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EXCHANGE-RATE POLICY, MONETARY POLICY, AND REAL EXCHANGE-RATE VARIABILITY

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INTERNATIONAL FINANCE SECTION

DEPARTMENT OF ECONOMICS

PRINCETON UNIVERSITY

Princeton, New Jersey

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International Finance Section

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1 Introduction

In this essay I discuss in broad outline the main sources of the exchange-rate variability that characterized the 1970s. I try to distinguish between the sources of nominal exchange-rate movements, such as differential growth rates of money per unit of output, and the sources of real exchange-rate movements, such as the discovery and exploitation of North Sea oil and natural gas. Following that, I consider the possible role of monetary policy in preventing such nominal and real exchange-rate movements from occurring or affecting the spot rates of exchange. Specifically, I want to raise these questions: What monetary policies are required to obtain exchange-rate and price-level stability? Are pegged-parity arrangements like the current EMS of any help in this respect? Is exchange-rate stability compatible with price-level stability and, if not, which is more important? Finally, can exchange-rate changes be instrumental in changing a country's competitive position and equilibrating its balance of payments?

2 Sources of Exchange-Rate Variability

Most economists seem to agree that the sources of change in the spot (or market) rate of exchange between two monies are both nominal and real.[1] Nominal changes in exchange rates occur when the rate of inflation differs between countries. For instance, if the rate

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[1] I prefer not to follow the common terminological practice of calling the spot (or market) rate of exchange the nominal exchange rate. Instead I separate changes in the spot rate of exchange into a nominal and a real component. Changes in the spot rate of exchange between the currencies of two countries are called nominal if they reflect nominal sources: diverging inflation rates between countries. Changes in the spot rate of exchange are called real if they reflect real sources: diverging developments in technology, resources, institutions, and trading patterns between countries. With e the spot rate of exchange (defined as the number of domestic currency units per unit of foreign currency), p the domestic price level, p^* the foreign country's price level, er the real exchange rate defined as $er = e/(p/p^*)$, and with hats ($\hat{}$) indicating percentage rates of change, it follows that $\hat{e} = \hat{er} + (\hat{p} - \hat{p}^*)$, where $\hat{er}$ reflects the real sources and $(\hat{p} - \hat{p}^*)$ the nominal sources of change of the spot rate of exchange.

of inflation in the United Kingdom is persistently above that of its trading partners, and the German rate of inflation is persistently below that of its trading partners, then the pound sterling will depreciate and the deutsche mark will appreciate against the currencies of these trading partners at a rate reflecting the relevant inflation differentials. The reason is that investors continuously reshuffle their portfolios by shifting out of assets denominated in currencies that are weak and into assets that are strong in terms of expected purchasing power. But even if inflation rates are the same everywhere, real changes in exchange rates between currencies may occur owing to specific diverging structural developments between countries, such as international shifts in technology and trading patterns. For instance, if North Sea oil is discovered in the United Kingdom and natural gas in the Netherlands and these fuels are subsequently exported abroad, replacing energy imports, then the pound and the guilder will tend to appreciate against all other currencies. And if international demand for tradables shifts away from the exportables produced by the United Kingdom toward those of its trading partners, the pound will depreciate against the other currencies. Finally, if productivity in the British tradables sector grows more slowly than productivity in its nontradables sector, the pound will tend to depreciate against all other currencies.

Before proceeding, let us pause to look at the evidence on the nominal and real sources of exchange-rate changes. Columns (1) to (3) of Table 1 tell the story. Column (1) shows the speed with which the spot exchange rates of the major Economic Community currencies and the dollar changed against the DM on average over the period 1970-79. In part the changes in these spot exchange rates are nominal and can be attributed to inflation differentials with respect to Germany, but in part they are real and cannot be attributed to these differentials. The real changes are shown in column (2). For each country, the difference between columns (1) and (2) equals that country's average inflation differential with Germany. Average inflation rates during the period 1970-79 are shown in column (3). As an example, let us look at the British-German inflation–exchange-rate complex. From 1970 to 1979, the pound depreciated at an average annual rate of 9.4 per cent, whereas the average annual British inflation rate exceeded the German inflation rate by 7.7 percentage points. The average annual rate of depreciation of the pound against the DM of 9.4 per cent thus consisted of a *nominal* annual rate of depreciation of 7.7 per cent and a *real* annual rate of depreciation of 1.7 per cent. As a result of real forces, the pound depreciated against the DM at

TABLE 1

EXCHANGE-RATE MOVEMENTS, INFLATION, MONETARY EXPANSION, AND OUTPUT GROWTH IN THE MAIN EC COUNTRIES AND THE UNITED STATES, 1970-79

(average annual percentage rate of change)

Country	*Rate of Appreciation (−) or Depreciation (+) of Currency against the DM*		*Rate of Consumer Price Inflation* (3)	*Growth Rate of Money Supply (M1)* (4)	*Growth Rate of Gross Real Domestic Product* (5)	*Growth Rate of Real Demand for Money because of Real Output Growth*[b] (6)	*Money Growth in Excess of Real Money-Demand Growth* (4) − (6) (7)	*Inflation/ Money Ratio* (3)/(7) (8)	*Inflation Consistent with Stable Spot Exchange Rates against the DM*[c] (9)	*Money Growth Consistent with Stable Spot Exchange Rates against the DM* [(9)/(8)] + (6) (10)
	Spot Exchange Rate (1)	*Real Exchange Rate*[a] (2)								
Belgium	2.3	0.1	7.1	7.9	3.8	2.8	5.1	1.39	4.8	6.3
Denmark	4.2	−0.2	9.3	10.1	2.6	2.9	7.2	1.29	5.1	6.8
France	5.9	1.9	8.9	10.2	4.0	3.6	6.6	1.35	3.0	5.8
Germany	—	—	4.9	9.8	3.2	3.5	6.3	0.78	4.9	9.8
Italy	11.2	3.8	12.3	19.6	3.1	7.4	12.2	1.01	1.1	8.5
The Netherlands	1.8	−0.8	7.5	10.2	3.5	4.2	6.0	1.25	5.7	8.8
United Kingdom	9.4	1.7	12.6	12.7	2.2	2.9	9.8	1.28	3.2	5.4
United States	8.1	5.9	7.1	5.9	2.9	1.5	4.4	1.61	−1.0	0.9

[a] The real rate of appreciation (−) or depreciation (+) of a country's currency against the DM is calculated by subtracting from the rate of change of that country's spot exchange rate against the DM (col. 1) its rate of inflation (col. 3) and adding to it the German rate of inflation.

