

PRINCETON STUDIES IN INTERNATIONAL FINANCE

No. 50, October 1982

Exchange-Rate Management
in Theory and Practice

Victor Argy

INTERNATIONAL FINANCE SECTION
DEPARTMENT OF ECONOMICS
PRINCETON UNIVERSITY

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IN INTERNATIONAL FINANCE

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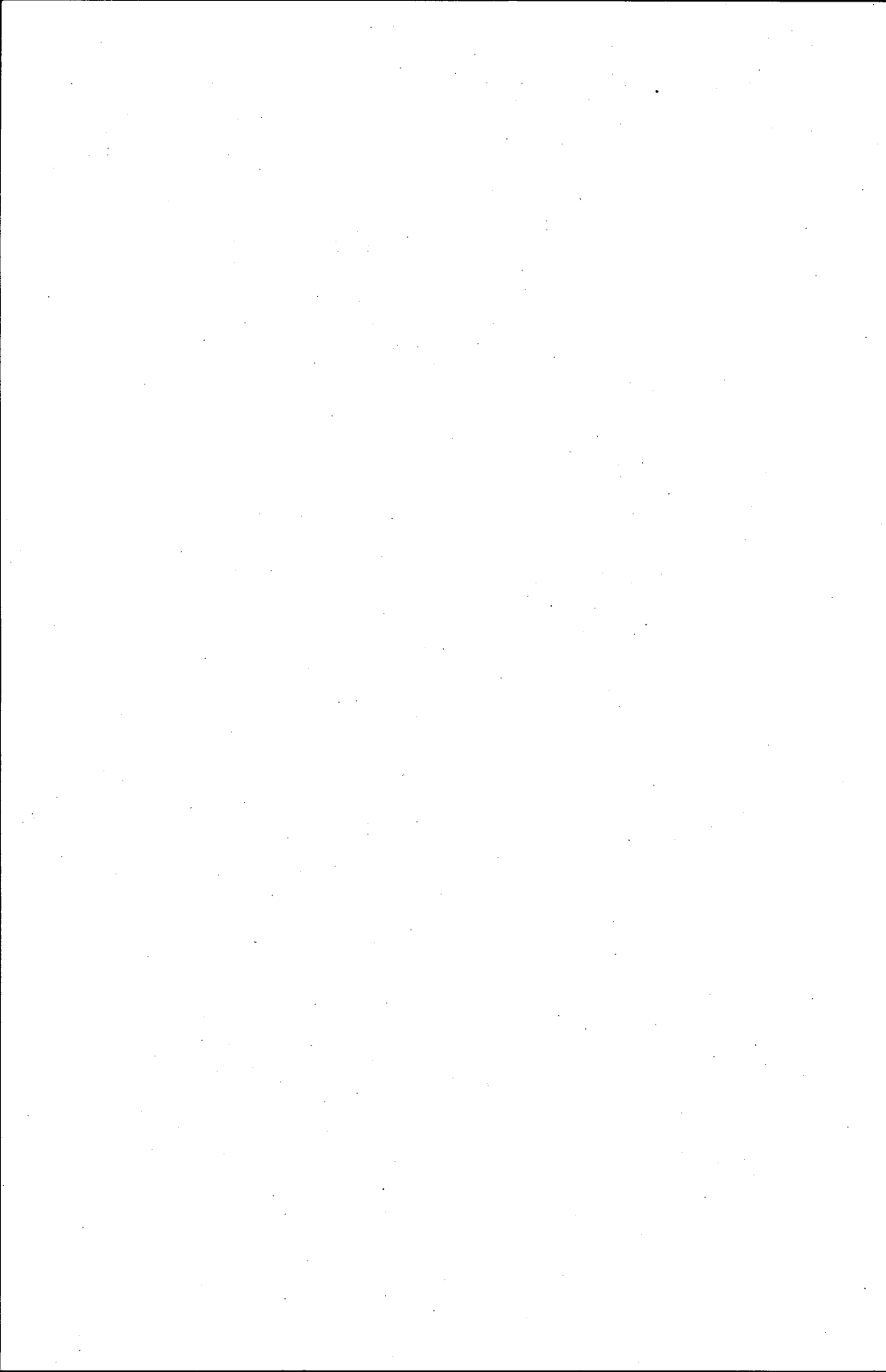
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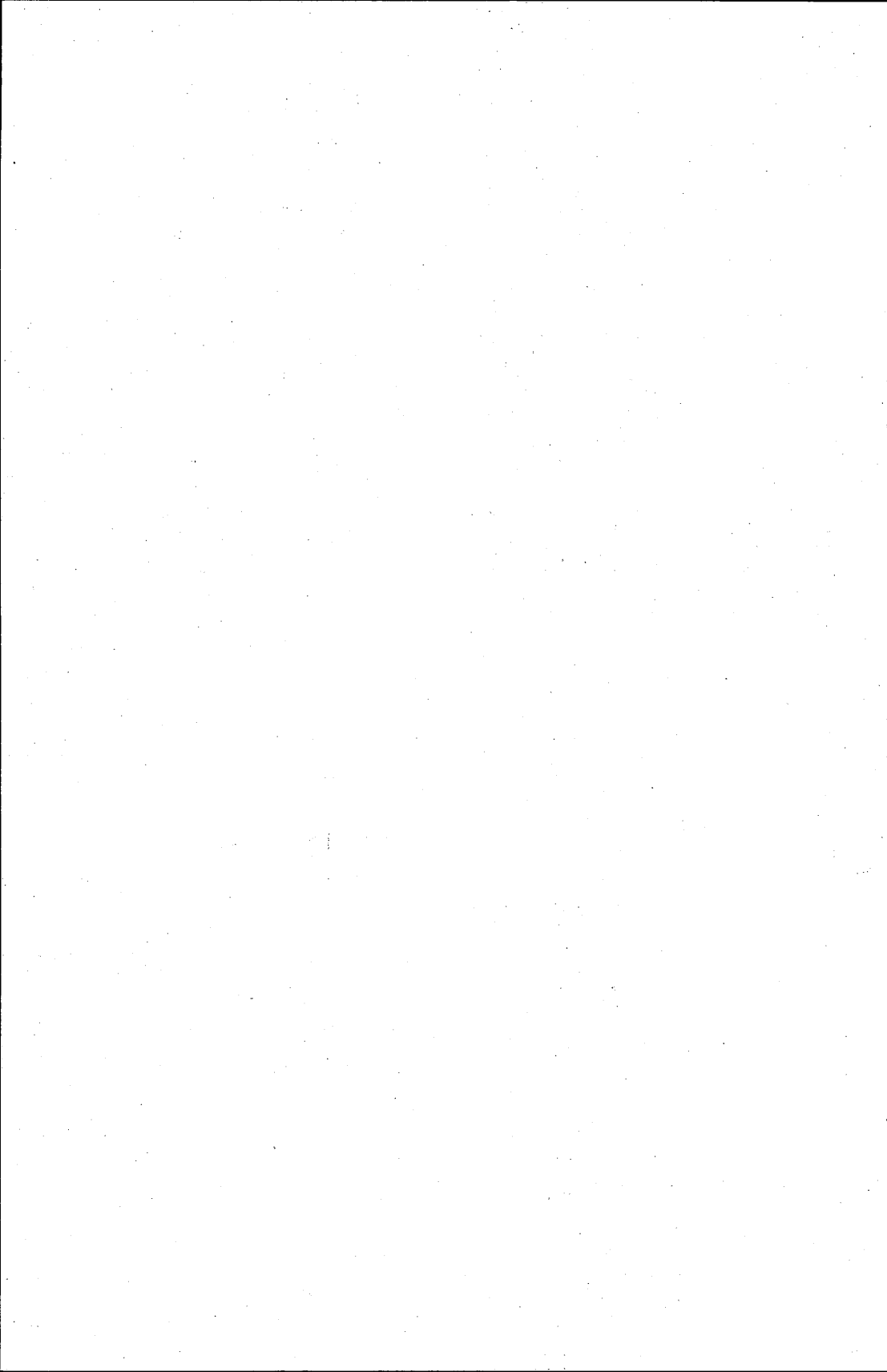
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INTRODUCTION

In the Bretton Woods system, as originally conceived, countries were to intervene in the short run in the foreign-exchange market to hold the exchange rate fixed within a narrow band around the official par value. In the longer run, however, they were allowed to change their intervention points (par values) to correct fundamental disequilibria. Thus, in the shorter run reserves would bear the brunt of the adjustment, while in the longer run exchange rates would be directed at securing external balance. At the same time, monetary and fiscal policies, freed of any external constraint, would be directed at the domestic economy.

The reality, however, was different. First, against the spirit of the Bretton Woods system, exchange rates became relatively rigid for considerable periods of time, even in the face of what appeared to be fundamental disequilibria. This effectively meant that the balance of payments could not be ignored. To hold the exchange rate at its par value required the use by some deficit countries (notably the United Kingdom) of restrictions on the outflow of capital, occasional deflationary policies, and massive overseas borrowings and the use by some surplus countries (notably Germany) of restrictions on the inflow of capital and more inflationary policies. Second, with the relaxation of exchange controls in 1958 and the growth of the Eurodollar market and multinationals later on, industrial economies became more integrated financially. This had the important consequence that, with fixed exchange rates, monetary policy could no longer be directed toward domestic objectives, even in the short run.

These strains, and others, ultimately took their toll, and by March 1973 the Bretton Woods system had collapsed. What followed was a regime which, in principle, allowed exchange rates to be determined by market forces.

In the idealized free float, changes in exchange rates would serve to remove any emerging potential disequilibria; in this way, exchange rates would be directed at securing continuing external balance. At the same time, monetary and fiscal policies could be directed at domestic objectives.

Thus, insofar as the design of policy was concerned, the free float was similar in some respects to the idealized Bretton Woods system. In both, monetary and fiscal policies were intended to be directed at domestic objectives. In both, exchange rates would take care of external balance in the long run. In the Bretton Woods system, however, there would be short-run intervention, while in the free float there would be no intervention.

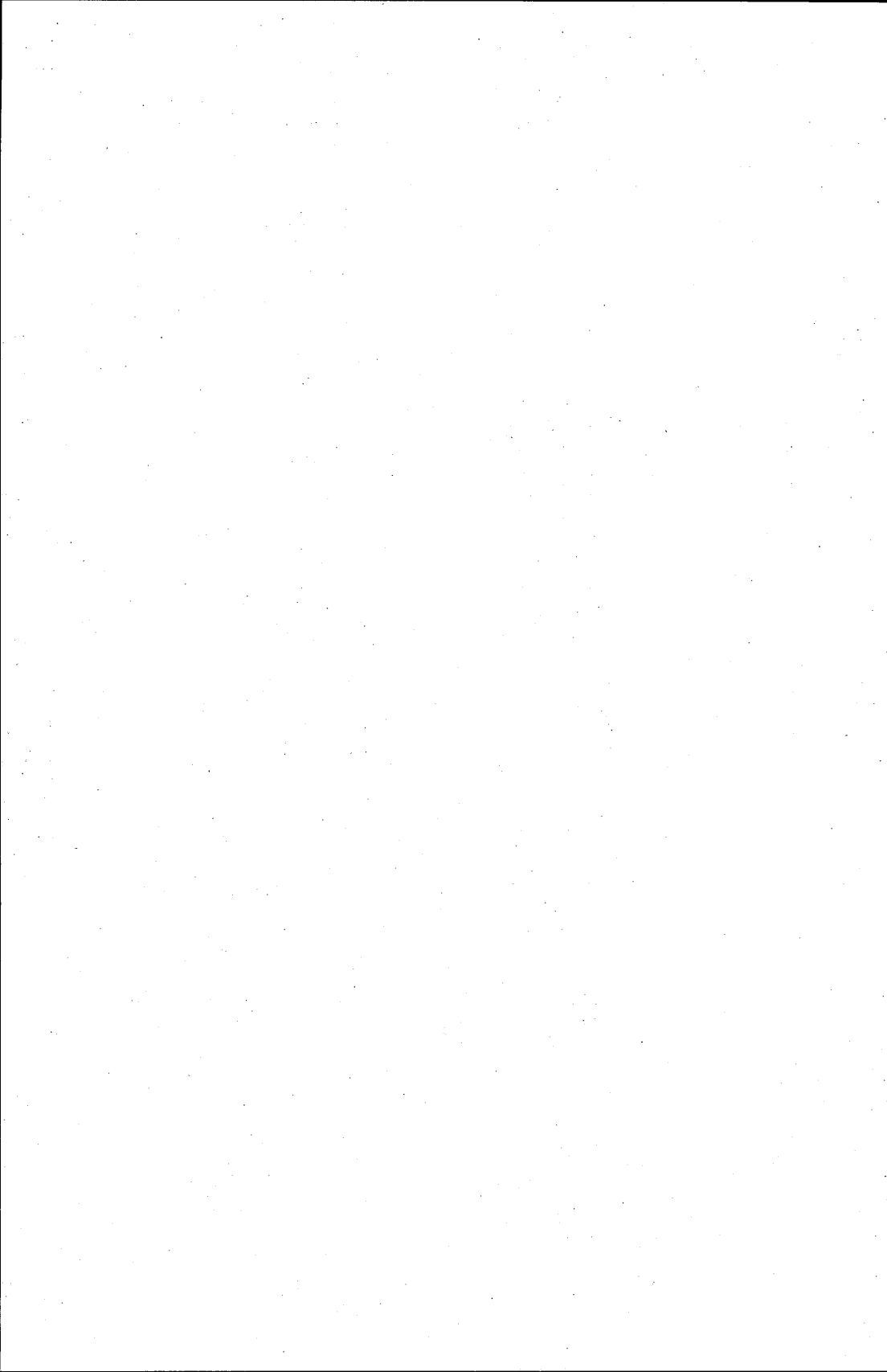
As in the case of Bretton Woods, however, there is a distinction to be made between the idealized free float and the way flexible rates have actually functioned since 1973. Exchange rates have been managed in a va-

riety of ways: (1) There has continued to be much intervention in foreign-exchange markets. At the same time, extensive use has been made of official foreign borrowing, notably in connection with oil-induced deficits. (2) Capital controls have been used to influence exchange rates. (3) Monetary policies have been widely used to manage exchange rates.

The study that follows deals with the theory and practice of exchange-rate management in developed economies. It is divided into two parts. Part I deals in Chapter 1 with the various techniques for managing exchange rates that have been used since 1973 and in Chapter 2 with the potential benefits that might flow from such management. Part II reviews in some detail the experience of three countries—Germany, Japan, and the United Kingdom—in the years from 1973 to the end of 1979. In the final chapter, an attempt is made to evaluate the experience in the light of the theoretical discussion in Chapter 2.

PART I

*The Techniques and Theory of
Exchange-Rate Management*



I TECHNIQUES OF MANAGING EXCHANGE RATES

Exchange-rate management, the use of official policies to influence the exchange rate that emerges in the foreign-exchange market, takes three principal forms. First, the monetary authorities may intervene by buying and selling currencies in the foreign-exchange market. Such intervention may or may not be sterilized. Second, the monetary authorities may use monetary policy to stabilize the long-run real exchange rate without associated reserve movements. Third, the monetary authorities may use capital controls as a means of stabilizing simultaneously the exchange rate and the volume of money.

Less important methods of managing exchange rates include the use of fiscal policy, of administrative controls over imports and exports, of special inducements to foreign central banks to hold reserves in a particular currency, and of various devices intended to alter levels of official reserves without intervening or borrowing. (For example, central banks may place dollar reserves with their commercial banks, which, in turn, lend them in the Eurodollar market, or they may convert their short-term dollar assets into longer-term assets, thereby reducing the officially defined level of their dollar reserves.)

This chapter briefly discusses each of the three principal methods of management. The rationale underlying them is examined in Chapter 2.

Foreign-Exchange Intervention: Some Issues

We start our discussion of intervention by examining the domestic financial effects of sterilized intervention, assuming sterilization is feasible. We then look at the conditions under which sterilization is feasible in practice. Finally, we evaluate the effects of intervention on the exchange rate.

The financial effects of sterilized intervention. Suppose there is a balance-of-payments surplus which the monetary authorities decide to sterilize, leaving the money supply unchanged.¹ What are the effects of such

¹ Intervention in the foreign-exchange market may be undertaken by the home country, using a reserve currency, or by the reserve-currency country. In practice, most intervention has been by the home country, but there was also some intervention by the United States, especially in 1978-80. The discussion here is limited to home intervention. For a detailed analysis of intervention by the United States, see Abrams (1979), Balbach (1978), and Kubarych (1977/78). See also the regular issues of Federal Reserve Bank of New York, "Treasury and Federal Reserve Foreign Exchange Operations," *Quarterly Review*. It is worth noting here the differences between the two forms of intervention. First, intervention by the Federal Reserve System is normally intended to be reversed within three months (although, of course, this period can be extended), whereas there is no time limit placed on the home country's

sterilized intervention on the level and the structure of interest rates?²

Consider, first, the case where the private sector holds its financial wealth in domestic money, a domestic bond, and a foreign asset that is an imperfect substitute for the domestic bond. The ratio of each of these to wealth is assumed to be a function of domestic and foreign interest rates. Suppose, to begin, that the foreign interest rate falls, inducing an inflow of capital that is met by intervention sterilized by sales of the domestic bond. The private sector will now hold more domestic bonds, fewer foreign assets, and the same volume of money. To restore portfolio equilibrium, the interest rate on domestic bonds must rise.

Suppose that the surplus comes instead from an improvement in the current account. The difference, in this case, is that the foreign interest rate is unchanged but there is a change in wealth, represented by the current-account surplus. This surplus is now offset by the sale of domestic bonds, forcing up the interest rate on these bonds. This in turn will encourage an inflow of capital, which will require additional sales of bonds (but these substitution effects do not, of course, add to wealth). In the end, there will be the same amount of domestic money, some reduction in holdings of foreign assets, and an increase in holdings of domestic bonds, on which the interest rate must rise.

The outcomes are less clear-cut if, for example, a second domestic asset (say equities) is introduced into the analysis. Suppose, again, that we have a current-account surplus that is sterilized as previously. If equities and bonds are close substitutes, there will be an excess supply of relatively illiquid assets, forcing up the return on the two domestic assets. If, however, bonds are closer substitutes for money than for equities, there will now be an excess supply of relatively liquid assets, and this will encourage some switch from bonds into equities, raising the interest rate on domestic bonds but lowering the yield on equities.

We conclude, therefore, that a sterilized purchase of foreign currency will unambiguously raise the interest rate on the bond used for sterilization, but the effect on the yield of a second domestic asset (equities) is ambiguous, depending on the assumption made about substitution. Since the yield on equities has some relevance for domestic activity, sterilized intervention

intervention. Second, intervention by the Federal Reserve System means that the U.S. authorities, instead of the foreign monetary authorities, normally bear the exchange risk on the transaction. Third, there are psychological differences. In general, U.S. intervention is more likely to restore confidence because it indicates a cooperative effort and a greater determination to manage the exchange rate.

² Some of the propositions that follow are demonstrated more rigorously in the Annex. For a much fuller discussion see Argy (1981b). The framework used in the analysis is a portfolio-balance model of the financial sector of an open economy (see, for example, Branson, 1980; Corden, 1981; and Kenen, 1982).

that left the volume of money unchanged could, in principle, either raise or lower domestic activity.³

The feasibility of sterilized intervention. We now ask in what circumstances central banks may be either unable or unwilling to sterilize.

Consider the case where intervention is short-term, in the sense that it will be reversed in due course. Whether or not sterilization is feasible depends on the degree of capital mobility, the degree to which the forward rate can adjust independently of the expected spot rate, and the degree to which some exchange-rate flexibility is allowed.

