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# ***The Vulnerability of Pegged Exchange Rates: The British Pound in the ERM***

**B**ETWEEN SEPTEMBER 1992 and August 1993, the European Monetary System (EMS) went through the most serious crisis since its start in 1979. Member countries cross-pegging their exchange rates in the framework of the Exchange Rate Mechanism (ERM) were confronted with a string of speculative currency attacks. Associated with these attacks were five realignments and the suspension of two major currencies—the Italian lira and the British pound—from the ERM. The situation eased off only when the fluctuation margins were widened considerably in August 1993.

There are two reasons to review these events. First, there had been no genuine realignment in the EMS for more than five years. The EMS had widely come to be seen as a model for a viable pegged exchange rate system. Second, most of the recent cases of speculative currency attacks occurred in developing countries, where access to foreign exchange reserves is rather limited and capital controls usually play an important role in maintaining pegged exchange rates.<sup>1</sup> Hence, the near-collapse of the ERM provides a useful example of a speculative attack under

conditions of easy access to foreign exchange reserves and free capital mobility.

This article concentrates on the British episode in the EMS crisis. Since the United Kingdom's participation in the ERM was suspended in September 1992, only the early phase of the crisis is covered. First, I describe a brief history of the pound in the EMS. Next, I have selected macroeconomic indicators on the eve of the crisis to provide a picture of the economic situation and the credibility of the exchange rate band as perceived by the markets. Then, I discuss the main features of the speculative attack on the pound against the background of the basic model of balance-of-payments crisis. To this end, I introduce the model originated by Krugman (1979), along with extensions motivated by the British situation.

## **BRITAIN'S PARTICIPATION in the ERM<sup>2</sup>**

When the EMS started operating on March 8, 1979, Britain did not participate in the central

<sup>1</sup>See Edwards (1989) for a detailed analysis of devaluations in developing countries.

<sup>2</sup>There is a vast literature on the EMS. Ungerer, et al. (1983, 1986, 1990) provide accessible reviews of EMS developments. Also see Fratianni and von Hagen (1992), Giavazzi and Giovannini (1989), and Gros and Thygesen (1992) for more advanced discussions.

piece of the new system, the ERM.<sup>3</sup> In the view of British monetary authorities, the loss of room for maneuvering under a system of pegged exchange rates outweighed probable gains. Many observers did not give the ERM much credit either. Some predicted an inflationary bias, while others expected the system to be drawn apart soon by the widely differing inflation rates among participating countries. In the event, the ERM performed surprisingly well. Inflation rates decreased substantially (albeit not more than in non-ERM countries), and the variability of nominal and real effective exchange rates fell a great deal.

Certainly, many realignments were required for the ERM to survive during its early years. The 17 realignments witnessed in the period 1979-93 are summarized in Table 1.<sup>4</sup> Two features stand out. First, the deutsche mark never was devalued against other ERM currencies. Second, realignments became less frequent until 1992, reflecting the decline in intra-ERM inflation rate differentials.<sup>5</sup>

Capital controls also played a role in the survival of the ERM. They had intensified in the final years of the Bretton Woods System and many European countries continued to use them after that. It was not until 1988 that an EC directive stipulated the complete liberalization of capital movements. For most member countries, this was accomplished by mid-1990 (extensions were granted for Greece, Ireland, Portugal and Spain).

Britain chose a different way. Rather than participate in the ERM when it began in 1979, Britain decided to pursue a deliberately tight monetary policy based on a free float and

growth targets for monetary aggregates. Capital controls were removed rapidly and fiscal policy was oriented toward balancing the budget.<sup>6</sup> This strategy resulted in a large reduction of inflation (from 18 percent in 1980 to less than 5 percent in 1983), albeit at the price of substantial output losses. A complicating factor was the increasingly unstable relationship between the targeted monetary aggregate (sterling M3) and nominal income.<sup>7</sup> This made sterling M3 a questionable indicator, which risked a reduction in the credibility of monetary policy. In response, monetary authorities tried several alternatives. First, several aggregates were targeted simultaneously. Then, the emphasis shifted to narrow monetary aggregates. Finally, in 1987-88, the free float was replaced by a managed exchange rate shadowing the deutsche mark.

In retrospect, the mark exchange rate targeting of 1987-88 was an ill-fated attempt at finding a stable nominal anchor. Initially, monetary policy loosened due to the determination of the government to stick with the unofficial target exchange rate of 3 marks per pound. As a result, the economy overheated and forced monetary authorities to tighten the policy stance and to let the pound appreciate.<sup>8</sup>

Despite this troubled experience with an exchange-rate oriented policy, ERM membership remained an option favored by the chancellor of the exchequer, Nigel Lawson, and supported by leading businesspeople. In June 1989, at the EC summit in Madrid, the government set the terms for Britain's entry to the ERM. These terms were: British inflation close to the EC average; real progress towards completion of

<sup>3</sup>The EMS includes all members of the European Community (EC). The ERM originally included only Belgium-Luxembourg, Denmark, Germany, France, Ireland, Italy and the Netherlands. Portugal, Spain and the United Kingdom joined in April 1992, January 1990, and October 1990, respectively. Italy and the United Kingdom suspended their participation in the ERM in September 1992. Greece has never participated in the ERM.

<sup>4</sup>It may be argued that there were only 16 genuine realignments. On January 8, 1990, when the Italian lira switched from  $\pm 6$  percent to  $\pm 2.25$  percent fluctuation margins, the central rate was devalued relative to the current market rate. The new lower intervention margins were not below the old margins, however, except for the Spanish peseta exchange rate of the lira.

<sup>5</sup>Giavazzi and Giovannini, among many others, argue that the EMS became a greater deutsche mark area by 1983; Germany is the center country, and countries such as Italy and France peg their currencies to the mark. See Fratianni and von Hagen for qualifications of this view.

<sup>6</sup>A chronological account of British economic policy is provided by the annual surveys on the United Kingdom published by the Organization for Economic Cooperation and Development (OECD).

<sup>7</sup>Sterling M3 is M3 less residents' deposits abroad.

<sup>8</sup>See Belongia and Chrystal (1990) for a critical discussion of this episode.

Table 1

**EMS Realignment: Percentage Changes in Bilateral Central Rates<sup>1</sup>**

Date	BLF	DKR	DM	PTA	FF	IRL	LIT	HFL	ESC	UKL
September 24, 1979		-2.9	2.0	*					*	*
November 30, 1979		-4.8		*					*	*
March 23, 1981				*			-6.0		*	*
October 5, 1981			5.5	*	-3.0		-3.0	5.5	*	*
February 22, 1982	-8.5	-3.0		*					*	*
June 14, 1982			4.25	*	-5.75		-2.75	4.25	*	*
March 21, 1983	1.5	2.5	5.5	*	-2.5	-3.5	-2.5	3.5	*	*
July 22, 1985	2.0	2.0	2.0	*	2.0	2.0	-6.0	2.0	*	*
April 7, 1986	1.0	1.0	3.0	*	-3.0			3.0	*	*
August 4, 1986				*		-8.0			*	*
January 12, 1987	2.0		3.0	*				3.0	*	*
January 8, 1990							-3.7			*
September 14, 1992							-7.0			*
September 17, 1992				-5.0			*			*
November 23, 1992				-6.0			*		-6.0	*
February 1, 1993						-10.0	*		*	*
May 13, 1993				-8.0			*		-8.0	*

<sup>1</sup>Calculated as the percentage change against the group of currencies whose bilateral parities remained unchanged in the realignment, except for the two realignments in which all currencies were realigned. Notation: BLF = Belgian franc; DKR = Danish krone; DM = Deutsche mark; PTA = Spanish peseta; FF = French franc; IRL = Irish pound; LIT = Italian lira; HFL = Netherlands guilder; ESC = Portuguese escudos; UKL = British pound. Star (\*) indicates that the currency was not in the ERM at this date.