[b] Calculated by multiplying the long-run real income elasticity of a country's demand for money (M1) by the average growth rate of its output. The values of the real income elasticities of the demand for money used are 0.75 for Belgium, 1.10 for Denmark, 0.90 for France, 1.10 for Germany, 2.40 for Italy, 1.20 for the Netherlands, 1.30 for the U.K., and 0.50 for the U.S. These values are taken from various sources: own estimates; OECD (1979, p. 41); and Fase and Kuné (1975, pp. 414-416).

[c] Calculated by subtracting from the German rate of inflation the rate of change of each country's real exchange rate against the DM in col. (2).

SOURCES: IMF, *International Financial Statistics*, August 1979-October 1980; Commission of the EC, *Annual Economic Review 1978/79;* Federal Reserve Bank of St. Louis, *International Economic Conditions*, June 1979; OECD, *Quarterly National Account Bulletin IV 1979* and *Economic Outlook*, December 1979.

a faster rate than the inflation differential between the two countries would have led one to expect.

From columns (1) to (3) a number of additional observations can be made:

1. It appears that on average all currencies depreciated against the DM in nominal terms during the 1970s.

2. There were wide differences in the rate at which currencies depreciated against the DM, with the Belgian franc, the Danish krone, and the Dutch guilder depreciating at low speed, and the Italian lira, the U.K. pound, and the U.S. dollar depreciating at high speed.

3. Whereas the spot exchange rates of the EC currencies against the DM moved largely to accommodate inflation differences with Germany (nominal changes), the spot exchange rate of the dollar against the DM moved largely to accommodate structural shifts in productivity and trade pattterns (real changes).

4. Whereas all currencies depreciated against the DM in nominal terms, the currencies of Denmark and the Netherlands slightly appreciated against the DM in real terms.

5. The dollar depreciated against the DM in real terms faster than any of the other currencies reviewed, implying that during the 1970s all EC currencies appreciated on average against the dollar in real terms.

Let us summarize our findings. During the 1970s, spot-rate movements of most EC currencies against the DM were in large part nominal, whereas spot-rate movements of most EC currencies against the dollar were for the most part real. Exchange-rate stability against the DM thus would largely involve turning off the nominal sources of exchange-rate changes, whereas exchange-rate stability against the dollar would largely involve turning off the real sources. The policy questions then are: Can either nominal or real sources be turned off at all, and, if so, what would that mean for policy and policy cooperation?

3 The Sources of Nominal Exchange-Rate Changes

If spot exchange rates between the currencies of countries change to accommodate the differences in the countries' inflation rates, what are the causes of inflation? There is wide agreement among economists that a country's inflation rate mirrors the rate at which it produces money relative to the rate at which it produces goods and services. Broadly speaking, if money is persistently produced faster than real

output, the result is inflation. More precisely, if the money supply persistently grows faster than the real demand for money arising from growth of real output, the inevitable result is inflation.[2] Whether the monetary authorities produce money too fast in order to finance a war or the welfare state, to keep interest rates low or exchange rates fixed, or to prevent wage claims in excess of productivity from being translated into unemployment, the unavoidable consequence of monetary growth persistently in excess of output growth is inflation.

Let us pause once again to look at the evidence. Columns (3) to (5) of Table 1 summarize the inflation rate, the growth rate of money, and the growth rate of output that actually occurred in the EC economies and the United States on average during the period 1970-79. Increases in production raise the demand for money balances. For each country, the rate at which its real demand for money increased on average during the 1970s as a result of real output growth is given in column (6). Actual monetary growth in excess of growth of the real demand for money determines a country's *underlying* (or potential) rate of inflation.[3] From column (7) of Table 1, it appears that in all countries reviewed money has grown much faster on average during the 1970s than has the real demand for money. When the *actual* average rate of increase of prices for each country during the 1970s in column (3) of Table 1 is compared with the *potential* (or underlying) rate of inflation in column (7), two conclusions emerge: (1) Roughly speaking, a country's inflation rate in large part mirrors the excess of that country's money growth over its output growth. (2) Again roughly speaking, inflation differentials between most countries are in large measure due to differences in the rates at which countries produce money relative to output.

4 Turning Off the Sources of Nominal Exchange-Rate Variability

In order to turn off the nominal exchange-rate changes that are a major source of variability in spot exchange rates, inflation differentials among the EC countries and between these countries and the United States must be eliminated. This raises a basic issue of coordination of monetary policy among these countries—agreement on the common inflation rate at which each country should aim in order to

[2] The exchange-rate effects of differential growth rates of domestic and foreign money and domestic and foreign output are further investigated in Bomhoff and Korteweg (1980).

[3] It is assumed here that changes in interest rates and their effects on velocity can be disregarded in the long run.

produce at least *nominal* exchange-rate stability. A common inflation rate of zero per cent, implying price-level stability everywhere, would in my view be the most desirable. But consensus on a zero inflation rate may be difficult to reach. The next best consensus inflation rate for current and prospective EMS members would seem to be what Germany, as the hegemonial-currency country, has frequently stated to be its maximum tolerable level of inflation, 2 per cent per year.

How can EMS members reach such a low common inflation rate? Since, as we have seen, inflation is the result of too much money chasing too few goods, each country could bring its inflation rate under control by measures aimed at reducing the trend rate of monetary expansion and raising the trend rate of real output growth. To get some idea of the kind of monetary policy required, it may be illustrative to calculate the money growth rates that would have produced a common average inflation rate of 2 per cent as well as nominal exchange-rate stability in the EC countries and the United States during the 1970s. Columns (6) to (8) provide the answer. For a common 2 per cent average inflation rate, monetary expansion would have had to exceed the rate of increase in the real demand for money because of real output growth by about 2.5 percentage points on average in Germany, 2 percentage points in Italy, 1.6 percentage points in the Netherlands, 1.5 percentage points in Denmark, France, and the United Kingdom, 1.4 percentage points in Belgium, and 1.2 percentage points in the United States.[4] It follows that rates of monetary growth would have had to be much lower and much closer to one another, on average, than they actually were, ranging from 4.2 to 6.0 per cent per year for most EC countries except Italy, from 2 to 3 per cent per year for the United States, and from 9 to 10 per cent per year for Italy.

