A broad look at exchange rate movements for eight currencies, 1972–80

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Given that econometric attempts to explain exchange rate movements have been notably unsuccessful, it adopts an alternative approach. It was hoped that careful inspection of charts of exchange rate movements and of factors likely to have influenced them might be more illuminating—possibly even providing insights which could later be tested more rigorously. Changes in the value of sterling or any other major currency are looked at, not in isolation, but in the context of currency movements generally—since exchange rates are by definition interrelated, and there may be common influences.

Some findings are:

- *Movements in exchange rates have not been closely related to changes in relative price levels in the short run, so they have fluctuated widely in real as well as in nominal terms. Moreover, purchasing power parities may not hold over longer periods.*
- *Changes in preferences for different currencies may have contributed to exchange rate movements, as may shifts in global wealth between countries whose preferences differ—in particular, shifts associated with current account imbalances induced by oil price changes.*
- *Current account developments may also frequently have been influential through their impact on expectations.*
- *Relative interest rate movements have also been associated with exchange rate fluctuations—but not in any obviously stable way.*

These results may help to suggest why econometric models of exchange rate behaviour have not been successful.[1]

Plan of the study

Part I identifies five main influences which must be held to give rise to exchange rate changes. Part II then sets out the facts about effective exchange rates, and also their relation to prices. The three following sections discuss the relation of exchange rate changes to portfolio preferences (Part III); to current account positions (Part IV); and to relative interest rates, inflation expectations and money supplies (Part V). Results are summarised and discussed in Part VI.

The eight currencies with which the study is concerned are the US dollar (US $), sterling (£), the deutschemark (DM), the French franc (FF) and the yen, and also three currencies of countries which, like the United Kingdom, are endowed with large energy resources—the Canadian dollar (Can $), the Norwegian krone (NK) and the Dutch guilder (DG).

I A framework for analysing exchange rate movements

Since the advent of 'managed floating' in 1972–73 there has been an intensive re-appraisal of the theory of exchange rate determination. In the preceding 'Bretton Woods' era of adjustable pegs, exchange rate changes were regarded as the appropriate policy instrument for the correction of 'fundamental disequilibria' in the balance of payments, which were identified primarily with persistent current account imbalances. Theory correspondingly focused mainly on the influence of exchange rates on the current account, and on the mechanism which this could provide for the correction of payments imbalances. The equilibrium exchange rate was seen as the exchange rate which would maintain equilibrium between balance of payments flows or, more especially and in the long run, between current account flows.[2] This approach has since come to be

(1) The widespread failure of econometric work in this area is reported in various studies. See for example a recent study by Meese and Rogoff (1981) which found that structural models of exchange rate determination failed to *explain* movements in the major currencies during the 1970s, and that they were outperformed in terms of their *forecasting* performance by a random walk model, ie a model which simply takes the current exchange rate to be the best estimate of its future value. These results are not surprising in view of earlier Bank work on sterling, discussed in Hacche and Townend (1981a).

(2) For some countries, this notion had to be modified to take into account net 'structural' capital flows which, if a permanent feature, might have allowed the maintenance of persistent current account imbalances consistent with equilibrium: see below.

regarded as partial and inadequate, at least for short-run analysis, for a number of reasons, some of which are related to the experience of floating. One reason is that, in the short run, trade flows appear to respond weakly, or even perversely (as described by the familiar J-curve), to exchange rates, so that the task of balancing payments flows is then thrown largely on to the response to the exchange rate of the capital account. A more fundamental reason is that it has become generally accepted, as an implication of the high degree of international mobility of financial portfolios, that capital flows are best regarded as adjustments of the composition of asset stocks undertaken by wealth holders as their portfolio preferences are revised and asset supplies change. The potential scale of such stock adjustments is much greater than the magnitude over any short period of the relatively inert balance on current account.

These two observations taken together suggest that, even though exchange rates may be maintaining equilibrium between balance of payments flows, their movements at least over short periods (of up to perhaps a year or so) may be better described as being determined, like interest rates and the prices of financial assets generally, by the balancing of supplies and demands for asset stocks. (As explained later, this does not mean that considerations relating to the current account are irrelevant even in the short run.) On this *asset market* view, an exchange rate will (in the absence of exchange controls) gravitate in any period towards an equilibrium where the stocks of assets denominated in the two currencies concerned are willingly held.[1] This will be the case when expected yields provide no incentive to switch out of either currency into the other. More specifically, this condition will be satisfied when the expected nominal interest differential in favour of any foreign asset in relation to a comparable domestic asset, net of any risk premium which wealth holders may require to persuade them to hold foreign currency assets, is matched by the market's expected rate of appreciation of the domestic currency.[2] This is to say that when expressed in a common currency, expected yields on domestic and foreign assets must be equalised, apart from a risk premium which measures the differential preference of wealth holders for one currency or the other relative to the respective supplies of assets denominated in each, and which would disappear if wealth holders were indifferent to the risks entailed in exchange rate variability—in which case the currencies would be regarded as perfect substitutes.[3]

This statement about relative asset yields may now be re-interpreted as a statement about the exchange rate required for asset-market equilibrium. Since the expected rate of appreciation of the domestic currency is the proportional difference between the expected future exchange rate and its current value, the above condition implies that the current exchange rate will be related in a particular way to its expected value, the interest differential, and the risk premium. More specifically, the exchange rate will tend to rise[4] from one period to the next if its expected future value increases, or if domestic interest rates rise in relation to foreign rates, or if the risk premium on foreign currency rises owing to a change in preferences in favour of the domestic currency or a relative increase in the supply of foreign currency assets. But these statements alone have little precise theoretical content and are of little use for empirical analysis: they acquire operational significance only when assumptions are adopted about portfolio preferences and the formation of expectations.

The appropriate assumption about the way expectations are formed clearly depends upon the time-horizon being considered. Over short horizons, expectations may well be dominated by assumptions about policy—more particularly, monetary policy—and about the diversity of events that might be significant for market psychology. Over longer horizons however, expectations are likely to be more firmly based on fundamental economic forces, and in particular on the notion that there are limits within which current account imbalances are sustainable.[5] These limits will be partly determined by prospective net long-term capital flows, which may for the purposes of this analysis be taken as given. It is convenient, therefore, to specify the above equilibrium condition in such a way that the expected future exchange rate refers to the exchange rate which is expected to be required for some given current account to be attained in the long run—this is to say over a horizon of a number of years. For countries where significant net long-term capital flows are not expected to persist in one direction, the requirement will be an eventual current balance of zero, and little is lost if this requirement is assumed to be generally applicable to the countries and periods concerned in this paper. In any event, the expected exchange rate specified in this way will clearly depend upon expected price developments at home and abroad; and it is helpful to decompose the expected nominal exchange rate into the expected real exchange rate (measuring competitiveness) on the one hand, and the relationship between expected foreign and domestic price levels on the other. The relationship between expected future price levels may in turn be expressed in terms of the relationship prevailing between actual current price levels and the difference between expected inflation rates at home and abroad.

(1) The asset demand for the majority of currencies is, of course, negligible, partly because of the lack of financial intruments denominated in them and the thinness of the markets in which they are traded. The applicability of the framework set out here may be regarded as being confined to the major currencies, ie the subset of currencies held in international portfolios.

(2) As a convenient simplification, it is assumed that expectations are uniform throughout the market. The existence of forward exchange markets and the possibility of covered arbitrage are also ignored. That this omission is immaterial is made clear in Appendix 1, where the argument of this and succeeding paragraphs is set out more formally.

(3) Strictly speaking, if every financial asset is matched by a liability within the private sector, the risk premium may be zero even if wealth-holders are not indifferent to exchange risk. The exchange risks faced by owners of foreign currency assets and by foreign currency debtors are then mutually offsetting, and may be traded in the foreign exchange market at a price which entails no risk premium (see Frankel 1979a). This indicates the importance for the risk premium of supplies of 'outside assets'—ie assets of the private sector which have no private sector liability counterpart. These comprise all forms of government debt which are not viewed by the private sector as entailing offsetting liabilities, such as future tax payments.

(4) Throughout this study, 'exchange rate' refers to the price of domestic in terms of foreign currency, so that an increase means appreciation of the domestic currency.

(5) This approach is suggested by Isard (1980).

All these considerations allow the *equilibrium condition for the exchange rate* to be re-interpreted in the following manner. The current value of an exchange rate will be related in a particular way to the current ratio of foreign to domestic prices; to expectations of the real exchange rate required for current account balance in the long run; to expectations over a long horizon of domestic and foreign inflation rates, and correspondingly long-term interest rates; and finally, to any risk premium on foreign or domestic currency. More specifically, *the exchange rate will tend to rise* in any period if:

(a) *prices* are currently rising less at home than abroad;

(b) *expectations of the real exchange rate* are revised upwards on account of favourable news as to current account prospects, probably occasioned by unexpected contemporary developments;[1]

(c) *domestic long-term interest rates* are increased, or foreign rates reduced;

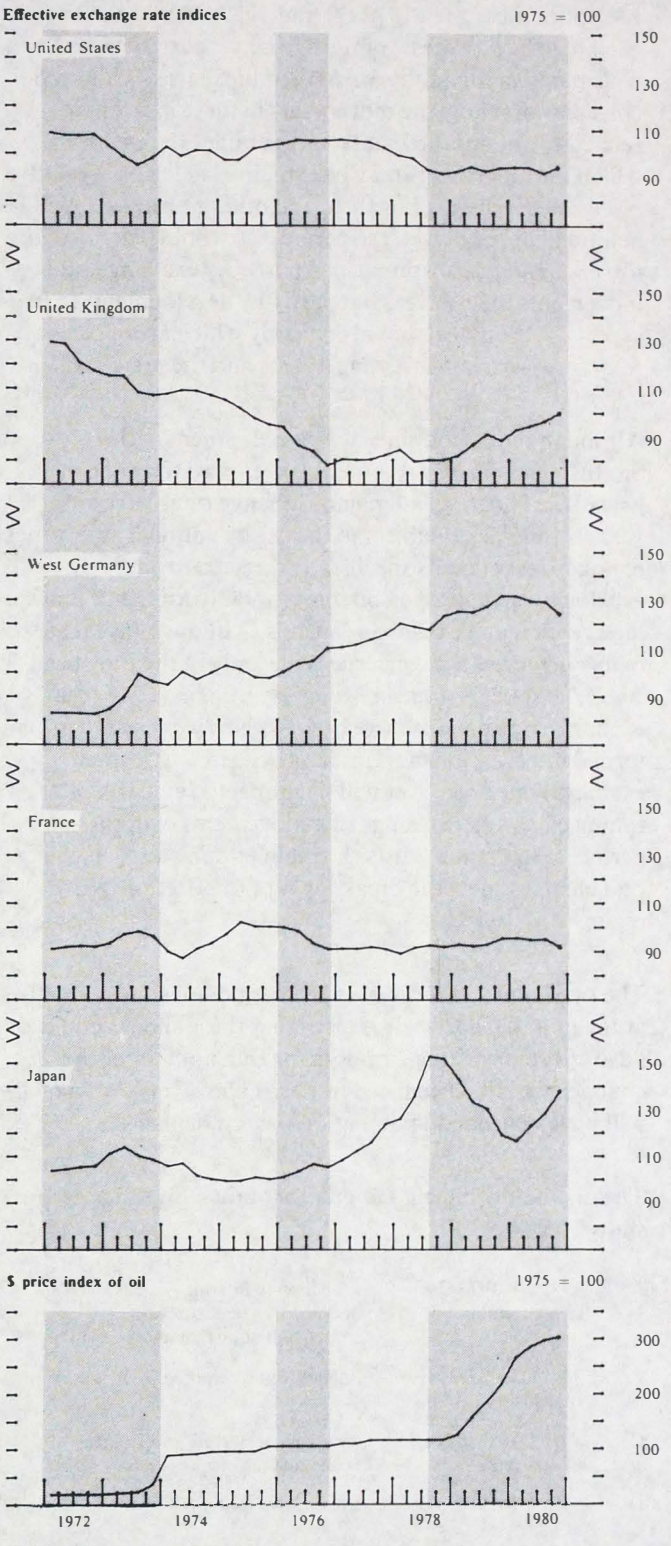
(d) *expectations over a long period of domestic inflation* are reduced, or those of foreign inflation raised, perhaps because of monetary developments at home or abroad;

(e) there is a shift in the risk premium on foreign currency, perhaps induced by a change in *portfolio preferences* in favour of the domestic currency.

