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# **Regional exchange rate arrangements in a world of floating rates: The experience of the EMS**

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EXCHANGE RATE DETERMINATION:  
ANALYSIS AND POLICY ISSUES

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REGIONAL EXCHANGE RATE ARRANGEMENTS IN A WORLD OF FLOATING

RATES: THE EXPERIENCE OF THE EMS

(a paper presented at the meeting of central bank economists  
held at the Bank of International Settlement in Basle on  
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by

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With the collapse of the system of fixed exchange rates at the beginning of 1973, the large oil price rises of 1973 and 1978 and the growing strength of the newly industrialised countries, the economies of the developed countries had to contend with major internal and external imbalances. For many, the solution to these imbalances lay in the general outright floating of currencies which, it was predicted, would give greater autonomy to national monetary policies and secure a more harmonious pattern of external payments.

The development of the world economy over the last ten years has not confirmed the optimism of the supporters of free floating. Economic growth in general has declined; under-employment has increased; inflationary pressures have continued to persist and current-account imbalances have reached an unprecedented scale, while the exchange rates of the major currencies have been subject to considerable "overshooting".

Aware of the dangers of this situation for the development of international trade, the monetary authorities of most of the industrialised countries have endeavoured to restrict exchange rate volatility with intervention. They have acted either individually by trying to stabilise their currency's rate against the dollar or against a "basket" of currencies, or by joining together to form a regional monetary union.

This is the solution that some European countries<sup>1</sup> adopted in creating first the "snake" and then the "European Monetary System". In what way does this solution combining floating and fixed exchange rates represent the best response on the part of the zone thus formed and its member countries to external and internal shocks? what must be the economic characteristics of candidates for a process of monetary integration? Has this process caused national authorities to make a fundamental adjustment in the priorities that they ascribe to the various internal and external equilibria? Have the objectives of economic stabilisation that were sought through exchange rate control been attained?

These are the major theoretical and empirical questions raised by the creation of a monetary arrangement such as the EMS.

The first part of this note deals with the theory of monetary integration under the following two headings: the optimum criteria for participation in a regional monetary agreement; the economic and monetary

consequences of establishing a monetary arrangement. The second part, devoted to the empirical analysis, sets down in the first section the structural characteristics of the member countries' economies, which allow an a priori evaluation of the potential degree of cohesion within the European Monetary System, and describes, in the section which follows, the visible results of the first stage of the monetary integration process instituted in 1979.

I.

The theoretical aspects of monetary integration

In economic literature the question of monetary integration is approached from two complementary angles: the first seeks to identify the structural economic characteristics that favour a country's participation in a regional process of exchange rate stabilisation; the second, taking the view that by the very nature of its objective monetary integration seeks specifically to modify these structural characteristics, is more concerned with the nature and optimality of the changes thus obtained.

The optimum criteria for membership in a regional monetary arrangement

The introduction of a mechanism of stable exchange rates between two or more countries is only desirable - in terms of both domestic growth and external equilibrium - to the extent that the candidate countries possess sufficiently flexible economic and financial structures. This is the general tenor of this line of thought.

Mundell (1961), the precursor of this approach, considers the strategic element in monetary integration to be the degree of mobility of the factors of production. The greater this mobility within a given region, the smaller the changes in relative prices and incomes required to maintain full employment and external payments equilibrium.

This general theory has been criticised for the lack of realism in the hypothesis of labour mobility as an optimum mechanism for current-account adjustment. This mobility remains very limited in the short term and thus cannot alleviate exchange rate inflexibility. So, the rigidity of the labour factor, accompanied by high capital mobility, may, in a regional fixed exchange rate system, trigger cumulative depressive chain reactions; an external deficit will, in the absence of an exchange rate change, in fact lead to a deflationary policy in the country involved, which will generate under-employment. This may then be exacerbated by a shift of capital to the growth regions of the monetary zone. Furthermore, one may question the optimality of such mobility in the medium term. Clearly, it entails a high social cost which may largely offset the possible gains to be expected from greater external payments equilibrium.

Other authors, while recognising that the mobility of the factors of production may under certain conditions facilitate external adjustments, take the degree of openness of the economy to be the fundamental criterion for monetary integration.

Tower and Willet (1976) demonstrate that the advantages for a country of participating in a monetary union increase in proportion to the degree of the economy's openness, this being expressed in terms of the ratio of exports or imports to GNP under conditions of full employment. The higher this ratio, the smaller the change in domestic demand required to restore external equilibrium and therefore the less costly restrictive policies in terms of employment. Moreover, the key influence of the price of imported goods on domestic prices should make countries with very open economies prefer adjustments in domestic demand to changes in exchange rates. The conclusion of this analysis is that it is in the interests of small economies, which are by their nature highly open, to join together in monetary unions.

Other authors advance a similar line of argument. McKinnon (1963) states that the degree of openness within the union must be greater than that existing between the union and the rest of the world.<sup>2</sup> He also adopts a more directly relevant definition of the degree of openness, which is measured by the ratio of tradable to non-tradable goods. In addition, McKinnon stresses the fact that in countries where this ratio is high, real incomes are strongly affected by exchange rate fluctuations, causing economic agents to index their incomes to changes in import prices and thus reducing the effectiveness of the exchange rate as an instrument of adjustment.<sup>3</sup>

Orcutt (1955) puts forward another argument for countries with highly open economies forming a monetary union; in these small countries imports are generally composed of products with low substitutability with goods produced domestically. So a depreciation of the national currency may have a perverse destabilising effect on the trade balance, with the rise in the prices of imported goods substantially exceeding the fall in their volume.

The proposition that a highly open economy is a criterion for monetary integration is based on the hypothesis that all causes of disequilibria in the economy are of domestic origin. This hypothesis was perfectly appropriate in the 1950s and 1960s when the theory was devised; nowadays this is no longer the case. The works by Kenen (1969), Giersch (1970) and Corden (1972) have demonstrated that diametrically opposite conclusions can be reached when the disturbances are of external origin. For Kenen, for example, the extent to which the economy is diversified is the determining criterion. The greater this diversification, the more the economy is capable of absorbing external shocks without a change in the exchange rate. It is therefore to the advantage of highly diversified economies to enter into monetary arrangements to stabilise exchange rates. Clearly, this theory is precisely the opposite of the proposition argued by McKinnon. The most diversified economies are in fact the largest and thus the least open.<sup>4</sup>

Recognising that the exchange rate has the quality of a monetary and financial variable, other authors have stressed the importance of the extent to which the financial markets of the candidates for a monetary union are integrated. Thus, according to Ingram (1973), in these countries perfect capital substitutability will allow automatic balance-of-payments

adjustment at a lower cost than would be involved in an exchange rate change. The main criticism levelled at this theory is that, faced with a lasting domestic imbalance, a country cannot go on borrowing indefinitely; it will eventually have to adjust in real terms. It is not certain that such a delayed real adjustment would be less costly than that which would have resulted from an immediate depreciation of the exchange rate.

The extent to which wages are price-indexed is the second monetary factor to which a key rôle in the viability of a monetary union is attributed. Countries which differ significantly in this respect usually have different inflation rates. Under these conditions, maintaining stable exchange rates is not an optimum solution in terms of growth. In effect, a country with high inflation would be forced to reduce the increase in its domestic prices in order to stay in the union and would have to accept a worsening of under-employment. This is the line of argument advanced by Corden (1972) and Tower and Willett (1976). It is, however, based on the assumption of a Phillips curve, i.e. a possible trade-off between inflation and under-employment. However, both the recent experiences of "stagflation" and the neo-monetarist approach of rational expectations tend to suggest the existence of a natural unemployment rate which monetary policy is powerless to influence on a lasting basis.<sup>5</sup> In these circumstances differences in inflation rates and degrees of wage indexation do not constitute, a priori, a fundamental obstacle to the formation of a monetary union.

However, if wages are fully price-indexed, Marston (1982) demonstrates that production is affected by real or monetary<sup>6</sup> domestic shocks in exactly the same way whether exchange rates are floating or fixed within a monetary union. Where indexation is not complete it is the origin and nature<sup>7</sup> of the economic disturbances that must determine the choice between the two régimes.