If capital mobility is low and the spot rate is fixed, sterilization is clearly feasible. A change in the interest-rate differential, by definition, will lead to only a limited movement of capital and reserves, and this in turn can be sterilized.

Sterilization is also feasible for very short periods even with high capital mobility, if the spot rate and the expected spot rate are given but there is some risk aversion combined with sufficient uncertainty surrounding the expected spot rate to allow the forward rate to deviate from the expected spot rate. To illustrate, suppose the foreign interest rate falls. Pure arbitrageurs would now sell foreign currency spot and buy foreign currency forward. If speculators are uncertain about the future spot rate, their own sales of foreign currency forward will not be unlimited at the expected future spot rate; the forward rate will have to rise relative to the expected future spot rate to induce them to sell foreign currency forward to the arbitrageurs. The rise in the forward rate will then open up a forward premium on the foreign currency, which itself can offset the interest-rate differential and so, in principle, limit the capital inflow.

Sterilization is also feasible with high capital mobility if the monetary authorities adopt a policy of "leaning against the wind," intervening but allowing the spot rate to bear part of the adjustment. Suppose, again, that the foreign interest rate falls but that now expectations about the future spot rate are firmly held. The capital inflow will lead to some appreciation and some reserve accumulation. The exchange rate will have to appreciate by enough to produce an expected depreciation of the domestic currency (as reflected in the forward discount on the currency) that exactly offsets the new interest-rate differential. Any purchases of foreign exchange required to bring about this outcome can also, in principle, be sterilized (see also the discussion on page 9).

Sterilization is not feasible for any length of time, however, when exchange rates are firmly fixed and capital is highly mobile. More generally,

³ In econometric work, it is common practice to use a weighted average of the two yields to represent the cost of capital (see Helliwell, 1976).

the higher the degree of capital mobility and the more durable the interest-rate differential, the more difficult it will be to sterilize without substantial reserve movements. Moreover, large reserve movements in themselves provoke expectations of exchange-rate changes, which in turn aggravate capital movements, rendering sterilization impossible at that point.

Finally, sterilization is again not feasible, whatever the degree of capital mobility, if there is sustained intervention in one direction (e.g. in the face of a more fundamental disequilibrium). The reason is that the continuing accumulation or loss of reserves will lead sooner or later to firm expectations that the exchange rate must change, and speculative capital will then make it virtually impossible to retain control over the volume of money.

Inability apart, monetary authorities may also be unwilling to sterilize, either because they wish to avoid the financial repercussions discussed earlier or because they wish to minimize exchange-rate instability. For example, if there are large capital inflows because a currency is strong, the monetary authorities may be prepared to allow the volume of money to increase to avoid the continuing upward pressure on the exchange rate.

Intervention and exchange rates. We turn now to the effects of intervention on the exchange rate. A useful distinction is between the immediate effects and the deferred effects.

In dealing with the immediate effects of intervention, it is convenient to begin with the interest-rate-parity framework, which we can approximate as

$$\dot{E} = \dot{F} + (\Delta rd - \Delta rf) \quad (1)$$

$$\dot{F} = \dot{E}e + RP, \quad (2)$$

where E is the exchange rate (in units of foreign currency per unit of the domestic currency), Ee is the expected exchange rate, F is the forward rate, rd and rf are the domestic and foreign interest rates respectively, and RP is the risk premium. A dot over the symbol represents the per cent change.

Consider, now, an intervention strategy aimed at resisting exchange-rate pressures (a policy of leaning against the wind) and suppose again, by way of illustration, that the foreign interest rate falls. The currency will strengthen (E will rise); at the same time, the central bank will buy some foreign exchange. Such intervention can affect E in one of three ways: through rd , through $\dot{E}e$, and through RP . (1) If intervention is not sterilized, rd will fall and the rise in E will be weakened; again, if E is affected, real money balances will rise and this, in turn, will also influence rd . (2) Intervention may influence private-sector expectations about the spot exchange rate (e.g. by reassuring the public that the fall in the foreign interest rate will not be

sustained). (3) Intervention may alter the risk premium (e.g. by supplying funds to arbitrageurs who buy the home currency spot and sell it forward, thus depressing the forward rate and containing the rise in the spot rate).

The case where capital mobility is imperfect (interest-rate parity does not hold) is straightforward. By influencing the availability of foreign exchange in the spot market, intervention must have a direct influence on the exchange rate. Consider a very simple "conventional" model of the exchange rate:

$$B = C + K \quad (3)$$

$$C = c \left(Y, \frac{pd \cdot E}{pf} \right) \quad c_1 < 0 \quad c_2 < 0 \quad (4)$$

$$K = k(rd - rf + \frac{Ee - E}{E}) \quad k > 0 \text{ (assuming } F = Ee) \quad (5)$$

where B is the balance of payments (assumed to be initially in equilibrium), C and K are the current and capital accounts respectively, Y is gross national product, pd is the (fixed) domestic price level, and pf is the (fixed) foreign price level denominated in foreign currency.

Substituting equations (4) and (5) into (3) and rearranging gives

$$\Delta E = -\frac{1}{c_2 + k} \Delta B - \frac{c_1}{c_2 + k} \Delta Y + \frac{k}{c_2 + k} (\Delta rd - \Delta rf + \Delta Ee). \quad (6)$$

It is clear from equation (6) that intervention, represented by ΔB , will have some effect on the exchange rate, unless k is infinity (the interest-rate-parity case).

When capital mobility is perfect, there will be no direct effect. As an extreme case, return to the earlier example in which intervention is sterilized and exchange-rate expectations are firmly held. Intervention will be self-defeating insofar as the exchange rate is concerned. The reason is simple. When the interest-rate differential is given and the expected spot rate is firmly fixed (and hence equal to the forward rate), the spot rate, as we have already seen, must rise sufficiently to create an expected devaluation exactly equal to the new interest-rate differential. The rise in the spot rate is predetermined, independently of the amount of intervention in the spot market.

Finally, if intervention alters the market exchange rate, it will also have longer-term effects on the balance of payments and hence deferred effects on exchange rates. For example, if, in our illustration, intervention suc-

ceeds in holding down the exchange rate, the future current account will be affected, and this, in turn, has implications for future exchange rates. These points, however, will not be pursued here (see Kenen, 1982).

The Use of Monetary Policy to Manage Exchange Rates

Consider now the use of monetary policy to stabilize exchange rates. Suppose that there is upward pressure on the exchange rate; the monetary authorities can remove this pressure by allowing monetary policy to be more expansionary. Short-term pressures on the exchange rate can therefore be alleviated by appropriate fluctuations in monetary policy.

To illustrate this case more concretely, let us take the case where the foreign interest rate fluctuates randomly. Suppose that domestic and foreign assets are imperfect substitutes and that the monetary authorities wish to stabilize the exchange rate. They can do this in three principal ways: by sterilized intervention, by nonsterilized (monetary) intervention, and by changing monetary policy. In the first case, the adjustment is borne by fluctuations in reserves; at the same time, both the money supply and the exchange rate are fixed. In the second case, reserves and the money supply are allowed to fluctuate. In the third case, reserves are fixed but the money supply is allowed to fluctuate to stabilize the exchange rate. In the second case, the source of change in the money supply is the change in reserves; in the third case, it is the change in the domestic assets of the central bank.

We have already evaluated the monetary implications of sterilized intervention. We focus here, therefore, on the differences between monetary intervention and monetary policy. Suppose, again, that the foreign interest rate falls and that we have the three-asset model presented earlier. (For a more formal presentation, see the Annex.)

With monetary intervention, residents will sell foreign bonds to buy domestic bonds and money. This forces down the interest rate on domestic bonds. Without sterilization, the domestic money supply will rise; in the end, residents will hold the same amount of domestic bonds, more money, and fewer foreign bonds.

Suppose alternatively that a discretionary monetary policy is followed to stabilize the exchange rate. If domestic residents try to sell foreign assets, they will put upward pressure on the domestic currency; to offset this upward pressure, the monetary authorities have to buy domestic bonds (i.e. implement an expansionary monetary policy). In the end, residents will hold the same amount of foreign assets, fewer domestic bonds, and more money.

With monetary policy, residents wind up holding fewer domestic bonds relative to the other two assets; with monetary intervention, they wind up holding fewer foreign assets relative to the other two assets. With monetary

policy, the domestic interest rate will have to be relatively lower to induce residents to hold fewer domestic bonds relative to other assets. This implies a larger increase in domestic money.

Suppose the authorities wish to bring about a given increase in output but to minimize the effects on the exchange rate. It may be possible for the authorities to combine monetary and fiscal policies to secure these twin aims (see Dornbusch and Krugman, 1976, and Prachowny, 1979).

Consider the case where capital is very mobile and exchange rates are determined by market forces. An expansionary monetary policy will normally lead to some increase in output and to a depreciation as well. An expansionary fiscal policy will have only weak effects on the real economy and will lead to an appreciation of the currency. It follows that some combination of monetary and fiscal expansion can be selected to increase real output without affecting the exchange rate. In other words, the appreciation associated with the fiscal expansion can be made to offset the depreciation associated with the monetary expansion, while allowing the desired increase in output.

The Use of Capital Controls to Manage Exchange Rates

Consider, now, the use of capital controls. Capital controls may be used to serve three distinct purposes:

1. On a continuing basis, to shelter the economy from potentially destabilizing inflows or outflows of capital.
2. To offset longer-term weaknesses or strengths in the current account, by biasing the controls against outflows in the case of a weak currency (as in the United Kingdom until 1979) or by biasing the controls against inflows in the case of a strong currency (as in Germany).
3. To offset short-term exchange-market pressures in either direction.

In case (1), the controls in place have implications for the short-term volatility of exchange rates. Consider again two potential disturbances, one coming from a fall in the foreign interest rate and the other from a current-account surplus. In the first instance, the presence of controls, by limiting inflows, may serve to moderate the rise in the exchange rate. In the second instance, the presence of controls may force the exchange rate to overshoot, because in this case it will inhibit the flow of stabilizing speculation. On balance, therefore, it is difficult to say whether generalized exchange controls stabilize or destabilize exchange rates.

In case (2), the exchange controls might succeed in influencing the exchange rate in the long term.

In case (3), capital controls may be used to offset short-term disturbances to the balance of payments. For example, fluctuations in foreign interest rates may be countered by inhibiting outflows when those rates rise and

inhibiting inflows when they fall. A good illustration of this third use of capital controls occurred in the years 1968-72, when Europe first used barriers to outflows as a means of countering rising U.S. interest rates, later reversing the measures and restricting inflows as U.S. interest rates collapsed.

The use of exchange controls, in this general context, poses three major issues for policy. What are the potential macro benefits from such controls? What resource-allocation costs are associated with these controls? How effective are they and what is their incidence on various sectors and income groups?

Clearly, if controls are ineffective, there is no case to be made for them. But if they have some effectiveness, the potential macro benefits should be offset against the efficiency costs and the inequities associated with their differential impacts. We return to these issues later.⁴

⁴ The potential macro benefits are discussed in Chapter 2 (see particularly pp. 21-25). The effectiveness of controls is discussed in Chapter 6 (see particularly pp. 76-80).

2 THEORETICAL RATIONALE FOR EXCHANGE-RATE MANAGEMENT

The objectives underlying the kinds of exchange-rate management reviewed in Chapter 1 can be grouped conveniently under three headings: allocation (resource efficiency), intertemporal distribution, and economic stabilization.¹

The Promotion of Allocative Objectives

Exchange-rate management by means of intervention may be used to promote three allocative objectives: to counteract private-sector inefficiency, to act from superior information in situations where there are restrictions on the use of information or access to it (a second-best type of rationale), and to buy time for structural adjustment.

Private-sector inefficiency. The private sector may be inefficient because foreign-exchange dealers are excessively prudent, conservative, and risk-averse, making them unwilling to take open positions in either the short or long run (see Artus and Crockett, 1978, and McKinnon, 1979). In this case, there is too little speculation, the supply of speculative capital is highly inelastic, and the rate of return to speculation is presumably excessive.

Or the problem may be that there is insufficient understanding of how exchange markets work, particularly over the longer term. Here there is ill-informed speculation about the longer run.

Finally, there may be excessive short-term pessimism or optimism about particular currencies, leading to "bandwagon" effects and disorderly exchange-market conditions. In contrast to the first case, there is too much speculation. And, like the second case, speculation is misinformed, but the misinformation is directed at the very short run.²

Consider the potential role for intervention in each of these cases.

To illustrate the first case, suppose that a transitory current-account surplus emerges. Traders will offer foreign currency on the spot market and the home currency will appreciate; with the forward rate unchanged at this point, covered arbitrageurs will have an incentive to buy foreign exchange on the spot market and sell an equivalent amount on the forward market.

¹ These correspond, of course, to Musgrave's (1959, Chap. 1) well-known classification of the objectives of budget policy. General references here include Aliber (1981), Black (1977, 1978, 1979), Ethier and Bloomfield (1975, 1978), Kemp (1978), Taylor (1980), Willett (1978), and Wonnacott (1980).

² For a general discussion of some of these issues see McKinnon (1979), Sohmen (1969, Chap. 3), Taylor (1980), Wonnacott (1980), and Yeager (1976, Chap. 14).

Assuming that interest-rate parity holds, the forward rate for the home currency will have to rise by the same amount as the spot rate. However, the amount of the adjustment depends on the inelasticity of supply of speculative capital. The more inelastic the supply, the larger the adjustments will have to be in both spot and forward rates. Hence, in this instance, risk aversion tends to destabilize exchange rates. If the central bank now acted as a speculator, intervening in either the spot or the forward market, it would stabilize the spot rate; at the same time, there would be a potential profit to be made.

To illustrate the second case, of insufficient understanding, suppose that the trade balance adjusts perversely initially or, at the least, adjusts with a long lag to a change in the exchange rate. Suppose, now, that a persistent current-account surplus emerges and, to simplify the problem, that exchange-rate changes are not offset by subsequent wage-price adjustments.³ If the private sector is not sufficiently well informed about these delayed adjustments, the domestic currency may appreciate by too much initially, because there would be insufficient speculative capital outflows. The central bank could then intervene either in the forward market or in the spot market to push the exchange rate toward its appropriate longer-term level.

We take, first, the case of forward-market intervention. Forward rates reflect, in large part, expectations about future exchange rates. If the currency has appreciated too much and the private sector is unaware of this, forward rates will be unduly optimistic (they will not, in other words, forecast the reversal). The central bank could then sell domestic currency forward, buying it back at the maturity of the relevant contract. By forcing up the forward discount on the domestic currency, it would encourage arbitrageurs to export capital, and this would serve to push down the spot rate.

If the central bank acts in this way and its judgment turns out to be correct, it will make a profit. If, however, it sets the forward rate at its "appropriate" long-term level and is then prepared to intervene indefinitely at this rate, it will forego a profit. In short, if the central bank acts "efficiently" by fixing the forward rate at its long-term level, it will not make a profit.

Intervention in the forward market, however, is severely constrained by the lack of longer-term forward markets in which central banks can intervene. It appears, therefore, that intervention must be principally on the spot market. In this event, the central bank would buy foreign exchange to sell subsequently when the currency weakened. Again, if the central bank

³ The case where subsequent wage-price adjustments nullify the effects of a change in the exchange rate would obviously be more complicated, but perhaps more realistic. There would then be an expectation, other things being equal, of a continuing appreciation into the future.

leans in this direction and is right, it will make a profit. If, however, it sets the spot rate at what it believes is the correct longer-term rate, it will presumably be acting more efficiently but will not make a profit.

Is there, then, a case for intervention on these grounds? To establish such a case, three assumptions must be satisfied. It must be shown that the lags are long, that the private sector is insufficiently aware of them, and that the central bank will in fact be able at any point in time to determine correctly that the exchange-rate change is excessive.

There is now considerable evidence to support the first assumption (see Artus and Young, 1979). If the second assumption is true, there must have been unexploited opportunities for profit in the past. We return to this question shortly. The strongest opposition to intervention on these grounds would come from those who reject the third assumption. How, in the face of a variety of pressures on exchange markets, does a central bank decide what is an excessive exchange-rate adjustment at any point in time?

Consider, to anticipate, the cases of the mark and yen in 1978. The two currencies appreciated substantially and there was heavy intervention by the two central banks. Was intervention justified then? The two cases turn out to be quite different.

In the case of the mark, the real effective rate actually changed very little in the course of 1978. It could therefore be argued that there was too much intervention. Less intervention would have allowed the real effective rate to rise by more, so as to reduce the current-account surplus.

By contrast, the yen almost certainly overadjusted. For example, between October 1977 and October 1978, the real effective rate rose by some 20 per cent. It could therefore be argued that there was insufficient intervention in this case and that the Bank of Japan allowed the real effective rate to overshoot. Indeed, the dramatic deterioration in Japan's non-oil balance in the course of 1979 owed something at least to the delayed effects of the exchange-rate change.

Finally, consider the third case of inefficiency, excessive short-term pessimism or optimism. Such inefficiency would open up opportunities for profit. If the central bank intervened in these conditions, it could stabilize the exchange rate and make the profit for itself.⁴

We can sum up in the following terms. If markets are inefficient in any of the three ways identified, there are profits to be made which central banks could exploit by appropriate intervention in the foreign-exchange markets.

⁴ A qualification here is that these bandwagon effects may become self-justifying. For example, if "excessive" devaluation led to wage-price adjustment that offset the devaluation, the pessimism would be justified. But this assumes an unrealistic speed of adjustment in labor markets.

A key question then is: Are markets inefficient in the sense of offering unexploited profit opportunities? The large literature on efficient markets addresses itself precisely to this question (see Argy and Clements, 1982; Cornell and Dietrich, 1978; Levich, 1978, 1979a, 1979b; Logue *et al.*, 1978; and Sweeney, 1980). What kinds of tests have been conducted, what have the findings been, and how relevant are these findings in our context?

There are essentially four tests of efficiency in foreign-exchange markets. One test looks for possible biases in using the forward rate as a forecaster. If the forward rate persistently under- or overpredicted future spot rates, there was a potential for profit that speculators might have been able to exploit. A second test tries to determine whether it is possible, by exploiting all available information, to "beat" the forward rate as an exchange-rate forecaster. Very simple naive alternative models are used in this test (exchange rates are forecast on the basis of current and past exchange rates or of purchasing-power parity, or predictions made by foreign-exchange advisory services are compared with predictions implicit in the forward rate). A third test, based on spot rates, tries to determine whether certain filter rules (e.g. instructions to buy a currency when its price rises by x per cent above its previous low and to sell it when it falls x per cent below its previous high) would have yielded profits.

A fourth test of efficient markets sees if the spot rate follows a random walk. Briefly, the reasoning underlying this test is the following. Consider the case where there are no transaction costs and the interest-rate differential across countries is randomly distributed around zero. Suppose the forward rate (F) represents the expected spot rate (Ee). Then, if markets are free, arbitrage and speculation combined will force the current spot rate (E) to the level of the expected spot rate. In other words, today's spot rate is the best predictor of the future spot rate. If the forward rate is an unbiased predictor of the future spot rate, the difference between the expected spot rate and the rate that actually emerges *ex post* (E_{t+1}) ought to be white noise (WN). We have, then, $F = Ee$ and $Ee - E_{t+1} = WN$. Since $E = Ee$, it follows that $E - E_{t+1} = WN$. (In other words, the spot rate will follow a random walk.) It is evident, however, that the random-walk hypothesis will not hold if transaction costs are significant; more important, the hypothesis will be weakened if the interest-rate differential is significantly different from zero on average and/or if the distribution around zero is not random.