The most promising way for countries to reduce their inflation rates to a common level of 2 per cent and keep them there would seem to be to adopt a *monetary rule*. Such a rule would imply a policy of stable and preannounced rates of monetary expansion for each country

[4] The inflation/money ratios in column (8) were used to calculate these numbers. This involves the assumption that the ratios of $\hat{V}$ to $\hat{M} - \eta\hat{y}$ that actually prevailed from 1970 to 1979 in the countries mentioned would have been the same if these countries had expanded their money supplies at the rates specified. (Here, $\hat{V}$ is the growth rate of velocity, $\hat{M}$ the growth rate of money, $\hat{y}$ the growth rate of output, and η the real income elasticity of the demand for money.) From what we know empirically about the determinants of the demand for money, this assumption does not seem too heroic, although it comes close to violating the hypothesis of rational expectations.

that would be roughly equal to the rate at which the real demand for its money increases as a result of normal growth in output plus the common 2 per cent inflation rate.

A first condition for the success of such a policy is that it be followed by all countries. If, say, only Germany and the Netherlands practiced monetary discipline and achieved low rates of inflation, the result might be a rising foreign demand for DM and guilders and appreciation of these currencies. This would leave insufficient monetary growth to satisfy the rising domestic demand for both currencies that would result from a 2 per cent inflation target and a growth target for output of, say, 3 per cent. The prospect of a recession in Germany and the Netherlands owing to the rising international demand for DM and guilders would greatly increase political pressure to raise their monetary growth targets or abandon them altogether, whereas the proper reaction would be for these countries to stick to their monetary targets by accommodating the increase in foreign demand for their currencies.[5] Indeed, such a series of events in 1978 made Germany and Switzerland temporarily abandon their monetary growth targets and led to an unfortunate acceleration of their inflation rates in 1979.

A second condition for the success of monetary targets is that policy-makers be able to convince the public at large that they will be steadfast in generating no more money than is compatible with their declared inflation-growth objectives. If policy-makers start out by moderating monetary expansion but the major market participants are convinced that the authorities, out of fear of recession, will in the end validate any wage and price setting that is agreed to, then a policy of moderate monetary growth will indeed lead to recession.

5 The Sources of Real Exchange-Rate Changes

The real exchange rate between the currencies of two countries is defined as the spot exchange rate between the domestic and foreign currencies divided by the ratio of the domestic country's price level and the foreign country's price level, $e/(p/p^*)$.[6] Changes in the real exchange rate can therefore occur only when developments affect the spot exchange rate *differently* from the price-level ratio between the two countries. In other words, real exchange-rate changes are those changes in the spot rate that cannot be attributed to inflation differentials between the two countries but instead reflect specific struc-

[5] The usual practice in Europe is to formulate monetary targets in terms of monetary aggregates that do *not* include nonresident money holdings.

[6] See footnote 1.

tural differences in real economic performance between these countries. Let us try to trace the effects of certain developments on the real exchange rate between the currencies of two countries under freely fluctuating spot exchange rates.[7]

We start with the real exchange-rate effects of an *unstable monetary policy.* A sudden unforeseen acceleration or slowdown in a country's rate of monetary expansion will affect its spot exchange rate immediately; because of sticky wages and prices, its inflation rate will not respond until later on. A sudden monetary acceleration, by raising a country's spot exchange rate faster than its inflation rate, will produce a temporary rise in its real exchange rate (i.e. a real currency depreciation). And a sudden monetary slowdown, by lowering a country's spot rate faster than its inflation rate, will produce a temporary fall in its real exchange rate (i.e. a real currency appreciation).[8]

Suppose there is a *rise in the growth rate of a country's productivity in manufactured tradable goods* relative to its productivity in manufactured nontradables. Total output starts rising faster, inducing faster growth in the demand for real money balances. Given the country's rate of monetary expansion, output will grow faster than demand for it. As a result, there is less inflation and prices rise more slowly for both tradable and nontradable goods. Since competition in the world market tends to ensure that traded-goods prices denominated in a common currency are the same everywhere, the country's currency starts to appreciate. The rate of appreciation must exceed the (falling) rate of inflation, since (assuming the same wages are paid in the tradables and nontradables sectors) faster productivity growth in the tradables sector implies a fall in the prices of tradables relative to nontradables. Rising productivity growth in a country's tradables sector thus leads to real appreciation of its currency against all other currencies, a reaction known as the Balassa effect.

Now suppose there is a *shift in international demand* toward a country's traded goods and away from its competitors. Such a shift affects neither the country's rate of monetary growth nor its rate of output growth, given full capacity. As a result, inflation is unaffected. The increased international demand for the country's tradables at

[7] For some empirical results on the determinants of real exchange-rate movements, see Bomhoff and Korteweg (1980). See also the Mathematical Appendix below.

[8] An unstable demand for money has real exchange-rate effects analogous to an unstable monetary policy. A sudden unexpected decline in the demand for a country's money will produce a temporary rise in its real exchange rate, while a sudden unexpected increase in demand will produce a temporary fall.

given world market prices leads to a surplus on its current account and, consequently, to an accumulation of foreign assets for which there is no demand at the going exchange rate. To restore portfolio balance, the prices of these foreign assets expressed in the country's currency have to fall. By implication, the country's spot exchange rate starts to fall against all other currencies, thereby raising the value of its currency against all others. With the inflation rate unaffected, a shift in international demand toward a country's tradables thus results in a real appreciation of that country's currency.