A study of the optimum criteria for monetary integration put forward in economic literature does not produce any clear-cut theoretical conclusions which could serve as a practical guide, for four main reasons:

- (a) it is unlikely that the countries wishing to join together in a monetary union will possess all the optimum characteristics of a good candidate;
- (b) unions based on such criteria would usually be short-lived, forming and dissolving according to whether the economic disturbances were real or monetary, or of external or domestic origin;
- (c) the aim of monetary integration is precisely to modify the structural characteristics of member economies in a direction that will help to preserve the union;
- (d) finally, the abrupt dividing line between floating and monetary union with immutably stable exchange rates does not conform to reality.



It might therefore seem more meaningful to examine the consequences which can be expected a priori for the candidates for a monetary union individually and collectively.

The economic and monetary consequences of establishing a monetary arrangement

The first and principal consequence of forming a monetary union is the loss of autonomy in national monetary policies. Maintaining exchange rate stability implies that the member countries will set similar monetary growth targets. The rate of growth can only be that chosen by the dominant economy, whose currency will tend to become the reserve instrument for the system (like the dollar in the Bretton Woods system).<sup>8</sup>

In fact, only this country will retain control of its monetary policy. Under such an arrangement, monetary policy convergence between the member countries is only possible, and the maintenance of stable exchange rates only lasting, if two conditions are met:

- (a) perfect capital substitutability within the union - no exchange controls - which will render policies of neutralising the influence of reserve movements on monetary growth ineffective;
- (b) a low degree of wage indexation - allowing price flexibility - so that monetary policy can modify inflationary expectations quickly and at low cost.

If these conditions are not fulfilled member countries will probably be unable, or unwilling, to relinquish autonomy in national policies. There will be only limited convergence of monetary growth rates, impairing the credibility of exchange rate stability which in turn will result in recurring exchange-market crises and the tightening of exchange controls. The basic aim of the monetary arrangement, namely a lower level of exchange rate volatility than there would have been under a régime of outright floating, might not then be achieved.

If, however, the condition of perfect capital mobility is fulfilled, the loss of monetary policy autonomy is absolute. In the present economic environment, the economic cost of abandoning this prerogative will nevertheless be small, insofar as its impact on the real domestic and external imbalances would tend, according to the monetarists,<sup>9</sup> to diminish: in the first case - domestic imbalance - as we have seen, because the Phillips curves are almost vertical; in the second case - external imbalance - because with floating exchange rates nominal exchange rate changes have less and less effect on real exchange rates so that a country cannot gain a lasting competitive advantage from a continuing depreciation of its currency.<sup>10</sup>

If the country with the union's reserve currency practises a monetary policy conducive to a low rate of inflation, one may therefore expect a general fall in and convergence of inflation rates in member countries, without any significant worsening of under-employment in the zone.

In terms of economic policy, the formation of a monetary union has a second important consequence: it restores the effectiveness of budgetary policy.<sup>11</sup> Once member governments have stopped using the monetary instrument, there is a great risk of intensive use of budgetary policy geared to national objectives, particularly in those countries in which the adjustment to a régime of low inflation rates entails a high social cost. This may create external disequilibria between member countries on such a scale as to endanger the survival of the monetary union. Maintaining the union therefore implies a certain degree of harmonisation of budgetary policies.

The authorities of member countries will only accept a reduction of autonomy in national economic policy if they can expect in return a number of positive results from integration in terms of domestic and external equilibria.

In this respect, the fundamental purpose of entering into a regional exchange rate arrangement is to eliminate the adverse repercussions of real and nominal exchange rate volatility on external equilibria. The last decade has shown that under a floating régime there is sometimes considerable real exchange rate overshooting furthered by an excessive mobility of short-term capital flows.<sup>12</sup> Balance-of-payments disequilibria are then exacerbated rather than alleviated as anticipated by the supporters of flexibility.

However, exchange rate stabilisation can only eliminate these drawbacks to the extent that the candidates for the union have fairly similar economic and social structures, especially in the case of a partial monetary union<sup>13</sup> in which exchange rates can fluctuate within certain margins and parities may be revised (as in the case of the European Monetary System).

If, on the other hand, economic structures vary too greatly, exchange rate stabilisation may have negative repercussions on both the current and capital-account balances. The competitiveness of the higher-inflation countries will deteriorate, exacerbating their trade disequilibrium and triggering periodic speculative pressures which will have a further adverse impact on their payments equilibrium. As a short-term response, these countries will draw heavily on their exchange reserves and introduce exchange controls, which will reduce their financial integration in the union. Exchange rate stability can thus be compromised by the fact that, notwithstanding developments within the zone, capital flows - from countries outside the union - will tend to gravitate towards the least segmented markets.

In the longer term, if these countries are not able to reduce their inflation rates to the same level as that of the dominant economy, they will have a choice between two policies:

- (a) a more or less frequent revision of their parities, in which case one of the decisive economic advantages of the union will tend to be lost. However, if these parity changes reduce the real exchange rate overshooting characteristic of outright floating,



the external disequilibria within the union will remain small and the union will therefore have a better chance of survival;

- (b) a deflationary policy which might spread through the union owing to low labour mobility accompanied by a high degree of integration of the goods and capital markets. The tendency towards uniform wage levels that will probably emerge within the union, regardless of productivity differences, may further aggravate the situation. However, it is not impossible that the concentration of capital in the most productive regions, while causing large pockets of regional unemployment, may eventually raise productivity in the monetary zone as a whole.

It therefore appears that the main economic consequences of entering into a monetary arrangement - unless it is a full monetary union - will, a priori, be positive if the member countries set similar priorities and possess similar economic and social structures. If this is not the case, the consequences will be negative, especially if the authorities delay revising inappropriate parity grids.

If parities are revised frequently, an examination of the economies' structural parameters is not sufficient for a diagnosis. An empirical analysis of the results of monetary integration is also necessary.

In the second part of this note the experience of the European Monetary System is examined on this basis.

## II.

### The empirical aspects of the creation of a regional monetary arrangement: the example of the European Monetary System

The main objective of the European Monetary System<sup>14</sup> established in March 1979 is to stabilise exchange rates between the member countries of the European Economic Community.

There are four chief reasons why this arrangement is only a partial monetary union:

- (a) the exchange rates may fluctuate within a certain band, which varies in size depending on the country concerned;
- (b) the parity grid may be revised by mutual agreement;
- (c) the creation of a European Monetary Fund, responsible for the definitive issue and control of ECUs, has been deferred to a later date;
- (d) from the outset the United Kingdom opted out of the exchange rate mechanism.

Furthermore, the EMS has existed in an especially unpropitious period for its survival. The external disequilibria of the EEC countries were aggravated by the substantial rise in oil prices in late 1978, the generalised slowing-down of world growth and, lastly, the abrupt rise and mounting volatility of the dollar exchange and interest rates, partly attributable to the new US monetary policy introduced in October 1979.

Despite this unpromising start, the European Monetary System has held its own, at the cost of a number of exchange rate adjustments and thanks to the greater co-ordination of monetary and exchange rate policies. It is worth examining the rôle played in this process by the structural characteristics of monetary integration (see Section I above) and the initial results of this monetary arrangement.

Examination of the optimum criteria for monetary integration for the EMS countries

1. The existence among the EMS countries, which are all members of the European Economic Community, of the principle of the free movement of factors of production is, according to Mundell's criterion, a point conducive to the establishment of a monetary union. However, the numerous cultural and social differences still subsisting within this group are a major barrier to labour migration. The most obvious manifestation of this inadequate flexibility is the continuing existence of significant differences in regional unemployment and wage rates.

Indirect - and very limited - evidence of the impact of labour movements on external adjustments may be supplied by the development of workers' remittances as recorded in the balance of payments. Table 1 below shows the relative contribution of such remittances to external equilibrium in 1976 and 1981.