Is it possible to draw firm conclusions from the large literature? It is now widely recognized that serious conceptual difficulties are associated with these tests as they have been applied. While many of the results point in the direction of efficiency, there is too much ambiguity to say anything definitive. Furthermore, nearly all the work in the area is limited to short-

term horizons, frequently of three months' duration. It is therefore even more difficult to speak with conviction about the efficiency of longer-term forward markets (which is the more relevant consideration when dealing with the second case of inefficiency).⁵ My own conclusion about this extremely complex area is that foreign-exchange dealers will tend to exploit opportunities for profit, particularly over the shorter term, provided they are unrestricted and have access to the relevant information. Moreover, when they fail to do so, there is no guarantee that central bankers will be able to do better. Therefore, the case for intervention on these counts is not proven and is unlikely to be a good one, except possibly for the longer run.

Restrictions on the use of information or access to it. Clearly, there are occasions when the central bank will have information relevant to exchange-rate trends that is not available to the private sector. Central-bank intervention under these conditions will be both stabilizing and, provided it takes the form of leaning in one direction or the other rather than pegging the rate indefinitely, profitable as well. It could, of course, be argued that such information ought to be made available, so the central bank would no longer possess superior information. On admittedly rare occasions, certain kinds of information must be withheld (e.g. information relevant to the security of the nation or having a degree of confidentiality), but it is not clear whether intervention would necessarily be appropriate in these instances.

If restrictions on the free flow of capital are in place and are effective, speculators cannot act efficiently on the available information. If, therefore, there is some independent case to be made for exchange controls, central-bank intervention will clearly be needed to stabilize exchange rates. Other things being equal, moreover, there will be profit to be made in such instances.

It is important to distinguish this case from the inefficient-markets case. Here, too, there are unexploited profit opportunities, but there is no suggestion in this case that markets are inefficient. This distinction implies that tests of efficiency are probably inappropriate when markets are restricted in various ways by government regulations.

Structural adjustment. Intervention may also be used to "buy time" for structural readjustment in the economy. Suppose that a country has a relatively large and persistent surplus in its balance of payments originating in the current or capital account and that the exchange rate is allowed to

⁵ In principle, the tests could be extended to longer-term horizons. For example, implicit forward rates could easily be calculated for longer terms (from spot rates and longer-term interest-rate differentials) and the tests could then be applied to these longer-term forward rates.

appreciate to correct it. In the short run, the real effective rate will rise, to the detriment of the traded-goods sector. The authorities may try to moderate the increase in the real effective rate to allow time for the traded-goods sector to adjust and for the authorities to cope with the associated structural strains on the economy. In this instance, intervention may be simpler and more efficient than a complex program of assistance to the traded-goods sector as a means of buying time for adjustment.

The Promotion of Intertemporal Distributional Objectives

An argument can be made for intervention to redistribute real absorption over time. To illustrate, consider the case of a sharp change in the external terms of trade produced by an oil-price shock. We assume that the shock redistributes "spending power" from oil-importing countries to oil-exporting countries. For simplicity, oil-exporting countries are assumed to "save" all their gains (the increase in the oil bill). We distinguish two groups of oil-importing countries, those (A) with developed capital markets (represented, say, by the United States) which are the recipients of capital inflows from oil-importing countries, and those (B) which receive no capital directly from the oil-importing countries.

The reduction in spending power (the increase in the oil bill) borne by an oil-importing country may take the form of a reduction in resources currently available for consumption and investment (in private real absorption) or a reduction in financial wealth or, of course, some combination of the two. Let us see how exchange-rate management by B-type countries can determine how much of the burden falls on current real absorption and how much falls on wealth.

Suppose that 10 units of spending power are being transferred from the oil-importing countries (A and B) to the oil-exporting countries (C) and that, initially, this opens up a current-account deficit of 6 units for B and 4 units for A. To focus on the strategies open to B, assume that A is passive. B can intervene in the foreign-exchange market to fix the exchange rate, or it can allow the exchange rate to be determined in the marketplace. The two strategies have different implications for the intertemporal redistribution of real absorption.

Table 1 shows on the left-hand side what happens when B follows the sterilized-intervention strategy. By accepting the emerging current-account deficits, the oil-importing countries are taking a reduction in real wealth without a corresponding reduction in real current absorption. In other words, the deficits allow these countries to continue to spend more on imports and the spending is financed by running down financial wealth. Consider, for example, what happens in B. The increased current-account deficit (6 units) is reflected in a fall in reserves. This, in turn, reduces base money, and the

monetary authorities are assumed to sterilize this effect by buying securities from the public. As a result, the reduction in wealth shows up as a reduction in net holdings of securities by the public. In A, the mechanism by which wealth falls is only slightly different. A's residents transfer domestic financial assets to C and in this way run down their wealth to the extent of 4 units. The other 6 units of the capital inflow represent a transfer from B's central bank to the oil-exporting countries.

TABLE I
EFFECTS OF AN INCREASE IN THE OIL BILL
(in units of spending power)

	<i>The Sterilized-Intervention Case</i>			<i>The Flexible-Rate Case</i>		
	A	B	C	A	B	C
Current account	- 4	-6	+10	-10	0	+10
Capital account	+10	0	-10	+10	0	-10
Official settlements account	+ 6	-6	0	0	0	0
Real absorption effect	0	0	0	+ 6	-6	0
Real wealth effect	- 4	-6	+10	-10	0	+10

CASE:

- A: Oil-importing countries receiving capital inflows from oil-importing countries.
- B: Oil-importing countries receiving no capital directly from oil-importing countries.
- C: Oil-exporting countries.

The right-hand side of Table 1 shows what happens when the alternative flexible-rate strategy is adopted. B's currency is allowed to depreciate vis-à-vis A's currency. Barring for simplicity all capital flows between A and B in response to the exchange-rate change, the depreciation will need to be sufficient to restore equilibrium to the official settlement balance for the two economies: B's current-account deficit must be eliminated while A's current-account deficit must increase from 4 to 10 units. To see what happens to real absorption and wealth in A and B, it is convenient to take the first solution (the sterilized-intervention case) as the starting point and then allow for flexible rates. By removing its current-account deficit, B is taking the reduction in real absorption of 6 units without any reduction in wealth. A, by contrast, enjoys an increase in current real absorption of 6 units, but runs down its wealth by 10 units; this reduction exactly matches the inflow of capital from C.

To summarize, an interventionist policy (i.e. a policy of managing the exchange rate) in the face of an oil-price shock allows a capital-deficient economy to postpone a reduction in real absorption. The capital-rich coun-

try, on the other hand, finds its real current absorption increasing in the flexible-rate case and is thus in a position where it may have to take a substantial fall in real absorption in the future.

Caveats apply to these alternative strategies. First, it was assumed that a depreciation of B's currency was successful in transferring real current absorption from B to A. Perverse initial effects and wage-price adjustments may frustrate this result. Second, it was assumed that A was passive and thus accepted outcomes generated by B's second strategy. If A finds the second strategy unacceptable (i.e. it does not choose to increase current absorption at the expense of the future absorption), it has to intervene itself to restore the interventionist solution. Third, assuming that capital markets are perfect and the private sector rational, the private sector, left to itself, might be able to secure the same intertemporal redistribution of real absorption by borrowing and thus adjusting its own real consumption over time. For example, if residents in B borrowed and imported from A to maintain their current consumption, B would have a current-account deficit offset by a capital inflow and the currency would not need to depreciate to the same extent. Fourth, the government in B might be able to achieve the interventionist solution without exchange-rate management by inducing changes in the consumption-investment mix (e.g. by encouraging current consumption at the expense of investment).

The Promotion of Stabilization Objectives

There are three reasons to use exchange-rate management for stabilization: to maximize the effectiveness of demand-management policies, to minimize the short-term local disruptive effects on output and prices of unanticipated random disturbances, and to avoid vicious spirals of inflation, devaluation, more inflation, and so on.

The effectiveness of demand management. Consider, first, the influence of the exchange-rate regime on the ways in which monetary and fiscal policies affect the real economy (i.e. on the capacity for "fine tuning").⁶ Unfortunately, there are differences of opinion here, with outcomes depending in part on the specification of the model, especially with regard to the degree of integration of capital markets, and in part on the time horizon allowed. If, however, we limit ourselves to a relatively short-term horizon (a year or so) before price effects become dominant, it is possible to make a number of very general assertions that may not provoke too much contention.

In an economy that is not highly integrated with foreign markets, both monetary and fiscal policies tend to have some potency, whatever the ex-

⁶ The literature here is very large and dates back to the well-known studies of Fleming (1962) and Mundell (1963). See also Allen and Kenen (1980), Argy (1981, Chap. 22), Frenkel and Mussa (1981), and Goldstein (1980).

change-rate regime. Both monetary and fiscal policies are usable in principle for fine tuning.

If the economy is highly integrated, however, the outcomes are more complicated. With fixed exchange rates, monetary policy loses its effectiveness, because it will tend to be offset by capital movements whose effects on liquidity will be difficult to sterilize, while fiscal policy continues to be effective. With flexible rates, the effectiveness of fiscal policy diminishes substantially, because the associated appreciation will act to offset the real effects of fiscal expansion, while monetary policy retains some effectiveness.⁷ Monetary policy is not usable under fixed rates, while fiscal policy tends to be somewhat ineffective under flexible rates. Therefore, flexible rates are to be preferred to fixed rates if monetary policy is to be used for fine tuning, while fixed rates are to be preferred to flexible rates if fiscal policy is to be used.

What is the relevance of all this to today's environment? Western governments have virtually renounced the use of monetary policy for fine tuning, with some choosing to announce money targets in order to help them control inflation. At the same time, there continues to be limited use of fiscal policy for fine tuning.

The dilemma this poses for integrated economies is the following: To secure the maximum price-restraining effects from a restrictive monetary policy, exchange rates should be allowed to find their own levels. With flexible rates, moreover, control over the money supply is secured. As we have seen, however, the use of fiscal policy for fine tuning is compromised. Intervention can be used to enhance the effectiveness of fiscal policy, but there is then the danger that the monetary authorities will lose short-term control over the money supply.

Output and price fluctuations. It is possible to take two views about the way policy should be designed with the second rationale, short-term stabilization, in mind. One view argues against any discretion whatsoever; it favors use of the monetary regime that provides the best automatic stabilizer (shelter) from a variety of potential disturbances.⁸ A second view allows much more discretion to monetary and exchange-rate policy in dealing with such disturbances (see Argy, 1981a, Chaps. 23 and 32).

Let us consider the first view; that governments should adopt the monetary regime that serves best as a built-in stabilizer. After deciding whether

⁷ This well-known Mundell-Fleming outcome needs to be qualified in at least two ways. First, the deflationary effects of the appreciation may take time to eventuate, allowing some real effects initially at least. Indeed, as is well known, the early effects of an appreciation may be perverse. Second, an appreciation lowers the overall price level and raises real money balances, in turn serving to support the initially expansionary effects of fiscal policies.

⁸ The literature on this subject is now also very large. See Argy (1981a, Chap. 23), Artis and Currie (1981), Boyer (1978), Fischer (1976), Frenkel and Aizenman (1981), Roper and Turnovsky (1980), Tower and Courtney (1974), and Turnovsky (1976).

we want to stabilize output, prices, or some combination of the two, we need to determine the monetary regime that must be used as a stabilizer. We distinguish between an economy that is financially integrated with the rest of the world (the integrated economy) and an economy that is able to constrain inflows and outflows of capital by means of exchange controls (the sheltered economy).

For the integrated economy, we take the choice to be between a monetary regime that deploys monetary policy in the course of the year to stabilize the long-run real exchange rate (a regime we label MP) and one that allows the exchange rate to do the adjusting while at the same time maintaining a money target (a regime we label FR). (A third possible regime is one of "monetary intervention," where monetary authorities intervene to fix the exchange rate but do not sterilize the effects on liquidity. This regime, however, turns out to be somewhat similar in its workings to the MP regime.)

For the sheltered economy, one additional monetary regime is available; the monetary authorities fix the nominal exchange rate by intervention and are able to sterilize the effects on domestic liquidity (a regime we label SI). The key feature of this regime is that it is capable of stabilizing monetary aggregates *and* exchange rates in the short term. In the integrated economy, by contrast, it is possible to stabilize only one or the other.

Finally, we need to identify the kinds of unanticipated disturbance to which the economy is likely to be exposed. We recognize seven kinds of disturbances: an exogenous capital flow, a change in foreign interest rates, a change in the demand for money, a change in foreign prices, a domestic cost push, a change in real domestic demand, and a change in real foreign demand. (To simplify we assume that the disturbances are independent of one another.)

Table 2 sets out the results of the analysis when the objective is to stabilize output. The model underlying these results is essentially a Fleming-Mundell model modified in two ways: (1) The deflator for money demand is the overall price level, which itself incorporates the effects of exchange-rate changes. (2) There is some, but not complete, wage indexation. In the model, a depreciation is assumed to improve the current account and to raise the level of economic activity (see Argy, 1981a, Chap. 11). We briefly consider each case in turn.

For a capital flow, the regime that stabilizes both the money supply and the nominal exchange rate (SI) will perform best. The shock will be largely absorbed by foreign-exchange intervention combined with sterilization. With a flexible rate there will be some exchange-rate adjustment (e.g. an inflow will lead to some appreciation), while a regime that stabilizes the real exchange rate will use monetary policy to offset any potential effects on the

TABLE 2
BUILT-IN PROPERTIES OF ALTERNATIVE MONETARY REGIMES
FOR STABILIZING OUTPUT

Source of Shock	Integrated Economy		Sheltered Economy		
	MP	FR	MP	FR	SI
Capital flow	?	?	?	?	(1)
Foreign interest rate	?	?	?	?	(1)
Money demand	(1)	(3)	(1)	(3)	(2)
Foreign prices	(3)	(1)	(3)	(1)	(2)
Domestic cost push	?	?	?	?	?
Real domestic demand	(3)	(1)	(1)	(3)	(2)
Real foreign demand	(3)	(1)	(3)	(1)	(2)

REGIME:

MP: Monetary policy used to stabilize long-run real exchange rate.

FR: Flexible exchange rate.

SI: Fixed exchange rate with sterilized intervention.

NOTE: Analysis assumes that no J-curves are operating. Numbers in parentheses rank regimes from most stabilizing (1) to least stabilizing (3). Question mark indicates ambiguous outcome.

exchange rate (e.g. an inflow will threaten a revaluation, which will be offset by an expansionary monetary policy). With FR, then, the exchange rate will be unstable; with MP, the volume of money will fluctuate.⁹ The instability in money and the exchange rate will have delayed effects on real activity, but it is difficult on *a priori* grounds to establish which regime stabilizes output more effectively.

The results for a foreign-interest-rate shock are very similar. Once again, the SI regime will be the most stabilizing. In the other two cases, we have an indecisive contrast between monetary instability with MP and exchange-rate instability with FR.

If the shock comes from money demand, the MP regime performs best. For example, an increase in the demand for money will raise domestic interest rates, putting upward pressure on the currency; this upward pressure will then be removed by an accommodating increase in the volume of money. In this case, SI, while inferior to MP, performs better than FR, because the latter also leads to exchange-rate pressures that tend to aggravate the effects on the real economy (e.g. an increase in the demand for money has deflationary effects that will be aggravated by the associated appreciation).

If the shock comes from foreign prices, the FR regime performs best.

⁹ The degree of instability will depend in both cases on how mobile capital is. For example, if capital is perfectly mobile and expectations of future exchange rates firmly fixed, the exchange rate will change very little and only marginal changes in monetary policy will be needed.

For example, an increase in foreign prices will tend to strengthen the currency, stabilizing output. With MP, monetary expansion is required to offset the potential revaluation, and this will further aggravate the effects on output. With SI, these additional effects will be avoided.

If the shock comes from domestic costs, the outcomes are ambiguous. Everything depends on the potential effect on the exchange rate, and that is uncertain. With a fixed money supply, real balances will fall and there will be upward pressure on the interest rate; these effects will dominate initially. The economy's competitive position will deteriorate in due course, however, worsening the trade balance and pushing down interest rates. For both reasons, economic activity will fall, but the effects on the balance of payments are ambiguous. If the currency strengthens, MP will be most stabilizing and FR most destabilizing. If the currency weakens, FR will be most stabilizing and MP least stabilizing.

If the shock comes from a change in real domestic demand, the answers are different for the two types of economies. In the integrated economy, where capital mobility is assumed to be very high, an increase in real domestic demand will put upward pressure on the domestic interest rate and this effect will dominate exchange-market pressures, forcing an upward movement in the currency. The appreciation will in due course serve to stabilize the level of activity. If the exchange rate is stabilized by monetary expansion, by contrast, the effects on real activity are aggravated. In the sheltered economy, where capital mobility is assumed to be relatively low, an increase in real domestic demand will put downward pressure on the currency (because the current-account effects will dominate). With MP, a restrictive monetary policy will be followed and will be stabilizing. With FR, by contrast, the depreciation will, in due course, reinforce the effects on activity.

If the change in real demand originates overseas, the results are straightforward. With FR, an increase in real foreign demand will lead to an appreciation that will, in time, stabilize output. With MP, the potential revaluation will force an expansion in the volume of money and thus aggravate the effects on output.

We can sum up our analysis as follows. If the objective is to stabilize output, the integrated economy is almost certainly better off with a flexible-rate regime than with one that seeks to stabilize the real exchange rate by monetary policy. The results are a little more ambiguous for the sheltered economy. The SI regime performs at least as well as the other two and may be marginally better.

Assume now that the objective is to stabilize the price level. We deal with this case briefly. Prices, we assume, are directly affected by exchange-rate changes but also by fluctuations in real demand. Consider, first, the

integrated economy. Without going into a detailed analysis, there is here some presumption that the FR regime will be the best performer. It serves as the best stabilizer in the face of foreign price fluctuations; it is also likely to be the best stabilizer in the face of fluctuations in real domestic and foreign demands. In both of these cases, output and exchange-rate changes have opposite effects on overall prices (e.g. increases in real domestic and foreign demands raise output but strengthen the currency). It appears, therefore, that for the integrated economy a case can be made for flexible rates on the ground that they serve, in general, to stabilize both output and prices.

For the sheltered economy the outcomes are again different. For most disturbances, the SI regime is a significantly better price stabilizer than the FR regime. It is more difficult, however, to compare it with the MP regime. On balance, then, the SI regime (exchange controls combined with sterilized intervention) may be the best performer when account is taken of the twin objectives of output and price stability.¹⁰

Consider now the use of discretionary policy to stabilize the economy. It is clear from our analysis that the most flexible elements of policy in the short run are discretionary monetary policy and exchange-market intervention. In practice, governments have tried to exercise discretion in this area with various objectives in mind. In terms of our own presentation we can, perhaps, most realistically represent policy as being concerned with manipulating the monetary and exchange-rate instruments in particular conditions and in the face of particular disturbances in order to minimize a composite of exchange-rate, price, and output instability. In other words, instead of choosing a regime that minimizes, say, price-output instability, policy tries to be more discriminating, tailoring policy stances to particular situations as they emerge.

Vicious circles. Governments may use intervention policy as a means of avoiding a vicious circle.¹¹ Consider a country experiencing a long-term deficit in its balance of payments and suppose that the government attempts to eliminate the deficit by devaluing its currency. If wages adjust fully to prices (the real wage rate is fixed) and if the government adopts an accommodating monetary policy to avoid additional unemployment, the devaluation will be offset sooner or later by an equivalent increase in domestic prices, necessitating a second round of devaluation and leading in turn to further inflation. The country might then be faced with a vicious

¹⁰ It will also be recalled that a sheltered economy can use intervention because restrictions on the free flow of funds prevent speculators from taking full advantage of available information.

¹¹ For treatments of the vicious circle in the literature, see Argy (1981a), Bilson (1979), Bond (1980), and Wallich and Gray (1979).

spiral of devaluation-inflation-devaluation. Under these conditions, intervention may serve to avoid or at least slow down this spiral, allowing time for the government to adopt more appropriate policies.

