Maastricht convergence criteria. Sufficient convergence will lead to entry into the EMU, insufficient convergence will lead to postponement of entry. In this dynamics of convergence there are several features that may trigger self-fulfilling speculative crises. A first one has to do with the interest rate convergence requirement. This has a strong self-fulfilling character. If the market expects a country to join it will quickly lead to a reduction of the interest rate margin with the euro interest rate. This will alleviate the burden of the government debt. In countries with a large government debt this can lead to a significant decline in the budget deficit, thereby helping to achieve the budgetary convergence requirement. Note that the latter effect occurs because the market is optimistic about the probability of joining EMU. A reverse dynamics can be triggered by bad news about the convergence process. This will lead to higher interest rates in the out-country and thus a larger budget deficit, thereby validating the prevailing pessimism about a country's chances of joining EMU.

The previous dynamics can be reinforced by speculative attacks in the foreign exchange markets. Pessimism about the prospects of entry into EMU may trigger a speculative attack and produce the multiple equilibria that are stressed in the second generation models. Speculators know that if the attack leads to a realignment, the country cannot enter EMU at the set date. Their pessimism about the prospects for entry then leads them to attack the currency which, by leading to a realignment, validates that pessimism. The probability that this speculation will be set in motion depends on the perception speculators have about the commitment of the authorities to maintain the existing band of fluctuation. If the authorities are seen to have a weak commitment (because they find the defence of the exchange rate costly) speculation will be forthcoming. Here also the size of the government debt matters. A speculative attack raises the domestic interest rate and increases the debt burden. The higher the debt burden the greater the cost of the defence of the fixed exchange rate. This leads to the conclusion that the self-fulfilling nature of the speculative attack is a positive function of the debt level. (In the next section we present a model that formalises this feature).

The perception speculators will have about the strength of the commitment in the future ERM II also depends on other factors. First, as mentioned earlier, the ECB does not intend to give unlimited support to a currency under attack. This will be perceived as a signal that the commitment towards a fixed exchange rate is weak and may invite speculators to attack the currency. Second, since the "entry-exam" will be organised every two years (the

country can even take the initiative earlier to "take the exam") there is always a relatively cheap option to postpone entry. The existence of this option may weaken the resolve to defend the currency at all cost.

In this section we have stressed to opposing forces that may influence the probability of self-fulfilling speculative crises. One, the large band of fluctuations, reduces this likelihood. The other, the self-fulfilling nature of the convergence dynamics, may increase this probability. Which of the two features of the ERM II will prevail is difficult to say a-priori. The start of a totally different monetary regime is a unique historical experience so that we cannot easily learn from other exchange rate arrangements of the past.

5. A MODEL OF SELF-FULFILLING SPECULATIVE ATTACK IN THE ERM II

In this section we present a stylised model of a speculative attack based on Obstfeld (1995) (see also Calvo (1988) and Obstfeld (1994)). We change the structure of the model, however, to fit the dynamics of convergence that countries in the ERM II are constrained by.

We start with the budget constraint of the country taking part in the ERM II:

$$\dot{b} = g - t + (i - \pi)\, b - \pi m \qquad (1)$$

where b is the debt to GDP ratio (a dot represents a rate of change); g is the primary government spending as a percent of GDP; t is tax revenues as a percent of GDP; i is the nominal interest rate and π is the inflation rate, m is the ratio of money to GDP (the inverse of the velocity of money); thus πm is the revenue from monetary financing (seigniorage). For a typical European country this term is very small (typically around 1% of GDP) and of a second order nature compared to the other terms in the equation. We will therefore disregard seigniorage as a source of financing of the government budget. Note that we assume (without loss in generality) that the real growth of output is zero.

The nominal interest rate can also be written as:

$$i = r + \pi^e \qquad (2)$$

where π^e is the expected inflation rate, and r is the real interest rate.

Substituting (2) into (1) yields

$$\dot{b} = g - t + (r + \pi^e - \pi)\, b \tag{3}$$

We observe that it is only the unanticipated component of inflation ($\pi^e - \pi$) that affects the budget constraint, i.e. inflation which is higher than expected lowers the debt burden. Fully anticipated inflation ($\pi = \pi^e$) does not lower the debt burden. The reason is that a fully anticipated inflation reduces the real value of the outstanding debt and increases the nominal interest rate at the same time.

We assume that purchasing power parity holds so that

$$\varepsilon = \pi \tag{4}$$

where ε is the rate of depreciation of the domestic currency. For the sake of convenience we set the rate of inflation in the euro-area equal to zero.