Table 1

NET BALANCES OF TRADE AND OF WORKERS' REMITTANCES  
EXPRESSED AS A PERCENTAGE OF IMPORTS

Country	1976		1981	
	Balance of trade	Workers' remittances*	Balance of trade	Workers' remittances*
Belgium .....	- 6.2	- 0.6	- 11.2	- 0.6
Denmark .....	- 24.1	- 0.4	- 5.6	- 0.8
France .....	- 7.8	- 2.4	- 8.1	- 2.0
Germany .....	19.5	- 4.0	10.6	- 3.2
Italy .....	- 10.4	1.4	- 15.2	1.9
Netherlands .....	3.6	- 0.95	7.2	- 1.2
Ireland .....	- 15.4	2.6	- 27.8	-

\* Line 77 aed in IFS entitled "Private unrequited transfers" (this item does not include direct transfers of wages by employers for their employees).

Source: IFS (IMF).

These figures prompt the following remarks:

- (a) A substantial portion of these remittances comes from workers whose countries of origin are outside the EEC and whose movements have been affected by the restrictions on immigration introduced by some countries. Thus, it is likely that, but for these restrictions, the modest reduction in the size of the income transfers observed in the German and French balances would not have occurred.
- (b) Subject to this reservation, it would seem that the apparent impact of labour mobility on balance-of-payments equilibrium in the EMS countries is negligible compared with that of movements of goods. This phenomenon is all the more remarkable in that unemployment rates almost doubled in some EMS countries between 1976 and 1981.

It appears, therefore, that as far as the criterion of mobility of factors of production is concerned the EMS does not, a priori, constitute an optimum monetary zone.

2. However, the large degree of integration amongst the economies participating to the EMS provides a counterbalance to the insufficient mobility of the labour. As Table 2 below shows, the degree of openness of the member countries vis-à-vis the world economy and within the EMS is particularly high in comparison with that of the United States or Japan.<sup>15</sup>

Table 2

DEGREE OF OPENNESS: EXPORT OF GOODS AND SERVICES  
AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT

Country	(1) To EMS countries	(2) To the rest of the world	(3) To the world as a whole (1 + 2)
Belgium .....	37.8	21.9	59.7
Denmark .....	12.1	21.4	33.5
France .....	9.5	11.6	21.1
Germany .....	12.3	16.6	28.9
Italy .....	9.7	13.0	22.7
Netherlands .....	34.1	18.9	53.1
Ireland .....	17.3	36.5	53.8
Japan .....	1.5	13.6	15.1
United States ....	2.5	7.6	10.1

Another measure of the sensitivity of external equilibrium to changes in national income can be provided by the income elasticity of import demand. The higher this elasticity, the greater will be the impact of changes in domestic demand on the balance of trade.

Table 3

ELASTICITY OF IMPORT DEMAND IN RELATION TO GROSS DOMESTIC PRODUCT

	Belgium	Denmark	France	Germany	Italy	Nether-lands	Ireland
Samuelson <sup>1</sup> (1973)	1.43	-	1.54	1.27	1.88	1.57	-
Apparent elasticities <sup>2</sup>	3.37	0.98	2.79	1.76	1.98	1.41	2.94

1 Estimation period 1962-73.

2 Estimation period 1975-80.

These data must be considered with the usual reservations, particularly in the case of the estimates for the period 1975-80. Subject to these reservations, it appears from Table 3 that these elasticities are, on the whole, considerably greater than unity. Moreover, they have tended to increase during the recent period. This makes policies designed to restrict domestic demand a vital regulatory factor in determining external equilibrium, since the re-equilibrating influence of exchange rate changes tends to diminish with the disappearance of money illusion phenomena both nationally and internationally.

A large degree of openness vis-à-vis the outside world and a high degree of income elasticity of imports thus make the countries of the European Monetary System a suitable group for forming a monetary union.

3. Whilst there is a fairly large degree of integration on the market for goods in the EMS, this is not the case on the financial markets, which are segmented, to a varying degree at different periods, by national regulations on capital movements. Only the German financial market is largely open to the outside world.

This also signifies that the sensitivity of EMS countries' balances of payments - and hence the speculative pressures on their exchange rates - to changes in interest rates in countries outside the zone can be substantially different. The findings of simulations made with the multinational Fair (1981) model measuring the impact of a one per cent. change in the dollar interest rate sustained for six quarters (see Table 4) testify to the existence of such differences.

Table 4

SENSITIVITY OF THE EMS COUNTRIES' BALANCES OF PAYMENTS AND EXCHANGE RATES TO A ONE PER CENT. INCREASE IN THE SHORT-TERM DOLLAR INTEREST RATE SUSTAINED FOR SIX QUARTERS

Country	Changes in the exchange rate <sup>1</sup> (in percentages)	Changes in the balance of payments as a percentage of GDP <sup>2</sup>
Belgium .....	3.7	0.1
Denmark .....	2.3	0.06
France .....	3.7	- 0.005
Germany .....	4.5	- 0.3
Italy .....	3.4	0.07
Netherlands ..	3.8	0.33
Ireland .....	n.a	n.a

1 A positive sign corresponds to a depreciation in the exchange rate.

2 A positive sign corresponds to an inflow of capital.

The limited financial integration of the EMS countries may therefore encourage speculative turbulence likely to jeopardise exchange rate stability within the monetary union. Similarly, this inadequate financial integration is an obstacle to the convergence of monetary policies, which can only be assured by a perfect substitutability of capital.

4. Neither are the existing differences in the degree of indexation of wage rates within the EMS, a priori, a factor conducive to monetary integration.<sup>16</sup> The degree of indexation can be measured directly by setting up a model of nominal wage rates adjusted to take account of the expected development of inflation rates and the level of employment. The data in Table 5 below, taken from works by Resnick (1976) and Sachs (1979) using this approach, provide an evaluation of the degree of indexation in the main EMS countries. The fact that the common estimates differ quite substantially suggests that the findings should be viewed with caution.

Table 5

ELASTICITY OF THE WAGE RATE IN RELATION TO THE EXPECTED INFLATION RATE

	Belgium	France	Germany	Italy	Netherlands
Sachs (1979) <sup>1</sup>	-	1.35	0.88	0.85	-
Resnick (1975) <sup>2</sup>	0.75	0.83	0.63	0.75	1.65

1 Estimation period 1963-78.

2 Estimation period 1953-68.

Two relatively clear points emerge, however, namely, that the degree of wage indexation in Germany is lower than in the other EMS countries and that, generally speaking, the degree of wage indexation in Europe is relatively high.

These characteristics of the EMS countries give all the more cause for concern about the success of the process of monetary integration in that the impact of nominal wage increases on employment tends to be both greater and more disparate in a situation of fixed exchange rates than in a period of outright floating, as is suggested by work carried out by Deardorff et. al. (1977) (see Table 6 below).<sup>17</sup>

Table 6

IMPACT ON TOTAL EMPLOYMENT OF A ONE PER CENT INCREASE IN NOMINAL WAGES UNDER A FIXED OR FLEXIBLE EXCHANGE RATE SYSTEM\*

(changes in employment in percentages)

Country	Fixed exchange rate	Flexible exchange rate
Belgium .....	- 2.03	- 1.15
Denmark .....	- 1.55	- 1.3
France .....	- 1.54	- 1.27
Germany .....	- 1.65	- 1.2
Italy .....	- 1.75	- 1.32
Netherlands	- 1.68	- 1.24
Ireland .....	- 1.94	- 1.47
UK	- 1.55	- 1.18

\* Results of simulations using a world model of production and trade covering the 18 principal industrialised countries and distinguishing between 29 sectors. See Deardorff et al. (1977).

It may be noted that, with fixed exchange rates, the impact on employment of an increase in nominal wages is particularly great where the economy concerned is small and thus largely open. This is because only wage increases in large countries can induce a significant increase in world prices which goes some way towards restoring those countries' competitiveness and partly offsets the initial adverse impact of the wage increase on employment.

With flexible exchange rates, however, disparities linked to country size are sharply attenuated and there is a significant reduction in the sensitivity of employment to increases in wage rates.