SOURCES: Ungerer, et. al. (1990) and Commission of the European Communities.

the single European market; financial-market liberalization; end of exchange controls; and strengthened competition policy in the EC.<sup>9</sup> When Britain actually joined the ERM 15 months later, all conditions except inflation convergence were virtually met.<sup>10</sup>

### **Britain Enters the ERM**

Britain entered the ERM on October 8, 1990, with fluctuation margins of  $\pm 6$  percent around bilateral central rates, instead of the usual  $\pm 2.25$  percent.<sup>11</sup> As with Italy and Spain before, and Portugal later, the ERM allowed wider margins to provide the newcomer some flexibility to adjust. By joining the ERM, Britain committed itself

to keeping the exchange rate within these margins. Essentially, two instruments were available to this end: interest rate policies and direct interventions on the foreign exchange market.<sup>12</sup>

Consider a case where the pound approaches the lower margin of its deutsche mark band. The Bank of England can sell foreign currency or it may raise short-term interest rates to prevent the pound from depreciating further. To finance the intervention, it may either draw on its own reserves or borrow from other sources (international capital markets, central banks). In the ERM, access to foreign exchange reserves is facilitated by the Very Short-Term Financing Facility (VSTF). Under the VSTF, the Bank of

<sup>9</sup>See OECD(1989/1990), p. 40.

<sup>10</sup>There may have been short-term reasons to speed up Britain's entry in the second half of 1990. With the inter-governmental conference on monetary union scheduled for December 1990, Britain knew that it had to be part of the ERM if it wished to influence the path of monetary integration in the EC. Furthermore, a general election was approaching, and the government could expect ERM membership to provide some "honeymoon" effect by allowing pound interest rates to fall without jeopardizing the exchange rate.

<sup>11</sup>The effective margins were approximately  $-2.22$  percent and  $+2.28$  percent for the narrow (4.5 percent) bands, and  $-5.82$  percent and  $+6.18$  percent for the wide (12 percent) bands. Margins of about  $\pm 2.25$  percent and  $\pm 6$  percent would violate the condition that central bank A's compulsory buying rate for currency B must be the same as central bank B's compulsory selling rate for currency A.

<sup>12</sup>In Britain, changes in the policy stance are typically signaled by changes in short-term interest rates. See Batten et al. (1990) for a discussion of the operating procedures.

England is allowed to borrow marks from the Bundesbank virtually without limits. The Bundesbank is obliged to grant such credits upon request.<sup>13</sup>

After Britain joined the ERM, the pound moved most of the time comfortably in the  $\pm 6$  percent band around its central rate. After a temporary appreciation, the pound stayed for more than one year in an implicit narrower band in the neighborhood of  $\pm 2.25$  percent around central parity. Pressure on the pound usually was short-lived and quickly reversed by either a slight increase in domestic interest rates or modest interventions in the foreign exchange market. Interest rates were raised temporarily when Margaret Thatcher stepped down as prime minister in November 1990 and in the weeks before the general election of April 1992, when opinion polls pointed to a victory for the opposition Labour party. On the whole, however, interest rates (as well as inflation) decreased substantially during the period Britain participated in the ERM.

### ***Tensions in the ERM***

The tensions in the foreign exchange markets that finally led to the near-collapse of the ERM in September 1992 were triggered by doubts about the progress toward monetary union.<sup>14</sup> In June 1992, the Danes had voted no in a referendum on the Maastricht Treaty, which included a chapter on European Monetary Union (EMU). Moreover, the outcome of the French referendum on the treaty in September was expected to be close. Since the prospect of monetary union had provided an anchor for expectations, the outlook for the current parities in the ERM looked rather bleak if France rejected the treaty also. For reasons discussed below, pressure on the exchange rate became most

notable first in Italy, where the discount rate was raised over the summer of 1992 in several steps, from 12 percent to 15 percent. The pound felt some pressure too, and British monetary authorities began to step up interventions on the foreign exchange market in late August. On September 3, 1992, Britain announced a program to borrow ECU 10 billion, about \$14.3 billion (U.S.) at the time, in the international market to increase foreign exchange reserves.

Ultimately, the rise in domestic interest rates did not save the Italian lira. On September 13, the lira's central rate was devalued by 7 percent. Two days later, Germany slightly eased monetary policy. The discount rate was lowered by 50 basis points to 8.25 percent and the Lombard rate was lowered by 25 basis points to 9.5 percent. These adjustments—the first German interest rate cuts in nearly five years—were perceived as unexpectedly small by the markets, and comments attributed to the Bundesbank president, who appeared to question the adequacy of the pound's central rate (subsequently denied), raised tensions further.<sup>15</sup>

### ***Britain Withdraws from the ERM***

On September 16—Black Wednesday—the Bank of England intervened massively on the foreign exchange market to prevent the pound from falling below the lower margin of its Deutsche mark band. Furthermore, it raised the base lending rate from 10 to 12 percent and announced later in the day a further rise to 15 percent, to be effective the following morning. These measures did not succeed in relieving the pressure on the pound. In the evening, British monetary authorities announced the temporary suspension of the pound from the ERM. It seemed hardly feasible to fix a new parity less

<sup>13</sup>Even if access to the VSTF is said to be unlimited, this is not literally true. The Bundesbank has two reasons to make sure that the VSTF is not overburdened. First, it bears an exchange rate risk since the credits are denominated in European Currency Unit (ECU), a basket currency defined by fixed quantities of member currencies. So, if the pound depreciates relative to the mark, the Bundesbank will be repaid the value of depreciated ECU. Second, the selling of the mark during interventions raises Germany's monetary base and would jeopardize its inflation objective unless the Bundesbank is able to sterilize the intervention. Therefore, the Bundesbank insisted right from the start of the ERM on an opt-out clause. According to *Central Banking* (1992; Robert Pringle, ed.), this clause was confirmed in a letter to the German government by the then-president of the bank, Otmar Emminger.

<sup>14</sup>For a detailed account of the events prior to Britain's withdrawal from the ERM, see *Bank of England Quarterly Bulletin* (November 1992).

<sup>15</sup>See *Financial Times*, September 15, 1992, and September 16, 1992, respectively. As is now known, the Bundesbank actually did suggest a trade—with the size of German interest cuts depending on the size of the realignment—to the chairman of the EC Monetary Committee. Since the Italian lira finally was the only currency devalued on September 13, German interest rate cuts consequently were small; see *Financial Times*, December 11, 1992, for a detailed account.

than a week before the French referendum on the Maastricht Treaty. The next day, the base lending rate was moved back to 10 percent. At the same time, Italy announced the lira's temporary withdrawal from the ERM, while Spain devalued its currency by 5 percent and imposed temporary capital controls.

The floating of the pound marks the end of Britain's ERM episode. In the following weeks, when the markets did not calm down after the French had narrowly approved the Maastricht Treaty, it became clear that Britain and Italy would not rejoin quickly. The ERM struggled on for another 10 months. Then, on August 2, 1993, EC member states decided to raise the margins of the exchange rate bands to  $\pm 15$  percent around the central parities, an action coming close to a suspension of the system. The old margins continued to be valid only for the deutsche mark/Dutch guilder exchange rate.

In retrospect, the distinctive feature of Britain's defense of the pound was the almost complete lack of interest rate policies. Domestic interest rates were raised only on the final day of the crisis and the size of this rise was rather small. Most other weak-currency countries in the 1992-93 crisis of the EMS raised their short-term interest rates more aggressively.<sup>16</sup> As indicated above, however, this did not provide them durable relief from speculative attacks.

### **ECONOMIC INDICATORS PRIOR TO BRITAIN'S WITHDRAWAL FROM THE ERM**

When Britain participated in the ERM, British monetary authorities regularly emphasized their commitment to the established exchange rate parities. It is not enough to make such a pledge, however. The market has to be convinced that monetary authorities have no incentive to drop their commitment and that they will take whatever action is necessary to defend the pari-

ties. This, of course, turns out to be difficult. The market knows that pegging the exchange rate ultimately is a conditional commitment. Expectations are formed that monetary authorities will realign if the perceived cost of defending the exchange rate is larger than the perceived cost of a realignment. This section takes a look at selected macroeconomic indicators and asks whether the exchange rate target bands were perceived as credible by the markets.