This schema is helpful in two ways. First, it leaves explicit (as some empirically applied theoretical models do not) the insights of asset-market theory that exchange rates are crucially dependent on expectations, and that exchange rate changes are largely, if not almost entirely,[2] a direct consequence of revisions to expectations (and preferences). The difficulty of systematically describing or modelling the formation of such expectations explains some of the failures of econometric work in this area,[3] while the inherent unpredictability of new information, to which the market will respond by revising its expectations, explains much of the difficulty of forecasting exchange rate changes. But second, and more positively, the schema directs attention towards those factors which may help to explain exchange rate movements, and provides a framework within which such movements may be analysed. The empirical application of this framework is of course far from straightforward, partly for the reasons just stated, but also because the five influences listed are likely to be interrelated. Thus faster domestic monetary growth may raise expectations of domestic inflation (d), but this effect may be offset or even outweighed by expectations that interest rates will be raised as a policy response (c). (This helps to explain why 'bad' news about monetary growth is sometimes observed to lead to appreciation in the short run.)

Furthermore, any change in relative interest rates which is not matched by a change in expected exchange rates will entail a change in the risk premium (e) (see Appendix 1), which will also tend to vary with shocks to the current account (b). Nevertheless, the following sections attempt to assess, in an inevitably rough way, how changes in exchange rates between 1972 and 1980 may be related to each of the contributory factors listed above.

Chart 1
Movements in effective exchange rates, 1972–80



(1) Or shocks to the 'structural' element of the capital account, to the extent that they can be identified.
(2) See below for a discussion of the evidence.
(3) See, for example, Beenstock *et al.* (1981), Dornbusch (1980), Hacche and Townend (1981a), and Isard (1980).

II Effective exchange rates: interrelationships and price developments

Movements between 1972 Q1 and 1980 Q4 in the effective exchange rate indices[1] of the five major currencies to be considered in this study are plotted in Chart 1. This section considers first how the movements in these indices are related to one another, and then examines the extent to which the movements may be explained in terms of relative price developments. For these and other purposes, it will be helpful if, at the outset, the period as a whole is divided into *five broad phases,* distinguished partly by exchange rate movements themselves, and partly by developments in two aspects of the international economy which are of general relevance—exchange arrangements and the price of oil.

Although the period since the abandonment of the Smithsonian parities is sometimes referred to as one of generalised floating, all major exchange rates have at various times been subject to the use by national authorities of policy instruments specifically directed towards *exchange rate management*, most notably exchange market intervention and exchange controls. Although (as far as the main currencies are concerned) it is only in the European 'snake' and the European Monetary System (EMS) that exchange rate policies have been explicitly expressed in formal intervention margins, less explicit and formal exchange rate objectives will have affected at least the timing of certain exchange rate movements over the period.[2] Appendix 2 lists the main administered exchange rate changes since the breakdown of the Bretton Woods regime.

The two *oil price shocks* over the period are shown vividly at the foot of Chart 1. It is clear that these shocks could have affected exchange rates through a number of the channels of influence listed in Part I above, in ways which will have depended upon national circumstances.

The distinguishing characteristics of these five phases are shown below:

A:	1972 Q1–1973 Q4: (8 quarters)	transition to floating—breakdown of Smithsonian parities and subsequent adjustments
B:	1974 Q1–1975 Q4: (8 quarters)	impact of and responses to first oil shock
C:	1976 Q1–1976 Q4: (4 quarters)	weakness of sterling and French franc (and also Italian lira)
D:	1977 Q1–1978 Q3: (7 quarters)	weakness of dollar
E:	1978 Q4–1980 Q4: (9 quarters)	recovery of dollar and impact of second oil shock; also, formation of EMS and effects of reformulation of operations of US monetary authorities

Correlations between movements in effective rates

Any explanation of the movements in a number of bilateral exchange rates *vis-à-vis* some common standard currency carries an implicit explanation of movements in the relevant cross rates. Thus explanations of why, say, the DM strengthened against the US$ in some period and of why the yen simultaneously weakened against the US$ will imply an explanation of the strengthening of the DM in relation to the yen. If the DM regularly strengthened against the US$ when the yen tended to weaken, and conversely, this might help explain the (consequently relatively sharp) changes in the DM:yen rate. It might suggest, for example, that the DM and yen were close substitutes in portfolios, or that the West German and Japanese economies tended to be inversely cyclically synchronised. An observation that the DM and yen tended to move together in relation to the US$ might carry opposite implications. In any event, the correlation between movements in the DM:US$ and yen:US$ rates might be relevant to an explanation of movements in the DM:yen rate.

Similarly, an examination of correlations among effective rates may contribute towards, and help to ensure internal consistency in, an explanation of their movements. But the correlation between the movements in any pair of effective rates depends not only on the factors which influence bilateral correlations, but also on the differences in the weighting patterns of the currencies concerned. To take a very simple example, if over some period the US$ appreciates uniformly by, say, 10% against all other currencies, the values of those other currencies in terms of the US$ will clearly all have fallen by 10%.[3] This will not be true of their effective rates, however; if the US$ appreciated by 10% against each other currency, the effective rate of the DM would have fallen by 2.2%, while that of the yen would have fallen by 4.7%, simply because the dollar's weight in the DM index is less than half its weight in that of the yen. (The Can$, meanwhile, would have depreciated in effective terms by 6.4%.) This must be borne in mind in interpreting the correlations between movements in the effective rates of the five major currencies shown in Table A.

This table refers to monthly percentage changes over the full sample period, and over sub-periods corresponding to the five phases distinguished above: where, for example, over the full period the correlation between the US$ and the DM is shown to have been –.60, this means that on average movements in the US$ tended to be reflected in movements in the DM in the opposite direction. Three features stand out. First, the only regularly significant correlations are those between the US$ and each of the DM, FF and yen, which are negative. They are significant throughout, other than in sub-period (D) for the FF and in sub-period (C)

(1) These are the indices calculated by the IMF using its Multilateral Exchange Rate Model (MERM) which covers eighteen currencies. They are intended to measure, for each currency, the unilateral exchange rate change which would have been required in any period to have the same effect on the trade balance of the country concerned as the exchange rate changes which actually took place. The weights used for this calculation are based on 1977 trade patterns from 1975, and on 1972 trade patterns for the earlier years.

(2) It is, of course, an open question how effective exchange rate management may be in the long run in establishing exchange rates different from those which would have prevailed in a free market.

(3) Technically, the depreciation will be 9.1%.

Table A
Correlations between monthly percentage changes in effective exchange rates

Full period: Feb. 1972–Dec. 1980

	US$	£	DM	FF	Yen
US$	1				
£	.04	1			
DM	– .60*	– .26*	1		
FF	– .45*	– .11	.21*	1	
Yen	– .52*	– .07	– .06	.01	1

A: Feb. 1972–Dec. 1973

	US$	£	DM	FF	Yen
US$	1				
£	.33	1			
DM	– .76*	– .49*	1		
FF	– .85*	– .12	.71*	1	
Yen	– .51*	– .09	– .07	.23	1

B: Jan. 1974–Dec. 1975

	US$	£	DM	FF	Yen
US$	1				
£	– .16	1			
DM	– .75*	– .19	1		
FF	– .40*	– .30	– .04	1	
Yen	– .38*	– .12	– .10	– .03*	1

C: Jan.–Dec. 1976

	US$	£	DM	FF	Yen
US$	1				
£	.04	1			
DM	.15	– .30	1		
FF	.06	.03	.06	1	
Yen	– .19	.20	– .04	– .24	1

D: Jan. 1977–Oct. 1978

	US$	£	DM	FF	Yen
US$	1				
£	.09	1			
DM	– .50*	– .09	1		
FF	– .18	– .39*	– .36*	1	
Yen	– .63*	– .31	– .17	.39*	1

E: Nov. 1978–Dec. 1980

	US$	£	DM	FF	Yen
US$	1				
£	– .18	1			
DM	– .50*	– .11	1		
FF	– .50*	– .06	.91*	1	
Yen	– .54*	– .04	– .35*	– .33*	1

* Significant at 5% level, ie there is only a small probability that correlations as large as these would have occurred by chance.

where no significant correlations are evident. Second, there is significant positive correlation over the period as a whole between the DM and FF; but it reflects only sub-periods (A) (prior to France's first departure from the 'snake') and (E) (dominated by the two countries' participation in the currency arrangements of the EMS). Finally, the only significant correlations for sterling are with the FF in sub-period (D), and with the DM in sub-period (A) and the period as a whole; in each case they are negative.

A later section of this study (Part IV) refers to connexions between current account developments among the countries considered: it shows that synchronous movements into surplus or into deficit are the exception rather than the rule, but a number of significant inverse relationships are identified. Where these coincide with negative associations between exchange rate movements it is not possible, in assessing the underlying reasons why exchange rates are thus related, to distinguish between current account and portfolio substitution influences. Only in the case of the DM and US$ does it seem possible to surmise that portfolio substitutability rather than current account developments may have been an important consideration in explaining their relative movements.

Relative price levels and real effective exchange rates

One of the oldest and simplest propositions in the economics of exchange rates is the 'law' of *Purchasing Power Parity* (PPP), which states that competition in trade will tend to ensure that movements in exchange rates will be such as to compensate for differences in national inflation rates. The relationship between countries' price competitiveness—or international differences in the price of any bundle of goods when expressed in a common currency—will then be constant: in other words, exchange rates will be constant in real terms.

There are a number of reasons why this proposition may fail to hold, both in the short run and over longer periods. Some of the reasons why deviations from PPP may occur in the short run were suggested in Part I. Exchange rates are sensitive to shifts in expectations, and their movements over short periods are unlikely to be dictated by current trade flows or the balancing of the current account. Furthermore, the consequences of relative price disparities for the current balance materialise only after long lags, since substitution in trade takes time. More fundamentally, exchange rates and indices of goods prices are determined in different kinds of markets. Whereas, in terms of the Hicksian distinction,[1] exchange rates are determined in 'flexprice' markets, the prices of most goods and services, apart from primary commodities, are set in 'fixprice' markets. In the latter, demand exerts a weaker influence in the short run and expectations play a much smaller role. Changes in expectations will tend to affect exchange rates but not prices, so that "...in periods which are dominated by 'news' which alters expectations, exchange rates are likely to be more volatile, and departures from purchasing power parities are likely to be the rule rather than the exception" [Frenkel (1981)].

Even over longer periods, when current account considerations may indeed dominate, PPP has to be qualified in a number of respects. First, cyclically-adjusted trade balances may not be explicable purely in terms of price competitiveness, and there may be significant swings or trends in the relative non-price advantages offered by the goods of different countries. Second, the condition that current accounts should balance in the long run does not imply that trade accounts should balance: in fact a widening trade imbalance, and hence a shifting real exchange rate, may be required to offset an invisibles balance widening in the opposite direction. This point is important because, within invisibles, net property income depends on the net accumulation of foreign assets, which will reflect the current account imbalances occuring in the short term. For this reason, the restoration of current account balance following any short-run disturbance to it is unlikely to require the restoration of the original real exchange rate.

Third, observed changes in real exchange rates will depend upon the price indices used for adjustment. The rationale of PPP implies that it should hold more closely when the prices referred to are those of traded goods than if they are more general national price indices. One particularly important problem is that real exchange rates defined in terms of the more general indices will tend to show swings

(1) Hicks (1974), pages 23-25.

and trends related to international differences in growth rates. Because the growth of productivity in (non-tradable) service sectors tends to be relatively uniform (at a low level), the costs and prices of tradables will tend to rise more slowly, in relation to those of non-tradables, in fast-growing than in slow-growing economies. This implies that in fast-growing economies real exchange rates, defined in terms of general price indices, may be perceived to rise, and in slow-growing economies to fall, owing to 'productivity bias', even though competitiveness may be being held constant in each case.