The key factor here is the speed of adjustment, and considerable controversy surrounds this issue. On the one hand, there is the view that it takes many years (some four to five) for this outcome to eventuate; in the meantime, the country's competitive position and its stock of reserves will improve. On the other hand, there is the view that the speed of adjustment is much more rapid now than in the past, implying a much greater potential for a vicious spiral.¹²

The truth almost certainly lies somewhere in the middle. Assuming monetary accommodation, the speed of adjustment will depend on (1) the degree to which "the law of one price" holds for traded goods and the weight of those goods in the relevant price index and (2) the mechanisms determining wages and prices. Clearly, the greater the degree to which the law of one price holds and the greater the weight of traded goods, the larger will be the initial impact on prices; at the same time, the faster wages and prices adjust to a given initial change in the overall price level, the sooner the end result will be reached. Under realistic assumptions about the impact and speed of the wage-price spiral, it is difficult to see how full adjustment can occur in much under eighteen months.¹³

Consider also in this context the case of a country in the throes of a political crisis that leads to large outflows of capital. The private sector might overreact, allowing the exchange rate to fall and setting in motion a wage-price spiral. This, in turn, could create a situation in which the equilibrium exchange rate would itself be lower, so the higher price level might not be reversed even when the political crisis had passed. It might be better under these conditions (albeit, not easily recognizable) to allow reserves to bear the brunt of the adjustment (or to borrow abroad) and thus avoid the inflation.

Rules for Exchange-Rate Management

There is now a large literature that attempts to establish guidelines or rules for intervention rather than assign exchange-rate policy to specific objectives.¹⁴ There are essentially three approaches: some form of "leaning against

¹² For econometric evidence supporting the first view, see Ball *et al.* (1977) and Laury *et al.* (1978). For the alternative view, see Thygesen (1978). See also Artus (1975).

¹³ Of course, if labor markets fully anticipate the end result (e.g. that a 10 per cent devaluation leads to a 10 per cent wage adjustment), the adjustment will be very quick. But this case is quite unrealistic, given the ways in which labor markets tend to adjust; wages generally respond to earlier price changes.

¹⁴ See Artus (1978), Ethier and Bloomfield (1975, 1978), Mikesell and Goldstein (1975), Tosini (1977), and Willett (1978).

the wind," the use of "exchange-rate targets" to guide intervention, and the choice of an exchange-rate regime on the basis of individual country characteristics. Also relevant in this context are the International Monetary Fund surveillance principles. These approaches are summarized here.

Leaning against the wind. In its simplest form, a "leaning against the wind" rule would require monetary authorities to intervene so as to resist market forces partially, with the aim of reducing swings in the exchange rate. The proposal does not claim to be based on "rational" information or to know what the long-run equilibrium exchange rate is. It does presuppose, however, that the private sector cannot be relied upon to achieve this result and that such intervention will be stabilizing on balance.

A more refined version of this approach attempts to safeguard against the possibility of asymmetrical intervention by including an additional rule. Net reserve changes in a given direction should not persist for more than a few consecutive months (except when reserve levels were excessive or deficient). A shorter form of the additional rule would require the monetary authorities to restore the original reserve position within a reasonable period of time. These supplementary guidelines might be hard to implement, however, and any reconstitution provision might provoke one-way speculation. It might, in fact, discourage intervention and so conceivably aggravate exchange-rate movements.

The target approach. The target approach assumes that the monetary authorities have information about an exchange-rate "norm" and that there are benefits in holding the exchange rate close to that norm. It assumes by implication that the private sector would not do so.

The target approach to intervention involves two steps: first, the determination of a target zone and then the establishment of rules for intervention in relation to it.

The best-known proposal for determining a target exchange rate is based on purchasing-power parity, or PPP. It suggests that the target be determined by trends in domestic prices relative to foreign prices, appropriately weighted (see Commission of the European Communities, 1975, 1976, and Thygesen, 1978). Another approach, designed to avoid some of the difficulties associated with PPP, is to set the rate in a way that would make it consistent with a satisfactory cyclically adjusted long-run basic balance (adjusted, too, for any oil deficit) (see Artus, 1978).

There are also two principal approaches to setting the rules for intervention. The first approach says that monetary authorities should intervene to ensure that the exchange rate does not go outside the target zone. This approach is closest in spirit to the old Bretton Woods system, with the important difference that the target zone would be changed more frequently and by smaller amounts. The second approach, represented by the

reference-rate proposal put forward by Ethier and Bloomfield (1975, 1978), is somewhat more refined. Each country would have a target exchange rate (the reference rate), which could be changed periodically, and a band (which may be zero) around that target rate. A country may or may not intervene within the band as it wishes. Outside the band, it may intervene if it chooses, but in only one direction. For example, outside the *upper* point of the band, the monetary authorities can either intervene to resist any further upward movement or allow market forces to push the exchange rate further up. They may not intervene, however, to resist any downward movement toward the reference rate or to push the rate further up by buying their own currency. Outside the *lower* point, they may allow market forces to push the exchange rate further down or resist the downward movement, but they may not intervene to resist any upward movement toward the reference rate or to push the rate further down by selling their own currency.

The difference between these proposals and arrangements under the Bretton Woods system can be put quite simply. Under the Bretton Woods system, intervention at the upper and lower points was mandatory; it was only within the band that the monetary authorities had some freedom of choice. Under these proposals, by contrast, the authorities may allow a free float, so the rate can move outside the band, but they may also choose to resist any movement outside the band.

The role of country characteristics. Some literature tries to relate "country characteristics" to the appropriate degree of exchange-rate flexibility (see Heller, 1978, and Holden *et al.*, 1979). One recent study along these lines (Holden *et al.*, 1979) identifies six characteristics thought to be relevant in the choice of exchange-rate regime: openness, capital mobility, diversification of the external sector, geographic concentration of trade, degree of economic development, and degree of divergence in the inflation rate. The authors draw on economic theory to determine *a priori* what each of these characteristics implies about the optimal exchange-rate policy. A summary of their analysis follows.

The more open an economy to trade, the smaller is likely to be the degree of money illusion. An exchange-rate change will thus be less effective in securing an improvement in the real exchange rate. At the same time, with fixed exchange rates, the use of demand management to correct external imbalances will be more effective (the leakages larger) in an open economy. One might therefore expect very open economies to opt for less exchange-rate flexibility. The implication of capital mobility is more ambiguous. On the one hand, the greater the degree of capital mobility, the more difficult it is to secure monetary independence under fixed exchange rates. Furthermore, monetary policy may be more effective under flexible rates.

These considerations suggest that countries exposed to high capital mobility are more likely to opt for flexible rates. On the other hand, we have seen that fiscal policy is less effective under flexible rates with highly mobile capital, and capital mobility may also aggravate fluctuations in exchange rates, causing disruptive movements in the trade account. This argues against opting for flexible rates in the face of highly mobile capital. The more diversified the external sector, other things being equal, the greater is the likelihood that microeconomic disturbances will tend to offset one another. Under a policy of nonintervention, then, the exchange-rate change resulting from those disturbances will tend to be small. Hence, high diversification should be positively associated with exchange-rate flexibility. Similarly, the greater the geographic concentration of trade, the stronger might be the case for pegging the country's currency to that of its major trading partner. And the greater the degree of economic development, the greater the case for flexibility. Finally, the more a country's inflation rate diverges from that of the rest of the world, the greater the need for exchange-rate flexibility.

Having identified these theoretical presumptions, the authors construct a measure of exchange-rate flexibility for seventy-six countries and try to determine whether there is a systematic relationship between the country characteristics (for which they calculate empirical counterparts) and exchange-rate flexibility. (Their measure of exchange-rate flexibility is the ratio of the sum of the absolute value of monthly percentage changes in the trade-weighted exchange rate to the sum of the absolute changes in official holdings of foreign exchange divided by the sum of imports and exports.) They find that some 42 per cent of the intercountry variance in their index of flexibility is explained by the characteristics. At the same time, five of the characteristics (openness, diversity, concentration, development, and inflation divergence) are significant and have the expected sign. Capital mobility has a negative sign (implying that the more capital mobility the less flexible the regime), but the variable is not significant.

If one accepted these conclusions and their underlying rationale, if one assumed that a particular country fitted into the implied pattern, and if one accepted the authors' measures of the country characteristics, one could then decide whether a particular country's exchange rate was more or less flexible than is indicated, on average, by the estimated relationship. At most, this would reveal that a particular country ought to have a more or less flexible rate, given its unique combination of characteristics.

The issues are highly contentious, and it has to be admitted that this approach does not provide very real guidance for exchange-rate policy. Moreover, the theory underlying the presumed association is not unambiguous. For example, the more open an economy, the greater is its exposure,

and one might argue that this strengthens the case for flexible rates, which would reduce its exposure. Also, the relationship between capital mobility and optimal exchange-rate policy may be nonlinear (e.g. the case for flexible rates may become strong only at the point at which a country loses its monetary independence). Finally, it would be easy to argue that less diversified economies ought to have flexible rates in order to stabilize their trade and domestic output.

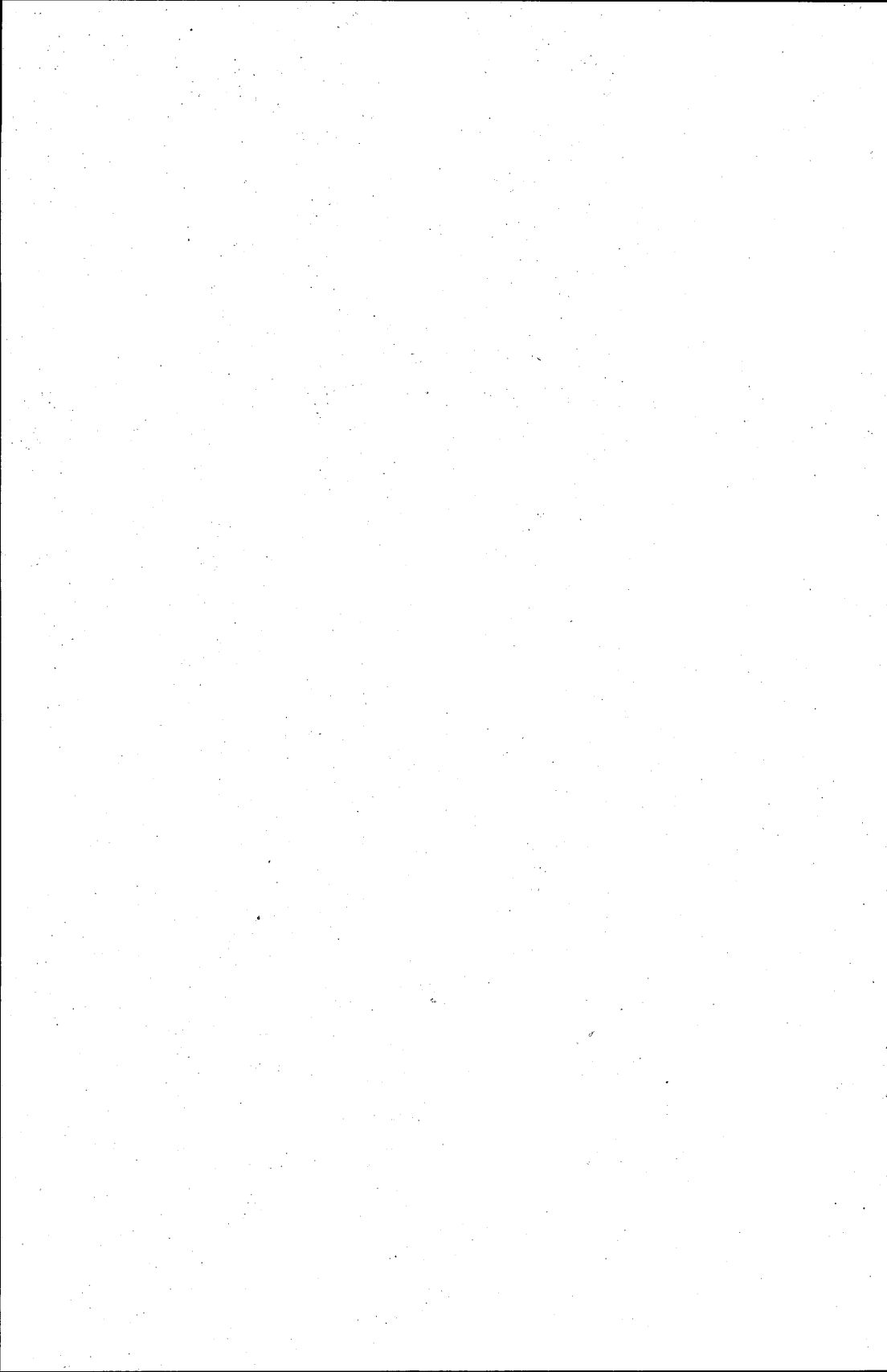
Principles for IMF surveillance. Article 10 of the Second Amendment to the IMF Articles of Agreement, which came into effect in March 1978, provides that the Fund shall "exercise firm surveillance over the exchange rate policies of members and shall adopt specific principles for the guidance of all members with respect to these policies" (for details, see IMF, 1977, pp. 107-109).

Members have an obligation to provide the Fund with the information required for surveillance and to consult with the Fund on exchange-rate policies. Three principles are set out for the guidance of members. Principle A provides that "a member shall avoid manipulating exchange rates or the international monetary system in order to prevent effective balance of payments adjustment or to gain an unfair competitive advantage over other members." Principle B provides that "a member should intervene in the exchange market if necessary to counter disorderly conditions which may be characterized inter alia by disruptive short-term movements in the exchange value of its currency." Principle C provides that, in their intervention policies, members "should take into account" the interests of other members.

There are also principles for the guidance of the Fund in its evaluation of a member's exchange-rate policies. Five indicators are put forward as possible pointers to an inappropriate exchange-rate policy: "protracted intervention in one direction in the exchange market, undue official or quasi-official borrowing, restrictions on or incentives for, current and capital transactions, the use of monetary/fiscal policies to stimulate or discourage capital flows, exchange rate behavior that appears to be unrelated to underlying economic and financial conditions including factors affecting competitiveness and long-term capital movements." (For the most recent developments in this area, see IMF, 1980a, pp. 52-58.)

PART II

*Experience with Exchange-Rate
Management*



3 GERMANY

Germany's experience with exchange-rate management in the 1970s fell into three phases.¹ The first phase, from April 1973 through 1975, included Germany's adjustment to the first oil-price shock. In this phase, net intervention was minimal and the mark experienced fluctuating fortunes. During the second phase, from 1976 through 1978, the mark was particularly strong and intervention was used to resist its upward movement. In the third phase, the year 1979, the current account worsened dramatically and the mark began to show signs of weakness (which became more pronounced in 1980). Table 3 presents the background facts.

Phase 1: April 1973 through 1975

Over phase 1 as a whole, the mark strengthened. The nominal effective exchange rate rose by some 8 per cent, but Germany's prices rose by about 11 per cent less than those of its competitors, so that the real effective rate actually fell by about 3 per cent (Fig. 1). The exchange rate against the dollar rose by some 7 per cent, but Germany's prices rose by about 12 per cent less than those of the United States, so that the real rate against the dollar actually fell by about 5 per cent (Fig. 2). These longer trends, however, occurred against a background of fluctuating fortunes for the mark, particularly against the dollar (Table 4).

Exchange-rate management over this period was directed principally at moderating fluctuations in the rate. Both sterilized intervention and capital controls were used to manage exchange rates.

Intervention and financial policy. Germany's experience with intervention is shown in Table 4 and Figure 3. Table 4 shows that the monetary authorities tended to buy foreign currency (indicated by a +) when the mark was strong and sell it (indicated by a -) in times of weakness. On balance, over the whole period, there was only a negligible net intervention. Thus, this phase can be appropriately characterized as one where the monetary authorities leaned against the wind to counter erratic exchange-rate movements.

This conclusion is largely consistent with the judgment of the Deutsche Bundesbank, expressed in the 1975 Annual Report (p. 50):

¹ Useful references here are Black (1977, 1978, 1979); Deutsche Bundesbank Annual Reports (1973-79); regular issues of Federal Reserve Bank of New York, "Treasury and Federal Reserve Foreign Exchange Operations," *Quarterly Review*; regular issues of *International Currency Review*; Kemp (1978); Matthes (1980); monthly issues of Morgan Guaranty Trust Company of New York, *World Financial Markets*; and Obstfeld (1979).

In 1974 and 1975 substantial compensatory or cushioning intervention was carried out in both directions by purchases or sales of foreign exchange. On balance, there was a small exchange outflow for the two years. This may be regarded, not least by the criteria of the IMF, as indicating that in the medium term (in due course over a period of two years) the foreign exchange intervention of the Bundesbank did not distort the fundamental market trends of the Deutsche Mark.

TABLE 3
BACKGROUND FACTS ON GERMANY, 1973-79

	1973	1974	1975	1976	1977	1978	1979
Internal balance:							
% change in consumer prices (mean for 1962-72: 3.2)	6.9	7.0	6.0	4.5	3.7	2.7	4.1
% change in real GNP (mean for 1960-72: 4.9)	4.9	0.5	-1.8	5.2	2.7	3.5	4.4
External strength:							
Current-account balance in billions of \$ (1972: \$0.8)	\$1.4	\$9.8	\$3.5	\$3.4	\$4.2	\$8.7	-\$5.7
Financial thrust:							
% change in M-1 (1971-72: 13.3)	0.8	12.2	14.0	3.9	11.9	14.5	3.5
% change in M-2 (1971-72: 15.3)	11.4	9.5	13.6	8.8	10.1	10.4	6.9
% change in fiscal-policy stance ^a	-0.5	0.6	1.8	-0.4	-0.6	0.1	...
Exposure to oil shock:							
Net oil imports as % of total energy ^b	53.8	...	49.9	...	51.8	...	...
Importance of mark as a reserve currency:							
% share of mark in total identified official holdings ^c	5.8	6.6	6.6	7.4	8.5	10.3	10.7

^a IMF (1980c, Central Government Table 37).

^b OECD (1979, p. 64).

^c IMF (1980a, p. 62).

SOURCE: *OECD Historical Statistics*.

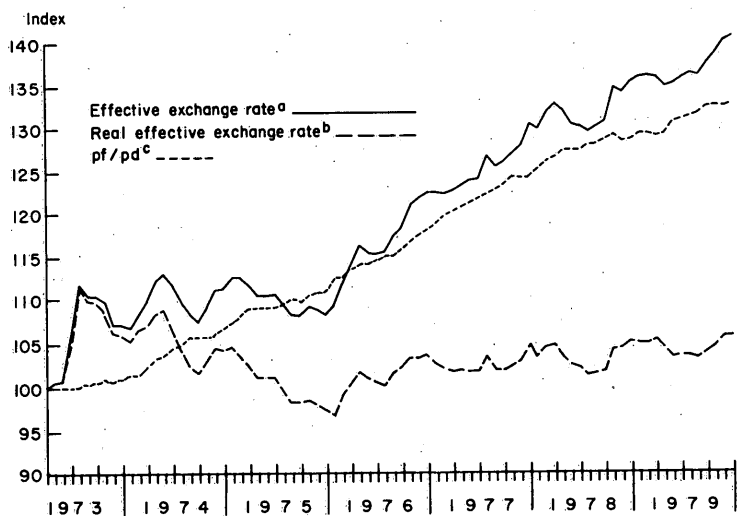
In these years, too, monetary and fiscal policies were directed primarily at domestic targets, almost entirely freed of any external constraint. The intervention that did occur, including mandatory intervention under the joint float, posed no threat to monetary policy. In other words, the Bundesbank was able to sterilize the effects of intervention on the liquidity base. The overshoot in the central-bank money target in 1975 (see Table 6 below) had nothing to do with external developments. It was, in fact, largely the result of massive government borrowing from the banks (see Deutsche Bundesbank, *Annual Report 1975*, p. 9).