### **General Economic Conditions**

Table 2 shows macroeconomic indicators on the eve of the crisis for all countries participating in the ERM (except Portugal, because of data limitations). The countries are ordered in terms of their relative size (measured by GDP). Indicators refer to August 1992 for monthly data and the second quarter of 1992 for quarterly data. Annual figures are OECD forecasts for 1992, published in June of the same year. The indicators can roughly be divided into three groups: monetary indicators (money supply growth, short-term interest rate, long-term interest rate); fiscal indicators (primary deficit/GDP ratio, debt/GDP ratio); and indicators describing final goals (output growth, inflation).<sup>17</sup>

These indicators shed some light on the divergent economic forces in the ERM. The most important single event hitting the EC during recent years has been German unification. Basic economic theory suggests that the German unification would lead to an increase in that country's aggregate demand and a real appreciation of the mark (where the real appreciation is equal to the nominal appreciation adjusted by the inflation rate differential against foreign countries). These effects were heightened by the decision to finance higher public spending by borrowing rather than by raising taxes.<sup>18</sup> Under pegged exchange rates, the real appreciation of the mark is brought about by a positive inflation differential between Germany and the other ERM member countries. Since the Bundesbank was

<sup>16</sup>See Goldstein et al. (1993), Annex VI and the statistical appendix in particular.

<sup>17</sup>Four out of the seven indicators closely correspond to the macroeconomic convergence criteria for EMU mentioned in the Maastricht Treaty. These criteria are: (1) the inflation rate of the country under review must not exceed the average of the three EC countries with the lowest inflation rate by more than 1.5 percent; (2) the interest rate on long-term government securities must not be more than 2 percentage points higher than the average rate of the same three countries; (3) the budget deficit must not exceed 3 percent

of GDP; and (4) the public debt/GDP ratio must not exceed 60 percent. Note, however, that table 2 uses the primary deficit (i.e. the budget deficit net of interest payments) to indicate whether the evolution of the fiscal indicators goes in the direction required by the EMU criteria.

<sup>18</sup>These are short-run effects. In the long run, an expansionary fiscal policy that permanently raises the debt/GDP ratio will cause the real exchange rate to fall, since the country must export more to offset the effects of the decline in its net external asset position.



**Table 2**  
**Macroeconomic Indicators on the Eve of the September 1992 Crisis**  
**(in percent)**

Countries	GDP shares <sup>1</sup>	Money growth <sup>2</sup>	Short-term interest rates <sup>3</sup>	Long-term interest rates <sup>4</sup>	General government primary balance/GDP <sup>5</sup>	Gross government debt/GDP <sup>5</sup>	Consumer price inflation <sup>6</sup>	GDP growth <sup>5</sup>
Germany	25.7	7.1	9.7	8.4	-1.3 <sup>7</sup>	43.5 <sup>7</sup>	3.5	1.3
France	19.5	-1.6	10.0	9.0	0.3	48.5	2.0	2.0
Italy	18.8	10.9	15.3	12.5	-0.9	107.8	5.0	1.5
United Kingdom	16.6	4.5	9.6	9.1	-2.9	38.5	3.6	0.4
Spain	8.6	11.0	13.0	12.7	-1.6	48.0	5.8	2.6
Netherlands	4.7	3.6	9.8	8.3	1.5	79.9	3.5	1.2
Belgium	3.3	N.A.	9.8	9.1	4.2	132.9	2.1	1.6
Denmark	2.1	10.9	11.5	10.4	1.1	61.6	2.2	2.1
Ireland	0.7	-5.6	10.6	9.1	5.1 <sup>7</sup>	108.8 <sup>7</sup>	3.7	2.4 <sup>7</sup>
All countries <sup>8</sup>	100.0	—	11.1	9.8	-0.8	61.6	3.6	1.5

<sup>1</sup>1991; International Financial Statistics (*IFS*), line 99 (b, b.c)

<sup>2</sup>Second quarter 1992; percentage changes from the same period a year earlier; *IFS*, line 34

<sup>3</sup>August 1992; *IFS*, line 60b

<sup>4</sup>August 1992; *IFS*, line 61 (except *IFS* line 61b for Italy)

<sup>5</sup>Projections for 1992; *OECD Economic Outlook* (June 1992)

<sup>6</sup>August 1992; percentage changes from the same period a year earlier; *IFS*, line 64

<sup>7</sup>GNP

<sup>8</sup>Average weighted by GDP shares

determined to keep inflation low and to let short-term interest rates rise, the required real appreciation of the mark could come only by a substantial reduction in inflation in the other countries.

So, Germany's economic policy on the eve of Britain's crisis was characterized by a slightly loose fiscal policy (reflected in the primary deficit) and a tight monetary policy (at least as reflected in short-term interest rates of nearly 10 percent, substantially higher than the inflation rates). Despite slow output growth in Germany, the chances of German interest rate cuts seemed bleak. The growth of the German money supply still was above the target range and the inflation rate—running at 3.5 percent and accelerating—was considered too high.

What were the specific problems of Britain, Italy and Spain, the three large EC countries forced to adjust their currencies in September 1992? Table 2 indicates that a deficit in the primary balance was expected for Britain and Italy. This was much more troublesome for Italy, since Britain's debt/GDP ratio was low, while Italy actually had to realize substantial surpluses

to reduce its large debt/GDP ratio in view of EMU. Britain was in an even better position with regard to inflation. Italy and Spain clearly had an inflation problem reflected in both inflation rates and long-term interest rates. Despite some success in bringing inflation rates down from double-digit levels, there was still a substantial gap compared with the other ERM countries.

Britain, on the other hand, had inflation and long-term interest rates below the average of the ERM countries. Britain's main problem was relatively slow growth. The OECD's forecasts for GDP growth in 1992 had Britain at the bottom of the EC countries. Starting in 1990, the British recession had been particularly stubborn, and hopes for an economic recovery had been disappointed repeatedly. As a result, it was difficult not only to accept the current interest rate level imposed by Germany, but also to convince the market that domestic interest rates would be raised even further should the pound come under pressure.

No attempt is made in table 2 to weigh the various indicators to calculate an overall weighted-average indicator for each country.

A review of EMS realignments since 1979, however, indicates that the chief cause for a devaluation was probably a persistent inflation differential, leading to an overvaluation of the currency. Such an overvaluation often was built up over an extended period of time. Therefore, a better indicator than an annual performance measure is the cumulated rate of change of the real exchange rate over the period starting with the date when the current parities were established.

### **Movements in the Real Exchange Rates**

Figure 1 shows the real mark/pound exchange rate when Britain participated in the ERM. Nominal exchange rates, the margins of the exchange rate band, and cost or price differentials are given for convenience. There are various ways to calculate real exchange rates. Here, two indexes were calculated. The first is based on unit labor cost, and the second on consumer prices.<sup>19</sup> Note that unit labor cost data are quarterly (ending in the second quarter of 1992), while consumer price data are monthly (ending in August 1992). Hence, the top graph of figure 1 (quarterly data) does not have the pound falling to the lower margin at the very end of the period. Both indexes show that cumulated inflation differentials were very small on the eve of the collapse (0.05 percent for consumer prices and 1.4 percent for unit labor cost). Since the nominal exchange rate of the pound depreciated inside the band, both measures of the real exchange rate indicate that the mark price of the pound was lower in real terms compared to its entry level.

Figures 2-4 repeat this exercise for France, Italy and Spain, the three other, major, non-German countries participating in the ERM. Only the real exchange rates based on consumer prices are shown. The starting dates differ according to the preceding realignment (January

1987 for both the French franc and the Italian lira) or the entry to the ERM (January 1990 for Spain).<sup>20</sup> The figures exhibit substantial real appreciation for both the Italian lira and (to a lesser extent) the Spanish peseta. The franc, while appreciating in real terms during the first few years, largely retraced its rise by 1990 thanks to low inflation.

Overall, the evolution of the real exchange rate does not point to the pound (or the franc) as a candidate for a devaluation.<sup>21</sup> There was nothing like the usual pattern of an increasing overvaluation due to a persistent inflation rate differential. Still, there was the discrepancy between the cyclical needs of the British economy and the high interest rates imposed on the ERM by Germany. The next section examines the perception of the exchange rate band's credibility before the speculative currency attacks actually forced the withdrawal of the pound (and the lira) from the ERM.