Of the four structural characteristics which play a key rôle in the optimality of a monetary union, only one appears, from an examination of historical data, to be relatively favourable to the establishment of the EMS (disregarding the reaction of the economy to external shocks): this is



the degree of openness to the outside world. However, one should not dwell on the negative aspect of insufficient financial integration and the existence of substantial disparities with regard to wage indexation, for it is permissible to hold that, thanks to its own momentum, the EMS has already exercised and will in future exercise increasing pressure towards greater convergence of monetary policies likely to increase financial integration and assure control over nominal developments within the group of EMS countries.

The beginning of this process is examined in the last section below.

#### Results of the first stage of the monetary integration process within the European Monetary System

In the face of the disarray of the international monetary system, the founders of the European Monetary System sought to attain three main objectives through the stabilisation of exchange rates, namely:

- to re-establish sustained growth, enabling a gradual return to be made to full employment in a stable monetary environment;
- to reduce regional disequilibria within the European Community;
- to create a stabilising pole in international economic and monetary relations.

Two approaches are possible in order to evaluate the result of this first step towards monetary integration. The first consists in using econometrics to estimate and simulate a multinational model for the period 1973-82: this would make it possible to identify the changes brought about by the creation of the EMS in the behaviour functions of private and public economic agents, to measure the specific effects of reducing exchange rate volatility and to assess the durability of the impact of this stabilisation on the long-term development of the exchange rates concerned. A second method consists in studying economic and monetary trends, in terms of growth and variability, in the EMS countries since 1973 in comparison with those recorded in the industrialised countries as a whole and in measuring how the 1979 monetary arrangement has affected their relative position in this general context and within the EMS itself.

For reasons of simplicity and time, we have adopted the second approach in this section, although it is not always possible to distinguish between the specific effects of the stabilisation of exchange rates and the impact of the other economic policy measures accompanying this stabilisation.

The outcome of the efforts made by the EMS countries to achieve monetary integration are examined in what follows under three headings:

- measurement of the reduction in the variability of nominal and real exchange rates;
- apparent consequences as regards external and internal equilibria;
- impact on the conduct of monetary and budgetary policies.

#### Measurement of the reduction in the variability of exchange rates

There is no doubt that the concertation machinery adopted in connection with the 1979 monetary arrangement has enabled the day-to-day variability of exchange rates to be reduced. However, taking a longer-term view, the effectiveness of this machinery seems more uncertain in that the permitted bilateral fluctuation margins remain relatively wide (-6 per cent. for the lira and -2.25 per cent. for the other currencies) and the member countries have taken advantage of the possibility of adjusting their central rates on six occasions.

In order to assess the reduction in exchange rate variability it is first necessary to define the concept. The most appropriate way of measuring exchange rate variability would be to isolate the changes which were not anticipated by economic agents, i.e. the "surprises", to use the jargon of the "new macro-economics", for only these can have an impact on the real economy. This, of course, calls for a model describing the formation of agents' expectations. In the absence of such a model,<sup>18</sup> we have adopted in this note an approach based on the average exchange rate growth calculated for different time-spans (1, 2, ..., 12 months). For any given time-span, the standard deviation<sup>19</sup> of the growth rates provides a measure of the variability around this average rate. By thus eliminating a trend effect, which, it may be thought, is taken into account by the market, the preceding criticism can to some extent be avoided.

The problem then arises of defining the exchange rate. One solution would consist in simply taking the bilateral exchange rates expressed in one of the EMS currencies. This has the merit of providing the authorities with a variability yardstick which can be interpreted directly in market terms. However, this approach is still incomplete, since it makes no allowance for the behaviour of economic agents, whose operations and assets are widely diversified internationally. The attitude of these agents with regard to exchange rate variability is better assessed with the aid of an effective exchange rate index. In order to combine the advantages of both approaches, we have used in this note an effective exchange rate concept - see Appendix III<sup>20</sup> - from which the bilateral exchange rate indices can be derived directly. Two sorts of effective exchange rate indices have been compiled (Table 7 below). The first is limited to the EMS currencies and enables the stabilisation effect to be assessed at the level of the European group as a whole. The second takes account in its composition of the fact that the EMS zone is largely open to the rest of the world and is therefore influenced by the floating of currencies outside the zone; this effective index has been compiled from the currencies of the eighteen principal industrialised countries.

Table 7

AVERAGE MONTHLY GROWTH RATES OF THE NOMINAL AND REAL EFFECTIVE EXCHANGE RATES OF THE EMS COUNTRIES\*

(expressed as annual growth rates in percentages)

Country	18-country weightings				7 EMS-country weightings			
	1975 I/1979 II		1979 II/1982 II		1975 I/1979 II		1979 II/1982 II	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
Belgium .....	5.26	- 3.30	- 6.88	10.30	3.73	- 2.29	- 2.58	5.11
Denmark .....	1.20	- 3.60	- 7.79	6.54	- 0.26	- 2.49	- 3.34	1.44
France .....	- 2.76	1.10	- 5.35	2.53	- 4.17	2.22	- 0.97	- 2.31
Germany .....	6.85	- 2.60	- 2.13	6.39	5.30	- 1.52	2.38	1.36
Italy .....	-10.31	3.83	- 7.48	0.08	-11.61	5.00	- 3.19	- 4.63
Netherlands ..	5.10	- 3.02	2.64	6.09	3.58	- 1.94	1.85	1.08
Ireland .....	- 4.27	- 0.06	- 4.05	- 3.42	- 5.66	0.49	0.36	- 7.98
Average growth rate	0.15	- 1.10	- 5.20	4.63	- 1.30	- 0.07	- 0.78	- 0.85
Standard deviation	6.24	2.80	2.30	4.07	6.15	2.81	2.37	4.41

\* An increase in nominal exchange rates corresponds to an appreciation of the domestic currency and hence to a loss of competitiveness, all other things being equal. An increase in real exchange rates corresponds to an improvement in competitiveness.

Having thus defined the framework for analysing exchange rate variability, it remains to determine the period of floating over which the stabilising effect of the establishment of the EMS is to be assessed. Since the German, Belgian, Danish and Dutch currencies were always members of the "snake", it would seem appropriate to take the years 1976 to 1978, the period in which the other three EMS currencies were all floating.

The statistical findings of a comparison of the growth rates and variability of the EMS currencies' exchange rates over the periods 1976-78 and 1979-82 as set out in Table 7 suggest the following comments:

- (a) The EMS has reduced the variability of the effective exchange rate of the participating currencies among themselves. However, by and large this sharp reduction has occurred for time-spans of less than 8 to 9 months. Beyond this, variability has tended to approximate that of the period of floating. During the latter period, in fact, variability ceased to increase beyond the tenth month. Moreover, the stabilising effect is - as one might

expect - more significant in the case of the French franc, the Italian lira and the Irish pound than for the ex-members of the "snake".<sup>21</sup> As regards the average rates of appreciation or depreciation, it may be noted that the trends observed during the period of floating have on the whole continued in the EMS, albeit with a clearly reduced intensity.

- (b) On the other hand, when one considers the variability of the EMS currencies in relation to that of the currencies of the eighteen major industrialised countries - Table 7 - it can be seen that there has been much greater instability in the recent period than during the period of floating. The reason for this must be sought in the appreciation of the dollar and the turbulence to which it was subject from the third quarter of 1979 onwards in connection, principally, with the introduction of the new US monetary policy. Only the Danish currency constitutes an exception to the general pattern in that its variability is smaller vis-à-vis the eighteen currencies than vis-à-vis its EMS partners for time-spans of over one week.

From a further examination of the statistics in Table 7 it emerges that, despite an external environment which was unfavourable for currency stability, the 1979 monetary arrangement enabled the "inter and intra-groups" variability of the EMS currencies to be reduced - appreciably - in the short term (less than one year) and permitted all the previous upward or downward trends to be moderated.