These considerations provide some background for an examination of Part C of Charts 2–9,[1] which shows, for each currency, the movements in its real value defined in two ways. 'RER' shows the real effective exchange rate, defined as the effective exchange rate multiplied by a ratio of a domestic consumer price index (shown in Part B) to a weighted average of corresponding price indices in the country's five main competitors.[2] 'RNULC' shows the IMF's index of relative normalised unit labour costs in manufacturing. RNULC provides a measure of price competitiveness in trade,[3] while RER is closer to a real exchange rate defined in terms of general price indices. The choice of these two measures mainly reflects the availability of consistent price data. It may be seen from the charts that they do not deviate significantly from each other in the cases of the United States, France, Canada, and Norway. The relative decline of RER in relation to RNULC in the United Kingdom, and its relative rise in Japan and the Netherlands, may reflect productivity bias, although this clearly does not explain its relative decline in West Germany. In the West German case, most of the divergence developed between 1976 and 1979 when the nominal appreciation of the deutschemark was fastest; and the traded goods component of consumer prices will on this account have tended to rise less than domestic prices and wage costs. A large part of the widening divergence between RNULC and RER indices in the United Kingdom in 1979–80 may be explained in the same way.

A cursory examination of the charts indicates that although the secular appreciations of the deutschemark and the Dutch guilder seem largely explicable in terms of their relatively slow rates of domestic inflation—so that by one or other definition their real exchange rates have been relatively stable—and although the real value of the French franc has been no less stable than its nominal value, in other cases there have been significant swings and secular trends (as well as short-term movements) in real exchange rates which make PPP seem an unreliable 'law' even for the medium term.

The data are presented in greater detail in Table B, which shows the average quarterly rates of change of EER (ie the nominal effective exchange rate) and RNULC in the period as a whole and in each of the five phases. The figures for the sub-periods, in the case of each currency, indicate the large changes in real exchange rates which occur over short periods. In fact for five of the eight currencies, the change in RNULC is numerically larger than the change in EER in most of the sub-periods; and in half of the forty observations shown, the change in RNULC exceeds the change in EER. Where RNULC changes in the same direction as, but by a greater magnitude than, a change in EER, the change in EER can be regarded as perverse, in the sense that restoration of international parity among unit costs would have required a movement in the nominal exchange rate opposite to that which took place; this is true in 80% of the observations when the change in RNULC exceeds the change in EER (ie sixteen out of the forty sub-period observations). Moreover, although there is a clear tendency for the direction of change of RNULC to reverse from one sub-period to the next, the figures for the period as a whole show real exchange rate movements of at least ½% a quarter in four out of the eight currencies (the US$ and Can $ depreciating, sterling and the Norwegian krone appreciating), exceeding the nominal movement in three of these cases, and also in that of the French franc. The table also draws attention to the extraordinary case of sterling, whose real appreciation of more than 1% a quarter is almost wholly accounted for by the last two sub-periods. The rate of real appreciation experienced by sterling in the final sub-period is the largest real exchange rate movement shown.

In sum, changes in real exchange rates between 1972 and 1980 were far from negligible, and in significant cases actually greater than the corresponding nominal changes. The frequently invoked assumption of PPP—represented by the first of the five contributory factors listed in Part I—would therefore seem to be of limited help, and to leave much to be explained.

Table B
Average quarterly percentage changes in nominal and real effective exchange rates[a]

	1972Q1–1980Q4		1972Q1–1973Q4		1973Q4–1975Q4		1975Q4–1976Q4		1976Q4–1978Q3		1978Q3–1980Q4	
	EER	RNULC	EER	RNULC	EER	RNULC	EER	RNULC	EER	RNULC	EER	RNULC
United States	− .39	− .61	−1.43	−2.32	.68	− .08	.48	.74	−1.71	−1.62	.12	.47
United Kingdom	− .72	1.08	−2.63	−2.46	−1.47	1.89	−4.82	−3.75	.46	1.96	2.43	4.76
West Germany	1.16	.26	2.09	1.65	.22	−1.10	3.03	2.14	.96	.30	.60	− .44
France	.03	.11	.81	.43	.52	.81	−2.40	−1.94	.25	.30	− .09	—
Japan	.82	− .14	.66	1.96	−1.01	−1.75	1.26	—	5.47	3.51	−1.14	−3.14
Canada	− .66	− .56	− .61	− .13	.07	.21	.99	1.60	−2.78	−2.72	− .39	− .85
Netherlands	.85	− .23	1.14	1.30	.47	− .34	2.30	1.41	.64	−1.16	.50	−1.29
Norway	.45	.50	1.36	1.30	.68	.86	1.91	2.84	−1.53	−1.24	.46	− .10

(a) For definitions of effective exchange rates (EER) and relative normalised unit labour costs (RNULC) see Appendix 3.

(1) Charts 2–9 follow at the end of this article.

(2) No adjustment has been made for indirect taxes and subsidies. The weights, based on the IMF's Multilateral Exchange Rate Model, are listed in Appendix 3, which gives the sources of all data used.

(3) See Enoch (1978).

III Portfolio preferences and risk premia

Before examining the contributions of current account imbalances and changes in relative interest rates to real exchange rate movements in particular episodes, it is worth discussing the role which portfolio preferences may have played. This is both because changes in such preferences are potentially of general relevance, and also because it should be made clear how risk premia provide a channel of influence for current account imbalances additional to that formed by expectations about real exchange rates (discussed in Part IV).

In Part I it was argued that expected yields on assets denominated in different currencies would be equalised, apart from any risk premia required by investors. If such premia did not exist, the currencies would be perfect substitutes: then, if yields were not equalised—if (uncovered) interest parity did not hold—equilibrium would not be possible because the demand for all currencies other than the highest yielding would be zero. Under these conditions, it is only when yields are equalised that all currencies would be willingly held, the demand for each then being indeterminate. The alternative assumption is that, in taking account of exchange risk, investors will seek to diversify their portfolios, being prepared to hold all currencies in non-zero amounts which vary with the configuration of relative yields. Equilibrium does not then require the equalisation of yields; and risk premia provide a conceptual measure of divergences among them. They will depend on all influences other than relative rates of return which impinge on relative asset demands and supplies in different currencies (including changes in administrative barriers), and thus provide a channel through which such influences can affect exchange rates.

In particular, a role is thereby provided for movements in *current accounts*, additional to their impact on expectations about real exchange rate adjustments required for long-run current account balance. Two mechanisms may be distinguished.

First, a deficit in a country's current account implies a shift in private sector wealth from domestic to overseas residents. Since the desired proportion of domestic currency assets in portfolios is likely to be larger for domestic than for foreign residents,[1] this shift in wealth is likely to cause an excess supply of domestic currency assets and an excess demand for foreign currency assets, whose elimination will require a depreciation of the domestic currency.[2] This effect may not, however, occur if the supply of outside assets[3] denominated in the domestic currency is simultaneously reduced by official intervention in the foreign exchange market, so that the foreign exchange reserves of the domestic authority are reduced or the reserves of the domestic currency held by foreign authorities are increased. In any event, the quantitative importance of such wealth effects is unlikely to be large in the short term because the current account imbalances of the industrialised countries are generally small in relation to the stocks of internationally mobile assets denominated in their respective currencies.

The second mechanism may be of greater empirical significance. The value of a currency may be affected by the current account imbalances of other countries if the countries between which wealth is thereby being redistributed have different portfolio preferences and, more specifically, different preferences for the currency concerned.[4]

The difference in preferences may be either in private sector portfolios, or in the portfolios of the monetary authorities if the imbalances are being met by intervention. The significance of this mechanism for the major currencies in recent years will be discussed below (Part IV) in the context of the current account surpluses of the oil exporting countries.

In addition to providing these channels of influence for current account imbalances, the risk premium clearly also provides a role in exchange rate determination for official exchange market *intervention*, since it alters the relative supplies of assets denominated in different currencies. This is quite independent of any monetary impact which may occur if the intervention is not sterilised. Finally, any shift in the stance of *fiscal policy* which is not offset by a compensating change in expected future tax liabilities will affect private sector wealth as well as the currency composition of asset supplies, and will therefore tend to have repercussions on the value of the domestic currency via its risk premium.

While the theoretical implications of risk premia for exchange rate determination are thus far reaching, it is difficult to identify them in practice. Evidence on the existence and magnitude of risk premia is necessarily indirect, since there are no reliable data on expected exchange rate movements.[5] Moreover, only very partial data are available on the currency distribution of official and private portfolios; and they are all necessarily *ex post*, reflecting responses to changes in exchange rates, interest rates and other variables, as well as variations in *ex ante* portfolio preferences. Thus even though shifts in asset preferences between different currencies may have been instrumental in causing important changes in particular exchange rates in certain periods, this may well be disguised in the available data; this qualification is important in interpreting Tables C, D and E.

(1) This is partly because domestic currency assets (more specifically money) are usually required for domestic transactions, and, correspondingly, foreign currency assets for foreign transactions.

(2) Assuming expectations are regressive, a depreciation of the domestic currency will increase the expectation of future appreciation and hence lower the return on, and demand for, overseas assets; depreciation will also increase domestic wealth by raising the domestic currency value of overseas assets and thus help to raise the demand for domestic assets.

(3) See footnote (1) on page 490.

(4) Such differences may arise if exchange rate expectations differ, or if attitudes to risk differ, or if tastes differ perhaps on account of political or historical influences.

(5) It is only possible to check the behaviour of forward premia (or uncovered interest differentials) against either evidence of a more or less informal or anecdotal kind about expected exchange rate movements (eg the projections of forecasting services) or against particular assumptions made about expectations formation (eg that expectations are 'rational', so that systematic errors are not made).

Table C
Shares of national currencies in SDR value of total official holdings of foreign exchange

Percentages

End-period	1973 Q1	1975 Q4	1976 Q4	1977 Q4	1978 Q4	1979 Q4(a)	1980 Q4(a)
US$	84.6	85.2	86.7	85.4	83.3	79.0	72.7
£	7.0	4.1	2.1	1.8	1.6	2.0	3.0
DM	5.8	6.6	7.4	8.3	10.0	11.3	13.9
FF	1.0	1.3	1.0	0.8	1.0	1.0	1.3
SF(b)	1.2	1.7	1.6	2.2	2.1	3.1	4.4
DG	0.3	0.6	0.5	0.5	0.5	0.7	1.1
Yen	..	0.5	0.6	1.0	1.4	2.8	3.6
Total(c)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: IMF *Annual Report*, 1981.

.. not available.

(a) In this calculation, the SDR value of European Currency Units (ECUs) issued against US dollars is added to the SDR value of US dollars, but the SDR value of ECUs issued against gold is excluded.

(b) Swiss franc.

(c) May not add because of rounding.

Table D
Currency distribution of official reserves (1980 Q1[a])

Percentages

	Industrial countries		Oil exporting countries	Non-oil developing countries	All countries
	EMS	Other			
US$	90.3	82.8	67.1	67.4	78.1
£	0.5	1.1	2.9	5.4	2.3
DM	5.6	8.9	16.7	17.7	11.7
FF	—	—	2.2	2.3	1.1
SF	0.2	4.5	4.9	3.9	3.1
DG	2.9	2.6	5.1	1.9	3.1
Yen	0.5	—	1.0	1.4	0.7
Total(b)	100.0	100.0	100.0	100.0	100.0

Source: *IMF Survey*, 26 January 1981.

(a) The only period for which data are at present published.

(b) May not add because of rounding.

The data in Tables C and D, compiled by the IMF, show the proportion of total official foreign exchange holdings by currency and by broad country grouping. Table C reveals a gradual decline in the share of the US dollar, which apparently gained momentum in 1979 and 1980 despite the steady exchange rate. This has been matched by the growing importance of the deutschemark and, from about the mid-1970s, the yen.

In contrast, the share of sterling, which at the beginning of 1973 was exceeded only by that of the US dollar, fell sharply, particularly during 1975 and 1976; but it regained some ground in 1979 and 1980.[1] The evidence from Table D is consistent with the view that different country groupings have different portfolio preferences, at least in official portfolios. In the first quarter of 1980, a considerably smaller proportion of reserves held by oil exporting countries was in US dollars and a much larger proportion in deutschemarks than for industrial countries as a whole. If this observation is broadly representative of the previous decade, the potential significance of the considerable transformation of world current account balances from 1973 onwards, and again from 1978 onwards, under the impact of the two oil shocks, is clear: the share of the US dollar should have declined most acutely in those years when oil exporting countries' surpluses were largest, in 1974–75 and 1979–80, with corresponding rises in other currencies in those years. The data for sterling and the US dollar, at least from 1975, are consistent with this implication, but the increasing shares taken by the deutschemark and yen between 1975–78 are not.