These views are again confirmed by the Bundesbank. Emminger (1977), for example, wrote (p. 39):

The end of mandatory dollar intervention heralded a completely new chapter for German domestic monetary policy. From then on, the external flank of stabilization policy was largely protected, control of the domestic money supply reverted to the Bundesbank, and speculative currency crises lost their sting.

Capital controls. Germany had entered the float without restrictions on outflows of capital but with continuing restrictions on most types of capital inflow. These restrictions included differential minimum reserve requirements on both the level and growth of selected foreign liabilities, requirement of prior approval for borrowing from nonresidents and sales of securities to nonresidents, a cash-deposit requirement (the *bardepot*), which applied to certain borrowing from nonresidents, and an effective ban on interest payments on nonresident deposits.

FIGURE 1
EFFECTIVE EXCHANGE RATES AND RELATIVE PRICES
IN GERMANY
(1973 = 100)



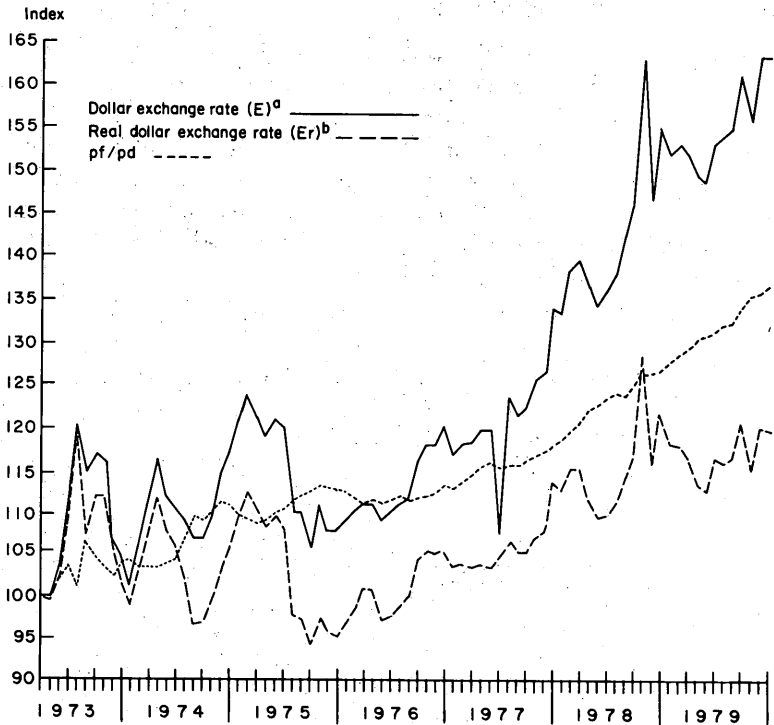
^a DM's trade-weighted average appreciation or depreciation vis-à-vis the currencies of 15 other major countries. A rise indicates appreciation of the DM. The exchange rates used in the construction of this index are the monthly and annual averages of daily noon spot exchange rates quoted in New York.

^b Index of the nominal effective exchange rate adjusted for inflation differentials, which are measured by wholesale prices of nonfood manufactures. A rise indicates impairment of competitiveness because of changes in exchange rates and/or prices.

^c Ratio of trade-weighted prices in the other 15 countries to home prices, derived by dividing the effective exchange rate by the real effective exchange rate.

SOURCE: Morgan Guaranty Trust Company of New York, *World Financial Markets*.

FIGURE 2
 DOLLAR EXCHANGE RATES AND RELATIVE PRICES IN GERMANY
 (1973 = 100)



^a Dollars per DM in index form (end of month). A rise indicates appreciation of the DM.

^b $E + pf/pd$. A rise implies an impairment of Germany's competitive position vis-à-vis the U.S.

^c Ratio in index form of U.S. to German wholesale prices.

SOURCE: IMF, *International Financial Statistics*.

The restrictions on capital inflows were progressively liberalized over the period, serving on balance to strengthen the mark; but the timing of developments bore some relationship to the state of the mark. From April to September 1973, when the mark was particularly strong, these restrictions were actually tightened. However, as the mark weakened in subsequent months, the restrictions were substantially relaxed. In January 1974, reserve requirements and the cash-deposit ratio were both lowered, while restrictions on foreign borrowing and on sales of securities to nonresidents were substantially liberalized. The *bardepot* was abolished in September 1974, at a time when the mark weakened. Finally, the trend to liberalization accelerated further from July to September 1975, when the mark was again weak, and the ban on interest payments on nonresident deposits was

TABLE 4
 CHANGES IN THE NET EXTERNAL POSITION OF THE DEUTSCHE BUNDESBANK (BALANCE OF ALL TRANSACTIONS)
 DUE TO INTERVENTION, APRIL 1973–DECEMBER 1975
 (in billions of DM)

	<i>State of the Mark^a</i>	<i>Principal Reason^b</i>	<i>Balance of All Transactions</i>	<i>Intervention within Joint Float</i>	<i>Other Intervention^c</i>
Apr. 1973–July 1973	Strong	Relatively tight German monetary policy. Political uncertainties in U.S.	+ 11.0	+ 8.5	+ 2.5
Aug. 1973–Jan. 1974	Weak	Easing of monetary policy in Germany.	- 7.0	- 0.9	- 6.1
Feb. 1974–May 1974	Strong	Continuing political uncertainties in U.S. Oil-price shock on U.S. current account. Removal of capital controls in U.S. and Germany.	+ 5.8	+ 4.0	+ 1.8
June 1974–Sept. 1974	Weak	Relative monetary-policy swings.	- 6.8	- 3.4	- 3.4
Oct. 1974–Mar. 1975	Strong	Relative monetary-policy swings.	+ 6.6	- 0.7	+ 7.3
Apr. 1975–Dec. 1975	Weak	Stronger U.S. current account. Relative monetary-policy swings.	- 7.1	- 1.8	- 5.3
Total			+ 2.5	+ 5.7	- 3.2

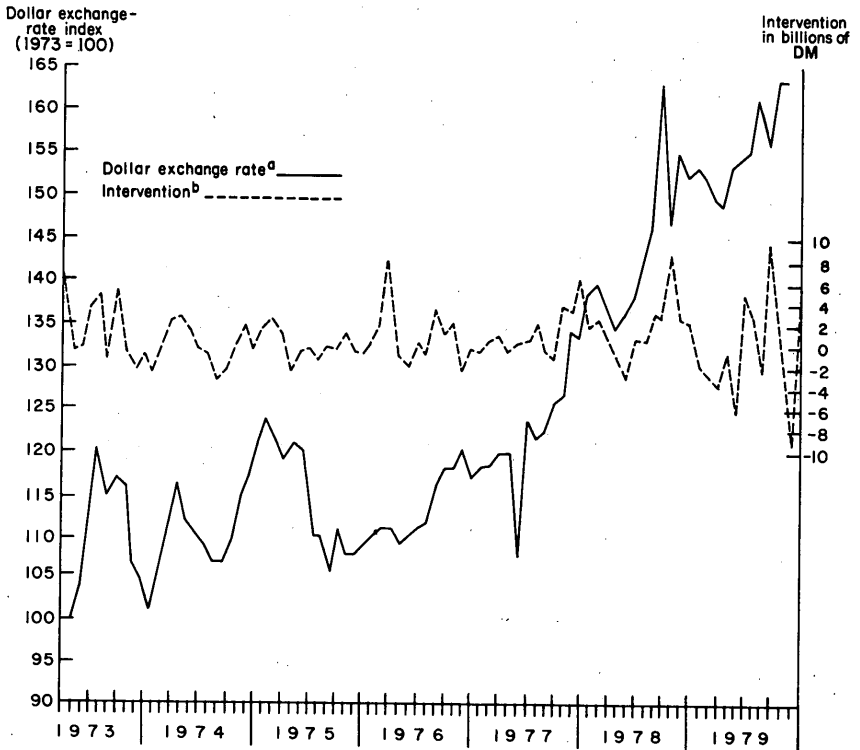
^a Usually for both effective and dollar exchange rates.

^b Focuses mainly on dollar rate and deviations from PPP.

^c Includes intervention in the DM/dollar market and purchases and sales of foreign exchange by the Bundesbank outside the exchange market.

SOURCE: Annual Reports of the Deutsche Bundesbank.

FIGURE 3
DOLLAR EXCHANGE RATES AND INTERVENTION IN GERMANY



^a Dollars per DM in index form (end of month). A rise indicates appreciation of the DM. (From Fig. 2.)

^b Balance of all transactions in billions of DM. (Deutsche Bundesbank, *Monthly Report*.)

lifted. By the end of the period, only a few types of capital inflow remained restricted.

Adjustment to the oil-price shock. How did Germany adjust to the oil shock of 1974? Its oil bill increased by some DM17 billion, yet the current account actually improved by some DM13 billion. This happened in spite of the rise in the real effective rate in 1973 and early 1974. There were two reasons. First, there was a sharp fall in German economic activity relative to activity in the rest of the world. Second, spurred by falling domestic sales and generous credit terms, exports ballooned, particularly to areas outside the industrial world.

In a sense, then, Germany overadjusted, at least in 1974, reducing real

absorption by more than was required by the oil deficit; there was thus no need for any adjustment in the real effective rates, and it showed virtually no change over the year as a whole.

Conclusions. Domestic deflation, combined with a vigorous export drive, allowed Germany to more than offset the substantial increase in its oil bill in 1974 without changing the real effective exchange rate. With the gradual dismantling of exchange controls, minimal intervention, financial policy directed principally at domestic targets, and the real effective exchange rate directed at securing external balance, Germany's experience in those years closely conformed to the theoretical blueprint of a freely flexible rate.

Phase 2: 1976 through 1978

Over the entire period from 1976 through 1978, the mark was very strong on a dollar and on an effective basis, reflecting the strong and growing current-account surplus (see Table 3 above). The mark appreciated by some 28 per cent against the dollar and by slightly less on an effective basis. Germany's advantage on the inflation front was smaller, so that real mark-dollar and effective rates rose by some 19 and 9 per cent respectively (see Figs. 1 and 2).

Exchange-rate management was directed chiefly at moderating the upward movement of the mark. The principal method was intervention in foreign-exchange markets. In 1976 and 1978, however, the monetary authorities were not able to sterilize the large balance-of-payments surpluses and so were forced into a somewhat more permissive monetary stance. In addition, some (minor) control was exercised over capital flows.

Intervention. In sharp contrast to the previous period, intervention from 1976 through 1978 was overwhelmingly one-sided. The sum of the balance of all transactions over the three years was some DM39 billion, compared with some DM2.5 billion over the period April 1973 to December 1975 (see Tables 4 and 5). Although there were months when the monetary authorities actually sold large amounts of reserves (mainly when the mark showed some weakness), these were overwhelmed by months when the authorities bought reserves to keep the mark down.

Three aspects of the intervention are worth noting. First, the volume of net intervention accelerated in the three years from DM8.7 billion in 1976 to DM10.5 billion in 1977 and DM20.1 billion in 1978 (see Table 5).

Second, there were important changes in the currencies being supported. In 1976 intervention was overwhelmingly directed at discharging exchange-rate obligations under the joint float, principally during the crises of February to March and again in July to mid-October (see Table 5). (For details of the currency crises, see the 1976 Annual Report of the Deutsche Bundesbank.) In that year, there was little net intervention to support the

TABLE 5
 CHANGES IN THE NET EXTERNAL POSITION OF THE DEUTSCHE BUNDESBANK
 (BALANCE OF ALL TRANSACTIONS) DUE TO INTERVENTION,
 JANUARY 1976-DECEMBER 1979
 (in billions of DM)

	<i>Balance of All Transactions</i>	<i>Intervention within Joint Float^a</i>	<i>Intervention in DM/Dollar Market^b</i>	<i>Other Intervention^c</i>
1976:				
Feb.-March	+ 9.7	+ 8.7	+ 1.0	
Apr.-June	- 3.6	- 1.4	- 2.2	
July-mid-Oct.	+ 6.7	+ 8.0	- 1.4	
Mid-Oct.-Dec.	- 4.1	- 3.9	- 0.2	
1977:				
Jan.-Sept.	- 0.8	- 1.8	+ 2.0	- 1.0
Oct.-Dec.	+ 11.3	+ 3.1	+ 9.3	- 1.1
1978:				
Jan.-June	0	- 1.2	+ 6.3	- 5.1
July-mid-Oct.	+ 12.8	+ 10.1	+ 1.8	+ 0.9
Mid-Oct.-Dec.	+ 7.3	- 1.1	+ 16.0	- 7.6
1979:				
Jan.-June 13	- 16.1	+ 0.4	- 14.0	- 2.5
Mid-June-Sept. 23	+ 15.1	+ 8.8	+ 18.6	- 12.3
Sept. 24-Dec.	- 4.2	- 1.1	+ 2.8	- 5.9

^a From Mar. 1979, the European Monetary System (EMS).

^b Includes intervention by the Federal Reserve Bank of New York under the swap arrangements.

^c Excludes intervention in DM/dollar market, including outflows of dollars due to conversions through the Bundesbank of foreign DM bonds and of notes and wealth raised by foreigners.

SOURCE: Annual Reports of the Deutsche Bundesbank.

dollar, and the mark-dollar rate was allowed to float in line with market conditions. By late 1977, however, intervention was predominantly directed at supporting the weakening dollar. From October to December 1977, some \$4 billion was bought in support of the dollar. This episode is particularly important because it marks the first occasion after the abandonment of mandatory intervention on which intervention in the mark-dollar market was on a fairly massive scale. It also marks the occasion on which the Federal Reserve Bank began to change its own attitude toward intervention, which had until then been aimed primarily at smoothing operations. Adopting a more aggressive stance, it started to make heavy use of its swap lines with the Bundesbank. Developments in the course of 1978 were also interesting. In the first half of the year, the U.S. authorities (now including the Treasury) joined the Bundesbank in purchasing dollars force-

fully in support of the dollar. Between July and mid-October, the crisis within the joint float forced the Bundesbank into large mandatory purchases of foreign exchange. From mid-October to the end of the year, however, the crisis again shifted to the mark-dollar rate, and now there was further massive intervention to support the dollar (see Table 5). The stabilization of the U.S. dollar vis-à-vis the mark did not come till early November 1978 after the November 1 U.S. announcement of a policy package. Its measures included a 1 per cent increase in the discount rate (for external reasons), a 2 per cent reserve requirement on large time-deposit accounts, and the coordinated mobilization of some \$30 billion to support the dollar.

Third, in the three years under review, the trend of monetary policy may have been partly dictated by the sheer magnitude of the intervention. In the course of 1976, the Bundesbank was forced to purchase large amounts of foreign currency to meet its obligations under the float. The authorities were not able (or not prepared) to sterilize fully the effects of these purchases; central-bank money grew at a faster rate than the target in 1976 (see Table 6). The Bundesbank admitted to this in its 1976 Annual Report (p. 54):

German monetary policy was seriously handicapped in 1976 by Germany's membership in the narrower margins arrangement. . . . Thus the experience of 1976 once again graphically demonstrates that the system of narrower margins . . . may have a substantial adverse impact on stabilization policy.

In late 1977 and in 1978, the Bundesbank purchased large amounts of dollars to stabilize the mark-dollar rate. Again, these large purchases were not fully sterilized by the monetary authorities, and this explains again why in 1977 and, more important, in 1978 the growth of central-bank money exceeded the target (see Table 6).

Referring to the large purchases of U.S. dollars in the last three months of 1977, the Bundesbank wrote:

This was the steepest rise in reserves within such a short space of time since the transition to generally floating exchange rates in the spring of 1973. It is obvious that foreign exchange movements of this magnitude greatly restrict the freedom of action of monetary policy.

The Bundesbank was even more emphatic about the 1978 situation, when purchases of dollars were massive over the year as a whole. In its 1978 Annual Report, it wrote (p. 1):

When assessing monetary developments in 1978 it must be borne in mind that the Bundesbank's room for maneuver in the monetary field was greatly constricted at times by external developments. Both at the beginning of the year and in the autumn new monetary unrest associated with the temporary weakness of

the U.S. dollar, and to some extent also with tensions in the European narrower margins arrangements (the "snake"), resulted in a rapid appreciation of the Deutsche mark in international foreign exchange markets. In order to slow down this upward movement, which far exceeded the price and cost differential between Germany and other countries, and at the same time to mitigate the dampening effect of an excessive appreciation of domestic activity, the Bundesbank took considerable amounts of foreign currency out of the market. . . . In these circumstances, the Bundesbank was forced to adhere to a relatively easy domestic monetary policy. Both factors—the massive inflows of funds from abroad and the stance of domestic monetary policy—led to an expansion of the money stock in Germany that greatly overshot the Bundesbank's original monetary growth target for 1978.

The rationale of the Bundesbank for its policies during 1978 is worthy of closer examination. It argued (pp. 1 and 26) that a more expansionary monetary policy was justified on two grounds. First, the unanticipated sharp real appreciation was having a depressing effect on economic activity, which needed to be countered by a more permissive money-supply policy. Second, the real appreciation was also helping to keep the rate of inflation down by lowering import prices, and this served to offset any effect a more permissive monetary policy might have on prices.

Is it correct, therefore, to represent the 1978 situation as one in which monetary policy was effectively directed at moderating the upward movement in the mark? Suppose that the Bundesbank had refrained from any intervention to stabilize the mark-dollar rate in the course of 1978. The real rate would presumably have risen more sharply, with an adverse effect on employment but a favorable effect on prices. The monetary authorities might then have decided to implement a more expansionary monetary policy by increasing its domestic assets. Thus, the more expansionary monetary policy might have occurred in any event, even with a free float, the only difference being that the source of the monetary change would have been domestic rather than external. Therefore, it may not be entirely accurate to say that monetary policy in 1978 was directed at external ends. But it is

TABLE 6
GROWTH IN GERMAN MONETARY AGGREGATES:
TARGETS AND OUTCOMES, 1974-79
(in per cent)

	Target	Outcome
End 1974-end 1975	8%	10.0%
Average 1975-76	8	9.2
Average 1976-77	8	9.0
Average 1977-78	8	11.5
1978IV-1979IV	6-9	6.3

SOURCE: OECD *Economic Outlook*.

true that external developments created a situation in which monetary policy might have had to change course.

Capital controls. In late 1977 and early 1978, the German monetary authorities also attempted (somewhat half-heartedly) to revive restrictions on capital inflows. At the end of December 1977, the Bundesbank announced it would no longer allow nonresidents to acquire domestic securities with maturities between two and four years. After January, it tightened reserve requirements on banks' foreign liabilities. These last restrictions were removed in June, however, when the mark was less strong.

Conclusions. In the three years under review, intervention leaned strongly in one direction; without intervention, the real rate might have risen substantially more and Germany's price performance have been better still. Some attempt was made early in 1978 to restore restrictions on the inflows of capital, but they were half-hearted and may have been ineffective. In any event, they were largely reversed in the second half of the year and no attempt was made to revive them when inflows were at their strongest toward the end of 1978. German commitments to the joint float forced her to adopt a somewhat more permissive monetary policy in 1976. It is generally believed, moreover, that monetary policy in the course of 1978 was directed at least partially toward managing the exchange rate. I have argued, however, that the more permissive monetary policy in that year might have been followed even under a free float, in which case what actually happened may have largely replicated events under a free float.