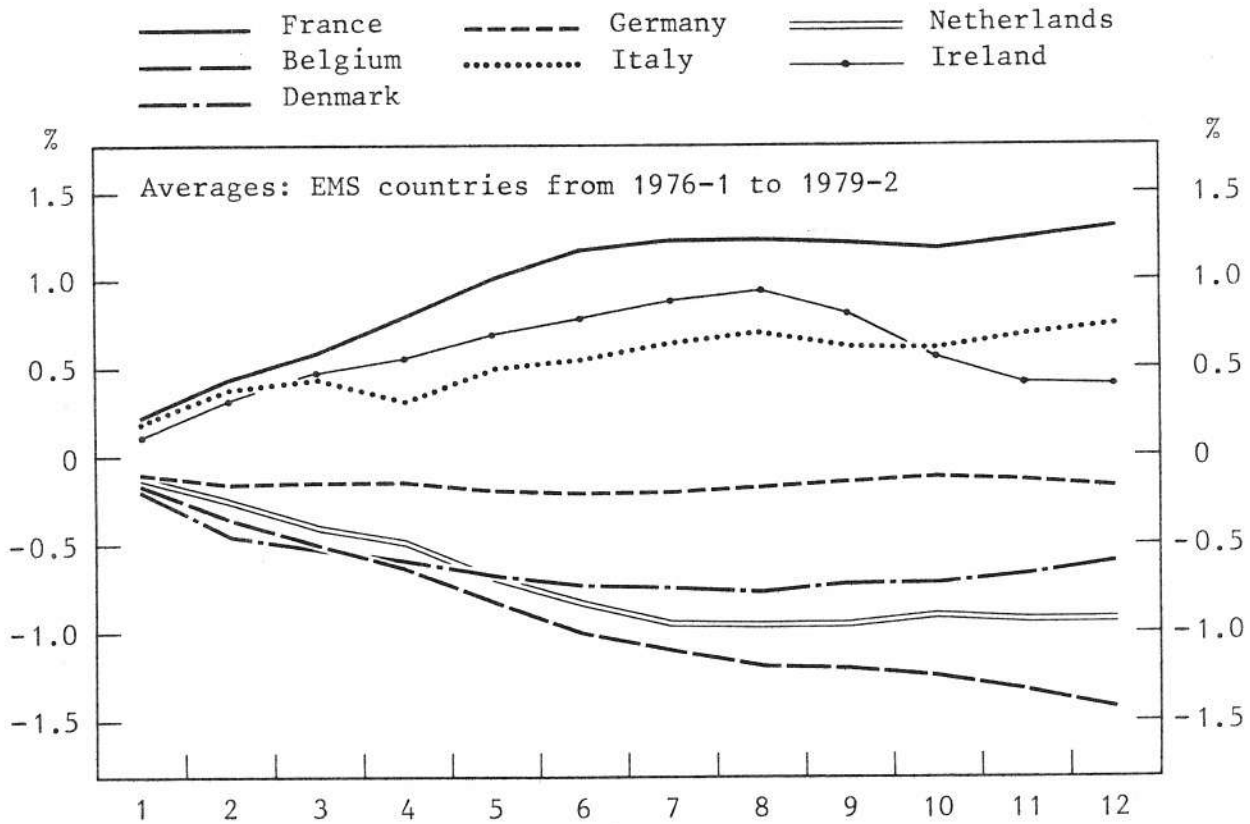
This reduction of the instability of nominal exchange rate provides a direct, but only partial, indication of the effectiveness of the EMS. In fact, exchange rate changes only have an impact on the real economy to the extent that they are not neutralised by price movements in the opposite direction. In order to take account of these effects, a real exchange rate index should be used, that is to say, an exchange rate index whose movements are corrected to take account of those of relative prices.

These real exchange rates have been calculated using the same procedures and definitions<sup>22</sup> as were used for the nominal rates and employing consumer price indices for the relative prices.<sup>23</sup> The average monthly growth rates for these real effective rates are shown in Table 7 along with those which were computed for the nominal effective rates. As can be seen clearly from the figures, whilst the establishment of the EMS has indeed resulted in a significant reduction in the "inter-group" variability of nominal exchange rates, there has been no similar movement in real rates - and this is true whichever effective exchange rate index is employed. A graphical representation of the real effective rates for the periods 1976-8 and 1979-82 (Graphs 1 to 4) given overleaf confirms this point. In fact, it may be seen that since the establishment of the EMS the deformation of real exchange rates has been more protracted and more pronounced than during the preceding period of floating. Moreover, the competitiveness of the non-"snake" members, which improved slightly during the period of floating, has tended to undergo a marked and sustained deterioration since 1979.



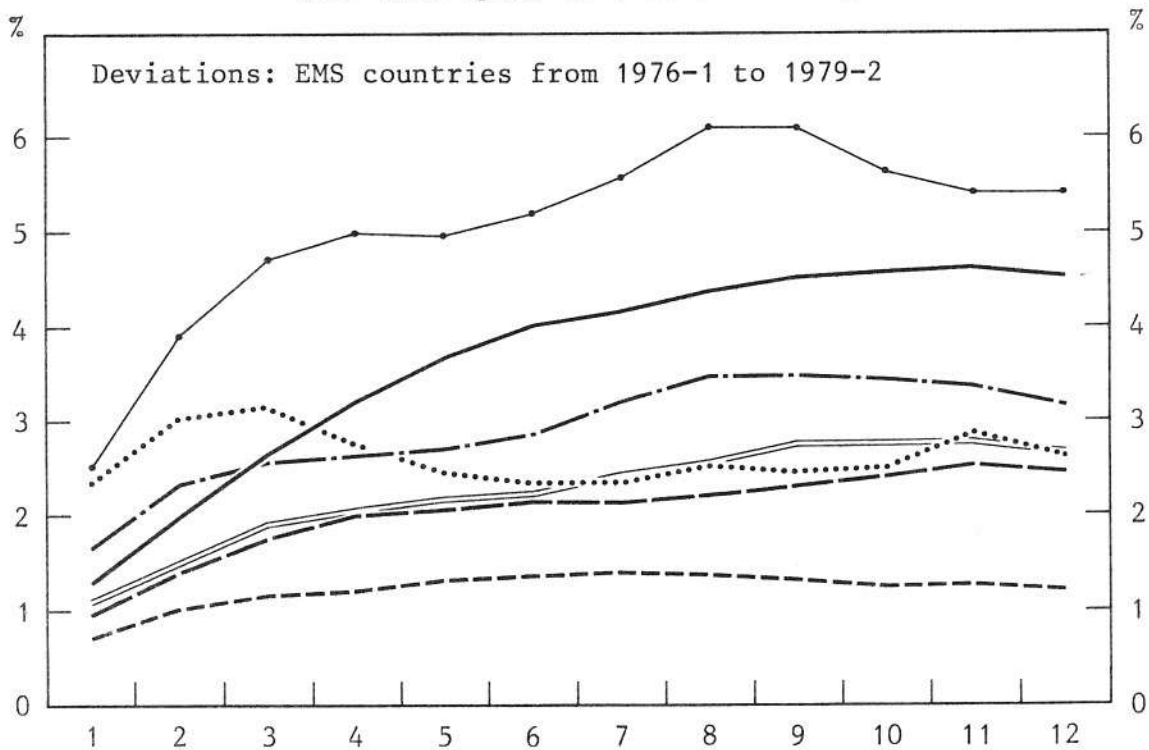
Graph 3

REAL EFFECTIVE EXCHANGE RATES  
(average percentage variations for time-spans of 1 to 12 months)



Graph 4

VARIABILITY OF REAL EFFECTIVE EXCHANGE RATES  
(for time-spans of 1 to 12 months)





It appears, therefore, that the stabilisation of nominal exchange rates has made for the emergence of more systematic and more protracted deviations of real exchange rates in the EMS countries and hence of these countries' respective competitiveness. This may have affected their external and internal economic equilibria.

Apparent consequences of the establishment of the EMS as regards external and internal equilibria

The impact of these systematic deviations of real exchange rates on the EMS member countries' economies is borne out by an examination of the evolution of the terms of trade in volume terms over the period 1979-81 (see Table 8).