Setting $\dot{b} = 0$ in (3) we obtain the condition necessary to stabilise the debt to GDP ratio. It can be interpreted as a necessary condition for solvency of the government. We will also interpret it as a necessary condition for the country to join EMU. (It is clearly not sufficient). Using (4), we can rewrite this condition as follows:

$$t = g + r\, b + (\varepsilon^e - \varepsilon)\, b \tag{5}$$

We observe that, given the level of spending, g, and the real interest rate, r, there is a trade-off between the tax rate and the rate of depreciation (inflation rate), i.e. an unexpected depreciation (increase in inflation) allows the government to reduce taxes (as percent of GDP) while keeping the solvency constraint intact. Put differently, an unexpected depreciation reduces the debt burden. This trade-off, however, only holds if the depreciation is unanticipated. In a rational expectations world, there can be no systematic deviation between expected and realised depreciation, so that on average $\varepsilon^e - \varepsilon = 0$ ($\pi^e - \pi = 0$). Thus, from (5) we can write the "long-run" trade-off between depreciation (inflation) and taxation that is necessary to maintain solvency as follows:

$$t_N = g + r\,b \tag{6}$$

where we interpret t_N as the "natural" rate of taxation given the level of spending, the accumulated debt and the real interest rate. This natural level of taxation is independent of the depreciation (inflation).

It will be clear that we have formulated the problem in a similar framework as the Phillips curve framework. (The latter is also the framework in which the Obstfeld (1995) model of self-fulfilling speculation is formulated). Equation (5) is the "short-term" solvency constraint. It has a structure reminiscent of the short-term Phillips curve. Unanticipated depreciations (increases in inflation) reduce the burden of the debt, very much like unanticipated inflation reduces unemployment. Equation (6) is the long-run solvency constraint which is similar to the long-run (vertical) Phillips curve. The "natural" tax rate is independent of the rate of depreciation (inflation), very much like the natural unemployment is.

One can represent equations (5) and (6) graphically. This is done in figure 9. The short-term trade-offs are represented by the downward sloping lines. There is one such trade-off for every level of expected inflation. The slope of these short-term trade-offs is given by the parameter b (the debt to GDP ratio) in equation (5). It can be seen that as b increases the short-term trade-off becomes flatter. This means that in a country with a high debt to GDP ratio a same inflationary surprise reduces the debt burden more than in a country with a low debt to GDP ratio. Note also that a higher b leads to a displacement to the right of the "natural" taxation rate.

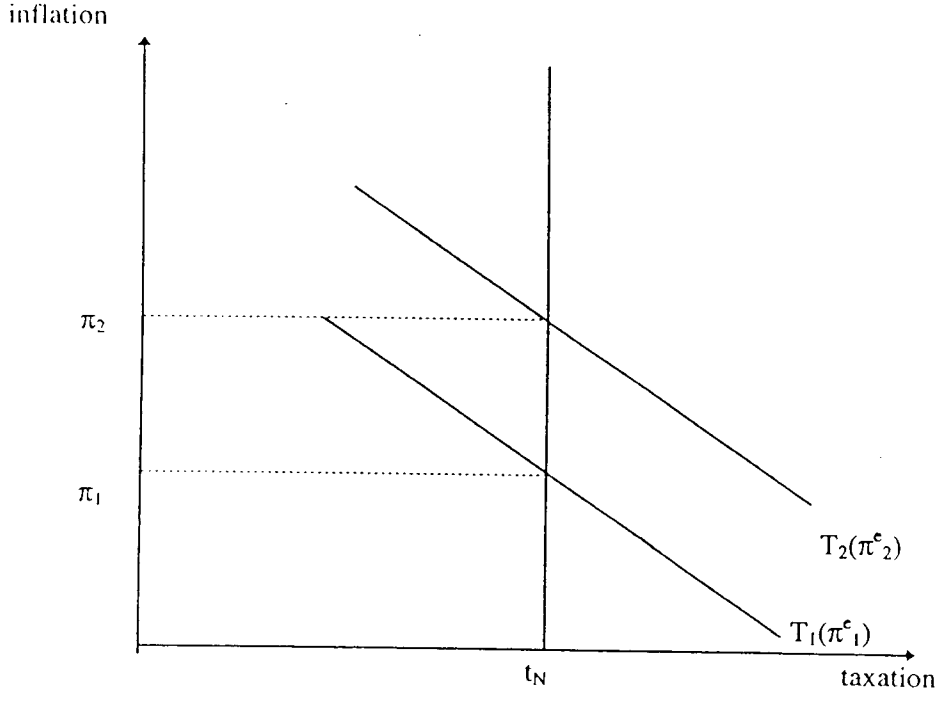
Assume now that the authorities aim at minimising a loss function of the type