Phase 3: 1979

The huge current-account surplus in the second half of 1978 of some \$5 billion had by the first half of 1979 dwindled to almost nothing; by the second half the current account had been transformed into a deficit of some \$5.7 billion (see Table 3). As a result of these trends, the mark began to show some weakness in the first half of 1979. In the second half, however, despite the continuing deterioration in the current account, the mark strengthened, most noticeably vis-à-vis the U.S. dollar. The principal reason was the weakness of the dollar as a result of the continuing high rate of inflation in the United States, the deterioration in the U.S. trade balance, and the upsurge in money growth there.

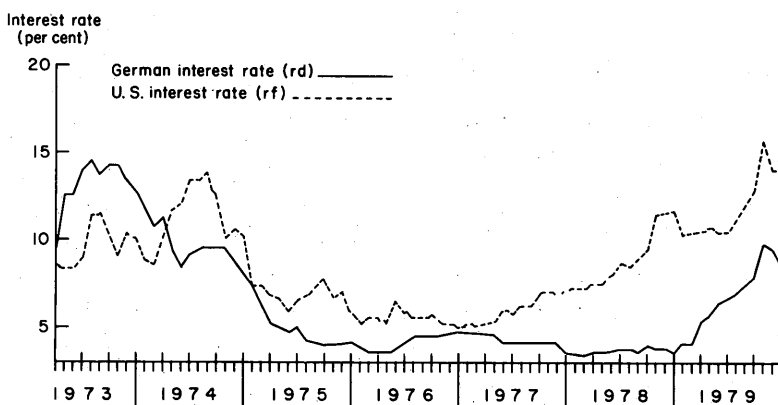
Substantial intervention occurred over the whole year. In the first six months, with the mark weak vis-à-vis the dollar, the Bundesbank sold most of the dollars it had acquired in the last quarter of 1978. Indeed, this was one of the principal purposes of intervention in this half. In the second half, with the mark showing renewed strength, dollars were again purchased on a large scale.

Monetary policy became progressively tighter in the course of 1979. It

was predominantly directed at the domestic front, where a sharp economic recovery was under way. But the changed monetary stance was not inconsistent with developments on the external front. The monetary authorities sterilized the effects of the large volume of intervention on domestic liquidity and were able to meet the central-bank money target for the first time since such a target had been announced.

The Bundesbank also confronted another problem late in 1979 in the face of continuing increases in interest rates in the United States. German interest rates rose roughly in line with U.S. rates, but these increases were justified, at least officially, predominantly on domestic grounds (see Figs. 4 and 5). From the end of February to April 1980, however, there were large outflows of capital associated with relatively low German interest rates; in those months, the mark depreciated sharply, and the Bundesbank chose to moderate the outflows by raising its own interest rates.

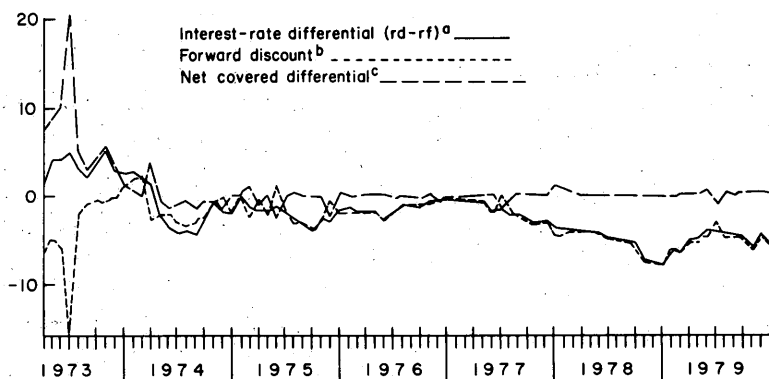
FIGURE 4
GERMAN AND U.S. INTEREST RATES



rd: German 3-month interbank rate (end of month).
 rf: 3-month Eurodollar deposit rate (end of month). (German and Japanese rates are compared with the Eurodollar deposit rate because these are private-sector rates.)

SOURCE: Morgan Guaranty Trust Company of New York, *World Financial Markets*.

FIGURE 5
INTEREST-RATE DIFFERENTIAL, FORWARD DISCOUNT, AND NET
COVERED DIFFERENTIAL IN GERMANY



^a See Fig. 4 for details.

^b A negative discount favors Germany. (Calculated from data in IMF, *International Financial Statistics*.)

^c Interest-rate differential minus forward discount. A negative differential works against Germany.

4 JAPAN

It is convenient to break down the 1973-79 period in Japan into three distinct phases corresponding in effect to trends in the current account.¹ A first phase, marked by a distinct weakening of the yen, ran from the start of the float in March 1973 to about the end of 1975. During the second phase, from the start of 1976 to late 1978, the yen became very strong, taking its place alongside the U.S. dollar and the mark at the forefront of international discussions of the adjustment process. The third phase covered 1979, when the yen again weakened dramatically. Tables 7 and 8 present the background facts.

Over the entire period, the monetary authorities tried to manage the exchange rate in two principal ways, by imposing controls over capital movements and by intervening in the foreign-exchange market. Other less important devices to influence the exchange rate included changes in financial policies, administrative controls over imports and exports, and some trade liberalization.

Phase 1: March 1973 through 1975

Over phase 1, the yen tended to be weak, falling against the dollar and on an effective basis by some 14 per cent. In real terms, the fall was about the same as on an effective basis but was about 9 per cent vis-à-vis the dollar (see Figs. 6 and 7). Virtually all of the fall in real terms occurred during 1974, which was dominated by Japan's adjustment to the first oil-price shock.

Preventing the yen from rising. With the yen strong during 1972 and early 1973, policy had been directed at discouraging capital inflows and encouraging outflows. In February 1972, ceilings had been established on the amount of foreign exchange that foreign banks could convert into yen, and in July 1972 marginal reserve requirements against free yen (nonresident) accounts had been raised to 50 per cent. In October 1972, additional restrictions had been placed on inward portfolio investment by nonresidents. Controls over outflows had been liberalized in the course of 1972: permission was given for freer financing in foreign exchange for outward direct investment, and restrictions on outward portfolio investment were eased.

¹ Useful references here are Black (1977, 1978, 1979); regular issues of Federal Reserve Bank of New York, "Treasury and Federal Reserve Foreign Exchange Operations," *Quarterly Review*; Keaney (1981); Kemp (1978); monthly issues of Morgan Guaranty Trust Company of New York, *World Financial Markets*; regular issues of Organization for Economic Cooperation and Development, *OECD Economic Outlook*; and Shirakawa (1980).

TABLE 7
BACKGROUND FACTS ON JAPAN, 1973-79

	1973	1974	1975	1976	1977	1978	1979
Internal balance:							
% change in consumer prices (mean for 1962-72: 5.7)	11.7	24.5	11.8	9.3	8.1	3.8	3.6
% change in real GNP (mean for 1960-72: 11.0)	10.0	-0.3	1.4	6.5	5.4	6.0	5.9
External strength:							
Current-account balance in billions of \$ (1972: \$6.6)	-\$0.1	-\$4.7	-\$0.7	\$3.7	\$10.9	\$16.5	-\$8.8
Financial thrust:							
% change in M-1 (1971-72: 27.1)	16.8	11.5	11.1	12.5	8.2	13.4	3.1
% change in M-2 (1971-72: 24.4)	16.8	11.5	14.5	13.5	11.1	13.1	8.4
% change in fiscal-policy stance ^a	0.9	-0.5	2.4	-0.4	-0.9	2.3	-0.2
Exposure to oil shock:							
Net oil imports as % of total energy ^b	77.6	...	74.5	...	70.5	...	...
Importance of yen as a reserve currency:							
% share of yen in total identified official holdings in billions of SDR	0	0	0.6	0.8	1.2	2.5	3.3

^a IMF (1980c, Central Government Table 37).

^b OECD (1979, p. 64).

^c IMF (1980a, p. 62).

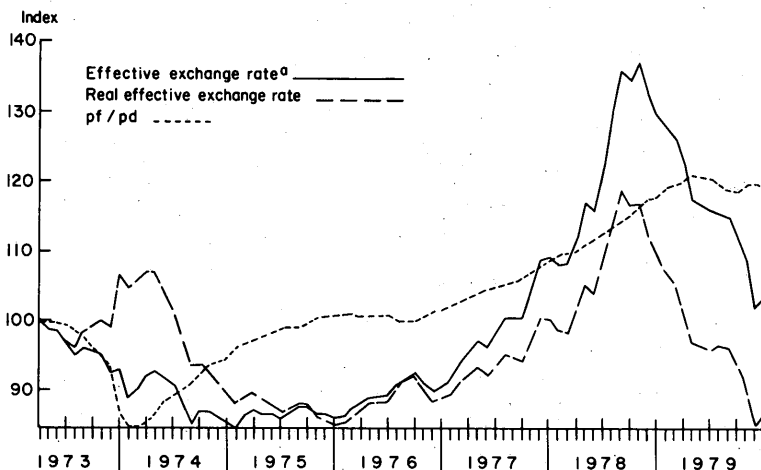
SOURCE: *OECD Historical Statistics*.

TABLE 8
GROWTH IN JAPANESE MONETARY AGGREGATES:
SELECTED TARGETS AND OUTCOMES
(in per cent)

	Target	Outcome
1977IV-1978IV (M-2)	12%	12.2%
1978IV-1979IV (M-2 and CDs)	11	11.2
1979IV-1980IV (M-2 and CDs)	10	11.0

SOURCE: *OECD Economic Outlook*.

FIGURE 6
EFFECTIVE EXCHANGE RATES AND RELATIVE PRICES IN JAPAN
(1973 = 100)



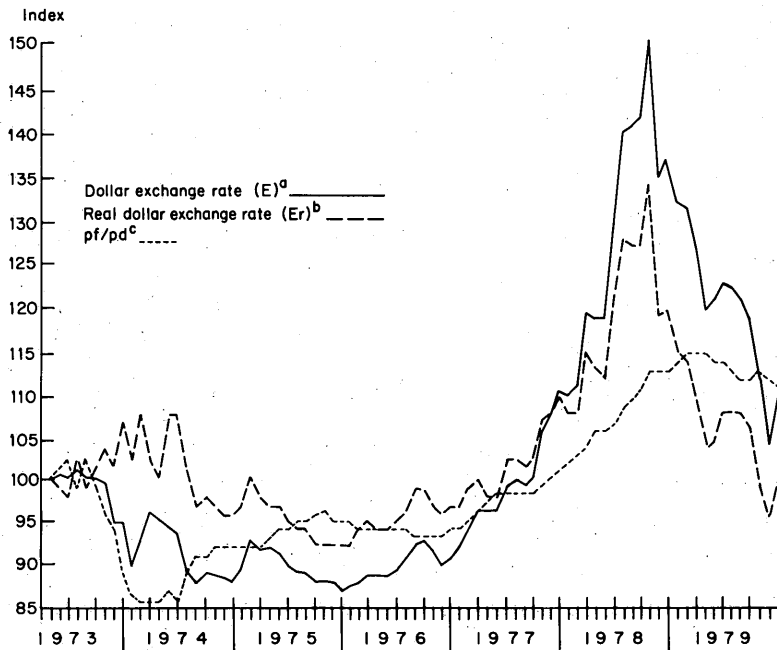
^a Yen's trade-weighted average appreciation or depreciation vis-à-vis the currencies of 15 other major countries. (For further details, see notes to Fig. 1.)

This stance continued through October 1973, serving to depress the yen further, even though it was already under some pressure from the weakening current account (see Table 7). The monetary authorities counteracted the downward pressure on the yen by selling dollars, stabilizing the yen-dollar rate at about Y 265 per dollar.

The monetary authorities also deliberately sought to reduce their official reserves without official intervention. Some reserves were deposited with the commercial banks, which then placed the dollars in the Eurodollar markets. The monetary authorities also switched some short-term dollar reserves into long-term U.S. government securities. As these moves did not represent foreign-exchange sales, they had no direct effect on the strength of the yen. Nevertheless, combined with official intervention, they reduced reserves by some \$4 billion between April and October.

The yen under attack. The situation changed dramatically from November 1973 to January 1974. Given Japan's exposure to an oil-price rise, the yen came under strong attack with the oil crisis underway. The monetary authorities responded in a number of ways. First, the successive falls in the yen were moderated by considerable official support (see Fig. 8). Second, some reserves previously placed with commercial banks were withdrawn, and it is reported that some officially held long-term bonds were converted

FIGURE 7
 DOLLAR EXCHANGE RATES AND RELATIVE PRICES IN JAPAN
 (1973 = 100)



^a Dollars per yen in index form (end of month). A rise indicates appreciation of the yen.

^b $E + pf/pd$. A rise implies an impairment of Japan's competitive position vis-à-vis the U.S.

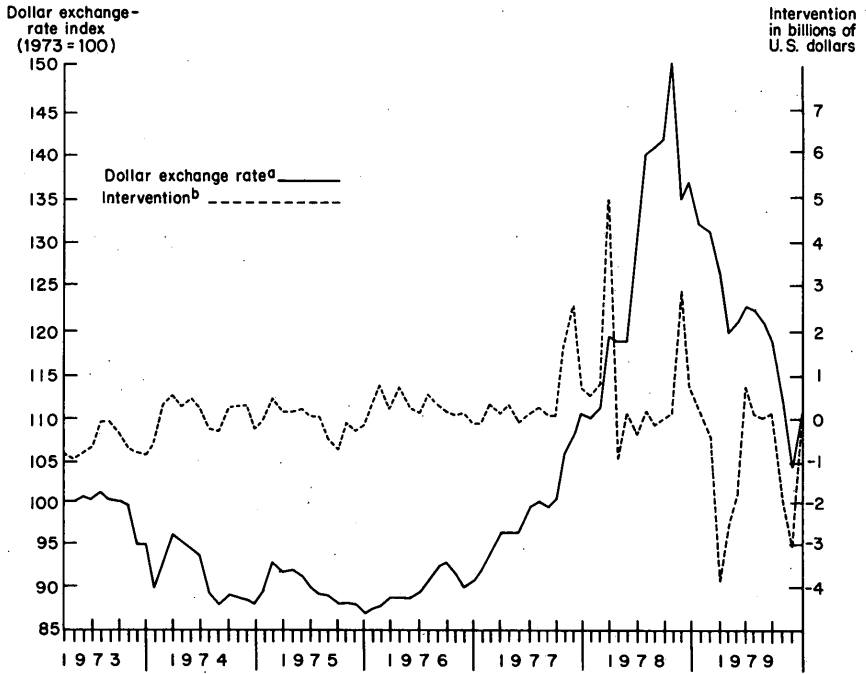
^c Ratio in index form of U.S. to Japanese wholesale prices.

SOURCE: IMF, *International Financial Statistics*.

back into liquid reserves. Third, the fall in the yen was cushioned by a succession of measures that involved a sharp change in the direction of capital controls to encourage inflows and discourage outflows. These measures included the abolition of restrictions on purchases of Japanese securities by nonresidents, a sharp fall in the marginal reserve requirement on free yen deposits from 50 to 10 per cent, considerable encouragement to borrow abroad for domestic use, and an intensification of restrictions on outflows. Fourth, with an eye on the external position as well as on the domestic inflationary scene, monetary policy was tightened significantly. Despite these measures, official reserves fell by nearly \$2.5 billion in the course of these three months alone.

Adjustment to the first oil-price shock. With a huge current-account deficit opening up in the first half of 1974, the commercial banks were en-

FIGURE 8
DOLLAR EXCHANGE RATES AND INTERVENTION IN JAPAN



^a Dollars per yen in index form (end of month). A rise indicates appreciation of the yen. (From Fig. 7.)

^b Change in foreign reserves in billions of U.S. dollars. (Bank of Japan, *Balance of Payments—Monthly*.)

couraged to borrow very heavily from the United States, where capital controls had been lifted at the end of January, and from the Eurodollar markets. Net bank borrowings in these six months amounted to some \$8.5 billion, which more than covered the current-account deficit. These borrowings served to strengthen the yen, which rebounded strongly in the early months of 1974, but they also allowed the monetary authorities to recoup a substantial proportion of the earlier reserve losses.

Tight monetary and fiscal policies produced a sharp downturn in the economy in the course of 1974. By the second half of 1974, this downturn combined with a vigorous export drive to transform the current account. It was now in surplus to the extent of \$1 billion. Therefore, the banks were discouraged from further borrowing and there was indeed a small monetary outflow in the last six months of the year. The improvement in the current

account continued into 1975, when the account was close to balance for the year as a whole. Generally speaking, however, capital controls continued to be slanted toward encouraging inflows and discouraging outflows.

Over the period July 1974 to the end of 1975, the monetary authorities intervened to keep the nominal effective exchange rate within very narrow limits. As a result, reserves fluctuated substantially, but the net reduction was only \$600 million.

To sum up, Japan adjusted initially to the oil shock by heavy borrowing, which served in lieu of massive intervention to keep the yen from depreciating. In due course, however, as economic activity fell and the real effective exchange rate dropped sharply after mid-1974, the surplus on the (nonoil) current balance increased dramatically. Thus, Japan shifted its share of the global oil deficit onto other countries, a development that brought some criticism from the rest of the world. Borrowings served to postpone the reduction in real absorption required by the oil shock, but not for long. There was a sharp reduction in real absorption in the second half of 1974 that lasted through 1975.

Phase 2: 1976 through 1978

Over the three years 1976 through 1978, the yen rose against the dollar by some 40 per cent while the effective rate rose by some 50 per cent. These rises were considerably larger than the improvements in Japan's relative price performance on a bilateral or trade-weighted basis. In real terms, then, the yen rose against the dollar by some 22 per cent, while the effective rate rose by some 30 per cent.

Exchange-rate management was directed at moderating the upward movement of the yen. Intervention was overwhelmingly one-sided, with the monetary authorities progressively increasing the scale of intervention. Reserves increased by over \$20 billion, of which some \$3.8 billion came in 1976, some \$6.2 billion in 1977, and some \$10.2 billion in 1978. There was again some window dressing of reserves; official reserves were occasionally placed with commercial banks.

Especially from mid-1977, capital controls were progressively reversed, with inflows discouraged and outflows encouraged, so as to offset the growing current-account surplus. Controls were tightened on securities purchased by nonresidents and marginal reserve requirements were raised on free yen accounts. At the same time, banks were permitted to increase their lending to nonresidents, and residents were permitted to hold larger foreign-currency deposits in Japan and overseas.

In the face of strong pressures from the international community, several measures were taken in the course of 1977 and 1978 to increase imports and restrain exports directly. The principal measures on the import side

were an emergency program that included the importation of goods to be stockpiled, special purchases of other goods, and the relaxation of trade restrictions on certain goods. On the export side, exports were to be monitored and restraint was concentrated on eight industries that had experienced strong export growth.

Again in the face of international pressures, Japan's financial policies may have been more expansionary, at least in 1978, than might have been desired on domestic grounds alone (see Table 7).

Phase 3: 1979

The increase in the oil bill in 1979 totaled \$120 billion and wiped out three-quarters of the 1978 current-account surplus. The nonoil balance was deteriorating too, due in large part to the lagged effects of the earlier appreciation in the real exchange rate. Therefore, major adjustments were called for again.

In the course of 1979, the effective exchange rate of the yen fell by some 20 per cent. With Japan's prices rising about as rapidly as those of its competitors, the real effective rate fell by about the same amount. Once again, the trend in the real effective rate was in the direction required to correct the current-account position. Exchange-rate management was nevertheless directed at moderating the yen's fall. Thus, the policies pursued in 1977-78 were reversed.