Table 8

EVOLUTION OF THE TERMS OF TRADE, COMPETITIVENESS AND DOMESTIC GROWTH OF THE EMS COUNTRIES OVER THE PERIOD 1979-81

(in percentages)

Country	Rate of growth <sup>3</sup> in volume terms		Changes in terms of trade (3) = (1 - 2)	Changes in the index of competitiveness		Differential of GDP growth in relation to that of the OECD countries <sup>3</sup> (6)
	(1) Exports	(2) Imports		(4) <sup>1</sup>	(5) <sup>2</sup>	
Belgium ...	2.6	1.1	1.5	10.3	6.0	- 0.3
Denmark ...	6.7	- 2.0	8.7	6.5	6.4	- 0.8
France ....	5.1	4.7	0.4	2.5	- 0.1	-
Germany ...	5.7	2.5	3.2	6.4	4.7	0.4
Italy .....	1.5	1.6	- 0.1	-	- 1.7	1.2
Netherlands	3.4	- 1.1	4.5	6.0	6.1	- 1.3
Ireland ...	5.6	3.6	2.0	- 3.4	n.a	0.2

1 Index of competitiveness calculated on the basis of consumer prices, using the methodology described in Annex III.

2 Index of competitiveness calculated on the basis of wage costs per unit produced in manufacturing industry; source: IFS (IMF).

3 Source: OECD economic outlook.

Doubtless the growth differentials between domestic demand and foreign demand (see column 6, Table 8) are partly responsible for this development, particularly in the case of the Netherlands and Denmark, where the decline in import volume - generally fairly insensitive to price effects in small countries - seems to be connected with the substantial decline of domestic demand. In the case of the other countries, on the

other hand, the changes in the terms of trade in volume terms appear to be clearly linked to changes in competitiveness. The consequences of this deterioration in real exchange rates seem to be particularly substantial in the case of Italy and France, where the insufficient competitiveness of the export sector<sup>24</sup> may have lastingly jeopardised investment and made it difficult to restore competitiveness over time. Thus there is a risk, here, of perverse chain reactions which can only be combated by more frequent adjustments of the EMS central rates or by a major reduction in the domestic inflation rate.

As far as internal equilibria are concerned, it is probable that this relative deterioration of competitiveness has adversely affected employment in France, Italy and Ireland.

These unfavourable consequences of the stabilisation of exchange rates within the EMS have not, however, prevented these countries as a whole from attaining equivalent levels of growth to those recorded in the main industrialised countries, which had not been the case in the earlier period of floating exchange rates. This can be seen from the statistics on the development of gross domestic product in Table 9 below. Similarly, the pace of inflation has been moderated more in the EMS countries than in the OECD as a whole (see Table 9). It would be rash to attribute these relative successes to the 1979 monetary arrangement. Indeed, it is likely that the reallocations of resources brought about by the deviations of real exchange rates within the monetary union have, for the time being, only had a limited impact. It should, however, be emphasised that the establishment of the EMS has not been a handicap to the economic development of the monetary area as a whole - far from it.

#### Impact of the establishment of the EMS on the conduct of monetary and budgetary policies

The founders of the EMS intended that it should introduce greater discipline into the conduct of the budgetary and monetary policies of the member countries, whose stance in the past had been particularly lax in this sphere. It was not envisaged that the low-inflation countries should intervene indefinitely on the exchange market to support the weak currencies, thus subordinating their monetary objectives to those of the countries with the highest inflation rates. On the contrary, it was expressly provided that the strong-currency countries might maintain their domestic monetary objectives and that the necessary exchange rate adjustments would be made.

This is in fact how the EMS has operated: the monetary impact of exchange-market intervention has been largely sterilised - as a result of the imperfect substitutability of capital - and thus has not prevented the member countries from pursuing monetary policies geared to domestic objectives, as witness the development of money supply and interest rates over the period 1975-78 as compared with 1978-81 (see Table 10 below). However, some elements of convergence towards stricter monetary policies can be observed, which tends to show that the intended disciplinary effect is beginning to materialise. In fact, the 4 per cent. slowdown in the growth of  $M_1$  for the EMS countries as a group is much larger than would be

implied by mechanical application of the GDP growth rate and inflation rate trends set out in Table 9; on that basis, the reduction would be a mere 0.5 per cent. A difference of this magnitude cannot be due merely to financial innovations introduced by the financial intermediaries. It appears that there has in this respect been a fundamental change in the behaviour of the monetary authorities, prompted by the momentum of the EMS. The reduction in the dispersion of rates of monetary growth and of nominal interest rates and the more co-ordinated development of expected real interest rates - of which Table 10 provides an approximate picture - support this impression.

It appears, therefore, that budgetary policy still remains the only instrument which is totally geared to strictly national imperatives. Recent trends emerging in this field, however, all point to a contraction of budget deficits by means of reducing the importance of programmes of social transfers and increased taxation.

Table 9

DEVELOPMENT OF GROSS DOMESTIC PRODUCT AND CONSUMER PRICES IN THE EMS COUNTRIES AND IN THE OECD COUNTRIES AS A WHOLE\*  
(average annual growth rate)

Country	GDP		Consumer price index	
	1975/78	1978/81	1975/78	1978/71
Belgium .....	3.2	1.2	6.9	6.2
Denmark .....	3.4	1.3	10.0	11.2
France .....	4.0	1.8	9.4	12.4
Germany .....	3.8	1.8	3.6	5.2
Italy .....	3.5	2.6	15.3	17.9
Netherlands .....	3.5	0.3	6.4	5.8
Ireland .....	5.2	1.9	13.0	17.3
EMS .....	3.6	1.7	7.6	9.0
OECD .....	4.1	1.7	8.5	11.1

Source: OECD.

Table 10

DEVELOPMENT OF THE MONEY SUPPLY ( $M_2$ ) AND OF REAL AND NOMINAL INTEREST RATES IN THE EMS COUNTRIES

Country	Average annual rate of growth of $M_2$		Day-to-day interest rate (annual average)		Real short-term interest rate	
	end-1975/ end-1978	end-1978/ end-1981	1976/78	1979/81	1976/78	1979/81
Belgium .....	9.5%	5.5%	6.3	10.2	- 0.5%	+ 3.8%
Denmark .....	9.1	10.3	13.4	14.8	+ 3.1	+ 3.2
France .....	13.1	11.1	8.5	12.0	- 0.8	- 0.3
Germany .....	9.4	4.5	3.8	8.8	- 0.2	+ 3.4
Italy .....	22.1	13.9	13.7	16.2	- 1.4	- 1.4
Netherlands .....	13.8	8.3	5.8	10.0	- 0.6	+ 4.0
Ireland .....	18.9	14.9	9.0	14.1	- 3.5	- 2.7
EMS as a whole .....	12.7	8.1	8.6	12.3	- 0.6	+ 1.4
Standard deviation of growth rates ....	9.2	5.8	3.8	2.8	2.0	2.8

Source: IFS (IMF).

Conclusion

In the first part of this note it was shown that the countries participating in the European Monetary System only satisfy one of the theoretical criteria that clearly favour monetary integration, viz. the large degree of openness of their economies; and even this is not relevant in the presence of an external shock. Despite this theoretical handicap and the existence of a particularly difficult external economic environment, the 1979 monetary arrangement has succeeded in stabilising nominal exchange rates to a significant degree and in encouraging the first moves towards a measure of co-ordination of monetary policies. On the other hand, the stabilisation of exchange rates has undoubtedly been accompanied by a lasting decline in the competitiveness of some member countries and has thus had a depressive effect on their economies. However, the relative deflationary impact that some authorities were anticipating at the outset for the monetary union as a whole has not yet materialised.