Next, suppose there is a *rise in a country's labor costs* relative to those of its competitors, owing to rapid growth of social security taxes. Faster-rising labor costs will lower profits. One result will be a lower growth in the output of both tradables and nontradables. With the rate of monetary expansion unchanged, lower output growth brings more inflation. More inflation implies that the domestic price of tradables starts rising faster than the world market price of tradables. Since competition tends to ensure that the price of tradables expressed in a common currency will be the same everywhere, the second result of rising social security taxes and labor costs will be a tendency for the country's spot exchange rate to increase (currency depreciation). However, as long as the negative effects of rising social security taxes affect output growth rates of tradables and nontradables equally, nothing will happen to the country's real exchange rate. But if such taxes reduce the output growth rate of nontradables more than that of tradables, the result will be a real appreciation of the country's currency. Conversely, if such taxes reduce the output growth rate of tradables more than nontradables, a real depreciation of the country's currency will result.

Finally, suppose there is a *discovery and exploitation of new natural resources*, such as North Sea oil or natural gas, which attracts demand from abroad and leads to import substitution of energy. One effect is that the country's normal output growth rate increases, leading—if there is no change in the rate of monetary expansion—to a lower inflation rate. Another effect is an improvement in the balance of trade because of increased exports and reduced imports of oil or gas. As a result, foreign assets are accumulated for which there is no demand at the going exchange rate. The country's spot exchange rate will therefore fall against all other currencies, raising the value of its currency against all others and lowering the prices of foreign assets expressed in that currency. A final effect of the discovery and exploitation of a new source of tradables is that the country's tradables

prices have to fall *relative* to its nontradables prices. With a lower rate of inflation of the general price level, this relative price change can occur only through an appreciation of the country's currency that exceeds its falling rate of inflation. The discovery and exploitation of oil or natural gas thus tend to lead to lower inflation and real appreciation of a country's currency. This real appreciation of the currency helps to shift resources from the tradables to the nontradables sector. And the less mobile these resources are, the greater the real appreciation is likely to be.

Let us pause to look at the evidence on real exchange rates once more. From column (2) of Table 1 it is clear that the real exchange rate between the currencies of Belgium and Germany has remained virtually unchanged on average during the 1970s, that the Danish krone and Dutch guilder have appreciated in real terms against all other EC currencies including the DM, and that the DM has appreciated in real terms against the French franc, the Italian lira, and the pound sterling. The rising real value of the guilder against all other EC currencies can safely be attributed in part to the successful exploitation and sales of the Dutch natural gas resources in the early 1970s. The rising real value of the DM against franc, lira, and pound can probably be attributed in part to the more rapid growth in the productivity of Germany's manufactured tradables sector, especially of capital goods, relative to that of France, Italy, and the United Kingdom. And the rising real value of all EC currencies against the dollar must no doubt be partly attributed to the narrowing technological gap between Europe and the United States.

6 The Sources of Real Exchange-Rate Variability: Can They Be Turned Off?

The sources of nominal exchange-rate movements between currencies can be turned off if countries are prepared to close the inflation gaps between them by appropriate monetary policies. But can economic policy turn off the sources of real exchange-rate movements? The seemingly obvious answer is a solid "No" except in the case of real exchange-rate fluctuations that are the result of unstable monetary policy. Such transitory real exchange-rate movements can easily be prevented by following a more predictable monetary policy of stable and preannounced rates of monetary expansion. Movements in real exchange rates that result from diverging structural economic developments between countries, such as shifts in productivity and trade patterns, cannot be prevented by economic policies. The reason is

that such shifts are difficult to predict and their quantitative effects on real exchange rates virtually unknown.

If the adjustment of real exchange rates to structural economic change cannot be prevented as long as the structures of economies change at different speeds and in different directions, another question arises: Can real exchange-rate changes be prevented from affecting the spot-market exchange rates? The answer is: In principle probably "Yes," but in practice probably "No." As argued above, the rate of change in a country's spot exchange rate against another country's currency ($\hat{e}$) equals the sum of the rate of change in its real exchange rate against the other country's currency ($\hat{\hat{er}}$) and the inflation differential between them ($\hat{p} - \hat{p}^*$):

$$\hat{e} = \hat{\hat{er}} + (\hat{p} - \hat{p}^*) .$$

It follows that changes in a country's real exchange rate can be prevented from affecting its spot exchange rate if it manages its inflation rate so that the inflation differential with the other country is the exact opposite of the real exchange-rate change:

$$\hat{e} = 0 \quad \text{if} \quad \hat{\hat{er}} = -(\hat{p} - \hat{p}^*) .$$

In general, countries that experience real currency appreciations against the DM will have to inflate more quickly than Germany, whereas countries that experience real currency depreciations will have to inflate more slowly. For instance, the guilder's real appreciation of 0.8 per cent per year against the DM from 1970 to 1979 need not have changed the guilder/DM spot exchange rate if the Dutch had kept their inflation rate 0.8 percentage points above the German inflation rate. Conversely, the pound's real depreciation of 1.7 per cent per year against the DM during the same period would have left the pound/DM spot exchange rate unchanged if the United Kingdom had kept its inflation rate 1.7 percentage points below the German rate. Column (9) of Table 1 summarizes the rates of inflation in the EC countries and the United States that would have been consistent, on average, with stable spot exchange rates during the period, given the German inflation rate and the actual movements in real exchange rates. And column (10) shows the rates of monetary expansion that would have generated these rates of inflation.[9] A com-

[9] The inflation/money ratios in column (8) were used to calculate the rates of money growth that would have been consistent with stable exchange rates on average from 1970 to 1979. As stressed in footnote 4 above, this involves the assumption that the ratio of $\hat{V}$ to $\hat{M} - \eta\hat{y}$ that actually prevailed in the 1970s in the countries reviewed

parison of columns (9) and (10) with the actual rates of inflation and monetary growth during the 1970s yields two striking observations.

One observation, of course, is that exchange-rate stability has apparently not been a first priority of the countries of Europe and the United States. This follows from the fact that monetary policy in Europe and the United States has been seriously inconsistent with stable exchange rates. Indeed, exchange-rate instability in our part of the world during the 1970s has been due mainly to a fundamental mismatch of monetary-policy preferences and a serious lack of monetary-policy harmonization. Given the German inflation rate of about 5 per cent per year and the real exchange-rate movements that occurred, exchange-rate stability would have required monetary policies substantially less expansive and less divergent from each other than they actually were. Indeed, only Germany and the Netherlands have pursued monetary policies that have been more or less consistent with bilateral exchange-rate stability. Monetary growth rates in Belgium, Denmark, and France should have been 2 to 4 percentage points less than they were, and monetary growth rates in Italy, the United Kingdom, and the United States should have been less than half what they actually were.