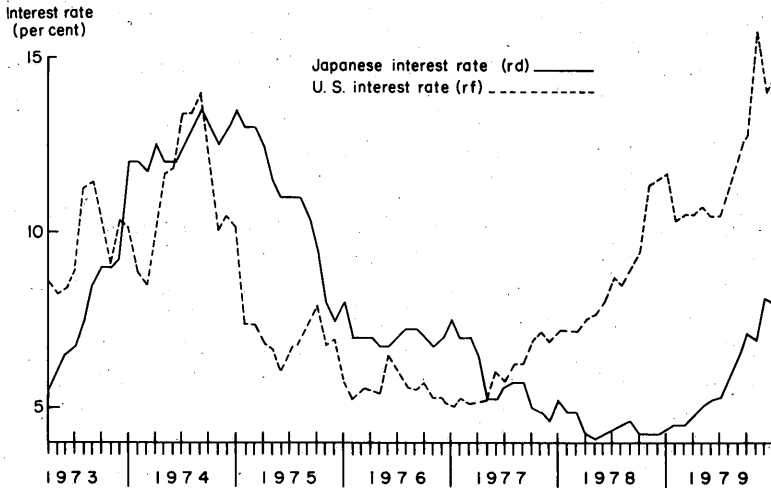
First, reflecting intervention, reserves fell by some \$12.5 billion in the course of 1979. This loss exceeded by some \$2 billion the gain during 1978. The reserve loss was very uneven, being concentrated almost entirely in the five months when the yen fell most sharply (March to May and October to November).

Second, capital controls were tilted toward encouraging net inflows. In January 1979, the marginal reserve requirement on free yen accounts was reduced from 100 to 50 per cent, and it was removed one month later. Restrictions on nonresident purchases of domestic securities were lifted at the same time, after being eased in January. In March 1979 and again in January 1980, foreign banks were required to convert larger amounts of foreign currency into yen. Several additional measures were taken in May 1979 to encourage net inflows. (In May, however, there was also some liberalization of outflows, but these were reversed in November.)

Third, financial policy became significantly more restrictive in the course of 1979 (see Table 7), reflecting external developments at least in part. Late in the year, moreover, when U.S. interest rates rose very sharply, Japanese rates were raised too, to avoid a further weakening of the yen and additional reserve losses (see Figs. 9 and 10).

Fourth, the government discontinued the various measures introduced in 1977-78 to moderate exports and encourage imports.

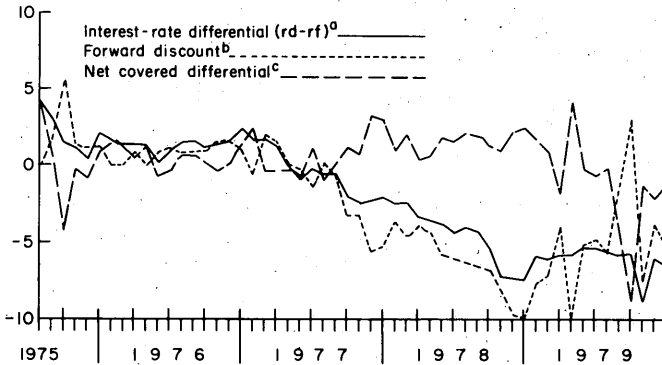
FIGURE 9
JAPANESE AND U.S. INTEREST RATES



rd: Tokyo interbank call money, unconditional, lenders' rate (end of month).
rf: 3-month Eurodollar deposit rate (end of month).

SOURCE: Morgan Guaranty Trust Company of New York, *World Financial Markets*.

FIGURE 10
INTEREST-RATE DIFFERENTIAL, FORWARD DISCOUNT, AND
NET COVERED DIFFERENTIAL IN JAPAN



^a See Fig. 9 for details.

^b A negative discount favors Japan. (Calculated from data in IMF, *International Financial Statistics*.)

^c Interest-rate differential minus forward discount. A negative differential works against Japan.

How then did Japan adjust to the second oil crisis? The adjustment was generally similar to that in 1974. As in 1974, policy was directed at strengthening the capital account and deflating the domestic economy. On both occasions, too, the real effective exchange rate fell; in 1974 this occurred with a delay of several months, but in 1979 it came simultaneously with the deterioration in the current account.

A Summary Perspective on Japan's Exchange-Rate Policy

Over the period 1973-79, Japan experienced substantial fluctuations in both its currency and its current-account position. As we have seen, foreign-exchange intervention and capital controls were used extensively to manage the exchange rate, with apparently mixed results. The later phases appear to have been more successful than the earlier ones.

In retrospect, there may have been too much support for the yen during the worst months of the first oil crisis (from late 1973 to April 1974). In those months, the real effective rate rose by some 7 per cent, when it would have been more appropriate to allow the rate to fall. After April 1974, the real effective rate did fall, and by the end of 1974 it had fallen by some 15 per cent. So adjustment came, but it was somewhat delayed.

In 1977-78, there was some resistance to the upward movement in the real effective rate, which rose by over 20 per cent. The adjustment to the nonoil current account appeared with a lag but became manifest during 1979. This turnaround and the sharp fall in the real effective rate in 1979 suggest that intervention in 1977-78 may have been in the right direction. (This is confirmed by the more formal analysis undertaken in Chap. 6.)

Finally, it is worth noting that the fall of some 15 per cent in the real effective rate from March 1979 to the end of the year was offset by an equivalent rise from March 1980 to the end of that year. In those months, the current-account deficit fell dramatically. It thus appears that some of the resistance to the fall in 1979 may have been justified in the light of developments in 1980.

5 THE UNITED KINGDOM

The United Kingdom's experience readily falls into a first phase from 1973 to 1976 when sterling was weak (a weakness that reached crisis proportions in the later months of 1976) and a second phase from 1977 to 1979 when sterling strengthened dramatically.¹ Table 9 presents the background facts.

Phase I: 1973 through 1976

In general, sterling was a weak currency from 1973 through 1976. It fell by about 45 per cent against the dollar and by some 34 per cent on an effective basis. Nearly all of this fall can be accounted for by Britain's relatively poor inflation performance; in real terms, the fall was on the order of 6 to 7 per cent on an effective basis and against the dollar (see Figs. 11 and 12).

Two principal methods were used over the period to manage exchange rates. First, there was a considerable amount of foreign-exchange intervention in the spot market (see Fig. 13) and extensive official foreign borrowing to replenish reserves and restore confidence in sterling (see Table 10). Second, and more important, domestic interest rates were frequently adjusted not only in line with movements in U.S. rates but also to offset or reverse trends in sterling exchange rates.

In addition, the United Kingdom used changes in exchange controls and fiscal policy to influence the exchange rate and, early in the period, resorted to various arrangements to discourage the withdrawal of official sterling reserves.

Weak sterling. In the months immediately after the switch to the managed float in June 1972, the dollar's continuing weakness together with relatively high interest rates in the United Kingdom led to some strengthening of the pound. From mid-1973 to January 1974, however, as the current-account deficit persisted and Britain's inflationary performance and prospects continued to be poor, sterling came under attack. The monetary authorities attempted to moderate the downward pressure in several ways.

First, beginning in March 1973, public-sector bodies were given an exchange cover to encourage them to borrow foreign currency. In the course of 1973, borrowings under this scheme amounted to nearly £1 billion (see

¹ Useful references here are Bank of England Annual Reports and regular issues of Bank of England, *Quarterly Bulletin*. See also Black (1977, 1978, 1979); Federal Reserve Bank of New York, "Treasury and Federal Reserve Foreign Exchange Operations," *Quarterly Review*; Hacche and Townend (1980); Kemp (1978); Morgan Guaranty Trust Company of New York, *World Financial Markets*; and Organization for Economic Cooperation and Development, *OECD Economic Outlook*.

TABLE 9
BACKGROUND FACTS ON THE UNITED KINGDOM, 1973-79

	1973	1974	1975	1976	1977	1978	1979
Internal balance:							
% change in consumer prices (mean for 1962-72: 4.9)	9.2	16.0	24.2	16.5	15.8	8.3	13.4
% change in real GNP (mean for 1960-72: 3.1)	8.0	-1.5	-1.0	3.7	1.3	3.5	1.7
External strength:							
Current-account balance in billions of \$ (1972: \$3.4)	-\$2.3	-\$7.9	-\$3.6	-\$2.2	-\$0.3	\$1.8	-\$5.2
Financial thrust:							
% change in M-1 (1971-72: 14.6)	5.1	10.8	18.6	11.4	21.5	16.4	9.1
% change in M-2 (1971-72: 20.5)	27.5	12.9	7.1	11.6	9.8	14.6	12.5
% change in fiscal-policy stance ^a	2.3	-0.1	2.6	-2.2	-2.7	2.3	-0.1
Exposure to oil shock:							
Net oil imports as % of total energy ^b	49.4	...	42.9	...	19.6	...	...
Importance of sterling as a reserve currency:							
% share of sterling in total identified official holdings in billions of SDR ^c	7.0	6.1	4.1	2.1	1.8	1.6	1.9

^a IMF (1980c, Central Government Table 37).

^b OECD (1979, p. 64).

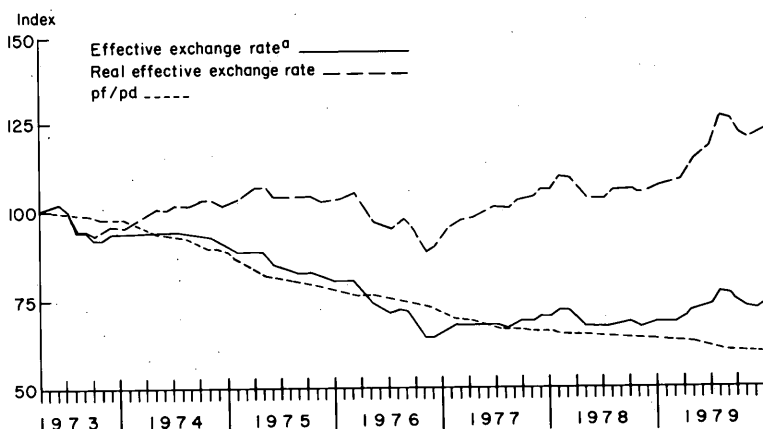
^c IMF (1980a, p. 62).

SOURCE: *OECD Historical Statistics*.

Table 10). Second, there was considerable official support for sterling, as indicated by a loss of reserves totaling some \$800 million from July 1973 to January 1974 despite the borrowings. Third, interest rates were raised, in part at least to encourage capital inflows.

Figures 14 and 15 show domestic and U.S. interest rates and the forward discount on sterling. A striking feature is the progressive increase in the forward discount and the offsetting increase in the interest differential in favor of sterling. Despite this increase, sterling depreciated over the period, suggesting that causation probably ran from the forward discount to the interest differential rather than the reverse. In other words, adverse expectations about sterling led to an increase in the forward discount on sterling; this encouraged outflows, provoking in turn a fall in spot sterling; finally, the weakness in sterling forced the authorities to raise the domestic

FIGURE 11
EFFECTIVE EXCHANGE RATES AND RELATIVE PRICES
IN THE UNITED KINGDOM
(1973 = 100)



^a Sterling's trade-weighted average appreciation or depreciation vis-à-vis the currencies of 15 other major countries. (For further details, see notes to Fig. 1.)

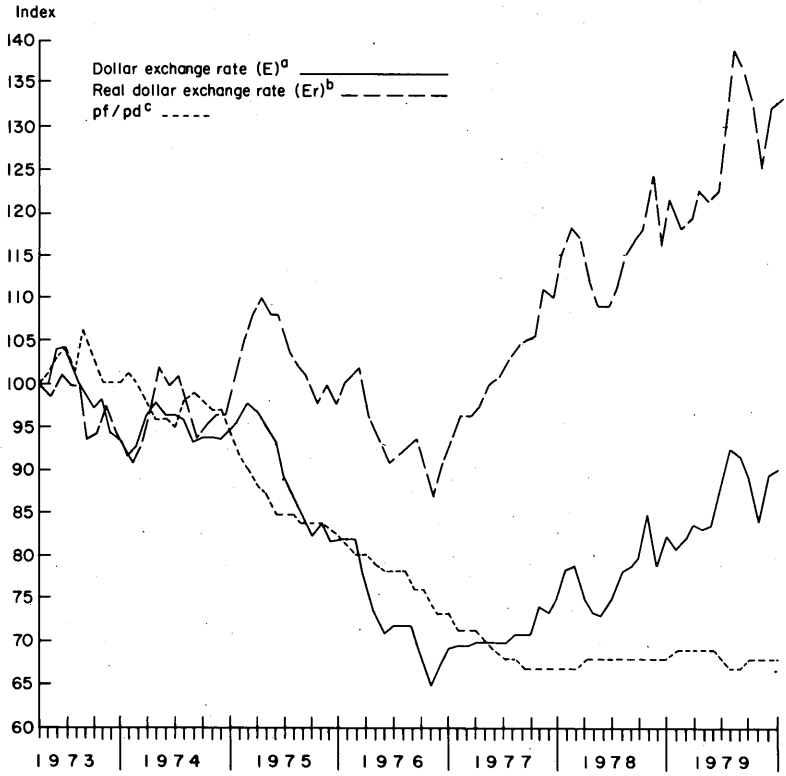
interest rate in order to stabilize the currency. There is little doubt that, in July 1973 and (less certainly) in November 1973, the sharp increases in domestic interest rates owed a good deal to the state of sterling.

Finally, the sterling-guarantee arrangements were due to expire at the end of September 1973. To reassure speculators and official holders of sterling, the British authorities announced in early September that they would extend the sterling guarantee on marginally better terms for six additional months.

Adjustment to the oil-price shock. The year that followed saw the U.K. current account deteriorate by more than the increase in the oil bill and its relative inflationary performance deteriorate as well. Over that period, sterling enjoyed mixed fortunes. The exchange rate vis-à-vis the dollar actually recovered some ground, while the effective rate fell by some 7 per cent. The real rate against the dollar rose by some 15 per cent, while the real effective rate rose by some 6 per cent. From the end of February 1974 to the end of February 1975, reserves increased by about \$1 billion. But the balance for total official financing was in deficit to the tune of some \$3.5 billion, implying considerable official support for sterling.

Sterling was strengthened over this period by a number of developments in the capital account. There were large inflows from the oil companies because of the high interest rates in the United Kingdom, the growing need

FIGURE 12
DOLLAR EXCHANGE RATES AND RELATIVE PRICES IN THE UNITED KINGDOM
 (1973 = 100)

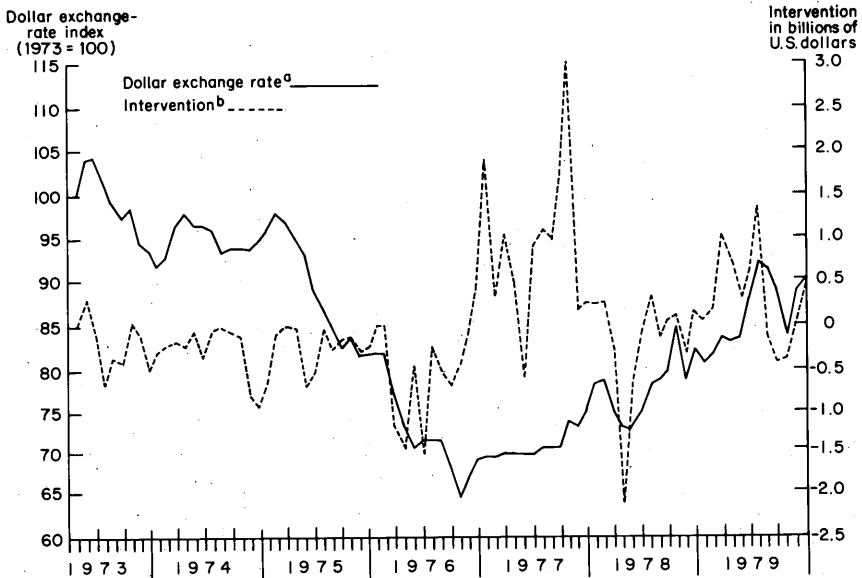


^a Dollars per pound in index form (end of month). A rise indicates appreciation of sterling.
^b $E \div pf/pd$. A rise implies an impairment of the U.K.'s competitive position vis-à-vis the U.S.
^c Ratio in index form of U.S. to U.K. wholesale prices.
 SOURCE: IMF, *International Financial Statistics*.

for sterling to make tax and royalty payments to the oil-exporting countries, and the demand for sterling to invest in North Sea exploration. At least until the last quarter of 1974, a substantial proportion of the oil exporters' current-account surplus (on the order of 10 to 15 per cent) was being placed in high-yielding sterling assets. These relatively favorable external conditions, as well as falling U.S. interest rates starting in January 1975, allowed a progressive drop in U.K. interest rates. Even so, the U.K. interest rates continued to enjoy a substantial advantage over U.S. rates and continued to attract some capital into London (see Fig. 14).

FIGURE 13

DOLLAR EXCHANGE RATES AND INTERVENTION IN THE UNITED KINGDOM



^a Dollars per pound in index form (end of month). A rise indicates appreciation of sterling. (From Fig. 12.)

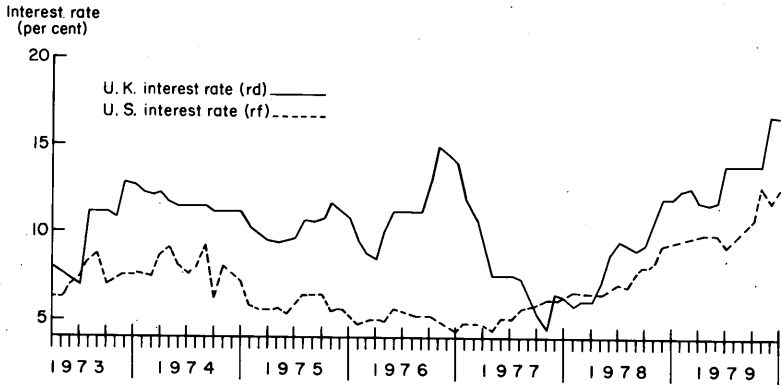
^b Balance for official financing in billions of U.S. dollars. Defined as additions to the official reserves other than those arising from foreign-currency borrowing by the Government and by public bodies under the exchange-cover scheme, plus net transactions with the IMF and other overseas monetary authorities. (Data supplied by John Townend, Bank of England.)

TABLE 10
U.K. OFFICIAL BORROWING, 1973-79
(in millions of pounds)

	Net Transactions with Overseas Monetary Authorities		Foreign-Currency Borrowing by	
	IMF	Other	Central Government	Other Public Sector (Exchange- Cover Scheme)
1973	...	...	...	+£ 999
1974	...	...	+£644	+ 1,107
1975	...	...	+ 423	+ 387
1976	+£1,018	-£34	...	+ 1,791
1977	+ 1,113	...	+ 871	+ 243
1978	- 1,016	...	+ 191	- 378
1979	- 596	...	...	- 251

SOURCE: OECD Economic Survey, United Kingdom.

FIGURE 14
U.K. AND U.S. INTEREST RATES



rd: U.K. Treasury Bill rate (end of month).
rf: U.S. Treasury bill rate (end of month). (U.K. rate compared with the U.S. Treasury bill rate because these are risk-free assets.)

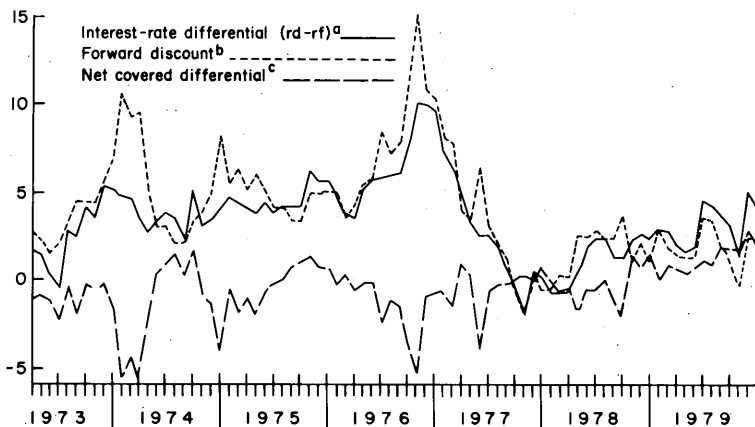
SOURCE: Bank of England, *Quarterly Bulletin*.

