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I. Introduction

The transition to very wide bands in the EMS has evoked interest in the origin of the speculative forces that led to the breakdown of the old system. The traditional literature on speculative attacks [Krugman 1979, Flood and Garber 1984, Obstfeld 1986, Wyplosz 1986, Grilli 1986] stresses the role of divergent paths for domestic credit and inflation. It seems, however, difficult to attribute the collapse of pegged rates among the core EMS countries to differences in money growth or inflation trends.

In this paper we shall pursue a different approach which focuses on the link between exchange-rate expectations and capacity utilisation in an adjustable peg system. We show that such a link helps to explain why Belgium, Denmark and France were subject to substantial speculative exchange-rate pressure which caused them to abandon the close peg to the D-Mark, while the Netherlands were not.

The paper is organised as follows. In part II we analyse the macroeconomic effects of speculative exchange-rate pressure in a sticky-price model. In part III we address modifications that are brought about by real-wage resistance. In part IV we endogenise exchange-rate expectations by relating them to the degree of capacity utilisation. In part V we give an empirical account of the link between capacity utilisation and exchange-rate adjustments for core EMS-countries. Part VI contains some policy conclusions.

II. Speculative Exchange-Rate Pressure in a Sticky-Price Model

To analyse the effects of speculative exchange-rate pressure we use a discrete-time version of the small-country model suggested by Dornbusch [1976].

Goods market equilibrium is given by

$$(1) \quad y_t = - a\, r_t + b\, (e_t + p_t^* - p_t) + c\, y_t^* + g_t,$$

where y_t denotes output, r_t the nominal interest rate, e_t the nominal exchange rate, p_t the producer price level and g_t a fiscal parameter; an asterisk indicates a foreign variable. All variables except for r_t are stated in logarithms. The term in brackets represents the real exchange rate.[1]

Money market equilibrium is given by

$$(2) \quad m_t - p_t = k\, y_t - l\, r_t,$$

where m_t is the log of the domestic money supply.

Prices are assumed to adjust sluggishly to excess demand

$$(3) \quad p_{t+1} - p_t = h\, (y_t - \bar{y}_t),$$

where $\bar{y}_t$ denotes the log of potential output.

Bonds market equilibrium is given by

$$(4) \quad r_t = r_t^* + (\tilde{e}_{t+1} - e_t) + j\, (s_t - \bar{s}_t),$$

where $\tilde{e}_{t+1}$ represents the log of the exchange rate which is expected for the next period, $\bar{s}_t$ denotes the share of domestic bonds in a minimum risk portfolio and s_t is the actual portfolio share of domestic bonds. The last term in equation (4) reflects the so-called risk premium. The coefficient j depends on the degree of risk aversion [Dornbusch 1983]. With risk neutrality, j is zero so that the last term drops out. With risk-averse behaviour, j is positive so that measures which increase the share of domestic bonds in private portfolios tend to raise domestic interest rates.

Setting $\bar{y}_t$, $\bar{s}_t$ and all foreign variables equal to zero and substituting (4) into (1) we obtain

$$(5) \quad y_t = -a\,(\tilde{e}_{t+1} - e_t) + b\,(e_t - p_t) + g_t - a\,j\,s_t.$$

We assume that initially the economy is in equilibrium and no exchange-rate change is expected, i.e. $\tilde{e}_{t+1} = e_t$.

Let us now consider what happens when expectations change exogenously. Suppose that market participants expect the foreign currency to appreciate so that $\tilde{e}_{t+1}$ rises. As can be seen from equation (5) a rise in $\tilde{e}_{t+1}$, with fixed exchange rates and with prices that are initially given, will cause a fall in output. This can be explained by the fact that the expectation of a depreciation of the domestic currency and the resulting speculative pressure in the financial market cause a rise in the interest rate which lowers demand for domestic products. Over time, the emergence of an output gap will result in a lowering of the price level and a real depreciation which in turn raises demand, until full employment output is restored.[2]

The policy relevance of a change in exchange-rate expectations would be low, if the change were reversed quickly. In fact, a frequent response of central banks to speculative pressure has been to allow the domestic interest rate to shift up, hoping that market participants, when learning that the expected appreciation of the foreign currency has not occurred, will revise their expectations and allow the interest rate to be lowered again soon so that the disturbance to demand whould be short-lived. Historical experience with reference to the so-called peso problem [De Grauwe 1989, p. 129] or more recent experience in the context of the EMS has, however, shown that the defense of fixed exchange rates may require the maintainance of an interest differential for an extended period of time.