A second observation is that, because of real exchange-rate movements, monetary policies compatible with exchange-rate stability are not normally compatible with price-level stability. Stability of exchange rates implies the neutralization of real exchange-rate changes by appropriate inflation differences between countries. Consequently, even if Germany preferred zero inflation, countries aiming at stable spot exchange rates but whose currencies appreciated against the DM in real terms would be forced to inflate their price levels, while those whose currencies depreciated in real terms would be forced to deflate their price levels.

Even if countries declared exchange-rate stability to be their first priority, stable spot exchange rates might prove difficult to obtain in practice. Stable spot exchange rates require monetary policies that produce inflation differences with Germany exactly equal to the real exchange-rate movements against the DM. Given the lags in the effect of money supply on inflation, such policies require that real exchange-rate movements be well understood and predictable. The problem is that the causes of real exchange-rate movements are nu-

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would have been unchanged if these countries had expanded their money supplies at the rates shown in column (10).

merous and difficult to predict and their quantitative impact is not very well known. Given this state of affairs, it would seem very difficult, if not impossible, for countries to chart growth paths for their money supplies that would be consistent *ex-ante* with exchange-rate stability.

7 Pegged-Parity Arrangements: Bretton Woods, the Snake, and the EMS

The lack of monetary cooperation demonstrated by the fundamental mismatch of monetary-policy preferences and the unpredictability of real exchange-rate movements have been the two major factors undermining all postwar fixed-exchange-rate arrangements. Both factors caused the collapse of the fixed-parity gold-dollar standard of Bretton Woods in March 1973, after a series of serious exchange-rate crises. And the same factors caused the snake arrangement of pegged parities among the currencies of Belgium, Denmark, France, Germany, Italy, Luxembourg, the Netherlands, Norway, Sweden, and the United Kingdom to lose most of its members rapidly and degenerate into a mini-snake involving only Germany and its small neighboring countries.[10]

It is this fate of previous fixed-exchange-rate regimes that raises the question whether the new European Monetary System (EMS) will have a chance to survive and bring exchange-rate stability in the 1980s. The answer depends on the willingness of the EMS member countries and the United States to substantially reduce the sizable inflation differentials between them, on the size and predictability of real exchange-rate movements among the EMS currencies and between them and the dollar, and on the willingness of Germany as the

[10] The chronological history of the snake is aptly summarized by Thygesen in Table 2 of his recent essay in this series (1979, p. 13). His table might be updated for 1979 as follows:

1979:

Mar. 12	European Council in Paris: announcement of the formal introduction of the EMS on Mar. 13.
Mar. 13	EMS enters into force. Participants: Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands (bilateral-fluctuation margins 2.25 per cent), and Italy (bilateral-fluctuation margins 6 per cent).
Sept. 23	Realignment of central rates among EMS currencies: 2 per cent revaluation of the DM and 3 per cent devaluation of the Danish krone.
Dec. 29	The Danish krone is devalued by 5 per cent.

hegemonial-currency country of the EMS to adjust its monetary policy to that of its EMS partners and the United States.

As regards the inflation differentials among the EMS partners and between them and the United States, nothing points to their disappearance yet. Indeed, Table 2 indicates that since 1978 inflation and inflation differentials between Belgium, Germany, and the Netherlands on the one hand, and the other EMS members and the United States on the other, are on the rise again, thereby increasing the need for further parity adjustments within the EMS and continuing the downward pressure on the dollar.

As regards real exchange-rate movements between the EMS currencies and the U.S. dollar, the technological gap between Europe and the United States may have largely disappeared by now. There may therefore be much less need in the 1980s than there was in the 1970s for permanent real appreciations of the EMS currencies against the dollar. As regards real exchange-rate movements among the EMS currencies, predictions are much more difficult to make. If the past is a reliable guide to future real exchange-rate behavior, one would expect a continued rise in the real value of the currencies of the former mini-snake countries (Belgium, Denmark, Germany, and the Netherlands) relative to the currencies of the other current and pro-

TABLE 2

INFLATION RATES IN THE MAIN EC COUNTRIES AND THE UNITED STATES

(percentage changes at annual rates)

Country	*1974*	*1978*	*1979*	*1980 (forecast)*
Belgium	12.7	4.5	4.4	6.3
Denmark	15.2	10.1	9.6	13.5
France	13.7	9.1	10.7	13.3
Germany	7.0	2.8	4.1	5.5
Italy	19.1	12.1	14.7	20.0
The Netherlands	9.4	4.1	4.2	6.5
United Kingdom	16.0	8.3	13.4	18.0
United States	10.9	7.5	11.3	13.5
Whole group:				
Average	13.0	7.3	9.1	12.1
Standard deviation	3.9	3.2	4.3	5.5
EMS group (incl. U.K.):				
Average	13.3	7.3	8.7	11.9
Standard deviation	4.1	3.5	4.5	5.9

SOURCES: IMF, *International Financial Statistics*, October 1980; OECD, *Economic Outlook*, July 1980; and Economic Surveys of various countries.

spective EMS members, although North Sea oil might halt and reverse the pound sterling's past record of real depreciation.[11]