### **Perceptions of Britain's Credibility in the ERM**

A simple way to assess an exchange rate band's credibility is based on uncovered interest rate parity.<sup>22</sup> Uncovered interest rate parity states that under perfect international capital mobility and risk-neutral speculation, the differential between nominal domestic and foreign interest rates is equal to the anticipated rate of depreciation of the domestic currency. So, given the current exchange rate and domestic and foreign interest rates for various maturities, the expected exchange rate for these maturities can be calculated. Then, the band is said to be credible if the expected exchange rate is within the margins of the band.<sup>23</sup>

Figure 5 shows the results for the mark/pound exchange rate when Britain participated in the ERM. The time horizons are three months, 12

<sup>19</sup>Consumer prices excluding mortgage rates are used for Britain in this calculation, but not in table 2. The former measure is widely seen as a better indicator of core inflation. If a tight monetary policy raises interest rates, including mortgage rates, the overall price index may actually show an acceleration of inflation, while the brakes on inflation are already in place. Britain's inflation would be lower (and the real depreciation of the pound even more pronounced) if the overall consumer price index were taken, since interest rates were falling during much of the period under review.

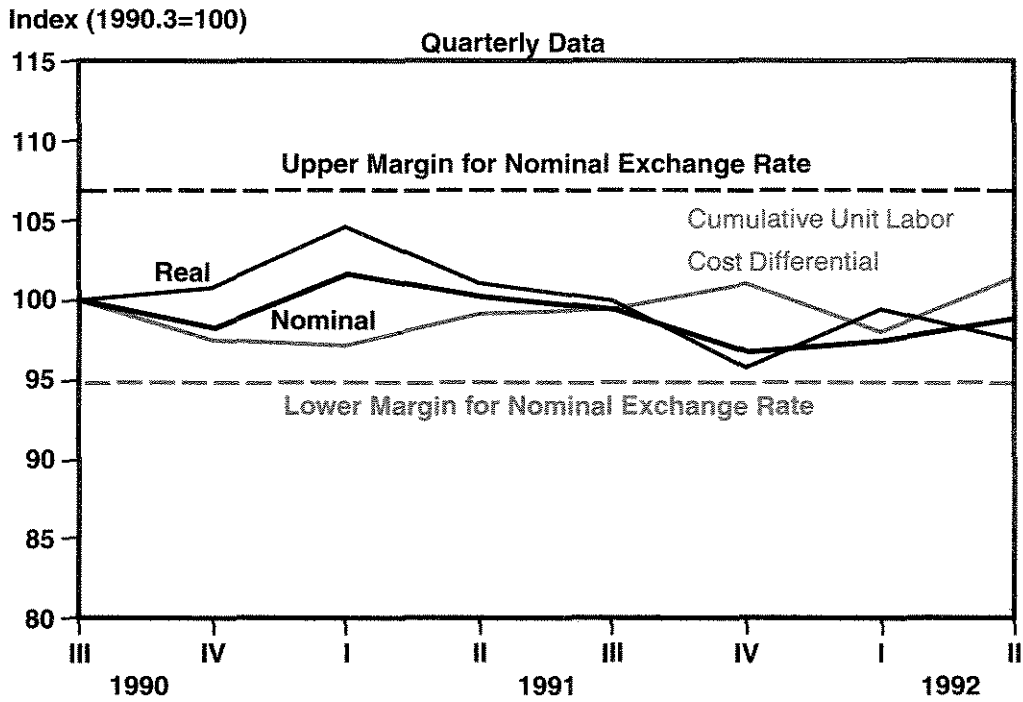
<sup>20</sup>Again, the realignment of January 8, 1990, caused by the switch of the Italian lira to a narrow band is ignored. See footnote 4 for explanations.

<sup>21</sup>There may have been real factors leading to a lower real mark/pound equilibrium rate, however. Also, the central parity may have been too ambitious from the beginning. Note that the real Deutsche mark/pound exchange rate was lower in October 1990 than during most of the 1980s.

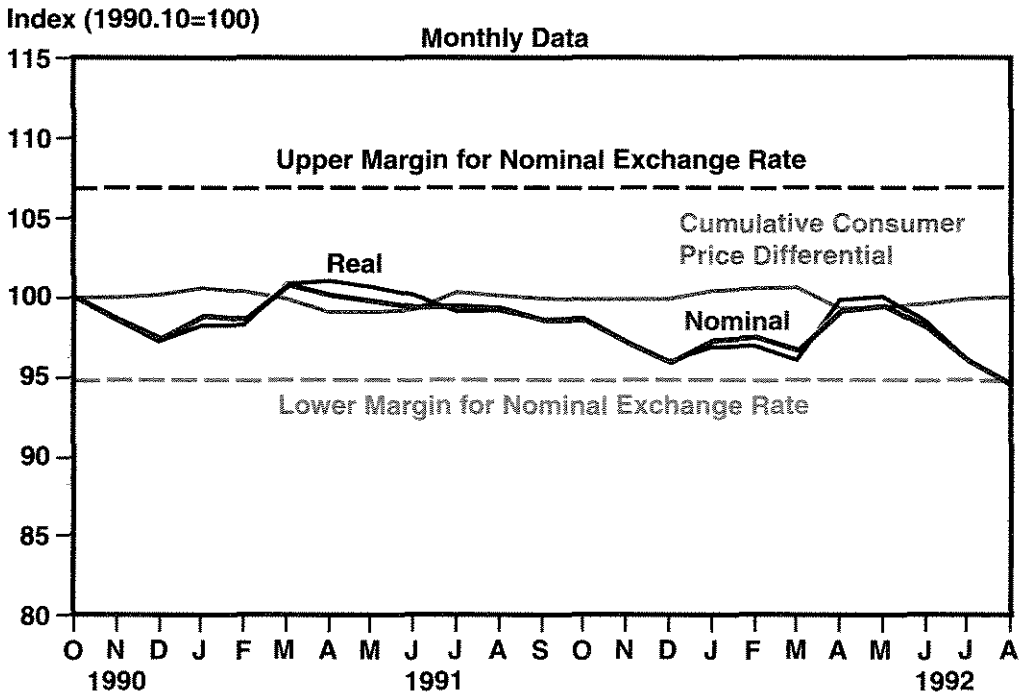
<sup>22</sup>This test was originated by Svensson (1991).

<sup>23</sup>If the assumption of risk-neutrality is dropped, a term for risk premia must be included in the interest rate parity condition. Svensson (1992) showed that these premia are very small for narrow exchange rate bands.