This suggests that, overlying any effects which the conjuncture of differential currency preferences with global redistributions of wealth may have had, more general forces making for portfolio diversification were at work during the 1970s. It must again be emphasised that, being *ex post*, these data can reveal nothing conclusive about *ex ante* preferences; but it may well have been the case that as investors—both official and private—gained experience of floating exchange rates, they became increasingly aware of the differing characteristics of assets denominated in different currencies and, being averse to risk, sought to diversify their currency holdings. Such a process would usually be expected to be gradual; but in the present case it may have been accelerated in the initial stages by perceptions of the dollar's vulnerability towards the end of the fixed exchange rate system.

The motivation for swings in portfolio preferences may, of course, lie outside strictly economic factors and involve 'political' influences. Most of the major currencies have been subject to such effects at one time or another. Apart from over short periods, however, they are unlikely to have dominated more fundamental economic forces.

Portfolio diversification associated with the different characteristics of international assets has been emphasised by Dornbusch (1980) as an explanation for the appreciation of the deutschemark between 1976 and 1979. Table E shows the different return and risk features of the major currencies during the 1970s, using data which again are necessarily *ex post*, and for this reason defective. It appears that over the entire floating rate period up to early 1981, whereas investments in most currencies would, *ex post*, have yielded a similar return after allowing for currency movements, the risks associated with them (as measured by their variability) differed considerably—in particular, the variances[2] for sterling and yen short-term assets were higher on average than for the US dollar, the deutschemark and the French franc. But deutschemark and yen returns, in particular, have tended to move inversely with those on the US dollar, implying, to the extent that such differences were anticipated, an inducement to diversify from the US dollar, given its preponderance, into these other currencies. Nevertheless, no conclusive statements can be made on the basis of these data, if only because most exchange rate movements have probably been unanticipated (see Part V), so that the *ex post* returns shown in Table E may have deviated substantially from those expected in advance.

Similarly, it might be thought that an examination of the data on interest rates and exchange rate movements might

(1) The limited extent to which this took place perhaps reflects the operation of the Basle Agreement of February 1977 under which the United Kingdom undertook to take steps to reduce the reserve role of sterling.

(2) See the footnote to Table E.

Table E
Means, variances and covariances of three-monthly percentage returns on five major currencies, 1972–81[a]

Full period: Apr. 1972–Mar. 1981

		US$	£	DM	FF	Yen
Mean		**2.0**	**2.2**	**2.8**	**2.3**	**3.1**
Variances/ covariances	**US$**	**11.0**				
	£	**2.4**	**16.6**			
	DM	**−6.5**	**−2.6**	**11.9**		
	FF	**−3.2**	**−0.6**	**1.5**	**8.7**	
	Yen	**−5.9**	**0.3**	**−3.4**	**−1.4**	**24.4**

A: Apr. 1972–Dec. 1973

		US$	£	DM	FF	Yen
Mean		0.4	−0.5	4.2	2.5	2.2
Variances/ covariances	US$	11.7				
	£	1.1	8.4			
	DM	−10.5	−2.5	24.6		
	FF	−6.8	1.9	7.8	6.0	
	Yen	−7.0	1.2	−2.7	3.0	12.8

B: Dec. 1973–Dec. 1975

		US$	£	DM	FF	Yen
Mean		3.3	1.8	2.3	3.3	2.2
Variances/ covariances	US$	13.8				
	£	−0.8	6.5			
	DM	−10.9	4.1	14.5		
	FF	−6.0	−3.7	−0.3	19.0	
	Yen	−5.5	0.6	4.3	−2.6	7.4

C: Dec. 1975–Dec. 1976

		US$	£	DM	FF	Yen
Mean		2.0	−1.9	3.8	−0.2	3.0
Variances/ covariances	US$	0.9				
	£	−0.1	12.9			
	DM	0.3	−3.2	6.5		
	FF	1.2	0.4	0.5	4.3	
	Yen	−0.3	0.1	0.1	−2.4	4.5

D: Dec. 1976–Oct. 1978

		US$	£	DM	FF	Yen
Mean		−0.1	2.6	2.4	2.4	6.7
Variances/ covariances	US$	3.6				
	£	−0.3	11.3			
	DM	−0.6	1.8	5.5		
	FF	0.8	−2.8	−3.3	3.1	
	Yen	−4.8	−2.6	−5.7	2.8	17.0

E: Oct. 1978–Mar. 1981

		US$	£	DM	FF	Yen
Mean		3.7	6.0	2.0	2.1	1.7
Variances/ covariances	US$	10.3				
	£	0.5	8.7			
	DM	−5.6	−3.9	6.5		
	FF	−3.6	−1.6	3.9	4.6	
	Yen	−1.2	3.9	−8.7	−6.1	48.1

(a) The return is defined as the percentage appreciation of the exchange rate, *plus* one quarter of the domestic interest rate (per cent per annum) prevailing at the end of the previous period. The interest rates are defined in Appendix 3. In each period the mean return is given for each currency in the same order in which it appears below in the variance/covariance tables: in these tables the variance for each currency, shown on the diagonal, shows how variable its return has been in relation to the mean, while the covariances—the off-diagonal elements—indicate how variations in the return on assets of one currency have varied with those in another currency—for example, over the whole period the covariance of the US$ with the DM was −6.5, indicating that variation in the return on the overall portfolio would have been reduced if part had been held in US$ and part in DM.

reveal something about risk premia. In the 1981 IMF *Annual Report* an attempt is made to compare the compounded return which would have been earned since 1973 by investing in particular currencies relative to a basket of currencies (the SDR). If assets were perfect substitutes, and both interest rate and exchange rate movements known in advance with certainty, then returns yielded by all currencies would have been equalised. Instead they have tended to deviate significantly and persistently from the SDR line. Where the lines diverge *ex post* it would have paid to invest in the currency whose line is rising most steeply. But the implication, again on the assumption of perfect foresight, is that in those cases where returns exceeded the average, like the deutschemark for much of the period or sterling from 1976 onwards, investors required a positive risk premium to invest in those currencies. This counter-intuitive implication indicates the inadequacy of the perfect foresight assumption and the difficulty of drawing conclusions from *ex post* data about the size, or even the existence, of risk premia.

Overall therefore, although it seems plausible to argue that there was a process of gradual portfolio diversification as adjustment to the floating exchange rate environment proceeded, there are no data to verify this, or even to prove the existence of risk premia on different currencies. Moreover, while such a gradual process may underlie the longer-term trends in some real exchange rates, it is unlikely to have been responsible for the sharper short-term fluctuations; and there may be a danger of attributing too much to changes in confidence or asset preferences rather than to more inexorable economic influences of the kind which are considered next.

IV Influence of the current account

In Part I, a role was identified for the influence of the current account on the exchange rate additional to the route just described by which current account imbalances affect the global composition of portfolios. Shifts in the current account may be interpreted as signifying the need for changes in real exchange rates, or the terms of trade, which are to be occasioned by changes in current nominal exchange rates. Underlying this argument is the eminently plausible notion that market participants expect real exchange rates to move in a way which prevents indefinite transfers of wealth through current account imbalances.[1]

There are a number of points about this role for the current account which deserve emphasis. First, this interpretation lends itself naturally to an *efficient markets* view of exchange rate determination: on such a view, at any time, current exchange rates, spot and forward, already incorporate all information known to the market about those factors, both economic and non-economic, which determine exchange rates, interpreted by participants in the best possible way. It is then the surprises contained in the continuous stream of new information on any of those influences, such as an unexpected move into, or an unexpectedly large, current account surplus or deficit, which will for the most part cause exchange rate movement.

In combination, an efficient markets approach, together with the portfolio effects of current account imbalances discussed earlier, suggests that such an unexpected surplus or deficit would cause a real exchange rate realignment consistent with whatever revisions to risk premia occur as a result of the global wealth redistribution.

Second, a clear distinction should be drawn between shocks which are regarded as short-lived or transitory and those which are expected to be permanent. Those which are thought to be purely transitory will neither affect the expected equilibrium exchange rate needed in the long run for current account balance, nor have significant redistributive effects on portfolios in the meantime. On the other hand, surprises which are considered to reflect a

(1) Bearing in mind the qualification made in footnote (2) on page 489.

permanent change in an underlying influence will affect the expected long-run equilibrium exchange rate and may also cause important disturbances to global portfolio balance in the short to medium term. It follows that, if expectations about underlying economic forces lie stably within a narrow range, large persistent imbalances in the current account will tend to coincide with periods of large exchange rate adjustment.

Third, whereas it is current balances in *absolute* terms which disturb portfolio balance, it may be argued that it is the *relative* current account positions of the main industrial countries *vis-à-vis* each other which are more likely to impinge on perceptions of long-run equilibrium real exchange rates. This is because market participants tend generally to be concerned only about the subset of exchange rates between these countries—which have large, active, developed financial markets—in assessing the balance of payments impact of shocks to any part of the international economy.

Evidence of strong contemporaneous links between current account movements and exchange rates could be interpreted as support for these inferences, but would not allow the direct influence via exchange rate expectations to be easily distinguished from the more indirect portfolio effects. Part F of Charts 2–9 shows the difference between each country's current account, scaled by its total trade (exports plus imports) to remove the effects of inflation, and the aggregate current account, similarly scaled, of the eight countries considered[1] (taken as representative of the combined OECD current balance). They do indeed tend to confirm that, for a number of currencies, there are episodes in which exchange rate movements can be related to relative current account developments. This is most obvious for the rise and subsequent fall of the yen between 1976 and 1980; but it is also evident, although in smaller degree, for the weakness of the US dollar through 1977–78 and its subsequent recovery; the strength of the deutschemark in 1973–74 and after 1976; and the real depreciation of the Dutch guilder since 1976. It is clearly not, however, a universal explanation for all currency movements in all periods: whereas a relationship appears to exist for the French franc until 1976, the subsequent improvement in the French balance of payments appears to have had little or no impact on the real effective franc rate. Moreover, although a positive relationship is frequently identified, causation is not uni-directional: although the theoretical considerations outlined above imply that it is unanticipated movements in current balances which are influencing exchange rates, the identified exchange rate movements will also, because of well-established J-curve effects, tend to have a positive contemporaneous impact on current accounts.

In the case of the real sterling exchange rate, it is only very early in the period, during 1972–73, and late in the period, from mid-1980, that a roughly synchronous connexion with the current account seems to be apparent. Any such relationship during the period 1974–76 is obscured by oil market developments and, in particular, the movement by OPEC investors first into, and then out of, sterling as noted in the previous section. Subsequent developments have been interpreted by some as a good illustration of the impact of an unanticipated shock to the current account, first as North Sea oil came on stream from 1976, allowing the United Kingdom to reach self-sufficiency by 1980, and second, as oil prices increased during 1979–80. But while it may be reasonable to consider both the timing and size of this oil price rise as unexpected, it seems inconceivable that before 1976 market participants were not expecting the onset of North Sea oil production: only if a very short-sighted view of market expectations is taken, or if the significance of the oil endowment was underestimated and this became clear only at the time of the second oil price shock, can oil-related developments alone explain the appreciation of sterling from late 1978 to early 1981.

It is interesting to compare the experience of sterling with that of the other energy producing countries. Although an energy advantage has, at certain times, been perceptible in the behaviour of the effective rate for the Canadian dollar and the Dutch guilder, only the appreciation of the Norwegian krone in 1973–74 approaches in magnitude the rise in the real value of sterling between 1978 and 1980. This is despite the fact that, in terms of energy surpluses and deficits, Canada's current and prospective position is, like that of the United Kingdom, one of self-sufficiency (although the UK approach to this position has been more abrupt), while Norway has become, and is expected to remain through the 1980s, an energy exporting nation.