The expectation of a devaluation may, thus, put a country into a policy dilemma. If it gives priority to external stability and keeps the exchange rate fixed, it will go through a recession.

The government could consider to escape the recession through an expansionary fiscal policy, i.e. a rise in g_t. But with high public sector deficits the room for an expansionary fiscal policy is often considered small or non-existent. Another possible response consists in lowering the share of domestic currency bonds in private portfolios. A standard measure in this context is sterilised intervention: the central bank sells foreign-currency assets or takes a foreign-currency loan, buys domestic currency in the exchange market and uses the proceeds to aquire domestic currency assets, thereby reducing their share in private portfolios. But with low risk aversion, the volume of the required operations may exceed the amount that authorities are willing to accept.[3]

The only remaining measure to avoid the recession, then, is to raise e_t, i.e. to depreciate the domestic currency. In the case of consideration it may be interesting to note that the required depreciation would fall short of bringing the rate up to $\tilde{e}_{t+1}$. For if e_t were raised to $\tilde{e}_{t+1}$, the resulting depreciation would cause an excess demand for domestic output. Formally, the nominal appreciation of the foreign currency which restores goods market equilibrium is given by

$$(6) \quad \Delta e_t = \frac{a}{a + b} \Delta \tilde{e}_{t+1}.$$

This result may be related to the discussion on self-fulfilling speculative attacks [Obstfeld 1986; Eichengreen and Wyplosz, 1993; Goldstein et al. 1993]. In the case which is considered here, the expectation of a depreciation may cause a devaluation; but the devaluation, if it occurs, is less pronounced than expected by the market participants.

The present model can also be used to analyse the effects of the formation of a monetary union which removes existing expectations of future exchange-rate changes. Suppose that initially the domestic currency is expected to depreciate. Now a monetary union is formed with irrevocably fixed exchange rates. As a result, the expected future exchange rate adjusts to the current rate and the domestic interest rate declines to the foreign interest rate

level. With initial equilibrium in the goods market the drop in the interest rate tends to raise output above its potential thereby triggering a transitory increase in the price level. To avoid transitory inflation, the decision for the monetary union would have to go along with a simultaneous decision to revalue the domestic currency, so that the stimulating effect of the reduction in interest rates is immediately neutralised by the dampening effect of the real appreciation.

III. Real Wage Resistance

Up to now we have assumed that potential output itself is not affected by the expectation of a depreciation. This may not be true in the case of real wage resistance [Bruno and Sachs, 1985]. If a worsening of the terms of trade causes higher nominal wages and, hence, higher producer real wages, potential output tends to be negatively affected by changes in the real exchange rate:

$$(7) \quad \bar{y}_t = - n \, (e_t + p_t^* - p_t) \qquad n > 0.$$

As can be seen, the expectation of a depreciation which raises the real exchange rate and tends to lower potential output. Thus, in the fixed exchange rate case, prices will fall less and output will not return to its initial equilibrium.

In a similar vein, a drop in output which is caused by speculative exchange-rate pressure cannot be totally prevented by a depreciation. The depreciation which restores goods market equilibrium is given by $\Delta \bar{y}_t = \Delta y_t$ and, using equations (5) and (7):

$$(8) \quad - n \Delta e_t = - a \, (\Delta \tilde{e}_{t+1} - \Delta e_t) + b \Delta e_t$$

$$\Delta e_t = \frac{a}{a + b + n} \Delta \tilde{e}_{t+1}.$$

Comparing equations (6) and (8) we find that the nominal depreciation is smaller in the case of real wage resistance.

In contrast to the analysis in part II, the effect of an expected depreciation on output is not transitory but permanent, since potential output falls to a lower level. Still, by nominally depreciating the currency rather than keeping it at the initial level the authorities can at least prevent output from falling below its reduced potential level.

IV. Capacity-Linked Exchange-Rate Expectations

So far we have considered the case of speculative pressure which results from an exogenous change in expectations about the future exchange rate. In this section we shall extend the analysis by making exchange-rate expectations themselves depend on the state of the domestic economy. In particular, we want to take account of the fact that speculative attacks in the EMS did not occur in a situation of fully utilised capacity, as has been assumed in the previous section, but came about in a period of recession.