**Figure 1**  
**Nominal and Real DM/Pound Exchange Rates**

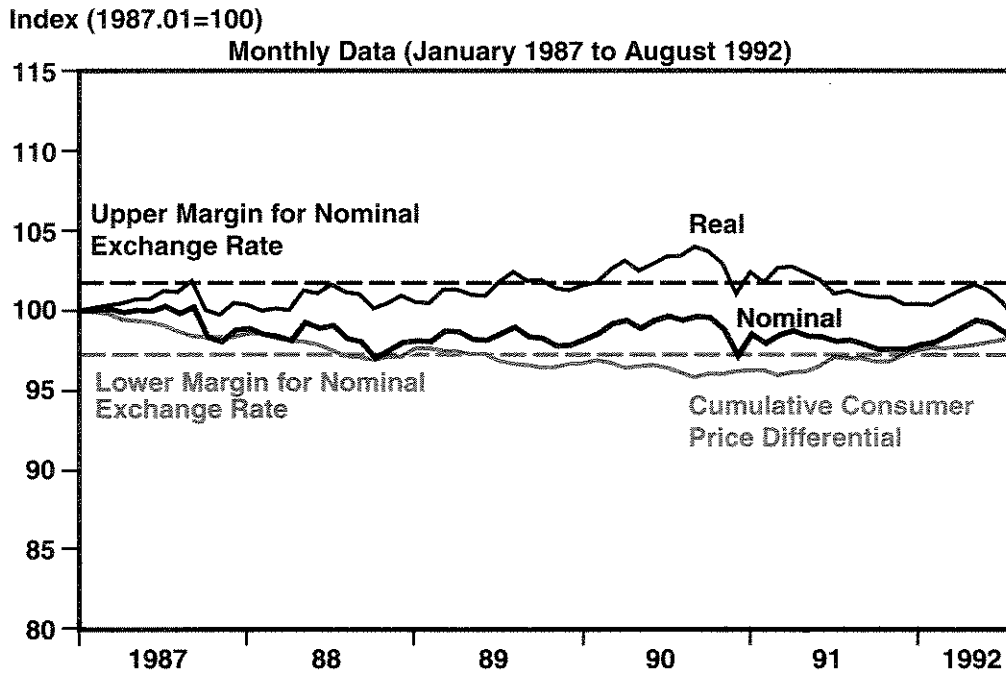


**Nominal and Real DM/Pound Exchange Rates**

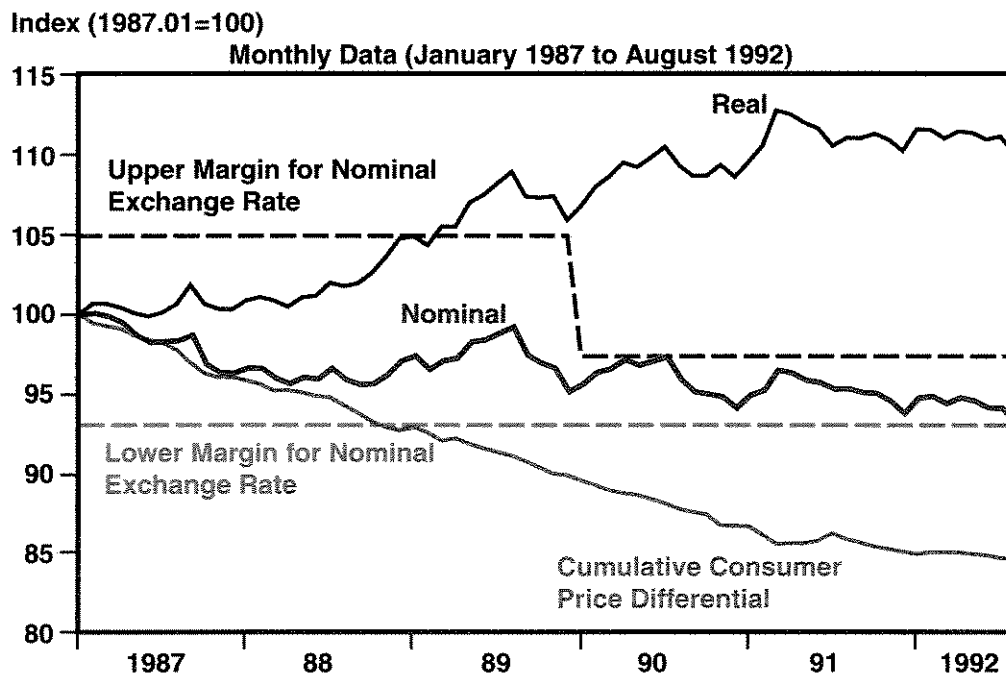




**Figure 2**  
**Nominal and Real DM/French Franc Exchange Rates**

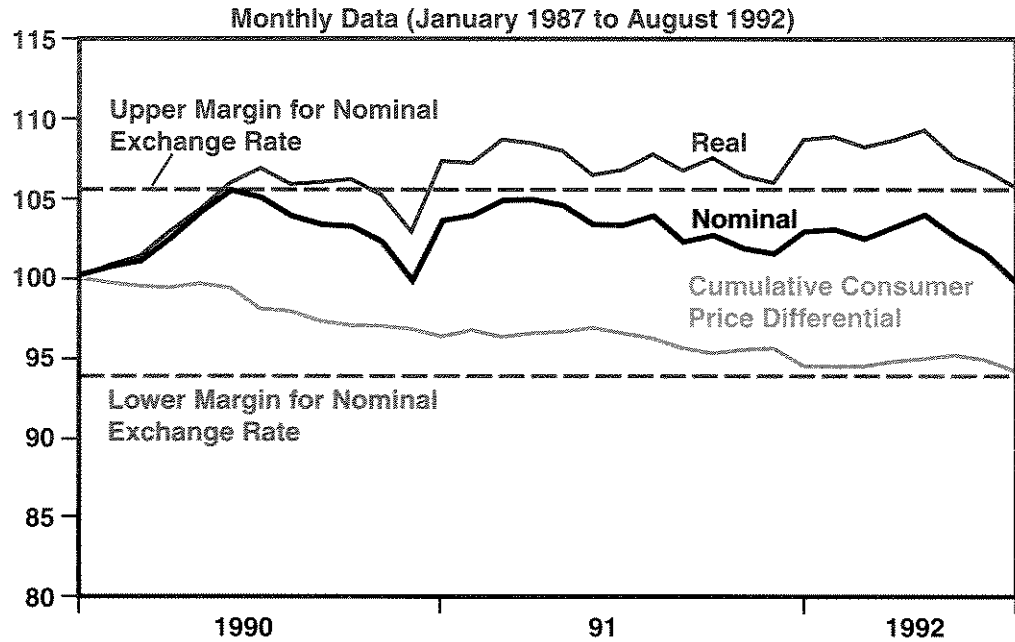


**Figure 3**  
**Nominal and Real DM/Italian Lira Exchange Rates**



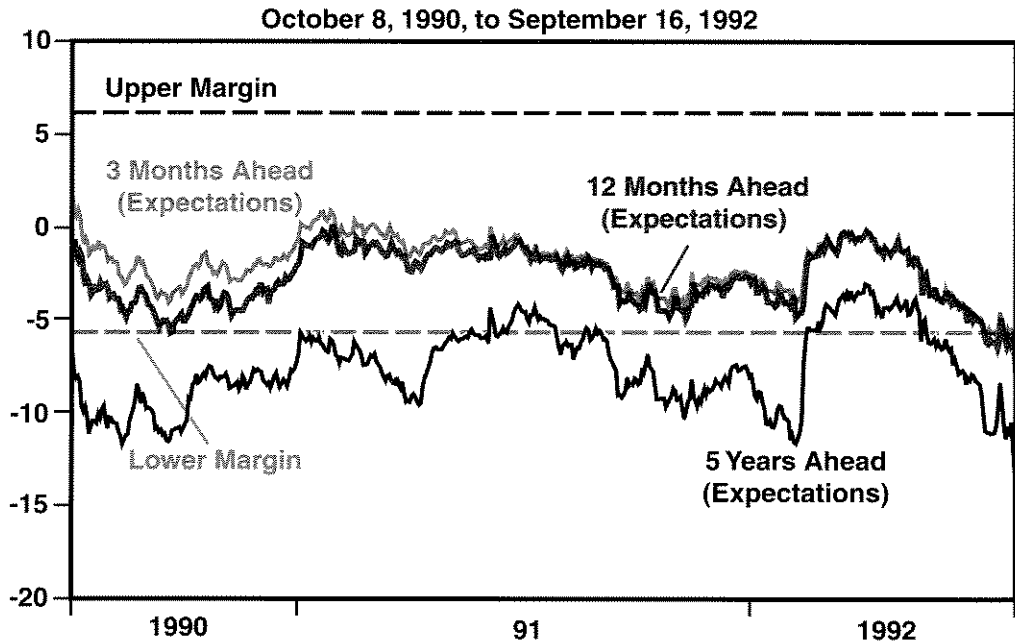
**Figure 4**  
**Nominal and Real DM/Spanish Peseta Exchange Rates**

Index (1990.01=100)



**Figure 5**  
**DM/ Pound Exchange Rate (as Deviation from Central Rate)**

Percent



months and five years, based on interest rate differentials. Interest rates for three and 12 months are Euromarket rates, guaranteeing that the deposits are comparable in every respect except currency denomination. The interest rates for five years are based on government bond yields, since no Euromarket rates are readily available for maturities of more than 12 months. The data are daily.