The picture that emerges for the near future of the EMS is thus of a continuing need for nominal depreciation and less need for real depreciation of the dollar against the EMS currencies and, consequently, a somewhat diminished threat to the survival of the EMS from the outside. But the picture also shows a continuing need for nominal appreciations of the currencies of Belgium, Germany, and the Netherlands against the other EMS currencies and, consequently, a persistent threat to the survival of the EMS from the inside. To prevent these inside pressures on the EMS, the countries of Denmark, France, Italy, and the United Kingdom will have to correct their long-standing overly expansionary monetary policies toward a degree of monetary discipline far greater than they seem to prefer in view of the temporary contraction that might involve for their real economies. Under the rules of the EMS, if these countries fail to make the necessary policy adjustments, the monetary authorities of Belgium, Germany, and the Netherlands will be forced either to adjust their parities or to prevent their currencies from appreciating against the Danish krone, the French franc, the lira, and possibly the pound sterling by continued purchases of these currencies in the exchange market. If the strong-currency countries in the EMS continually intervene to stabilize their exchange rates against the weak currencies, they are in effect *subordinating* their own monetary policies to those of the weak-currency countries and importing the higher rates of inflation and monetary expansion. The strong-currency countries will then be confronted with the choice between adhering to an exchange-rate target or to a money-supply and inflation target. From the statements issued by the monetary authorities of the strong-currency countries—especially Germany and the Netherlands—it seems clear that in such situations they will prefer to adjust parities, revalue their currencies, and stick to their inflation and monetary targets.[12] History teaches us, however, that the prospects of such parity changes, which normally come too late and are often too small, will

[11] Indeed, since 1977, along with the continuing benefits of North Sea oil, the trend rate of real depreciation of the pound sterling against the dollar and most EMS currencies has been halted and reversed into a trend real appreciation. For further evidence, see Burns *et al.* (1977, pp. 13-20).

[12] This has been made particularly clear by the former President of the Bundesbank, Otmar Emminger, in an article in *Handelsblatt* of March 26, 1979, and in an article in *Lloyds Bank Review* of July 1979.

revive speculation. Massive speculative runs in or out of the currencies whose parities are to be adjusted will then be with us again. Large-scale exchange-market interventions, capital controls, and, eventually, abrupt parity changes will be tried but found wanting. For they fail to solve one of the basic problems underlying exchange-rate instability—inconsistent monetary policies among countries. If such policies are left unchanged, and nothing yet points to their disappearance, the prospects of survival for the EMS are dim indeed, and the chances are that after a series of exchange-rate crises it will collapse.

8 The Choice between Price Stability and Exchange-Rate Stability

If confronted with the choice between importing inflation and money growth from the weak-currency countries or sticking to a target of low and stable rates of inflation and monetary growth, then, the strong countries will choose the latter and adjust their parities instead. I strongly endorse this choice. As a rule, stable prices or, for that matter, low and stable inflation rates are to be preferred to stable exchange rates. In the EMS countries many more contracts are affected by the purchasing-power risk incurred by price-level variability than by the exchange-rate risk incurred by exchange-rate variability. This follows from the fact that in most of these countries (except the very small ones like Luxembourg, Liechtenstein, or Monaco) people's assets and liabilities are mostly expressed in the domestic currency. Moreover, insurance against exchange-rate risk is more available than insurance against inflation risk.

Like the monetary authorities of Germany and the Netherlands, I prefer monetary and price-level stability to exchange-rate stability. But, unlike these monetary authorities, I do not think that the consequence of this preference is to accept the EMS as an adjustable-peg system rather than a genuinely fixed exchange-rate system. Chances are that operating the EMS as an adjustable-peg system will revive currency speculation, cause exchange controls, and induce unnecessary exchange-rate variability. Indeed, my proposal would be to use the EMS not as an engine to produce exchange-rate stability but, rather, as an instrument to equalize inflation rates in its area. Countries should be granted membership only if they agree to conduct their monetary policies for the sole purpose of stabilizing their inflation rates at the lowest possible common level, preferably zero per cent. By preventing inflation differentials in this way, a major

source of exchange-rate variability would be turned off. Real exchange-rate movements would then be the only remaining major source of exchange-rate variability. Since these movements cannot be prevented by economic policy, spot-market exchange rates would have to be flexible in order to be able to float smoothly to whatever level real exchange-rate movements forced them to and to deter currency speculation. Under such an EMS, members would pursue their monetary policies with the sole aim of reducing, stabilizing, and equalizing their inflation rates and would not try to prevent real exchange-rate changes from affecting their spot-market exchange rates. Consequently, monetary policies would be much less demanding than under the current EMS but would nevertheless substantially reduce exchange-rate and purchasing-power risks by reducing nominal exchange-rate variability and inflation.

9 Floating and International Competitiveness

It should be clear by now that I prefer a system of floating exchange rates to the current system of fixed but adjustable pegs, provided member countries conduct monetary policies aimed at a low, stable, and common inflation rate.

An opposing view argues against a system of floating rates that leaves the determination of spot exchange rates to the exchange markets. In this view, exchange rates should be government-determined, not market-determined, and should be used as an instrument of economic policy. Proponents of this view are located mainly in strong-currency countries such as Germany and the Netherlands. They seem to argue that in the recent past floating rates have induced the guilder and DM to rise rapidly in value against their partner currencies, thereby damaging the international competitive position and export-oriented industrial structure of the two economies. Consequently, they say, the monetary authorities of the strong-currency countries should take control of their exchange rates and raise them in order to devalue the guilder and DM and restore competitiveness.

The view that the floating-rate system has been to blame for a deterioration of Dutch and German international competitiveness is at odds with the broad facts. From a macroeconomic point of view, a country's competitive position may be thought of as being determined by the value of its currency in terms of a trade-weighted basket of its competitors' currencies (the *effective* spot exchange rate) as well as by the country's tradable-goods price level relative to a trade-weighted average of its competitors' tradable-goods prices (the *effec-*

tive price ratio). If the effective value of a country's spot exchange rate rises at the same speed as its tradable-goods prices fall relative to those of its trading partners, or vice versa, nothing happens to its competitive position (the *effective* real exchange rate) vis-à-vis its trading partners.