The attractiveness of a depreciation results from its ability to avoid or shorten a recession which otherwise would occur due to the sluggish adjustment of domestic prices. As long as there is full capacity utilisation, the country does not have an incentive to depreciate. With output falling short of potential output, the incentive to depreciate increases. This may be reflected in expectations of market participants: the expected future exchange rate depends on the output gap.

Formally, this may be stated as:

$$(9) \quad \tilde{e}_{t+1} = e_t + q\, v\, (\bar{\tilde{y}} - y_t),$$

where $v\,(y_t - \bar{\tilde{y}}_t)$ reflects the exchange-rate change that in the view of market participants is required to adjust actual output to potential output and q is the probability that this exchange-rate change will occur. Using equations (9), (4) and (1) and setting g_t, $\bar{\tilde{y}}_t$ and the risk premium equal to zero we obtain

$$(10)\quad y_t = a\,q\,v\,y_t + b\,(e_t + p_t^* - p_t) - a\,r_t^* + c\,y_t^*$$

$$= \frac{b}{1 - a\,q\,v}\,(e_t - p_t) + \frac{c\,y_t^* - a\,r_t^* + b\,p_t^*}{1 - a\,q\,v}\,.$$

With rational expectations the expected exchange-rate change that is required to close the output gap is equal to the actual required change which is given from (10) so that

$$(11)\quad v\,\Delta\,y_t = \frac{1 - a\,q\,v}{b}\,\Delta\,y_t,$$

where $\Delta\,y_t$ denotes the change in output that is required to close an existing gap. This equation implies that

$$(12)\quad v = (1/b) - (a\,q\,v/b)$$
$$= (1/b)/(1 + a\,q/b) = 1/(b + a\,q).$$

Substituting the expression for v into (10) one obtains

$$(13)\quad y_t = \frac{b}{1 - z}\,(e_t - p_t) + \frac{c\,y_t^* - a\,r_t^* + b\,p_t^*}{1 - z}\,;\quad z = \frac{a\,q}{a\,q + b} < 1.$$

Equation (13) shows that the effect of a foreign shock on the domestic economy in an adjustable peg system may differ from that in a rigidly pegged system. With irreversibly fixed rates, the probability of an exchange-rate change, and hence q and z, are zero. In an adjustable peg system with a non-zero probability of an exchange-rate adjustment to close an emerging output gap, q is positive. This implies that a change in foreign output, interest rates or prices has a stronger effect on the domestic economy than under a rigid peg. The lack of credibility of a stated exchange-rate target, therefore, tends to strengthen the transmission of a foreign disturbance. A recession abroad, for example, which affects domestic output negatively via reduced exports, in this case also creates the expectation of a devaluation of the domestic currency which in turn raises domestic interest rates above foreign rates and reduces output further.

The probability of an exchange-rate adjustment is likely to reflect historical policy reactions. Thus, q tends to be relatively

high for countries where authorities in the past have devalued the currency when capacity utilisation fell or reached a critical value, as compared to countries which have not done so.[4]