The results indicate that the expected exchange rate always moved within the margins of the band for maturities up to 12 months until mid-August 1992. For maturities of five years, however, the expected exchange rate most of the time was outside the margins. The latter result implies that there were some lingering doubts about the long-term credibility of the mark/pound exchange rate band. Nevertheless, a crisis was not perceived as particularly likely. Doubts about the short- or medium-term credibility of the band arose only immediately before the parity actually was attacked.

Using monthly data for 12 months, the same exercise was applied to the franc, the lira and the peseta during the periods these currencies were participating in the ERM. The results, summarized in figures 6-8, show that the credibility of the band derived for the pound cannot be generalized to apply to other EMS countries throughout the period of their participation. The expected future exchange rates of both the franc and the lira mostly were outside the margins of the bands during 1979-89. Since 1989, the expected future exchange rates of ERM currencies usually were within the margins.<sup>24</sup>

Rose and Svensson (1991) proposed a slightly more elaborate technique to assess the credibility of exchange rate bands.<sup>25</sup> They split the total rate of depreciation implied by the interest rate differential into the expected rate of depreciation within the band and the expected rate of realignment. The expected rate of depreciation

within the band (conditional upon no realignment) is estimated under the assumption of rational expectations using realized exchange rate data. The result is deducted from the interest rate differential to get the expected rate of realignment.<sup>26</sup> Rose (1993) recently used this method to calculate expected realignment rates for the mark/pound exchange rate. He shows that expectations of a pound realignment were low throughout most of 1992. The pound's credibility was not in reasonable doubt until mid-August 1992, at the earliest.

Overall, the credibility measures indicate that the successful speculative attack on the pound was not anticipated well in advance. The divergent economic forces stemming from German unification—well known for quite some time—did not result in a prompt decline in the exchange rate band's credibility. Signs of an approaching crisis were strikingly rare. To gain a broader picture of the timing and the dynamics of the speculative attack, the next section considers the basic model of a balance-of-payments crisis.

## THE ECONOMIC ANALYSIS OF A SPECULATIVE ATTACK

To clarify Britain's problem in the ERM, an outline of the basic model of speculative currency attacks that has dominated the recent literature follows. Also reviewed are some extensions motivated by the preceding discussion of the British episode. These extensions include the roles of interest rate pegging, borrowing and capital controls.<sup>27</sup>

### *Some Theoretical Considerations*

Consider a situation of a currency whose value is pegged to a foreign currency. The foreign interest rate is assumed to be constant. There is no commercial banking sector, and the supply of money is equal to the total of both

<sup>24</sup>See Frankel and Phillips (1991) for an investigation of credibility in the EMS using survey data on expected exchange rates in addition to interest rate differentials.

<sup>25</sup>See Svensson (1993) for an application on EMS data.

<sup>26</sup>It is assumed that the position of the exchange rate inside the band is the same before and after the realignment. While this makes it possible to interpret the result as the expected rate of realignment, it is somewhat at odds with the facts. After most realignments, the exchange rate jumped toward the upper margin of the band.

<sup>27</sup>The literature on speculative currency attacks starts with Krugman (1979) and Flood and Garber (1984b). Flood and Garber (1984a) and Obstfeld (1986) analyzed self-fulfilling attacks and multiple equilibria. Agenor et al. (1992) and Blackburn and Sola (1993) provide selective reviews of the fast-growing literature. For an excellent non-technical description, see Goldstein et al. (1993), Annex V.

Figure 6  
DM/ French Franc Exchange Rate, 12 Months  
Expectations (as Deviation from Central Rate)

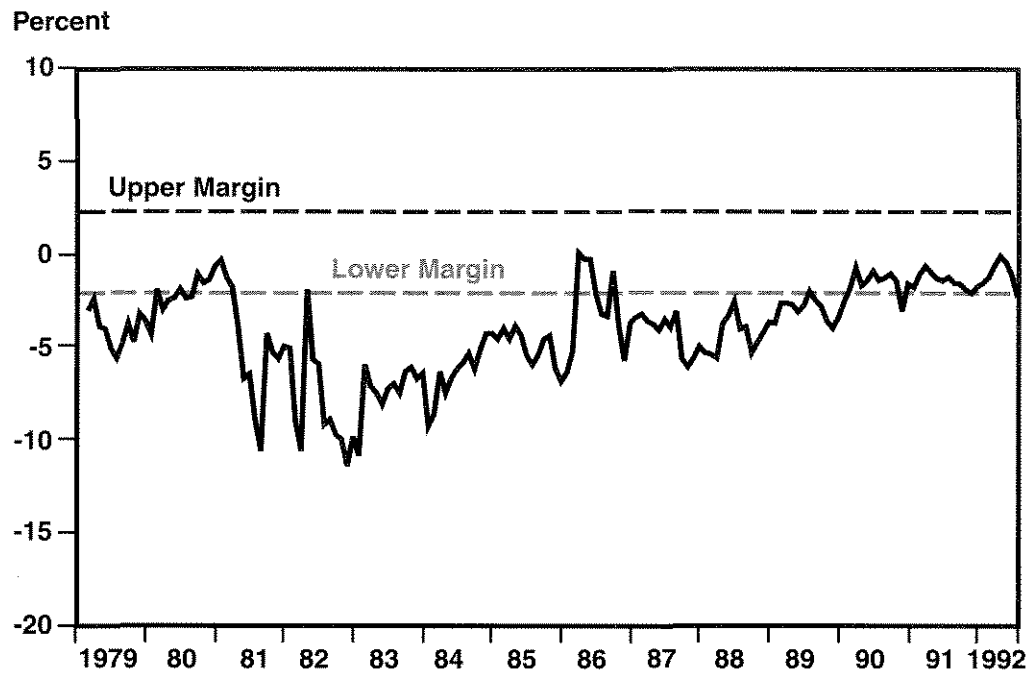


Figure 7  
DM/ Italian Lira Exchange Rate, 12 Months Expectations  
(as Deviation from Central Rate)