At first sight it might in any case appear odd that a country which is merely self-sufficient in oil, or approaching that

(1) That is, for each country i where BAL represents the current balance, X the level of exports and M imports, Part F of Charts 2-9 illustrates:

$$\frac{BAL_i}{(X+M)_i} - \left[\sum_{i=1}^{8} BAL_i \Big/ \sum_{i=1}^{8} (X+M)_i\right]$$

This is best thought of as measuring the deviation of the current account of country i from the hypothetical share of the total OECD current account position which it might be expected to have, given the size of its trade $(X+M)_i$ in relation to total

OECD trade $\left[\sum_{i}^{8} (X+M)_i\right]$ scaled by $(X+M)_i$ to remove the effects of inflation, ie:

$$\left[BAL_i - \sum_{i=1}^{8} BAL_i \frac{(X+M)_i}{\sum_{i=1}^{8} (X+M)_i}\right] \frac{1}{(X+M)_i}$$

position, would experience nominal and real exchange rate appreciation when oil prices rise. The exchange rate, is however, a relative phenomenon, and although there may be no benefit to the current account position of a self-sufficient country from such a rise, oil importing countries will suffer a current account deterioration. Relative to such countries therefore, the self-sufficient economy is better off. If the oil exporting countries are willing to finance fully the increased deficits of the oil importers by acquiring financial claims on those countries, then no exchange rate adjustments would be required. But it is more likely that both oil exporting and other countries would wish to increase the proportion of their portfolios held in assets denominated in the currencies of countries relatively insulated from such price rises, and that the restoration of equilibrium would thus require these currencies to appreciate, at least in the short run.[1]

The unique experience of sterling in the second half of the 1970s probably cannot therefore be related solely to oil developments, although these developments, in conjunction with sterling's past and present role as an international trading currency and asset, must together explain some part of its real appreciation.

An earlier section reported correlations among exchange rate movements: in this connexion it is relevant to consider whether current account developments among the major OECD countries have been associated, and if so whether positively or negatively. Casual inspection of the charts, and examination of the correlation coefficients in Table F, reveals some clear relationships. One of the most striking is between Japan and the United States: when Japan was moving into relative current account surplus against its partners, the United States was generally moving into deficit, and vice versa, and this might help to explain the negative correlation between the yen and the US dollar. A similar but less pronounced relationship between France and the United States and between West Germany and the United Kingdom may be observed, but no such pattern is apparent overall between the West German and US relative current account positions to help explain the negative association between their exchange rates. It may be therefore that, in this last case at least, the partial substitutability of the deutschemark and US dollar in the eyes of portfolio holders has been a dominant influence in explaining their relative movements.

Table F
Correlations among relative current account positions

	United Kingdom	United States	West Germany	France	Japan
United Kingdom	1				
United States	−0.49*	1			
West Germany	−0.67*	0.06	1		
France	0.34	−0.36*	−0.38*	1	
Japan	0.35*	−0.85*	−0.15	0.26	1

* Significant at 5% confidence level.

V Relative interest rates, inflation expectations, and money supplies

The influences remaining to be considered are relative interest rates and expectations about future relative inflation rates, which, taken together, refer to expected relative real rates of interest.

It is natural to take these two influences together, because inflation expectations help to determine rates of interest. Indeed, special assumptions might be adopted under which variations in relative interest rates would be due entirely to changes in expected relative inflation rates. This is the case with the *monetary approach* to exchange rate theory: risk premia are assumed to be absent, so that relative yields among currencies are equalised, with interest differentials mirroring expected exchange rate movements; furthermore, real exchange rates are constant and expected to be so, implying that interest differentials also mirror expected inflation differentials. Under these assumptions, changes in interest relativities occur in order to offset changes in both inflation and exchange rate expectations, which would otherwise give rise to disparities in expected relative yields. They are not to be regarded as changes in relative yields carrying any direct implication either for the relative demands for different currencies or for exchange rates. Changes in relative interest rates under these assumptions do, however, carry an indirect implication for exchange rates. If, say, the interest differential in favour of the domestic currency increases, the demand for money in the domestic economy will tend to fall in relation to the demand for money abroad, so that, for given relative money supplies and income levels, the restoration of equilibrium in money markets will require a relative increase in the domestic price level; and, given the assumption that exchange rates are fixed in real terms, this will require a depreciation of the domestic currency.

The indirect mechanism derived from the assumptions of the monetary approach therefore implies that the value of the domestic currency will be *negatively* related to interest differentials in its favour. This is in striking contrast with the *positive* relationship referred to in Part I[2] and implied by more general assumptions which allow relative real interest rates to vary (as in portfolio balance models) or which allow nominal interest rates to respond to liquidity conditions independently of expected exchange rate movements.[3]

Before examining the prevalence in the data of relationships of these two contrasting kinds, it is worth referring to an implication of the hypothesis that currencies are perfect substitutes (or that risk premia are absent) which has been noted by some writers in the light of the data.[4] This is that expected exchange rate changes, which this hypothesis implies are measured by interest differentials, invariably account for a minor proportion of subsequent actual changes. In other words, if currencies

(1) These issues were touched on in the Governor's Ashridge lecture, reproduced in the December 1980 *Bulletin*, page 449.
(2) For an explicit reconciliation, see the final paragraph in Appendix 1.
(3) See, for example, Dornbusch (1976).
(4) For example, Mussa (1979).

are perfect substitutes (if they are not, the calculation obviously cannot be directly made), the greater proportion of exchange rate movements are unanticipated, representing responses to unforeseen shocks or new information. The data used in this study, for quarterly interest differentials and exchange rate changes between 1972 and 1980, suggest on this basis that the average proportion of currency movements unanticipated by the market was 48% for the US $, 77% for sterling, and 94% for the French franc; while for the deutschemark and the yen the market on average incorrectly forecast even the direction of change, since the corresponding proportions for these currencies are 177% and 128% respectively.

Part D of Charts 2–9 shows for each currency the differential between both domestic short and long rates of interest and respective weighted averages of short and long foreign interest rates. Both positive and negative correlations with nominal and real exchange rates are evident for the short-term differential. There seems to have been a fairly consistent *positive* relationship in the case of the Can $ through the period as a whole, and a positive relationship also seems to dominate in the case of the Norwegian krone. For other currencies, no consistent picture emerges. Examples of positive correlations include: sterling between 1977 and mid-1980; the US $ between 1974 Q2 and 1975 Q3, and also from mid-1979 through 1980; and the deutschemark through 1973, from mid-1976 to mid-1977, and to some extent in 1980.

Negative correlations with short-term interest differentials have, however, been equally prevalent, as may be seen from a cursory examination of the charts for the United Kingdom up to 1978, and the United States, France and Japan from 1977. This may indicate the operation of the mechanism of the monetary approach described above. Alternatively, however, it may indicate the importance of the way in which changes in exchange rate expectations can outweigh changes in short-term interest differentials, or, perhaps more pertinently, the way in which changes in those interest differentials induced by monetary authorities in response to exchange market pressure may be insufficient to offset the movement in expectations by which the pressure is generated. Some support for this alternative interpretation is provided by the impression that positive correlations have been more prevalent in recent years as interest rate policy in a number of countries has been redirected towards domestic monetary objectives, so that variations in short-term interest differentials may have tended to entail corresponding variations in relative yields rather than compensating (or partially compensating) responses to movements in expectations.[1]

Long-term interest differentials, which may have been less influenced by policy reactions of the authorities and more a reflection of relative inflation expectations than short-term differentials, might in theory at least be expected to be more consistently negatively related to exchange rate movements.[2]

Although for some countries — most notably the United Kingdom and Canada — the charts provide some support for this view, no particularly strong or stable relationships stand out.

Part E of Charts 2–9 shows, for each currency, movements in the ratio between an index of the domestic money stock and a weighted average of indices of foreign money stocks, on both narrow and broad definitions. The significance of these ratios in theory depends upon the particular framework adopted. Their role is most clear-cut in the case of the monetary approach, which may be interpreted as implying first, that apart from variations in relative income levels, the path of an exchange rate over the long run will follow closely the inverse of the path of relative money supplies, and second, that in the short run, variations in rates of relative monetary expansion will be the most important determinant of expectations of relative inflation and exchange rate movements. It is not easy to discern any effects of the latter kind in the charts. Nor is there any clear evidence of trend relationships of the former kind in most of the charts, although relative broad money in West Germany and Canada does seem to describe the respective trend paths of relative prices and the exchange rate.

VI Conclusions

Because of the breadth of the subject, much of the above analysis is inevitably cursory, and those inferences which do not seem trite are necessarily largely tentative. The following points stand out:

- There is no strong evidence that real exchange rates generally tend to be stable, either in absolute terms or in relation to nominal exchange rates, over either short or long periods. On the other hand, there are some currencies — notably the deutschemark — for which relative inflation rates do appear to have been an important explanatory factor, at least through the period considered; and in addition, the forces represented by the law of *Purchasing Power Parity* may become dominant only over periods longer than that examined in this study.

- It is likely that some of the longer-term movements in real exchange rates which occurred between 1972 and 1980 were due in part to a movement towards more diversified currency portfolios following the collapse of the US dollar-dominated Bretton Woods regime. It is also possible that the transfers of wealth towards the oil exporting countries which resulted from the jumps in the real price of oil had a significant impact on global currency preferences: in the case of sterling these were also influenced by the development of the United Kingdom's oil endowment. It is not, however, possible to appeal to conclusive supporting evidence for any of these influences, because of data deficiences.

(1) For the case of sterling, see Hacche and Townend (1981a).

(2) This is, for example, an implication of the model developed by Frankel (1979b).

- It is much easier to refer to data for relative current account positions, and these appear to indicate that changes in current account balances have frequently been influential in the short term. This may be interpreted as evidence that exchange rates are often sensitive to the concern of foreign exchange markets that the real values of currencies must reflect the need to correct, in the long run, current account imbalances.

- Short-term exchange rate movements have also frequently been associated with changes in relative interest rates, but the direction of the association has sometimes been positive and sometimes negative. Where there is a negative relationship, it may be argued that interest rate movements were outweighed in their effects by movements in expectations with which they themselves were associated. There is some evidence in support of this argument: a positive relationship appears to have prevailed most frequently in recent years, as monetary authorities have oriented their interest rate policy more towards domestic than external objectives.

The influences examined in this paper are obviously not exhaustive; and in a larger study other possible determinants of currency movements could be considered. These include the stance of fiscal policy and relative levels of activity, although these will to some extent be reflected in the current account and monetary variables which have been taken into account.

Many of the observations made in this study are supported by events since the end of 1980. Although the direction of movement in some of the major exchange rates has apparently been consistent with a narrowing of previous purchasing power disparities (notably the appreciation of the US dollar and the depreciation of sterling and the French franc), factors other than competitiveness have clearly contributed to these developments (the movement of the US dollar, for example, is probably larger than can be accounted for by PPP considerations alone), and the movements of other currencies probably cannot be explained in these terms (for example the depreciation of the yen). The appreciation of the US dollar in the first half of 1981 reflected persistently high US interest rates and a growing expectation of a sustained tightness in domestic monetary policy; and the synchronous depreciation of sterling, the European currencies and the yen was to a large extent the mirror image of these developments. Other influences, however, have also been evident. Current account developments probably accounted for much of the weakness in the deutschemark in the earlier part of the year and also for the subsequent recovery of both the deutschemark and yen and the weakening of the US dollar and perhaps sterling. Downward pressure on the French franc, which culminated in the EMS realignment in early October, may have been partly due to worsening expectations about domestic inflation. The unexpected weakening of the oil market in mid-year may meanwhile have made an especially large contribution to the real depreciation of sterling.

Although this narrative may have highlighted a number of behavioural influences behind some of the movements in the major currencies during the floating rate period, it offers rather less help as a guide for the future econometric modelling of exchange rates. A start has been made elsewhere in trying to estimate empirical models consistent with a broad interpretation of the general conceptual framework outlined here,[1] apparently with only limited success.[2] This follows the failure of models based on more special assumptions. Given this experience, it would seem optimistic to expect much from econometric models of exchange rates, at least as far as the forecasting of future short-term developments is concerned. An understanding of the underlying determinants of exchange rate movements and the quantification of their relative importance is nevertheless required if meaningful policy simulations are to be undertaken with any macroeconomic model. The search for an econometric exchange rate relationship must therefore continue. This study may have helped in emphasising the importance, among other factors, of making adequate allowance for current account developments and portfolio preferences. The relationships identified are, however, by no means regular, which is not surprising if they are dependent on the way in which the market interprets new information. Expectations are crucially important, yet remain elusive.