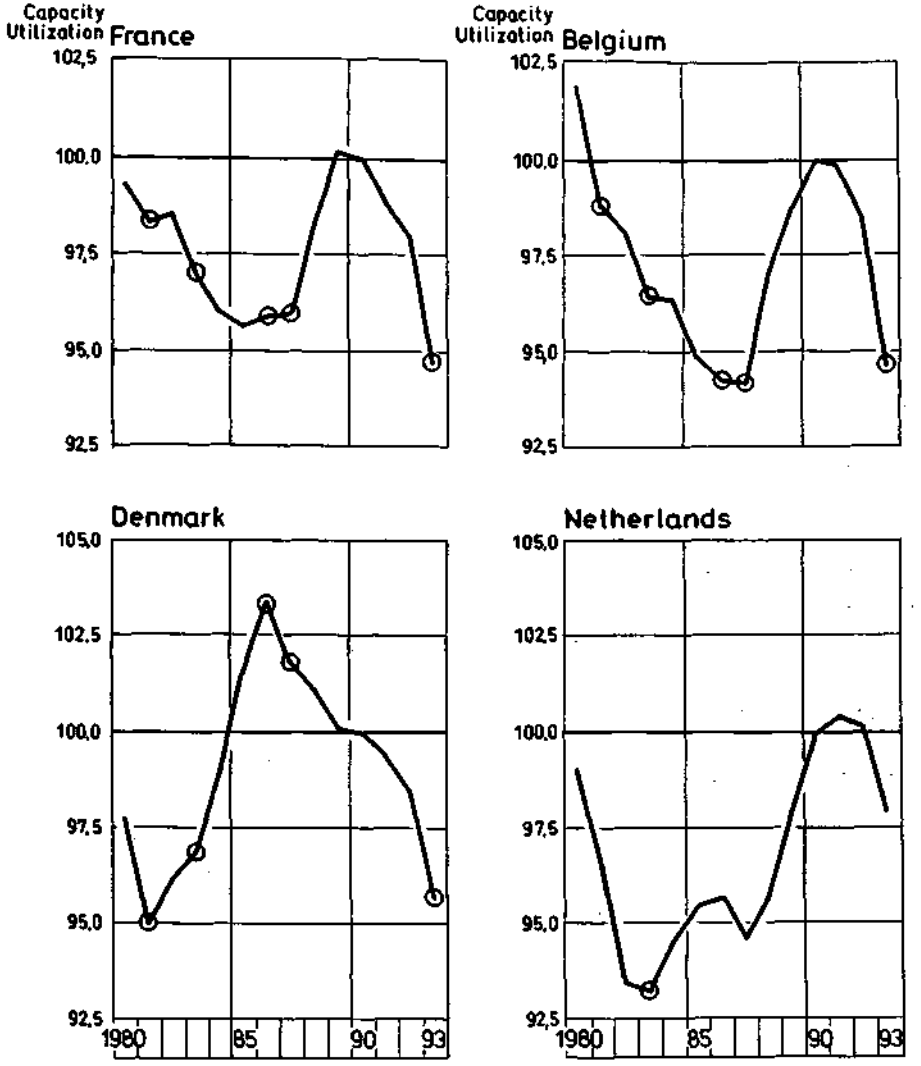
V. Capacity Utilisation and Exchange-Rate Adjustment in Core EMS-Countries

Figure 1 gives an empirical illustration of the link between capacity utilisation and exchange-rate adjustments in core EMS-countries outside of Germany.[5] As can be seen, each of the countries devalued its currency vis-a-vis the D-Mark when the capacity utilisation rate reached a particularly low level. Belgium and France also devalued their currencies twice (in 1981 and 1983) when capacity utilisation was falling markedly. Denmark shows a different cyclical pattern than the other three countries and devalued its currency along with Belgium and France even in peak years such as 1986/87. Thus, the historical record for the listed countries could be sketched as follows: the Netherlands only devalue when capacity utilisation reaches a very low level; Belgium and France devalue when capacity utilisation is on a very low level or falls markedly; Denmark devalues when capacity utilisation reaches a very low level or when other core countries devalue.

This historical experience may help to explain why Belgium, Denmark and France decided to abandon the close peg to the D-Mark in summer 1993, while the Netherlands did not. During the tranquil period between 1987 and 1992, none of the mentioned criteria for the respective countries signaled a depreciation. This changed in 1992 and particularly in 1993 when capacity utilisation dropped substantially in France and Belgium (traditionally a potential signal for a devaluation which Denmark would then join) and when capacity utilisation in all these three countries approached the trough of the eighties (another potential signal for a devaluation). In contrast, capacity utilisation in the Netherlands in 1993 was still substantially above the level that had been observed in connection with the previous realignment, so that there

Figure 1

Capacity Utilisation and Exchange-Rate Adjustments for Selected EMS-Countries 1980-93[a]



[a] A circle denotes realignments or a widening of the exchange-rate band vis-a-vis the D-Mark.

Source: OECD, own calculations

was no signal for a devaluation. Thus, the speculative attack against the Belgian franc, the French franc and the Danish crown can be explained by the historical links between capacity utilisation and exchange-rate adjustment and their effect on the expectation of market participants.

Figure 1 also shows that the downturn of the Dutch economy in the period 1992-93 has been less pronounced than that of the other three countries. One plausible reason is the absence of capacity related speculative pressure. As the above model has shown, the effects of a common external shock, such as a rise in German interest rates or a German recession, should be more pronounced when capacity utilisation affects exchange-rate expectations. Thus, the decline of capacity utilisation in Belgium, Denmark and France was intensified by the emerging expectation of a depreciation which drove-up interest rates and reduced demand even more, in contrast to the Netherlands where interest rates stayed close to the German level.