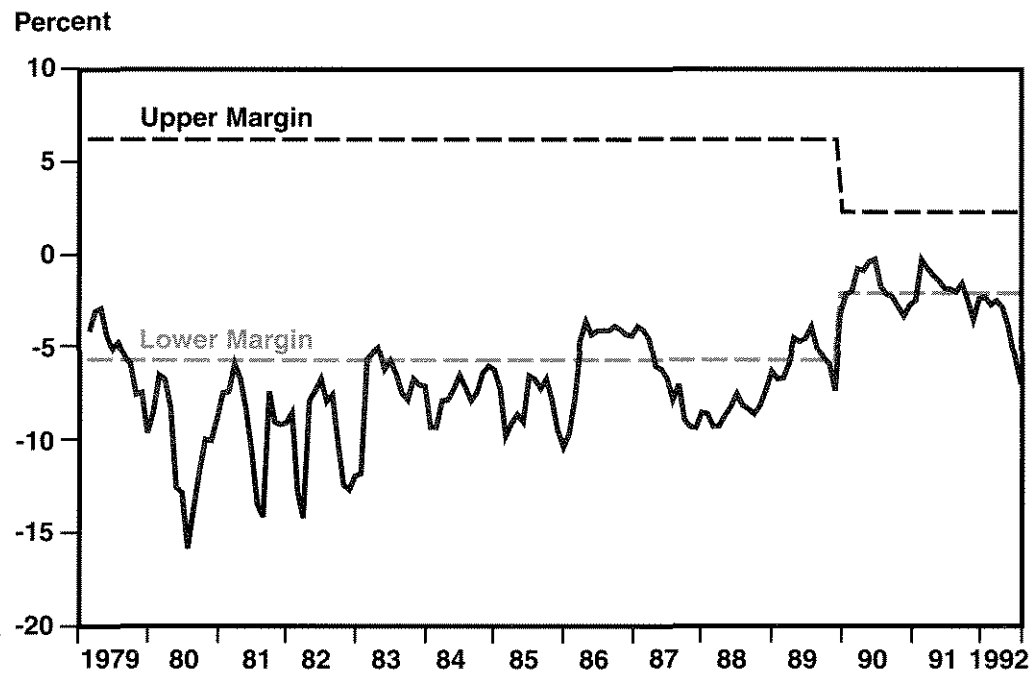
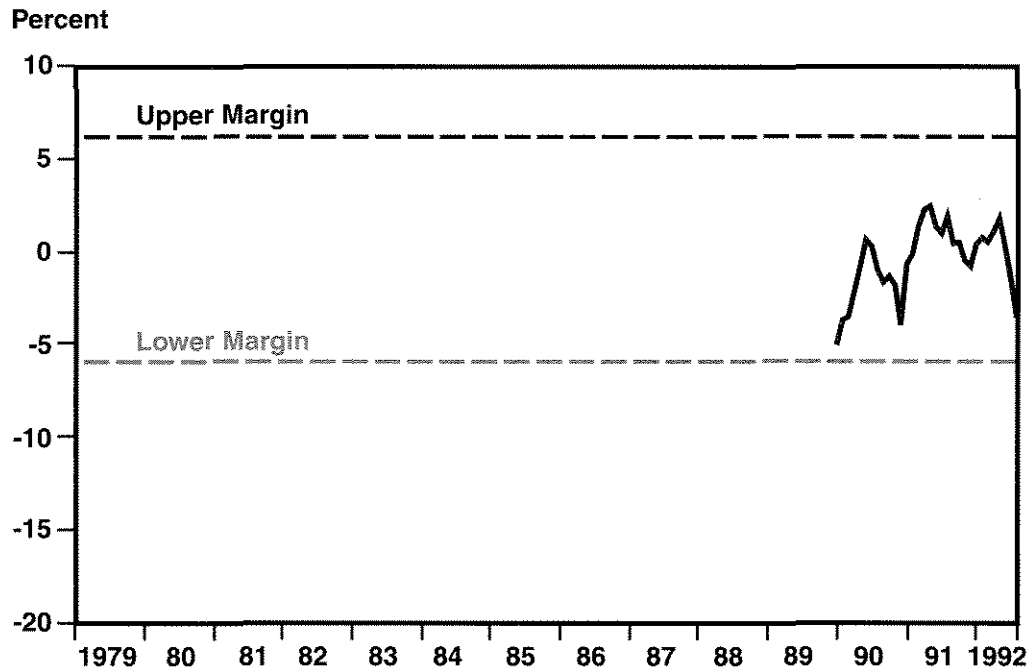


Figure 8  
**DM/ Spanish Peseta Exchange Rate, 12 Months  
 Expectations (as Deviation from Central Rate)**



domestic credit and foreign assets held on the central bank's balance sheet. Now, imagine that all domestic assets are increasing at a steady pace, in part, to finance a chronic government budget deficit. Since the exchange rate (defined as the foreign currency price of one unit of home currency) is fixed, a steady outflow of foreign exchange reserves occurs if the growth of domestic credit exceeds the growth of money demand. In this case, foreign exchange reserves eventually are exhausted and the central bank has to withdraw from foreign exchange intervention. Once exchange rates are flexible, the price level will rise and the exchange rate will fall at the same pace as domestic credit growth in excess of money demand.

There is a problem, however. At the moment of the switch to a flexible exchange rate, investors with assets denominated in domestic currency suffer a capital loss since the exchange

rate falls discretely. Consequently, forward-looking speculators, foreseeing the imminent collapse, would try to sell domestic currency and buy foreign currency before the central bank runs out of reserves. A speculative attack on the foreign exchange reserves of the central bank takes place, and a collapse occurs. With perfect foresight, no discrete drop in the exchange rate occurs at the time of the collapse.

For assessing the timing of the attack, it is useful to look at the so-called shadow exchange rate.<sup>28</sup> The shadow exchange rate is the exchange rate that would result if the speculative attack that exhausts all foreign exchange reserve holdings of the central bank would take place today. The speculative attack takes place when the shadow exchange rate is equal to or below the current exchange rate. As long as the shadow exchange rate is higher than the current (pegged) exchange rate, a speculative attack

<sup>28</sup>See Flood and Garber (1984b).

<sup>29</sup>This is known in the literature as the peso problem.

would bring losses for the speculator. On the other side, a speculative attack is profitable if the shadow exchange rate is lower than the current (pegged) exchange rate. Competition among speculators reduces expected losses and profits down to zero. This story provides an explanation of why a speculative attack may take place even when the central bank still has sizable reserves. The ultimate reason for the collapse is the inconsistency of the pegged exchange rate with the growth of domestic credit. But the point to remember is the pivotal role of expectations in bringing the collapse forward.

Perfect foresight, however, is not a realistic assumption. What happens when this assumption is dropped? Imagine that there is uncertainty either about domestic credit growth or about the minimum size of foreign exchange reserves that would cause the central bank to adopt flexible exchange rates. Again, the speculative attack takes place when the shadow exchange rate is equal to or below the actual rate. Now, however, uncertainty implies that there is always a probability greater than zero for the policy switch to take place in the next period. Moreover, this probability increases over time, since the decline in reserves makes it more likely that the next realization of credit growth forces the switch to a free float. As a result, there is a positive (and, over time, increasing) interest rate differential, implying an expected depreciation of the home currency exchange rate.<sup>29</sup> In addition, there may be a discrete drop in the exchange rate at the moment of the policy switch. These regular features of a balance-of-payments crisis are not captured in the perfect-foresight case.

A chronic fiscal deficit financed by the central bank is the driving force of the collapse described above. This assumption does not meet the experience of Britain in 1992. The Bank of England did not have to finance a budget deficit, domestic credit growth was low, and there was no continuous outflow of reserves. So, an alternative conceptual analysis would consider a situation in which a country initially adopts fiscal and monetary policies in line with the maintenance of the pegged exchange rate. Nevertheless, suppose the market expects the central bank to switch to a free float and that it would ease monetary policy if a speculative attack exhausted the foreign exchange reserves

of the central bank. In contrast to the two cases discussed above, the policy of the central bank in this case is not exogenous to the speculative currency attack. As a result, there may be several equilibria, depending on the expectations of the market. If there is no attack, the exchange rate is perfectly viable forever. If there is an attack, the central bank gives in and accepts a depreciation of its currency.

This model of a self-fulfilling speculative attack is quite attractive in the context of the British case. Remember that the main reason for joining the ERM was the credibility that the ERM seemed to provide for monetary policy. Later, realignments were rejected repeatedly because of the suspected risks to the credibility of the system. So, when the speculative attack on the pound revealed that the established exchange rate parities actually had lost their credibility, the situation had to be reevaluated. The costs of defending the established parities had increased and it was quite possible that monetary authorities would regard these costs as being too high.

### *The British Experience*

The main characteristic of the defense of the pound in September 1992 was the reluctance of British monetary authorities to raise interest rates. What are the implications of this policy for speculative currency attacks?<sup>30</sup> Consider the general case with a pegged exchange rate and selling pressure against the home currency. So long as interest rates are free to move, competition among speculators for expected profits from an attack on the home currency drives up domestic interest rates. If the central bank prevents these interest rates from rising, that brake on the demand for foreign exchange disappears. As a result, the central bank will have to absorb the larger demand for foreign exchange. In the end, the central bank, by pegging the interest rate, offers the market a favorable opportunity for a run on Britain's reserves. Investors may speculate at very low costs, and the speculative currency attack thus easily may involve huge amounts of funds.

A second characteristic of the British episode was the government's borrowing on the international capital market to increase foreign exchange

<sup>30</sup>Goldstein et al. (1993) first examined this extension of the basic model.



change reserves. As emphasized above, a speculative attack occurs when the shadow exchange rate is equal to or below the current pegged exchange rate. The size of the foreign exchange reserves, in turn, has an effect on the shadow exchange rate. Since a run on foreign exchange reserves reduces the domestic money supply (assuming the effect is not sterilized), the money supply reduction associated with running out of a larger stock of foreign reserves is also larger. The potentially larger reduction in the domestic money supply, in turn, raises the shadow exchange rate.