$$L = t^2 + a\,\varepsilon^2 + C(\varepsilon) \tag{7}$$

where a is a parameter expressing the weight given by the monetary authorities to the exchange rate target. Both inflation and taxation are perceived to be costly to the monetary authorities. The authorities therefore set inflation (the exchange rate) so as to minimise the cost of inflation given that they also care about minimising the tax burden. The latter can also be interpreted as minimising the debt burden. As in Obstfeld (1995) we have added a second term in the rate of depreciation $C(\varepsilon)$. This term expresses the fixed cost C of devaluing the currency. It takes on two values, c_D when a devaluation occurs, and c_R when a revaluation happens. In the context of our ERM II country, this cost can be interpreted as the cost of having to postpone entry into EMU when the currency is devalued. As will be

remembered, a country cannot be accepted into EMU if it has devalued the currency during a period of two years prior to the entry date. This implies that c_R (the cost of a revaluation is low compared to the cost of a devaluation).

Figure 9: Trade-off between inflation and taxation



We will assume that stochastic shocks occur in g, the level of government spending, i.e.

$$g = \bar{g} + u$$

where u is a random variable with zero mean.

These shocks in g occur, for example, because of disturbances in output: during a recession the government is forced to increase spending for the unemployed, during a boom government spending declines. Thus, the stochastic shocks in g can be seen as expressing stochastic shocks in output.

The authorities now select an ε that minimises the loss function given the shock they observe in g and given the devaluation expectations of private agents. If we initially ignore the fixed cost term, the government chooses the optimal rate of depreciation

$$\varepsilon = \frac{b\left(g^* + rb + u\right) + b^2\varepsilon^e}{a + b^2} \tag{8}$$

Substituting this solution into (5) yields the tax level (the burden of the debt)

$$t = \frac{a\left(g^* + rb + u\right) + ab\varepsilon^e}{a + b^2} \tag{9}$$

Substituting (8) and (9) into the loss function (7) we obtain the value of the loss under flexible exchange rates.

$$L_{flex} = \frac{a}{a + b^2}\left(g^* + rb + u + b\varepsilon^e\right)^2 \tag{10}$$

In a rigidly fixed exchange rate this loss would be

$$L_{fix} = \left(g^* + rb + u + b\varepsilon^e\right)^2 \tag{11}$$

It can be seen that $L_{flex} < L_{fix}$

However, taking into account the fixed cost of devaluing the currency, $C(\varepsilon)$, the authorities will only devalue if u (the shock in g) is large enough to make

$$L_{fix} - L_{flex} > c_D$$

Similarly the authorities will only revalue if the negative shock in u is large enough to make

$$L_{fix} - L_{flex} > c_R$$

We can compute the critical value of u for which devaluation occurs:

$$u_D = \frac{1}{b}\sqrt{c_D\left(a + b^2\right)} + g^* + rb - b\varepsilon^e \tag{12}$$

and the critical value of u for which a revaluation occurs

$$u_R = -\frac{1}{b}\sqrt{c_R\left(a + b^2\right)} + g^* + rb - b\varepsilon^e \tag{13}$$

We note the following interesting result

$$du_D/d\varepsilon^e = -b$$

This implies that an increase in the expected depreciation lowers the critical value at which the devaluation occurs, the more so as the level of the debt is high. Thus, a country with a high debt level will more likely be forced to devalue when expectations of a depreciation increase than a country with a low debt level.

This result lies at the heart of the self-fulfilling nature of speculation: an expected devaluation increases the cost of the debt service because it raises the domestic nominal interest rate. This expectations induced increase in the debt service increases with the size of the debt. Thus, with a higher debt, the authorities have a higher incentive to devalue than with a lower debt. Since speculators know this, they also realise that by speculating against the currency they increase the incentive of the authorities to devalue the more so as the debt is high.

Rational agents take (12) and (13) into account and compute the probability of a change in the exchange rate. Assuming that u is uniformly distributed on [-u, u] we obtain the following rational expectation of the rate of depreciation

$$E\varepsilon = \frac{b}{a+b^2}\left[\left(1-\frac{u_D-u_R}{2u}\right)\left(g^* + rb + b\varepsilon^e\right) - \frac{u_D^2-u_R^2}{4u}\right] \qquad (14)$$

This non-linear expression gives rise to the possibility of multiple equilibria. We represent them graphically in figures 9.a, b, c. The non-linear line represents equation (14). The dotted line is the expected depreciation under a free float. We show three cases depending on three levels of government debt. In the low government debt case there is only one equilibrium with a low devaluation probability. The size of the realignment conditional on devaluation is ε_1.