## Appendix I

Exchange rate systems adopted by countries participating in the "Snake"  
and the EMS after the abandonment of the Bretton Woods System

Country	Exchange rate system		
	Fixed exchange rates		Floating exchange rates
	"Snake"	EMS	EMS
Belgium-Luxembourg	24.04.72 to 31.12.78	since 13.03.79	
Denmark .....	01.05.72 to 23.06.72 10.10.72 to 31.12.78	since 13.03.79	24.06.72 to 09.10.72
France .....	24.04.72 to 19.01.74 10.07.75 to 15.03.76	since 13.03.79	20.01.74 to 09.07.75 16.03.76 to 01.03.79
Germany .....	24.04.72 to 31.12.78	since 13.03.79	
Italy .....	24.04.72 to 13.02.73	since 13.03.79	14.02.73 to 01.03.79
Netherlands .....	24.04.72 to 31.12.78	since 13.03.79	
United Kingdom ...	01.05.72 to 23.06.72		24.06.72
Ireland .....	01.05.72 to 23.06.72	since 13.03.79	24.06.72 to 01.03.72
Sweden .....	19.03.73 to 29.08.77		30.08.77
Norway .....	23.05.72 to 31.12.77		01.01.78

Appendix II

The main technical properties of the European  
Monetary System

The main properties of the European Monetary System, established in March 1979 by the nine member countries of the European Economic Community, are the following:

Creation of the ECU and exchange rate arrangements

The European Currency Unit, the ECU, is defined as a "basket" of currencies composed of constant amounts of member countries' currencies, viz:

0.828	Deutsche Mark
1.15	French francs
0.286	Dutch guilder
0.14	Luxembourg franc
0.00759	Irish pound
0.0885	pound sterling
109.00	Italian lire
3.66	Belgian francs
0.217	Danish krone

The value of the ECU in terms of any currency is obtained by adding together the equivalents of these amounts in that currency. Each country defines its currency's parity in terms of the ECU and undertakes to hold its bilateral rates within a margin of  $\pm$  2.25 per cent. from bilateral central rates. It should, however, be noted that Italy is authorised to observe a fluctuation margin of  $\pm$  6 per cent. and that the United Kingdom does not participate in the exchange rate mechanism.

Intervention and support mechanisms

The divergence indicator is the main innovation of the European Monetary System. A divergence threshold is set at 75 per cent. of the maximum authorised divergence spread in relation to a currency's ECU parity. If a currency crosses this threshold there is a presumption that the parent authorities will initiate corrective monetary and economic exchange rate policies. Interventions on the foreign exchange markets are made in member countries' currencies, which can be acquired against gold, dollars, SDRs or ECUs. ECUs are created on a temporary basis against the transfer of 20 per cent. of member countries' gold and dollar reserves to the European Monetary Co-operation Fund (EMCF). These ECUs are used to settle the short-term debts arising from financing under the unlimited short-term (45-day) credit facilities that member countries grant each



other. The interest rate on these facilities is equal to the weighted average of national discount rates. The existence of the ECU is not yet definitive, as the EMCF has not been replaced by the European Monetary Fund, the intended issuing and controlling body.

In addition, the existing reciprocal credit arrangements between the EEC countries were expanded, making ECU 25 billion available for three-month credits, renewable twice, and for medium-term financing.

Appendix III

Derivation of effective exchange rate indices  
from an aggregatable system of export demand equations

The theoretical framework used to construct these indices is based on the following hypotheses:

- (a) The world is composed of "n" countries and each country produces a "composite", exchangeable commodity, the price of this commodity being expressed in domestic currency.
- (b) The consumer divides his expenditure among commodities of the exposed and sheltered sectors in accordance with utility functions with the characteristics of group independence as defined by Theil (1980). This hypothesis permits the utility function of the commodities exchanged to be treated independently.
- (c) The analysis assumes that all the commodities exchanged may be defined as "specific substitutes" in accordance with Theil's interpretation (1980). This hypothesis is tantamount to assuming that the composite commodities are for the most part industrial goods. It is indeed probable that raw materials and industrial goods are more in the nature of "specific complementary goods".
- (d) All consumers are rational and their demand function parameters are stable; they have the same system of preferences. Furthermore, the income elasticity of the demand for goods is equal to unity for all agents. In this way it is possible to aggregate the behaviour of consumers and to consider them as a single agent who divides his expenditure among the "composite" goods of the "n" countries under the following budget constraint:

$$M_i = \sum_j \frac{P_j}{l_{ij}} Q_j, \quad j = 1, \dots, n \quad (1)$$

where  $M_i$  is the total amount of world exports expressed in currency  $i$ ,  $Q_j$  is the volume of goods exported by country  $j$  at the price  $P_j$  expressed in currency  $j$ , and  $l_{ij}$  is the bilateral exchange rate between the currencies  $i$  and  $j$ . It is further assumed that the world consumer divides his expenditure between the "n" composite commodities so as to maximise a preference function  $V_i(M_i, Pw_i)$  expressed as a function of prices and income or as an indirect utility function<sup>26</sup> in the form:

$$V_i(M_i, Pw_i) = \frac{\prod_j Pw_{ij}^{\alpha_j}}{M_i} \quad \text{with} \quad 0 < \alpha_j < 1 \quad \forall_j, \quad \sum_j \alpha_j = 1 \quad (2)$$

$$Pw_{ij} = \frac{P_j}{l_{ij}} \quad i \neq j \quad \text{with} \quad Pw_{ii} = P_i \quad (3)$$

$$Pw_i = \prod_j Pw_{ij}^{\alpha_j} \quad (4)$$

where (3) and (4) define, respectively, the price of commodity j and a world price index for exported goods expressed in currency i.

By applying the Roy theorem (1942) to equation (2) it is possible to obtain a consistent set of demand equations<sup>27</sup> for the "n" composite commodities. The demand equation for commodity i ( $Q_i$ ) derived from the indirect utility function thus becomes:

$$Q_i = - \frac{\partial V_i}{\partial P_{w_{ii}}} / \frac{\partial V_i}{\partial M_i} \quad (\text{ROY identity}) \quad (5)$$

In the present case the two terms of this equation will be equal to:

$$\frac{\partial V_i}{\partial P_{w_{ii}}} = \alpha_i P_{w_{ii}}^{(\alpha_i-1)} \prod_{\substack{j \\ j \neq i}} P_{w_{ij}}^{\alpha_j} M_i^{-1} \quad (6)$$

$$\frac{\partial V_i}{\partial M_i} = - \frac{1}{M_i^2} \prod_{\substack{j \\ j \neq i}} P_{w_{ij}}^{\alpha_j} = - \frac{P_{w_i}}{M_i^2} \quad (7)$$

By combining (5), (6) and (7) it is possible to obtain the demand equation for commodity i in which, in accordance with hypothesis (d), income elasticity is equal to unity.

$$Q_i = \alpha_i P_{w_{ii}}^{(\alpha_i-1)} \prod_{\substack{j \\ j \neq i}} P_{w_{ij}}^{\alpha_j} \frac{M_i}{P_{w_i}} \quad \text{with} \quad \sum_{\substack{j \\ j \neq i}} \alpha_j = 1 - \alpha_i \quad (8)$$

Note, here, that this equation is a simplified form of the classic export demand function. It comprises, in fact, a variable representing the volume of world demand ( $M_i/P_{w_i}$ ), a price index for the exported commodity ( $P_{w_{ii}}$ ) with negative elasticity ( $\alpha_i - 1$ ) and an aggregated price index for competing commodities ( $\prod_{\substack{j \\ j \neq i}} P_{w_{ij}}^{\alpha_j}$ ) with positive elasticity.

The market share of each commodity can be obtained by substituting  $Q_j$  in equation (1) by its expression in equation (8):

$$w_i = \frac{P_{w_{ii}} Q_i}{M_i} = \alpha_i \quad (9)$$

This result signifies that two particularly strong hypotheses are included in the indirect utility function (2):

- (i) The substitution elasticity of each commodity is equal to its market share in world trade.

- (ii) The system of demand equations, thus defined, assumes stability of market shares in value terms.