(1) See, for example, Isard (1980) and Hooper and Morton (1980).
(2) As demonstrated by Meese and Rogoff (1981).

Chart 2
United States[a]

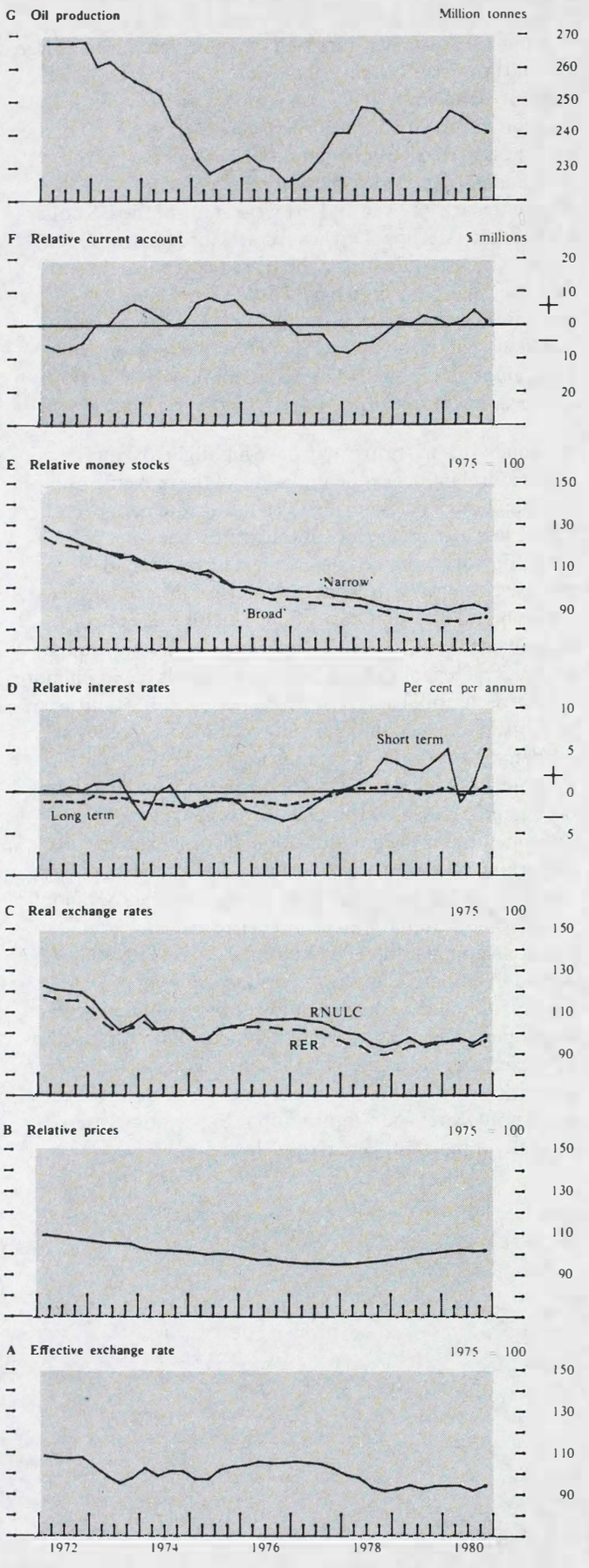
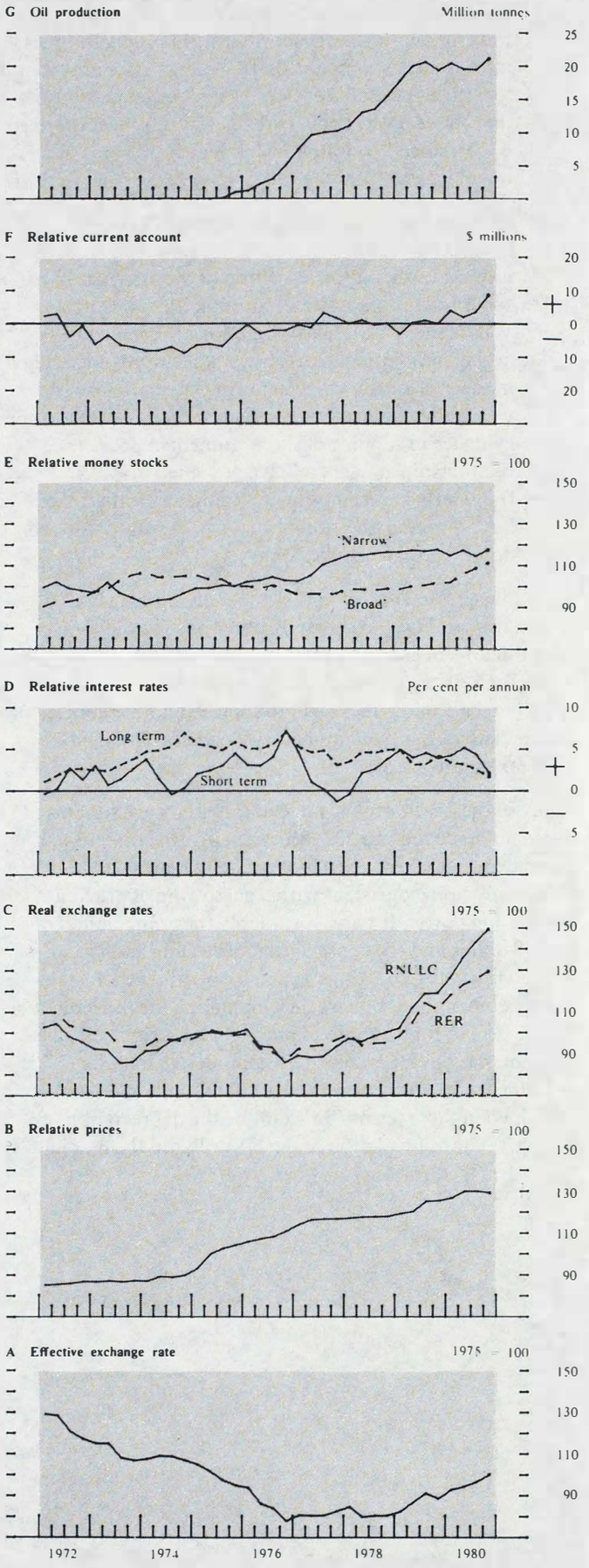


Chart 3
United Kingdom[a]



(a) All data series are defined in Appendix 3.

Chart 4
West Germany[a]

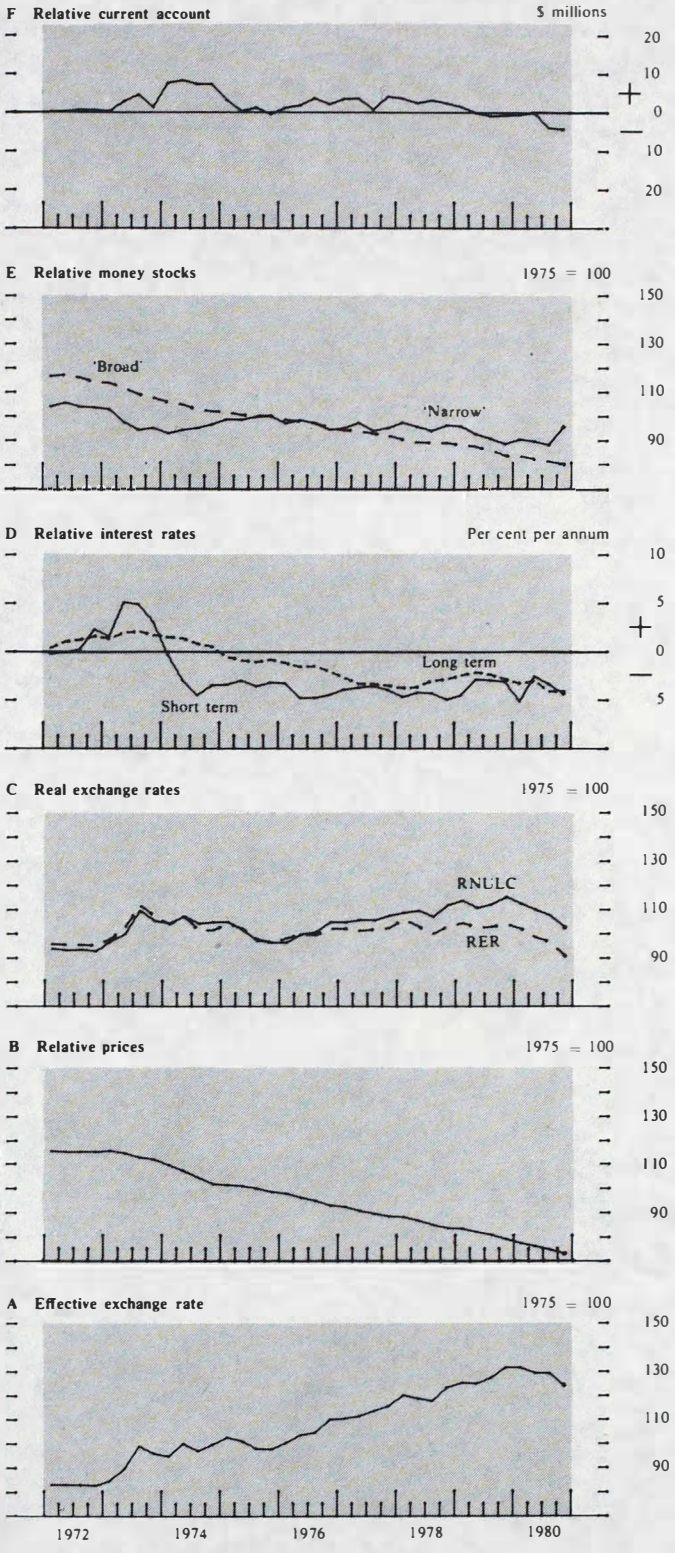
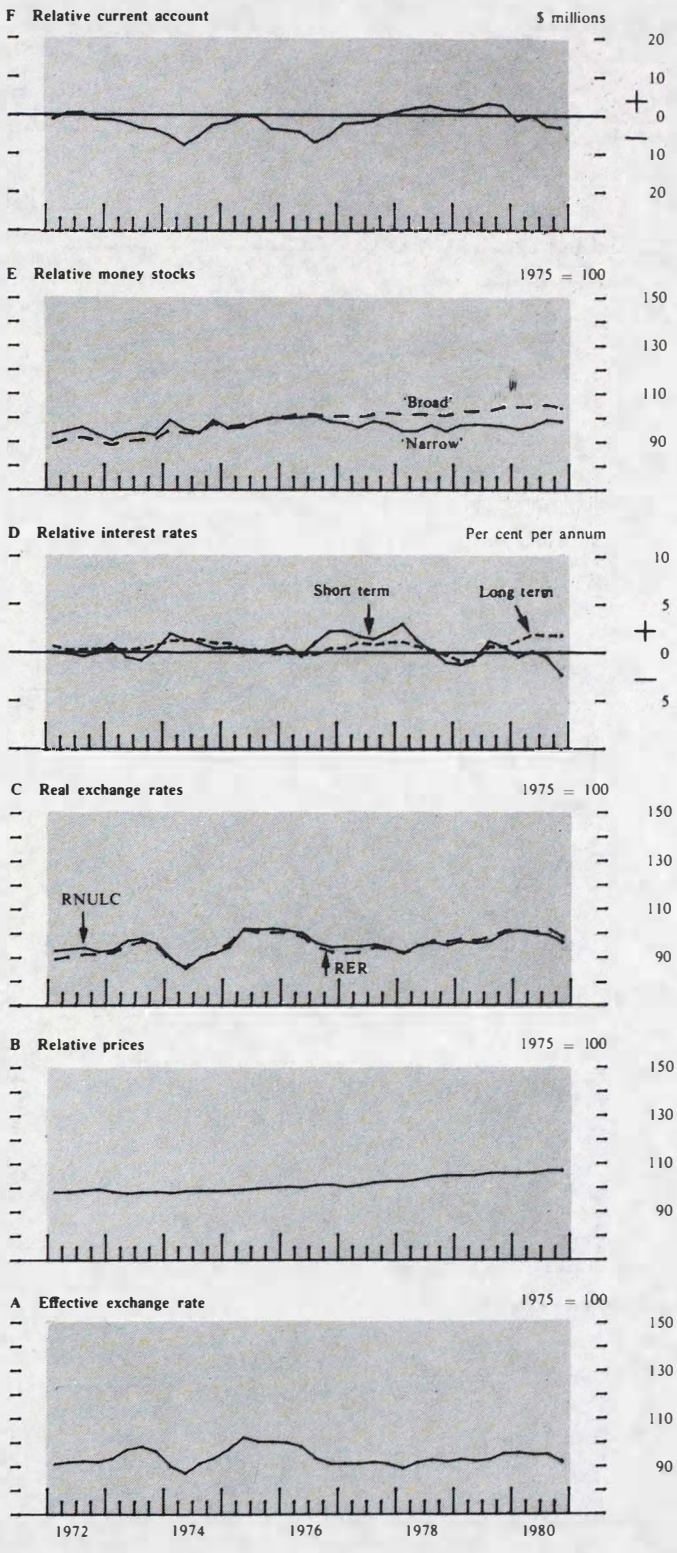


Chart 5
France[a]



(a) All data series are defined in Appendix 3.