The case of the high government debt is represented in figure 9.c. This case also exhibits one equilibrium. In this case the probability of the devaluation is one, so that the expected realignment is ε_3. In this case the authorities are forced to devalue.

The most interesting case is represented by figure 9.b which shows the case of an intermediately high level of government debt. This case shows three equilibria. It embodies the possibility of self-fulfilling attacks. For example, a country can be moved from the first to the second equilibrium by a change in the perceived probability of a devaluation. In equilibrium 1 relatively large shocks in g are needed to force the country off its fixed exchange rate commitment. In 2, however, the country can be forced to abandon the fixed exchange rate by a relatively small increase in g.

This model illustrates the potential problem outside countries, with a relatively high government debt, participating in the ERM II may face. The model also makes clear what the role is of the cost of devaluing the currency. If c_D is high we are more likely to be in the situation represented by figure 10a: the probability of a devaluation is low and so is the probability of a speculative crisis. As c_D increases, we are more likely to find ourselves in the case of figure 10.b or even 10.c. Thus, if countries are perceived to take the next convergence "exam" very seriously c_D will be large, so that speculative attacks become less likely. On the other hand, if these countries are perceived to take it less seriously, because they can "take the exam" at a somewhat later date anyway, then the speculative attack becomes more likely.

Figure 10.a: Low government debt

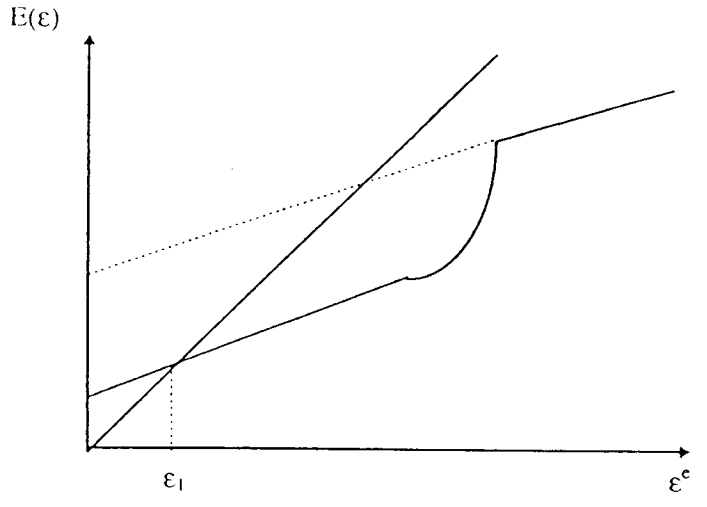


Figure 10.b: Intermediate government debt

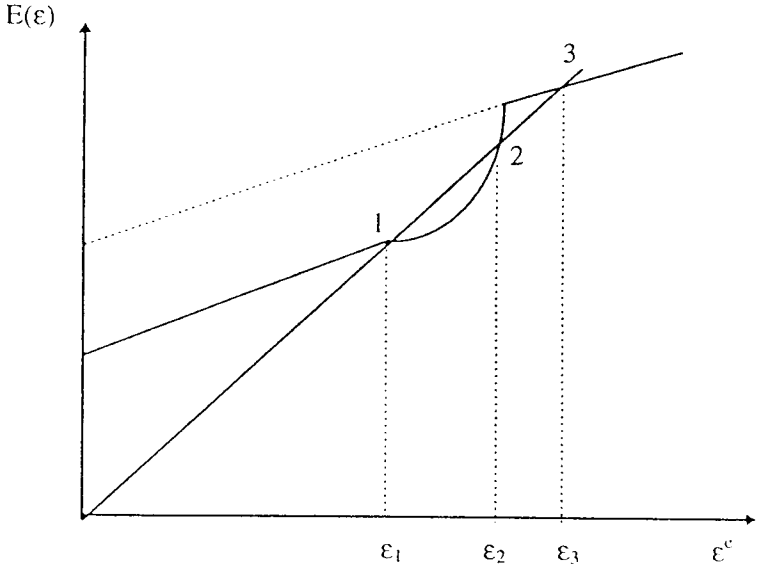
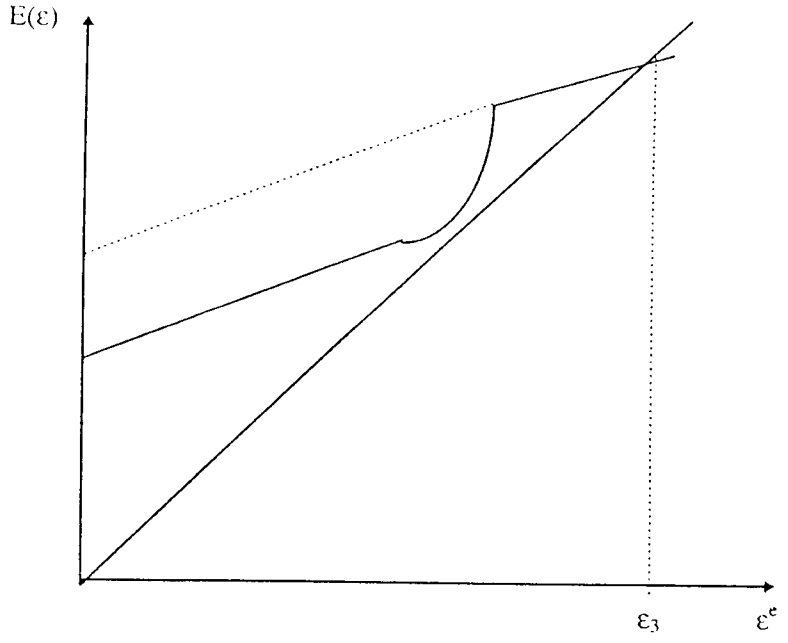


Figure 10.c: High government debt



6. CONCLUSION

In this paper we have analysed the future exchange rate relations between the Ins and the Outs (assuming that there will be Ins and Outs). We asked the question whether the ERM II which will guide these relations, will be a stable one. We analysed this question by studying two subsidiary questions.

First, we asked the question of how likely it is that classical ("first generation model") speculative crises will erupt. At first sight the risk for these speculative attacks is small since the Outs are most likely to have converged significantly in terms of underlying fundamentals (e.g. inflation rates). However, the nature of the ERM II as a stepping stone towards access into EMU, may interfere in two ways. First, since countries have to "pass a convergence exam" small changes in some fundamentals can make all the difference. As a result, speculators may become very sensitive to small movements in these fundamentals. Second, the structure of the real exchange rates between the Ins and the Outs may not correspond to an equilibrium. In particular, there is some evidence that the German mark is overvalued (in 1997) mainly against the "peripheral" countries. This may necessitate exchange rate adjustments. If the "peripheral" countries are the Outs, this may generate speculative pressures within the ERM II.