On the basis of this theoretical framework it is possible to define a consistent set of indices of nominal and real effective exchange rates. To do this it is sufficient to divide the two sides of the equation (8) by the quantity  $M_i$  thus giving:

$$Q_i \frac{P_{w_i}}{\alpha_i M_i} = P_{w_{ii}}^{\alpha_i - 1} \prod_{j \neq i} P_{w_{ij}}^{\alpha_j} \quad \text{with} \quad \sum_{j \neq i} \alpha_j = 1 - \alpha_i \quad (10)$$

Equation (10) shows that the market share in volume terms<sup>25</sup> simply depends on price indices, exchange rates and substitution elasticities between the various composite commodities. This equation defines the real effective exchange rate concept ( $PPP_i$ ) adopted in this note:

$$PPP_i = P_{w_{ii}}^{\alpha_i - 1} \prod_{j \neq i} P_{w_{ij}}^{\alpha_j} = \frac{\prod_j P_{w_{ij}}^{\alpha_j}}{P_{w_{ii}}} = \frac{P_{w_i}}{P_i} \quad (11)$$

$\alpha_i$ , being constant, can be ignored in the analysis; the market share is normally equal to  $\frac{Q_i P_{w_i}}{M_i}$

Equation (11) shows that the real effective exchange rate of a given country is equal to the ratio of an index of world prices - covering all countries, including the country concerned - to the price index of that country.

To obtain the nominal effective exchange rate index it is sufficient to rewrite (11) using (3) and (4) as follows:

$$PPP_i = \frac{\prod_j P_j^{\alpha_j}}{\prod_{j \neq i} 1_{ij}^{\alpha_j} \cdot P_i} = \frac{\bar{P}}{\bar{l}_i \cdot P_i} \quad (12)$$

where  $Q_i$  is precisely the nominal effective exchange rate and  $\bar{P}$  a weighted index of world prices not deflated by exchange rate variations:

$$\bar{l}_i = \prod_{j \neq i} 1_{ij}^{\alpha_j} \quad \text{with} \quad \sum_{j \neq i} \alpha_j = 1 - \alpha_i \quad (13)$$

$$\bar{P} = \prod_j P_j^{\alpha_j} \quad \text{with} \quad \sum_j \alpha_j = 1 \quad (14)$$

The interest of the effective exchange rate indices ( $PPP_i$  and  $Q_i$ ) is twofold:

- they are interpreted directly in terms of the development of the market share of the country concerned;
- they are also directly consistent with the bilateral exchange rate indices ( $PPP_{ij}$ ,  $l_{ij}$ ).

This latter point can be illustrated as follows:

- let  $PPP_i$  and  $PPP_j$  be the real effective exchange rates of countries  $i$  and  $j$ , and  $PPP_{ij}$  their bilateral index, so that:

$$PPP_{ij} = \frac{P_j}{l_{ij} P_i} \quad (15)$$

Knowing that the relationship of indices  $PPP_i$  and  $PPP_j$  is:

$$\frac{PPP_i}{PPP_j} = \frac{P_j}{P_i} \cdot \frac{\bar{l}_j}{\bar{l}_i} \quad (16)$$

definition (13) makes it possible to write:

$$\frac{\bar{l}_i}{\bar{l}_j} = l_{ij}^{(\alpha_i + \alpha_j)} \cdot \prod_{\substack{k \neq 1 \\ k \neq i \\ k \neq j}} \frac{l_{ik}^{\alpha_k}}{l_{jk}^{\alpha_k}} = l_{ij}^{(\alpha_i + \alpha_j)} \cdot l_{ij}^{(1 - \alpha_i - \alpha_j)} = l_{ij} \quad (17)$$

Application of this result to equation (16) shows that the bilateral exchange rate is equal to the ratio of the effective exchange rates:

$$\frac{PPP_i}{PPP_j} = \frac{P_j}{l_{ij} P_i} = PPP_{ij} \quad (18)$$

Footnotes

- 1 Appendix I contains a review of the exchange rate régimes adopted by the major European countries since the system of fixed parities was abandoned.
- 2 Marston (1982) formalised this analysis in a general model describing a process of monetary union in a three-country world. He demonstrates that the important factor is not only the degree of openness of the economy in general but also the extent of trade between the candidates for monetary integration.
- 3 We should note that McKinnon does not take account in his analysis of the wealth effects caused by exchange rate changes. These effects play a central rôle in the modern theory of exchange rate determination.
- 4 In the present context of a highly unstable international economy, countries such as Belgium, Denmark or the Netherlands would, on this criterion, be advised to opt for free floating of their currencies.
- 5 Paradoxically, this has led some monetarists [Parkin, (1972)] to advocate, under certain circumstances, the formation of monetary unions.
- 6 It should be noted that in the case of domestic monetary shocks Marston confirms the classical findings of the Mundell model, i.e. that monetary policy can only influence the real economy when there is perfect exchange rate flexibility. Marston demonstrates that this advantage of flexibility vanishes when wage levels are fully indexed: then, the exchange rate fall triggered by monetary expansion is offset, through full indexation, by a symmetrical rise in domestic prices which leaves the terms of trade unchanged. The expansionary effect on domestic production of an increase in exports cannot therefore occur.
- 7 These findings correspond to the conclusions reached by Turnovsky (1976), who demonstrates that for countries with highly open economies exchange rate stability is preferable to flexibility when the money market is more uncertain than the export goods market.
- 8 Unless, of course, a common currency is created which is issued and controlled by the union's central bank.
- 9 It should be noted that this neo-monetarist proposition of the growing ineffectiveness of monetary policy, regardless of the exchange rate régime, runs counter to the theory elaborated by Fleming (1962) and Mundell (1968), which attributes to it a key rôle in a period of floating.
- 10 This neo-monetarist theory is far from being proved in the case of a reserve currency such as the dollar.



- 11 Fleming (1962) has demonstrated that the effectiveness of Keynesian expansionary policy is only proved under a fixed exchange rate régime. With floating exchange rates the expansionary effect of the budget deficit is offset by the depressive impact of the current-account deficit. The latter results from the growth in domestic demand induced by budgetary expansion and from the appreciation of the exchange rate caused by the rise in interest rates due to the increase in the public sector's demand for capital.
- 12 In this connection, see Frenkel and Rodriguez (1982).
- 13 This question does not arise in the case of full monetary union, with reserves pooled and exchange rates immutably fixed.
- 14 Appendix II sets out the main technical properties of the system.
- 15 It should be borne in mind that the criterion of a large degree of openness as a factor favouring monetary integration has only been verified in the presence of internal economic shocks.
- 16 Unless one adopts the neo-monetarist argument of the powerlessness of monetary policy under both fiscal and flexible exchange rate systems.
- 17 The effects on employment of an increase in nominal wages would probably be considerably less in the recent period owing to the disappearance of money illusion.
- 18 Owing to the inefficiency of the exchange market and/or the existence of a risk premium, the forward exchange rate is not a good predictor of the future exchange rate. This being so, determination of "surprises" depends on the assumptions made by the maker of the model regarding the nature of the information used by speculators to form their expectations.
- 19 Utilisation of standard deviation as the indicator of dispersion is not above criticism, for the underlying assumption that the distribution of exchange rate variations is Gaussian is not necessarily proved - see Solnik (1978) on this point.
- 20 The bilateral exchange rate index of two countries is equal to the ratio of their effective exchange rate indices. The variability of the bilateral exchange rate is equal to the sum of the variabilities of the effective exchange rates minus twice their co-variances. By virtue of their construction, these effective exchange rate indices evolve in line with export market shares in volume terms. The construction of the weighting system for the effective exchange rates is based on the assumption that export market shares in value terms are constant. Appendix III describes the theoretical construction of these indices.
- 21 The co-variances of the effective indices computed from the effective and bilateral rates bear out this observation.

- 22 Note that the real effective exchange rate indices are presented as representative of the evolution of export market shares in volume terms - see Appendix III. Thus, an increase in the index denotes a gain in competitiveness.
- 23 This decision was made with a view to preserving monthly indices, which ruled out the construction of a relative cost index per unit produced, which might have been more relevant.
- 24 In the case of France, exporters have sought to hold onto market shares by cutting their export margins and increasing their margins on the domestic market, which goes some way to explain the sharp growth on the import side.
- 25  $l_{ij}$  is the price of a unit of currency  $i$  expressed in units of currency  $j$ .
- 26 As Gorman (1976) demonstrates, demand functions can be derived more easily on the basis of indirect rather than direct utility functions.
- 27 This system is consistent in that it has the characteristics of perfect aggregation: that is to say, resolving the system of "n" equations as a function of prices and income gives a vector of the quantities perfectly consistent with the budget constraint (1).

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