Chart 6
Japan[a]

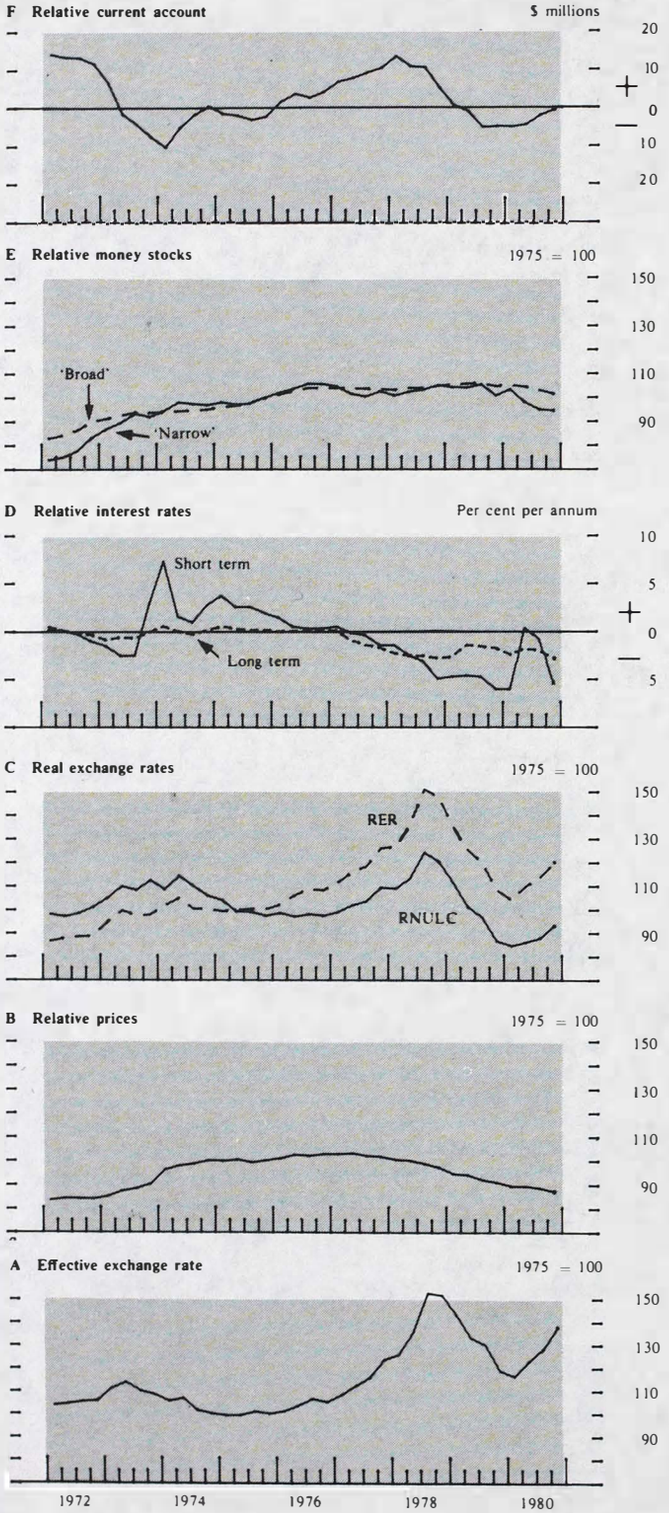
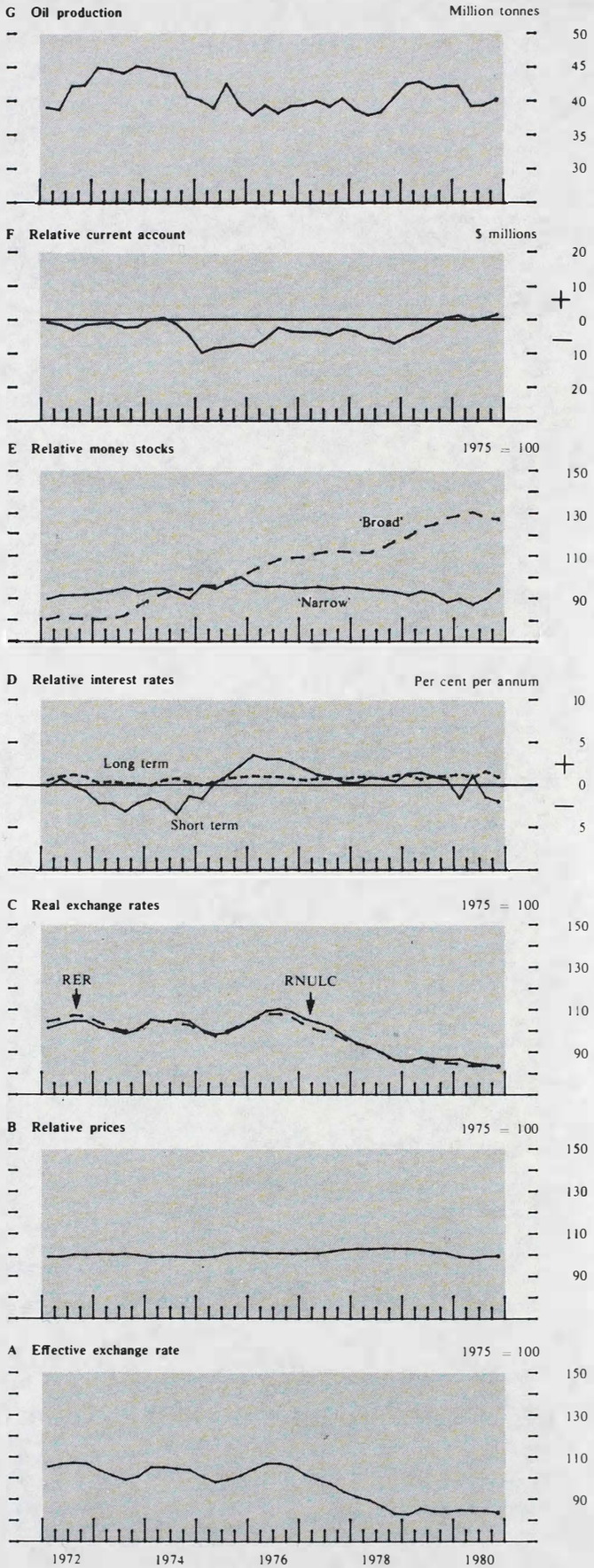


Chart 7
Canada[a]



(a) All data series are defined in Appendix 3.

Chart 8
Netherlands[(a)]

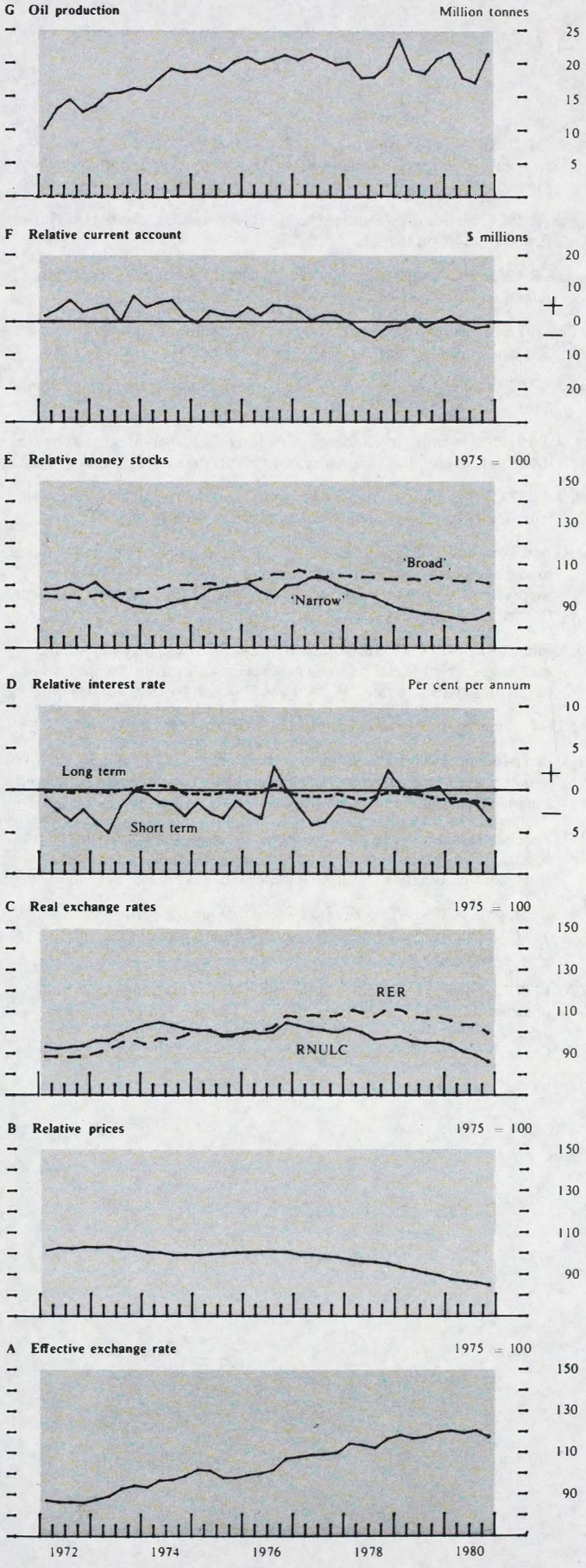
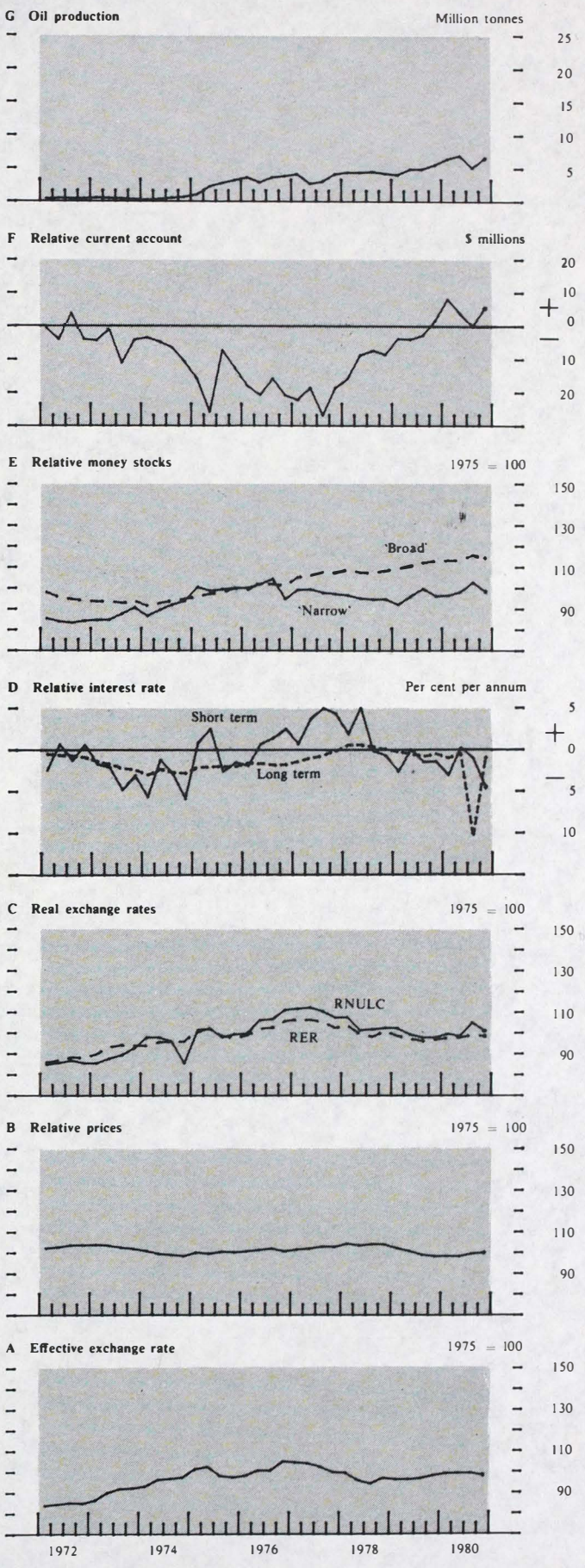


Chart 9
Norway[(a)]



(a) All data series are defined in Appendix 3.