In Table 3, the 1978 and 1979 competitive positions of sixteen countries are compared with those of March 1973. As is shown in column (3), between 1973 and 1979 Germany's competitive position has deteriorated by a mere 4.2 per cent and Dutch competitiveness by a trifling 0.2 per cent. It appears from Table 3 that during the years of floating rates the effective spot exchange rates of the DM and guilder, and of most other currencies including the dollar, for that

TABLE 3

EXCHANGE RATES AND INFLATION IN SIXTEEN COUNTRIES

(March 1973 = 100)

	1979 Indexes Using Bilateral Exchange Weights			*1978 Index of Effective Real Exchange Rate*	*Standard Deviation of Effective Real Exchange Rate Mar. 1973-Dec. 1978*
Country	*Effective Spot Rate of Exchange (1)*	*Effective Foreign Price Ratio (2)*	*Effective Real Exchange Rate (1)/(2) (3)*	*(4)*	*(5)*
Australia	74.2	86.7	85.6	86.9	6.58
Austria	118.2	109.6	107.8	109.9	3.89
Belgium	110.6	114.1	96.9	99.5	2.11
Canada	84.2	90.7	92.8	92.0	5.60
Denmark	99.7	98.1	101.6	104.4	3.30
France	89.9	91.1	98.7	97.1	2.58
Germany	136.5	131.0	104.2	103.2	2.96
Italy	55.1	59.0	93.4	93.8	4.52
Japan	115.4	118.5	97.4	108.8	8.37
The Netherlands	118.5	118.3	100.2	103.6	2.03
Norway	101.8	112.9	90.2	98.4	2.52
Spain	76.5	73.5	109.4	97.0	5.70
Sweden	87.9	88.6	99.2	96.1	4.91
Switzerland	116.7	143.4	116.2	119.7	9.46
United Kingdom	72.9	61.4	118.7	106.3	4.58
United States	97.6	102.5	95.2	95.5	2.83

NOTE: The index of the effective exchange rate for a currency is a measure of that currency's trade-weighted average appreciation or depreciation vis-à-vis the currencies of 15 other major countries. An index above 100 implies that a currency has appreciated against these 15 other currencies, and vice versa for a depreciation. The exchange rates used are the averages of daily noon spot exchange rates in New York for the months shown. Column (2) shows the ratio of trade-weighted foreign to domestic wholesale prices of nonfood manufactured goods. The trade weights used are based on 1976 bilateral trade in manufactures.

SOURCE: Morgan Guaranty, *World Financial Markets*, April and December 1979 and February 1980.

matter, have generally moved so as to maintain the international competitiveness of the countries involved. Competition, it seems, tends to ensure that the prices of tradables expressed in a common basket of currencies will be the same everywhere. By implication, inconsistent rates of inflation in the prices of tradables tend for the most part to be accommodated by changes in effective spot exchange rates. Of course, there are exceptions. The pound sterling and the Swiss franc have both experienced sizable effective real appreciations against trading-partner currencies during the period 1973-79, whereas over that same period the Australian dollar has experienced a rather strong effective real depreciation against trading-partner currencies. But a comparison of columns (3) and (4) reveals that the effective real appreciation of the pound sterling occurred largely after 1978, probably in connection with increased North Sea oil production.

10 The Use of Exchange Rates as an Instrument of Policy

Table 3 seems to say that flexible spot exchange rates automatically move so as to maintain a country's competitive position in the world market. This raises the question whether spot exchange rates can be used as a policy instrument to bring about improvements in a country's competitive position. Let me answer this question by way of an example.

Assume that North Sea oil is found by the United Kingdom, that natural gas is discovered in the Netherlands, and that these countries start to exploit these resources and to export. As argued in section 5 above, these shifts in productivity and trade patterns would cause the spot and real exchange rates of the pound sterling and the guilder to fall against all other currencies. The rising real value of the pound and the guilder resulting from increased productivity of or demand for *specific* exportables (oil and gas) would damage the competitive position of all other exportables produced by the United Kingdom and the Netherlands. Would this damage be prevented by keeping spot exchange rates fixed? Or could the damage be undone by decisions to devalue the pound and the guilder in order to restore their initial spot exchange rates? The answer to both questions is most probably "No." After such shifts in productivity and trade patterns, the pound and the guilder would have to appreciate in real terms, whether their spot rates were fixed or flexible. With fixed spot rates, the required real appreciation of the pound and guilder would eventually take place via rising inflation rates in the United Kingdom and the Netherlands relative to inflation elsewhere. Nor could the monetary authorities of the two countries undo the real appreciation of

the pound and guilder and restore the competitiveness of their other tradables by decisions to devalue both currencies to their initial level. Such action would raise the cost of production, and—in a world where money illusion is scarce—this rise would be passed on promptly to higher domestic prices, thereby raising domestic inflation relative to inflation elsewhere.

There are better ways than currency devaluation for the governments of the United Kingdom and the Netherlands to try to prevent the competitive position of their "veteran" tradables industries from being damaged by the real appreciations of the pound and guilder accompanying the rapid development of "infant" tradables. One way would be to use the proceeds of oil and gas to subsidize capital investment and wages by lowering taxes on profits and wages and social security taxes. Instead, in the Netherlands, the proceeds were used to finance major increases in social security payments.

It should be stressed at this point that discretionary revaluations or devaluations of a country's currency fail to affect its real exchange rate and competitive position *only* if they cause the spot exchange rate to move away from its equilibrium level. If, however, such actions are aimed at restoring the real exchange rate to its equilibrium level, they will affect a country's real exchange rate and competitive position. For example, if certain shifts in productivity and trade patterns require the real value of a country's currency to rise relative to all other currencies, but spot exchange rates are fixed, then that country's inflation rate will have to increase relative to inflation elsewhere to bring about the required real appreciation of its currency. But if inflation adjusts slowly, the country's real exchange rate will temporarily diverge from its equilibrium value: the real exchange rate will be higher, and the real value of the currency lower, than required. In theory, the temporary effects of such disequilibrium real exchange rates on a country's competitive position could be prevented by a discretionary revaluation of the country's currency (i.e. a decrease in its spot rate) equal to the required appreciation of the currency. In practice, however, policy-makers may find it impossible to fine tune their spot exchange rate this way because they do not know the equilibrium level of their real exchange rate.

11 Summary, and the Lessons to Be Learned

Let me summarize by briefly repeating the major points I have made:

1. Pegged-parity systems like the EMS can be successful in bringing

about exchange-rate stability and preventing exchange-rate crises in the 1980s only if nominal and real exchange-rate movements are transitory and small.

2. I have defined nominal exchange-rate movements to be equal to the inflation differentials between countries. Inflation is the result of too much money chasing too few goods. Inflation and inflation differentials can be reduced if countries are prepared to achieve stable and preannounced monetary-growth targets aimed at a low, stable, and common inflation rate. This raises a basic issue in monetary-policy cooperation among the members of any pegged-parity system—how to arrive at consensus on what this "common" inflation rate should be.