Another device to postpone speculative currency attacks is capital controls. While Britain did not use them at all in 1992, the ERM crisis in September 1992 was the first, since virtually all capital controls in the EC had been removed. Thus, it may be useful to take a look at how capital controls work in a speculative currency attack. The simplest way to model capital controls is to treat them like a tax on foreign interest earnings. To simplify the account, let the starting point be a situation in which the fundamentals are in order: i.e., no chronic fiscal deficit or other influence is causing a gradual depletion of the central bank's foreign exchange reserves. The pre-tax foreign interest rate continues to be assumed as constant throughout the analysis.

Since a speculative attack takes place when the shadow exchange rate is equal to or below the current pegged exchange rate, we direct our attention again to the effects of the instrument on the shadow exchange rate. A tax on foreign interest earnings reduces the net return on foreign assets. As a result, an excess supply of foreign currency emerges at the current exchange rate. Since the exchange rate is pegged, the excess supply must be absorbed by the central bank. This leads to higher foreign exchange reserves, a higher money supply, and a reduction in the domestic interest rate (reflecting the reduced level of the net return rate on foreign assets). The increase in foreign exchange

reserves, in turn, raises the shadow exchange rate in much the same way as in the example in which reserves are increased by borrowing. A tax on foreign interest earnings, by pushing up the shadow exchange rate, may postpone a speculative attack. To put it another way, the removal of capital controls in the EC removed a shelter for weak ERM currencies.<sup>31</sup>

Overall, the distaste of British monetary authorities for allowing short-term interest rates to rise made the defense of the pound in September 1992 more difficult. The effects on speculation were particularly grave since there were no restrictions on capital movements. Borrowing foreign exchange reserves by the authorities—short of unlimited borrowing—was no serious substitute under these circumstances.

## CONCLUSIONS

The near collapse of the ERM in 1992-93 reflected the vulnerability of pegged exchange rate systems. This feature of pegged exchange rates is hardly new. Standard theory in international macroeconomics teaches that monetary autonomy and pegged exchange rates are incompatible in the absence of capital controls. Divergent economic forces or simple political events may trigger a speculative attack, leading to the collapse of the pegged exchange rate.

For policymakers, the possibility that speculative currency attacks may be self-fulfilling is particularly troublesome. In Europe, proponents of pegged exchange rates have argued for years that exchange rate pegging to the mark provides a way to import the reputation of the Bundesbank and get a credible anchor for monetary policy. For obvious reasons, this approach had a special appeal to countries lacking a credible monetary policy. Yet the argument is less convincing if speculative attacks are self-fulfilling and the credibility of a country's exchange rate commitment can vanish as quickly and unexpectedly as it did in September 1992.

<sup>31</sup>Of course, capital controls are not as efficient as true taxes on foreign exchange. More importantly, capital controls typically are not introduced when there is no pressure on foreign exchange reserves. Nevertheless, the analysis here clarifies that capital controls can reduce the prevailing excess demand for foreign currency, boosting foreign exchange reserves and the shadow exchange rate. This analysis ignores the reduction in incentives to invest in a country that imposes capital controls as well, and this influence could also bode ill for any actual boost in the shadow price.

A necessary condition for such an attack to occur is that the markets expect the central bank to shift policy as a result of the attack. If the markets have reasons to believe that a country will relax monetary policy once a speculative attack has exhausted the central bank's reserves, an attack is more likely. In the case of Britain, a persistent recession prepared the way for such beliefs. Uncertainties about the prospects for EMU and the reluctance of British authorities to allow short-term interest rates to rise in defense of the pound subsequently accelerated the attack and reinforced a realignment of the pound. In short, the United Kingdom could not convince the markets of its commitment to a fixed exchange rate. This credibility is an essential factor in maintaining an effective exchange regime.

## REFERENCES

- Agénor, Pierre-Richard, Jagdeep S. Bhandari and Robert P. Flood. "Speculative Attacks and Models of Balance of Payments Crises," *IMF Staff Papers* (June 1992), pp. 357-94.
- Bank of England Quarterly Bulletin* (various issues, 1992).
- Batten, Dallas S., Michael P. Blackwell, In-Su Kim, Simon E. Nocera and Yuzuru Ozeki. "The Conduct of Monetary Policy in the Major Industrial Countries: Instruments and Operating Procedures," *Occasional Paper No. 70*, International Monetary Fund (July 1990).
- Belongia, Michael T., and K. Alec Chrystal. "The Pitfalls of Exchange Rate Targeting: A Case Study from the United Kingdom," this *Review* (September/October 1990), pp. 15-24.
- Blackburn, Keith, and Martin Sola. "Speculative Currency Attacks and Balance of Payments Crises," *Journal of Economic Surveys* (June 1993), pp. 119-44.
- Edwards, Sebastian. *Real Exchange Rates, Devaluation, and Adjustment* (MIT Press, 1989).
- Flood, Robert P., and Peter M. Garber. "Gold Monetization and Gold Discipline," *Journal of Political Economy* (February 1984a), pp. 90-107.
- \_\_\_\_\_. "Collapsing Exchange-Rate Regimes: Some Linear Examples," *Journal of International Economics* (August 1984b), pp. 1-13.
- Frankel, Jeffrey, and Steven Phillips. "The European Monetary System: Credible at Last?" *Working Paper No. 3819*, National Bureau of Economic Research (August 1991).
- Fratianni, Michele, and Jürgen von Hagen. *The European Monetary System and European Monetary Union* (Westview Press, 1992).
- Giavazzi, Francesco, and Alberto Giovannini. *Limiting Exchange Rate Flexibility: The European Monetary System* (MIT Press, 1989).
- Goldstein, Morris, David Folkerts-Landau, Peter Garber, Liliana Rojas-Suárez and Michael Spencer. "International Capital Markets: Part I. Exchange Rate Management and International Capital Flows," *World Economic and Financial Surveys*, International Monetary Fund (April 1993).
- Gros, Daniel, and Niels Thygesen. *European Monetary Integration* (Longman, 1992).
- Krugman, Paul. "A Model of Balance-of-Payments Crisis," *Journal of Money, Credit, and Banking* (August 1979), pp. 311-25.
- Obstfeld, Maurice. "Rational and Self-Fulfilling Balance-of-Payments Crises," *American Economic Review* (March 1986), pp. 72-81.
- Organization for Economic Co-operation and Development. *OECD Economic Surveys: United Kingdom* (various issues).
- Pringle, Robert, ed. "The Currency Crisis: A Seven Part Special Feature," *Central Banking* (Vol. 3, No. 2, autumn 1992), pp. 12-21.
- Rose, Andrew K. "European Exchange Rate Credibility Before the Fall: The Case of Sterling," Federal Reserve Bank of San Francisco *Weekly Letter* (May 7, 1993).
- \_\_\_\_\_, and Lars E.O. Svensson. "Expected and Predicted Realignments: The FF/DM Exchange Rate During the EMS," *Working Paper No. 3685*, National Bureau of Economic Research (April 1991).
- Svensson, Lars E. O. "Assessing Target Zone Credibility: Mean Reversion and Devaluation Expectations in the ERM, 1979-1992," *European Economic Review* (May 1993), pp. 763-94.
- \_\_\_\_\_. "The Foreign Exchange Risk Premium in a Target Zone with Devaluation Risk," *Journal of International Economics* (August 1992), pp. 21-40.
- \_\_\_\_\_. "The Simplest Test of Target Zone Credibility," *IMF Staff Papers* (September 1991), pp. 655-65.
- Ungerer, Horst, Owen Evans and Peter Nyberg. "The European Monetary System: The Experience, 1979-82," *Occasional Paper No. 19*, International Monetary Fund (May 1983).
- \_\_\_\_\_, Owen Evans, Thomas Mayer, and Philip Young. "The European Monetary System: Recent Developments," *Occasional Paper No. 48*, International Monetary Fund (December 1986).
- \_\_\_\_\_, Jouko J. Hauvonen, Augusto Lopez-Claros and Thomas Mayer. "The European Monetary System: Developments and Perspectives," *Occasional Paper No. 73*, International Monetary Fund (November 1990).