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Appendix 1
Determinants of exchange rate changes

This appendix derives formally the classification of determinants of exchange rate changes discussed in Part I. A similar classification is set out by Isard (1980); it is implicit elsewhere in the literature on portfolio balance models of exchange rate determination.

In the absence of exchange controls and non-exchange risk, it may be assumed that, apart from a margin of indeterminacy dependent on transactions costs, the forward exchange rate F will be related to the spot exchange rate S in such a way that there is covered parity between the interest rates i and i^* on comparable domestic and foreign assets:[1]

$$(1+i)=\frac{S(1+i^*)}{F}$$

This condition may be rewritten approximately as:

$$s=f+i-i^* \tag{1}$$

where s and f are the logarithmic values of S and F. (The approximation is closer the smaller are i and i^*: alternatively, expression 1 holds exactly if i and i^* are interest rates appropriate for continuous compounding.) The risk premium r on foreign currency is conveniently defined as:

$$r=f-E(s) \tag{2}$$

where $E(s)$ is the expected future value of s.

With the real spot rate $\bar{S}$ defined by:

$$\bar{S}=\frac{SP}{P^*}$$

where P and P^* are indices of domestic and foreign price levels, $E(s)$ may be decomposed as follows into the expected logarithmic values of $\bar{S}$, P, and P^*:

$$E(s)=E(\bar{s})-E(p)+E(p^*) \tag{3}$$

Finally, the expected logarithmic price levels may be further decomposed into their actual current levels, p and p^*, and the respective expected rates of inflation, $E(\pi)$ and $E(\pi^*)$:

$$\begin{aligned} E(p) &= p+E[ln(1+\pi)]=p+E(\pi) \\ E(p^*) &= p^*+E[ln(1+\pi^*)]=p^*+E(\pi^*) \end{aligned} \tag{4}$$

(These again are approximations, requiring that π and π^* are close to zero, unless they are the expected inflation rates appropriate for continuous compounding, in which case the relationships in 4 are exact.)

The substitution of expressions 2, 3 and 4 into 1 then gives the relationship for s which is referred to in the text:

$$\begin{aligned} s &= (p^*-p)+E(\bar{s})+[E(\pi^*)-E(\pi)]+(i-i^*)+r \\ \text{or}\quad lnS &= ln(P^*/P)+E(ln\bar{S})+[E(\pi^*)-E(\pi)]+(i-i^*)+r \end{aligned} \tag{5}$$

The first difference of this condition is a formal statement of the classification of sources of exchange rate changes set out in Part I of the main text:

$$\Delta lnS=(\pi^*-\pi)+\Delta E(ln\bar{S})+\Delta E(\pi^*-\pi)+\Delta(i-i^*)+\Delta r \tag{6}$$

It is to be emphasised that expressions 5 and 6 are, apart from the assumption of covered interest parity and arithmetic approximations, accounting identities with no theoretical content. Their interpretation depends upon what additional assumptions are adopted. In the *monetary approach* to exchange rate determination, for example, risk premia are assumed to be zero, so that forward rates equal expected spot rates, and the nominal interest differential in favour of the domestic currency matches its expected rate of depreciation. In addition, *Purchasing Power Parity* (PPP) is assumed to maintain a constant real exchange rate, implying that the expected rate of depreciation, and hence the interest differential, must equal the difference between expected rates of inflation at home and abroad. Expressions 5 and 6 therefore reduce to PPP conditions:

$$lnS=E(\bar{s})+ln(P^*/P) \tag{5a}$$

$$\text{and}\quad lnS=\pi^*-\pi \tag{6a}$$

where $E(\bar{s})$ is now a constant. The further assumption of stable demand functions for money allows P and P^*, and hence S, to be expressed in terms of domestic and foreign money supplies and the determinants of money demand other than price levels. The exchange rate will then be *negatively* related to the interest differential in favour of domestic assets, not positively as an interpretation of expressions 5 and 6 (which omits these special assumptions) would suggest.[2]

(1) Both F and S are measured in units of foreign currency per unit of domestic currency. The term of the interest rates is the same as the term of the forward contract: for example, if F is the three-month forward rate, i and i^* are interest rates (per quarter) on, for example, three-month bank deposits.

(2) For further consideration of the monetary approach, see Hacche and Townend (1981a), pages 206–15, and Hacche and Townend (1981b).

Appendix 2
Main administered exchange rate changes, 1971–81

1971

15 Aug. Dollar convertibility suspended: dollar depreciates against sterling and most other European currencies and yen.

20 Aug. Two-tier French franc rates established.

18 Dec. Smithsonian agreement, establishing parities with wider ($\pm 2\frac{1}{4}\%$) margins, entailing US dollar devaluation against all currencies other than Canadian dollar (still floating).

1972

24 Apr. European 'snake' agreement by six European Community countries came into effect, entailing $\pm 1\frac{1}{8}\%$ margins. United Kingdom and Denmark joined on 1 May, and Norway on 23 May.

23 June United Kingdom and Ireland floated their currencies.

27 June Denmark withdrew from snake.

10 Oct. Denmark rejoined snake.

1973

22 Jan. Swiss franc floated.

12 Feb. US dollar devalued by 10%; yen floated; commercial lira floated (two-tier market had been established in January). Swedish krona and Finnish markka devalued by 5%.

19 Mar. Deutschemark revalued by 3% against gold; snake currencies abandoned margin for US dollar.

29 June Deutschemark revalued by $5\frac{1}{2}\%$.

17 Sept. Dutch guilder revalued by 5%.

16 Nov. Norwegian krone revalued by 5%.

1974

19 Jan. French franc floated.

21 Mar. Commercial French franc withdrawn.

1975

10 July French franc rejoined snake.

1976

15 Mar. French franc floated.

18 Oct. Deutschemark revalued by 2%; Danish krone devalued by 4%, Swedish krona and Norwegian krone by 1%.

1977

4 Apr. Danish and Norwegian krone devalued by 3%, Swedish krona by 6%.

29 Aug. Danish and Norwegian krone devalued by 5%; Sweden left snake.

1978

12 Feb. Norwegian krone devalued by 8%.

16 Oct. Deutschemark revalued by 4%; Dutch guilder and Belgian (and Luxembourg) franc revalued by 2%.

(1 Nov. Co-ordinated stabilisation measures by United States, Japan, West Germany and Switzerland.)

11 Dec. Norway withdrew from snake, the krone being pegged to a trade-weighted basket of currencies.

1979

13 Mar. Snake replaced by European Monetary System (EMS), with a $\pm 1\frac{1}{8}\%$ band and eight participating countries: Ireland, Belgium, Luxembourg, Denmark, West Germany, Italy, the Netherlands and France.

24 Sept. EMS realignment: deutschemark revalued by 2%, Danish krone devalued by 3%.

30 Nov. Danish krone devalued by 5%.

1981

23 Mar. Lira devalued by 6%.

4 Oct. EMS realignment: deutschemark and Dutch guilder revalued by $5\frac{1}{2}\%$, French franc and lira devalued by 3%.

Appendix 3
Definitions and sources

Lines shown on charts are denoted†

(1) EER†: Effective exchange rates, 1975 = 100, IMF: *International Financial Statistics* (IFS), line amx.

(2) RNULC†: Relative normalised unit labour costs, 1975 = 100, IFS line 65umc.

(3) P: Consumer price indices, 1975 = 100, IFS line 64.

(4) P*: Weighted average foreign consumer price indices, using each country's five main competitors with weights, based on those derived from the Multilateral Exchange Rate Model of the IMF, normalised to sum to 1, as follows:

	Weight of:								
In index for	United States	United Kingdom	West Germany	France	Japan	Canada	Netherlands	Italy	Belgium
United States			0.1805	0.1402	0.2946	0.2811		0.1036	
United Kingdom	0.3522		0.2013	0.1485	0.1954			0.1026	
West Germany	0.3120			0.2399	0.1809		0.0876	0.1796	
France	0.3055		0.2701		0.1467			0.2113	0.0664
Japan	0.6244	0.0521	0.1655	0.1018				0.0562	
Canada	0.7568		0.0593	0.0548	0.0838			0.0453	
Netherlands	0.2673		0.2792	0.1922	0.0945			0.1668	
Norway	0.3904	0.1183	0.1830	0.1219	0.1864				

(5) (P*/P)†: Relative prices: ratio of domestic to weighted average foreign price index, × 100.

(6) RER†: Real effective exchange rates, 1975 = 100, (1) × (5)/100.

(7) Short-term interest rates:

United States: Eurodollar rate in London, IFS line 60d.
United Kingdom: Three-month inter-bank rate, mean of spread of rates at close of business averaged over working days.
West Germany: Monthly data on three-month loan rate, averaged over three months, OECD database.
France: Monthly data on three-month inter-bank rate, averaged over three months, 1972–77 *Banque de France Annual Report*, 1978–80 *Conseil National du Credit Annual Report*.
Japan: Monthly data on Gensaki three-month rate, averaged over three months, 1972–76 *Japanese Bond Statistics* (Nomwa Co Ltd), 1977–80 *Economic Statistics Annual Report* (Bank of Japan).
Netherlands: Monthly data on rate on three-month loans to local authorities, averaged over three months, OECD database.
Canada: Monthly data on three-month CD rate, averaged over three months, OECD database.
Norway: Call money rate, IFS line 60b.
Italy: Monthly data on inter-bank deposit rate, averaged over three months, OECD database.
Belgium: Monthly data on three-month Treasury certificates, averaged over three months, OECD database.

(8) Long-term interest rates: IFS line 61.

(9) (i–i*)†: Relative interest rates, short and long-term: difference between domestic and weighted average foreign interest rate, using weights in (4).

(10) Narrow money:

United Kingdom: M_1 smoothed for breaks, seasonally adjusted.
All other countries: IFS line 34b.

(11) Broad money:

United Kingdom: Sterling M_3 smoothed for breaks, seasonally adjusted.
All other countries: IFS lines 34 and 35, seasonally adjusted by the Bank of England.

(12) Relative narrow and broad money stocks†: Ratio of domestic money to weighted average foreign money index, end-1975 = 100, using weights in (4).

(13) Relative current accounts†: The seasonally adjusted difference between the current account, deflated by the sum of exports and imports, for each country and the total current account balance for all eight countries, similarly deflated by their aggregate exports and imports, × 100. Current balances taken from IFS lines 77aad, 77abd, 77acd, 77add, 77aed and 77agd.

(14) Oil or oil and gas production†:

United States: Crude oil production, IFS line 66aa, converted into seasonally adjusted million tonnes.
United Kingdom: Oil production million tonnes, Department of Energy, *Energy Trends*.
Canada: Crude oil and natural gas production, *Canadian Statistical Review*, converted into million tonnes oil and oil equivalent, and then seasonally adjusted by the Bank of England.
Netherlands: Crude oil and natural gas production, *Maandschrift*, converted into million tonnes oil and oil equivalent and then seasonally adjusted by the Bank of England.
Norway: As United States.

(15) $ price index of oil†: Until end-1978 $ price index of Saudi marker crude oil, IFS line 76aad; from then, a production-weighted average of OPEC effective oil prices.