3. I have defined real exchange-rate changes as those changes in spot exchange rates that cannot be attributed to inflation differentials between countries. Most such real exchange-rate changes are due to international shifts in productivity and trading patterns and cannot be prevented by economic policy.

4. As long as real exchange rates change, fixed spot exchange rates are incompatible with a stable and common inflation rate.

5. Stable prices or low and stable inflation rates are to be preferred to stable spot rates, because many more people are affected by purchasing-power risk than by exchange-rate risk, given the fact that most of their assets and liabilities are expressed in domestic currency.

6. If the past is a reliable guide to the future, nominal and real exchange-rate changes among the currencies of the EMS member countries will be of a magnitude that will threaten the survival of the EMS from the inside.

7. If flexible, spot exchange rates tend to move so as to maintain a country's competitive position in the world market. A corollary of this argument is that exchange-rate changes cannot be used as an instrument to bring about changes in a country's competitive position.

From this analysis of the aims and scope of monetary and exchange-rate policy, three important lessons can be learned.

1. Fixed spot exchange rates may retard but can never prevent the adjustments of a country's real exchange rate that become necessary when productivity and trade patterns shift.

2. Fixed spot exchange rates, since they cannot adjust, shift the burden of adjustment to disturbances over to those variables that are left to adjust: prices, output, unemployment, real exchange rates, international competitiveness, etc. Fluctuations in these variables need to be larger, the less scope there is for spot-rate fluctuations.

3. Finally, in a world with little or no money illusion left, discre-

tionary changes in a country's spot exchange rate cannot be expected to affect its real exchange rate and competitive position. Over the past twenty years we have learned the hard way that the inflation rate cannot be used as an instrument to lower real wages and unemployment. By the same token, spot exchange rates cannot be used to devalue a currency in real terms in order to improve a country's competitive position. With money illusion absent, higher prices will be passed on promptly to higher nominal wages, leaving the real wage rate unchanged. Likewise, discretionary increases in a currency's spot exchange rate away from its equilibrium value will increase import prices and the costs of production, which will be passed on promptly to higher domestic wages and prices, leaving the real exchange rate unchanged. It took a decade of accelerating inflation and continued stagnation to learn that the Phillips curve is dead, that there is no relationship between the inflation rate and real wages that can be systematically exploited by inflationary policies aimed at lowering unemployment. It is to be hoped that it will not take us another decade of stagflation to learn that there is also no relationship between the spot exchange rate and the real exchange rate that can be systematically exploited by exchange-rate policy to reduce the real value of the currency, improve competitiveness, and raise output and employment.

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Mathematical Appendix

In its *simplest* deterministic form, the following two-country model underlies much of what has been written in this essay:

$$(1.a)\ p = p_T^{\beta} p_N^{(1-\beta)} \qquad (1.b)\ p^* = p_T^{*\beta} p_N^{*(1-\beta)}$$

$$(2.a)\ y = y_T^{\beta}\, y_N^{(1-\beta)} \qquad (2.b)\ y^* = y_T^{*\beta} y_N^{*(1-\beta)}$$

$$(3.a)\ w = p_T y_T \qquad (3.b)\ w^* = p_T^*\, y_T^*$$

$$(4.a)\ w = p_N y_N \qquad (4.b)\ w^* = p_N^* y_N^*$$

$$(5.a)\ M = kpy \qquad (5.b)\ M = k^* p^* y^*$$

$$(6)\quad p_T = e p_T^*$$

Asterisks indicate foreign variables. Equations (1.a) and (1.b) define the general price level (p) as a geometrical average of the prices of tradables (p_T) and nontradables (p_N). Equations (2.a) and (2.b) state that total per capita output (y) is a geometrical average of per capita output of tradables (y_T) and nontradables (y_N), both of which are assumed to be exogenous to the model. For simplicity, the weights used in equations (1) and (2) are taken to be the same at home and abroad. Equations (3.a), (3.b), (4.a), and (4.b) state that wages per capita (w) are the same across the tradables and nontradables sectors. In each sector, real wages equal that sector's productivity. Equations (5.a) and (5.b) state that the stock of money per capita is willingly held by the public. The demand for money is taken to depend proportionally on the price level and total output per capita. The stock of money per capita is assumed to be exogenous. Parameters k and k^* are constants. Finally, equation (6) restricts purchasing-power parity to tradables.

The model can easily be extended: Social security tax rates can be introduced in equations (3) and (4). Variables describing asset substitution and currency substitution, such as interest rates, expected inflation rates, and expected exchange-rate changes, can be introduced in the money-demand functions of equations (5.a) and (5.b). Equations for interest arbitrage can be added. Variables y_T and y_N can be endogenized by postulating demand and supply functions for tradables and nontradables. And stochastic properties can be added to the equations. Since the above model is meant to be an expositional device only, such extensions will not be pursued here.

From equations (2) and (5) it follows that

(7.a) $p = M/ky_T^{\beta}\, y_N^{(1-\beta)}$ (7.b) $p^* = M^*/k^*y_T^{*\beta}y_N^{*(1-\beta)}$.

From equations (1), (3), and (4) it follows that

(8.a) $p = p_T y_T^{(1-\beta)}/y_N^{(1-\beta)}$ (8.b) $p^* = p_T^* y_T^{*(1-\beta)}/y_N^{*(1-\beta)}$.

From equations (7) and (8) it follows that

(9.a) $p_T = M/ky_T$ (9.b) $p_T^* = M^*/k^*y_T^*$.

From equations (6) and (9) it then follows that

(10) $e = k^*y_T^*M/ky_TM^*$.

Defining the real exchange rate as $er = e/(p/p^*)$, it follows from combining equations (7) and (10) that

(11) $er = [(y_T/y_T^*)/(y_N/y_N^*)]^{-(1-\beta)}$.

From combining equation (11) with equations (3) and (4) it is clear that the real exchange rate reflects the ratio of the relative prices of foreign and domestic tradables and nontradables:

(12) $er = [(p_T/p_N)/(p_T^*/p_N^*)]^{(1-\beta)}$.

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