VI. Policy Conclusions

Currently, there is a debate about the appropriate time for a return to narrow bands in the EMS. The preceding analysis has two implications for this discussion. First, it has been shown that the EMS is particularly vulnerable to speculative exchange-rate pressure when capacity utilisation is low. Thus, a return to narrow bands should not occur before a substantial improvement in capacity utilisation has taken place. Second, the analysis has demonstrated that an adjustable peg system is more vulnerable to exogenous demand shocks than a regime of rigidly pegged or floating exchange rates. Thus, the question arises: Why return to an adjustable peg system with narrow bands at all?

One argument says that exchange-rate flexibility among EC-currencies should be retained but changes of rates ought to require the consent of other EC-countries in order to prevent a competitive depreciation. This is the classical argument for an adjustable-

peg system. Experience in recent decades, however, has shown that competitive depreciation did not pose an actual policy problem. In fact, EMS countries that moved to floating rates or wider exchange-rate bands have tried to dampen rather than to enforce depreciation of their currencies vis-a-vis the D-Mark. Moreover, even if competitive depreciations were a problem, the EMS could not prevent them since it is possible for a country to leave the exchange-rate mechanism without facing sanctions.

A second argument says that the return to narrow bands is a precondition for the transition to irrevocably fixed rates in the context of the European Monetary Union (EMU). The Maastricht treaty, however, does not mention participation in a narrow band exchange-rate mechanism as a criterion for membership in the EMU. What it says is that countries should have kept their currency in the normal exchange-rate band which, however, has in the meantime been widened to 30 percent. Thus, the decisions of summer 1993 have de facto abolished the exchange-rate criterion for a transition to EMU. As our analysis in part II shows, this criterion is questionable anyhow, since the appropriate exchange rate for joining a monetary union may differ from the exchange rate which was maintained previously under an adjustable peg.

Appendix

If goods demand depends on real interest rates rather than nominal interest rates, equation (1) in the text changes to

(A1) $y_t = - a (r_t - (\tilde{p}_{t+1} - p_t)) + b (e_t + p^*_t - p_t) + c\, y^*_t + g_t$.

With sluggish adjustment of prices and rational expectations, the expected increase in prices is equal to the actual price increase:

(A2) $\tilde{p}_{t+1} - p_t = p_{t+1} - p_t = h (y_t - \bar{y}_t)$.

Substituting equations (A2) and (4) into (A1) and setting $\bar{y}_t$, g_t, y^*_t, p^*_t, r^*_t and $j (s_t - \bar{s}_t)$ equal to zero, goods market equilibrium is given by

(A3) $y_t = - u (\tilde{e}_{t+1} - e_t) + w (e_t - p_t)$,

with $u = a/(1 - a\,h)$ and $w = b/(1 - a\,h)$.

Assuming that $1 - a\,h > 0$, a rise in $\tilde{e}_{t+1}$ will lead to an initial fall in output as is the case when demand for goods depends on nominal interest rates. The initial rise in the real interest rate is larger than the rise in the nominal interest rate because the drop in output causes an expectation of a falling price level. Over time, the decline in prices and the resulting real depreciation will move output back to its initial level.

Footnotes

[1] In the appendix we show that the results which are derived in this part of the paper also hold, if demand for goods depends on the real interest rate rather than the nominal interest rate.

[2] It is worth noting that during the transition period inflation in the country which faces depreciation pressure is lower than abroad - a phenomenon which could be observed recently for several EMS countries whose currencies were under pressure vis-a-vis the D-Mark although their inflation rates were below the German level.

[3] This limitation is confirmed by the recent experience in the EMS. Obviously, authorities are reluctant to fight speculative attacks on their currencies by taking large net-debtor positions in foreign currency. One reason is that such a position may make a future depreciaton prohibitively costly [Sohmen 1969], and hence imply the irrevocable loss of the country's monetary autonomy. For the remaining part of this paper we shall assume that $j = 0$, so that aspects of portfolio composition can be neglected.

[4] It is also possible that the probability of an appreciation in case of excess capacity utilisation is not the same as the probability of a depreciation in case of underutilised capacity. Moreover, the probability may also depend on the expected durability of the shocks: the probability of an exchange-rate change is likely to be lower when the shocks are expected to be short-lived. Thus, the expectation that, say, foreign interest rates will fall tends to reduce the probability that the domestic country will resort to a depreciation to remove an existing output gap. On the other hand, a cut in foreign interest rates which falls short of an expected change may increase the probability of a depreciation and raise the domestic interest rate. This could push capacity utilisation below a critical level, with the result that the currency is devalued.

[5] Capacity utilisation is set equal to 100 in 1990. Growth of potential output is calculated as the average growth rate in the period 1980 - 1990.

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