A second question we asked is whether the ERM II will be subject to self-fulfilling ("second generation model") speculative crises. We argued that the convergence dynamics may indeed lead to such attacks especially against currencies of countries with a large government debt. The probability that this happens depends on a number of factors. First, if the authorities are perceived to take the next "entrance exam" very seriously, the probability of such attacks will be low. If, however, the perception is that the authorities take a more relaxed attitude because they can "take the exam" a year or two later anyway, then the probability of a speculative attack may increase significantly. Second, if the commitment to intervene in the foreign exchange market by the ECB is low, the probability of such an attack may be high.

A factor that will reduce the probability of speculative attacks is the large size of the band of fluctuation. This will significantly reduce the "one way bet" situation which typically attracts large speculative activity. This feature of the ERM II, together with a willingness of having timely realignments may eliminate the danger of large scale speculative crises of the type that erupted in 1992-93.

The conclusions arrived at in this paper should be handled with care. The new monetary regime taking shape in Europe is without historical precedence. This makes the analysis difficult, and forecasts of what may happen very hazardous.

It has been assumed in this paper that from 1999 on, the monetary regime will consist of a core group of countries forming the EMU and of a second group which has been refused access into EMU. It should be emphasised that it is not clear at all that such a scenario is realistic. Many of the peripheral countries will fight very hard to obtain access right from the start, and as a group they will have the power to force the issue, given that the entry decision will have to be taken by qualified majority (see De Grauwe(1996) on this). It is more likely, therefore, that the EMU will start with all potential candidates or that it will be postponed. If this scenario comes out, there will be no ERM II worth analysing.

But even if the scenario of a core group of countries forming EMU and another group waiting outside is realised, it will have been preceded by great political conflicts that may destabilise the foreign exchange markets. It would then not be an easy affair to start ERM II smoothly on January 1, 1999.

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