Apart from private flows and flows from foreign monetary authorities, official borrowing continued on a massive scale. In 1974, the central government borrowed more than £600 million, and other public-sector borrowing under the exchange-cover scheme exceeded £1 billion (see Table 11 below). In March 1974, the negotiation of the sterling-guarantee arrangements on a somewhat different basis helped to reassure the exchange markets. Late in the year, however, the Chancellor of the Exchequer announced that the guarantee arrangements would be allowed to expire, and sterling fell substantially. (These arrangements were discontinued at the end of 1974.)

The period under review encompasses the initial adjustment to the oil-price shock. As we have seen, official borrowings and private capital inflows combined to keep sterling relatively strong, but these capital inflows had the effect of concealing sterling's fundamental weakness. Indeed, the upward trend in the real effective exchange rate was, if anything, perverse; it served to delay adjustment by the current account while at the same time allowing Britain to enjoy current absorption at the expense of future absorption.

Renewed weakness of sterling. From March through September 1975, the inflation rate grew worse relative to other industrial countries, and though the current account was strengthening, sterling fell substantially. The reason for the renewed weakness in sterling can be found in the capital ac-

FIGURE 15
INTEREST-RATE DIFFERENTIAL, FORWARD DISCOUNT, AND NET COVERED
DIFFERENTIAL IN THE UNITED KINGDOM



^a See Fig. 14 for details.

^b A negative discount favors U.K. (Calculated from data in Bank of England, *Quarterly Bulletin*.)

^c Interest-rate differential minus forward discount. A negative differential works against the U.K.

count. A turnaround in capital flows more than offset the improvement in the current account. The most dramatic change occurred in foreign official holdings of sterling. These holdings, notably by oil-exporting countries but also by other monetary authorities, fell substantially in the course of the second and third quarters of 1975. They had been increasing at a rate of some £350 million a quarter in 1974 and the early months of 1975 but fell by some £300 per quarter in the second and third quarters.

Exchange-rate management was directed at moderating the slide in sterling. Official borrowing continued, particularly by public-sector institutions under the exchange-cover scheme. There was considerable intervention in support of sterling, as implied by the fact that reserves fell by some \$1.3 billion from the end of March 1975 to the end of September 1975 despite continuing official borrowings. Finally, in July 1975, at a time when the United Kingdom was in recession, interest rates were raised, principally to restore a substantial margin of advantage over U.S. interest rates and thus to strengthen sterling.

Fluctuating fortunes. In the months that followed until March 1976, the monetary authorities succeeded in holding the dollar rate fairly steady. They intervened flexibly in the market, selling reserves when sterling was weak and buying them when it strengthened. They used the interest rate as an

exchange-rate regulator. In early October, for example, when sterling continued to be weak, the interest rate was raised again at a time when U.S. interest rates were actually falling; when sterling rallied somewhat in early 1976, U.K. interest rates were allowed to fall by more than U.S. rates (see Fig. 14). To reassure the markets that it had adequate resources to manage the exchange rate, the British Government announced in November that it would apply for some \$2 billion from the IMF, including \$1.2 billion from the oil facility.

Sterling in crisis. From March to November 1976, sterling came under severe pressure; the dollar rate fell by some 26 per cent from March to October, while the effective rate fell by some 20 per cent. The real effective rate fell by about 15 per cent. The pressures on sterling became particularly intense in March to May and again in September and October.

Several factors, past and current, combined to create this sterling crisis. In 1974, it will be recalled, the current-account deficit was financed in large part by official borrowing and by oil-induced capital inflows. In 1975, the current-account deficit fell sharply, but the capital inflows fell off even more sharply. In the course of 1975, moreover, the U.K. inflation rate was higher than the rates of its competitors. By 1976, the current account was again taking a turn for the worse, and movements in relative prices threatened to increase the deficit; the real effective exchange rate had actually increased by nearly 5 per cent in the three years from March 1973 to March 1976. The United Kingdom had extensive borrowing rights, notably from the IMF, and could have continued to borrow in foreign markets too, but there was considerable concern in international circles about the viability of such a policy.

The government tried to moderate the depreciation of sterling by taking several measures. There was massive intervention. From end February to end October, reserves fell by \$2.3 billion, despite heavy official borrowing. Monetary policy was also used to strengthen sterling. Figure 15 shows that the forward discount on sterling increased progressively from some 4 per cent in February 1976 to a peak in October of some 15 per cent. As in 1973-74, however, there was an increase in the interest differential in favor of sterling. In September and October, however, the months when the crisis was worst, the covered differential strongly favored investment overseas. As before, adverse expectations, reflected in the forward discount, forced sterling down, provoking defensive increases in domestic interest rates. There is thus little doubt that external developments were largely responsible for the increasingly restrictive monetary policy. In its Annual Report for the year ended February 28, 1977, the Bank of England conceded (p. 6): "The conduct of monetary policy was heavily influenced by the state of the foreign exchange market." Fiscal policy became progres-

sively tighter in 1976. Cuts were made in public expenditure in July and December, aimed principally at restoring foreign confidence.

Exchange controls were tightened in August and again in November 1976. In August, there was an intensification of restrictions on the provision of sterling finance by U.K. banks to overseas sterling-area residents. In November, this lending was prohibited, along with lending to finance third-country trade in sterling.

Massive new borrowing facilities were announced. In the middle of the year, standby credits amounting to \$5.3 billion were obtained from the Group of Ten and the Bank for International Settlements. In November, negotiations with the IMF were undertaken, leading in January 1977 to the approval of a \$3.9 billion standby facility.

Phase 2: 1977 through 1979

The improved outlook concerning inflation, the massive financial assistance available, the agreement concluded with the IMF, the feeling that sterling had depreciated excessively, and the prospects for North Sea oil all combined to produce a dramatic turnaround in sterling's fortunes by late 1976. This was to be the start of an extraordinary three-year period during which sterling rose strongly, allowing the United Kingdom to repay much of what was borrowed over the years when sterling was weak.

In 1977-79, sterling appreciated vis-à-vis the dollar by some 23 per cent, and the effective rate rose by some 9 per cent. United Kingdom prices rose more sharply than those of its competitors, however, causing the real effective rate to rise by some 28 per cent. Britain's competitive position was squeezed dramatically over these years, not only by the revaluation but, even more important, by relatively high inflation. North Sea oil was the fundamental reason for sterling's strength. Not only did it make a direct impact on the current account (see Table 11), but it also provided important psychological support for sterling, giving it a kind of immunity from future oil crises. During 1979, moreover, when the current account took a new turn for the worse, sterling continued to receive considerable support from high U.K. interest rates.

Another important development toward the end of this period was the progressive dismantling of exchange controls by the new Conservative Government, which took office in May 1979. These controls were relaxed in the summer of 1979 and finally abolished altogether in October. While the principal objective of the dismantling of controls was ideological, the timing was not unrelated to sterling's strength.

Sterling's rebound. From December 1976 to June 1977, the monetary authorities succeeded in repegging the dollar exchange rate within narrow bounds and thus took advantage of sterling's strength to build up reserves.

TABLE 11
CONTRIBUTION OF NORTH SEA OIL AND GAS TO U.K. BALANCE OF PAYMENTS, 1973-79
(in billions of pounds)

	1973	1974	1975	1976	1977	1978	1979
1. Value of oil and gas sales	0.5	1.1	1.5	2.4	4.5	5.2	10.5
2. Net imports of goods and services less exports of some services directly for program	-0.2	-0.3	-0.8	-1.2	-1.2	-0.7	-0.8
3. Interest, profits, and dividends due overseas	...	...	...	...	-0.4	-0.6	-1.2
4. Net contribution to current account	0.3	0.8	0.7	1.2	2.9	3.9	8.5
5. Net effect on capital account	0.1	0.2	1.0	1.2	1.4	...	0.7
6. Visible balance	-2.4	-5.2	-3.2	-3.9	-2.2	-1.5	-3.3
7. Oil balance	-0.9	-3.3	-3.0	-3.9	-2.8	-2.0	-0.8
8. SNAPS balance ^a	...	...	...	-0.2	-0.5	-0.1	-0.1
9. Underlying non-oil visible balance (6 minus 7 and 8)	-1.5	-1.9	-0.2	+0.2	+0.9	+0.6	-2.4

^a Ships, North Sea production installations, aircraft, and precious stones.

SOURCE: Bank of England (1979, 1980).

In those months alone, reserves increased by nearly \$7.5 billion. This was more than double the loss of some \$3 billion between March and December 1976. Between July and October 1977, the objective shifted from pegging the dollar rate to pegging the effective rate. Reserves continued to increase, rising by a massive \$9 billion.

The strength of sterling may be seen in the progressive fall in the forward discount on sterling illustrated in Figure 15. By October, it had been converted into a forward premium, the first since the float of June 1972. The interest-rate differential turned dramatically in favor of U.S. investment, but the covered differential stayed close to zero most of the time. Thus, the monetary authorities allowed interest rates to fall sharply as external conditions improved.

This episode is particularly interesting because it posed problems for monetary policy exactly opposite to those the United Kingdom had confronted earlier. In its Annual Report for the year ending February 1978, the Bank of England wrote:

For much of the year external factors had a major and expansionary influence on domestic monetary conditions. The turnaround in market expectations about the exchange rate attracted substantial flows into sterling during the year. . . . From

November 1976 until November 1977 pressure in the markets was almost continuously towards lower interest rates. The downward pressure on short-term rates came in large part from the inflows.

The importance of these external developments for the conduct of monetary policy is vividly demonstrated in Table 12, which shows how the M-3 (sterling) target of 9-13 per cent was substantially exceeded for the financial year 1977/78.

TABLE 12
GROWTH IN U.K. STERLING M-3: TARGETS AND OUTCOMES, 1976-80
(in per cent)

	Target	Outcome
1976-77 ^a	12%	10%
Year to Apr. 1978 ^b	9-13	15.9
Year to Apr. 1979	8-12	10.9
Year to Oct. 1979	8-12	13.2
June 1979-Apr. 1980	7-11	17.2

^a Set in July 1976 at annual rate.

^b First full year.

^c Annual rate.

SOURCE: *OECD Economic Outlook*.

Continuing strength. From October 1977, an attempt was made to let sterling float more freely without a target exchange rate. In its Annual Report for the year ending February 1978, the Bank of England wrote: "Official intervention to hold down the rate ceased at the end of October. Thereafter the main concern of the authorities was with smoothing operations designed to maintain an orderly market." As Saville (1980) put it, the "aim was that intervention should average at zero over a period of months." This objective appears to have been met with some degree of success. Between end October 1977 and end December 1979, currency reserves remained virtually unchanged at some \$18 billion. In general, the monetary authorities purchased reserves when sterling was strong and sold them when sterling was weakening. Thus, the monetary authorities carried out smoothing operations without altering the fundamental trends in the exchange rate produced by market forces.

The decision to allow the rate to float more freely finally resolved a conflict that had been occupying the monetary authorities for most of the year. The Bank of England wrote in its 1978 Annual Report:

There was a potential conflict between the policy of maintaining exchange rate stability and the policy of restraining the monetary aggregates. In the early part of the year, the unwelcome effects of continuing inflows on the money supply had been largely absorbed or offset. . . . But the conflict sharpened in the au-

tumn. . . . It was clear that the exchange rate could no longer be kept down without risking excessive expansion of the monetary aggregates. . . . Maintenance of control over the monetary aggregates was the higher priority. Official intervention . . . therefore ceased at the end of October.

Despite the apparent resolution of the conflict in favor of monetary control, the same difficulties reappeared in a more moderate form in early 1979. On March 1, 1979, Minimum Lending Rate was reduced to 13 per cent, a decision which may have owed something to the preceding inflows. In the 1979 Annual Report, the Bank of England made this comment about the period immediately following reduction in MLR:

Thereafter it was clear that a further reduction in short-term interest rates would be inappropriate for domestic monetary policy. . . . On the other hand, the external inflows seemed likely either to bring about an undue appreciation of the exchange rate or if this were prevented by intervention, to undermine domestic monetary control. Striking a balance between these considerations it was decided to reduce MLR to 12% on April 5 and to modify exchange market tactics so as to allow a wider fluctuation in the rate.

Nevertheless, there is evidence that interest-rate policy after October 1977 was directed more at domestic than at external objectives (see Hacche and Townend, 1980).

In July 1979, when inflows were heavy again, the Bank of England tried to counter them by a further dismantling of exchange controls. The Federal Reserve Bank of New York (1979, p. 60) wrote:

The perception that the Bank of England, reluctant to compromise its control of the money supply, would restrain its intervention in the exchanges also propelled sterling higher. In these circumstances, the authorities accelerated their policy of relaxing exchange controls by lifting totally all restrictions on overseas direct investment and easing those on outward portfolio investment.

After July, interest rates rose overseas while remaining relatively constant in the United Kingdom, causing the U.K. interest-rate advantage to slip. In October, too, the remaining exchange controls on resident outflows were removed. These factors combined to weaken sterling, and the monetary authorities sold reserves to moderate the fall. In November, however, predominantly for domestic reasons, interest rates rose very sharply. This led to renewed inflows and to a sharp rise in sterling, which was moderated by purchases of dollars.

6 SUMMARY, EVALUATION, AND CONCLUSIONS

An Evaluation of Intervention

Table 13 summarizes and compares the experience of Germany, Japan, and the United Kingdom with the use of intervention. Two calculations are presented for each calendar year from 1973 to 1979. (The calendar year may, of course, be arbitrary for this purpose.) The first calculation, the volume of gross intervention, provides an indication of the extent of intervention, irrespective of direction. The second, the volume of net intervention, takes account of signs and thus provides an indication of the degree to which intervention was reversed within each year.

Consider, first, gross intervention. Excluding 1973, which we can regard as a settling-in period, Germany and Japan resorted increasingly to intervention; its volume increased over the period, peaking in 1978 and 1979. By contrast, intervention by the U.K. authorities peaked in 1977, when it reached massive levels.

Consider, next, net intervention. On this measure, intervention increased in Germany to 1978 and fell sharply in 1979. In Japan, net intervention increased over the period as a whole, peaking in 1979. In the United Kingdom, net intervention peaked in 1977, like gross intervention, and fell sharply in 1978 and 1979. There were very few years when net intervention by any country was negligible (below, say, 2 per cent of imports), and there were runs of years when net intervention continued in the same direction (1976-78 in Germany and Japan and 1973-76 in the United Kingdom).

Motives and emerging conflicts. The theoretical discussion in Chapter 2 made reference to various objectives for intervention. With these objectives in mind, let us review briefly the motives underlying intervention in the three countries, noting at the same time how potential conflicts emerged in their pursuit.

Germany and Japan had somewhat similar experiences, so they may be treated together. In 1974 and 1975, intervention was motivated predominantly by "smoothing" objectives. (The term "smoothing" here applies essentially to the first two allocative objectives mentioned in Chapter 2: counteracting private-sector inefficiency and acting from superior information.) From 1976 until late 1978, however, when current-account surpluses were large and the currencies were strong, the motives for intervention were more complex. The desire to take advantage of the price-deflationary benefits of appreciation contended with concern over the adverse effects of a strong currency on employment and on the traded-goods sector. In addition, there was a desire to lean against the wind, to achieve smoother structural adjustment, and in 1978 there was a feeling that the appreciations had

TABLE 13
GROSS AND NET INTERVENTION IN GERMANY, JAPAN, AND
THE UNITED KINGDOM, 1973-79^a

Country	1973 ^b	1974	1975	1976	1977	1978	1979
Germany:							
Gross	15.3	7.9	6.5	9.4	6.7	10.3	16.3
Net	+ 4.8	- 0.8	-1.0	+ 3.4	+ 3.8	+ 6.9	- 1.6
Japan:							
Gross	22.6	7.6	5.4	6.1	8.3	15.3	15.3
Net	-22.6	+ 2.3	-1.3	+ 5.7	+ 7.9	+10.6	-12.5
U.K.:							
Gross	9.4	10.8	8.0	16.1	23.7	7.0	6.6
Net	- 6.7	-10.7	-8.0	-14.2	+21.5	- 3.6	+ 4.3

^a Gross intervention is defined as the sum of the months, irrespective of signs, divided by exports in that year. Net intervention is the same except that the sum of the months takes account of signs. + (-) indicates that, on balance, the central bank bought (sold) reserves.

^b Sums are annualized: Germany from April, Japan from March, U.K. from January.

been excessive (possibly in light of the long lags in the adjustment of the trade balance to a change in the exchange rate). In 1979, smoothing objectives were again dominant in Germany, but in Japan a chief objective was to avoid the inflationary effects of the sharp fall in the yen.

Until late 1976, the United Kingdom had mixed reasons for propping up sterling: to avoid an inflationary spiral (the vicious-circle case), to moderate the reduction in real absorption that would otherwise have taken place, and, especially in 1976, to avoid what appeared to be an excessive depreciation of sterling (perhaps again taking account of lags in adjustment). During most of 1977, there was a desire to rebuild reserves. After October 1977, smoothing objectives became dominant as the authorities tried to regain control over monetary policy. At the same time, as in Germany and Japan, a strong currency was seen as a means of controlling inflation. On the other hand, there was the usual concern in the later period about the adverse effects of a strong currency on employment and on the traded-goods sector.

There is now a substantial literature on the subject of intervention and motives for intervention that attempts to explain intervention econometrically.¹ The most important explanatory variable in these studies is the percentage change in the nominal or real exchange rate, reflecting in effect a policy of leaning against the wind. Other variables, such as lagged intervention or levels of unemployment, also appear to be significant in some cases.

¹ See Artus (1976), Black (1979), Dornbusch (1980), Hacche and Townend (1980), Longworth (1980), Quirk (1977), and Wonnacott (1980).

Table 14 shows the results of econometric work on intervention for Germany, Japan, and the United Kingdom in the 1973-79 period, focusing particularly on a leaning-against-the-wind variable and on the lagged-intervention variable. The results confirm the importance of a leaning-against-the-wind policy.² In general, the percentage change in the nominal effective rate has more explanatory power than the percentage change in the real effective rate. The lagged-intervention variable is also significant for Japan and for the United Kingdom in the earlier period. For the United Kingdom, over 50 per cent of intervention is explained by the variables; for Germany and Japan, the explanatory power is much lower.

TABLE 14
INTERVENTION EQUATIONS, MARCH 1973-DECEMBER 1979

Country	Constant	Independent Variable			R ²	DW	h
		\dot{E}	\dot{E}	I_{-1}			
Germany	-41.2 (- 0.1)	115.4 (5.1)		a	0.25	2.0	
	369.2 (1.2)		104.4 (4.6)		0.20	2.0	
Japan	11.2 (0.1)	210.5 (3.7)		0.16 (1.5)	0.24		-0.026
	45.7 (0.4)		147.4 (2.8)	0.24 (2.3)	0.18		-0.017
United Kingdom:							
Mar. 72-Oct. 77	112.8 (1.4)	163.1 (3.6)		0.62 (5.3)	0.53		0.00113
	- 1.8 (0.0)		145.6 (3.6)	0.67 (5.8)	0.53		0.0043
Nov. 77-Dec. 79	-13.2 (0.2)	252.6 (5.5)		0.08 (0.8)	0.61		-0.0098
	-92.7 (1.1)		216.8 (5.2)	0.08 (0.8)	0.59		-0.101

^a Not significant.

VARIABLE:

\dot{E} = percentage change in effective rate.

$\dot{E}r$ = percentage change in real effective rate.

I_{-1} = lagged intervention.

t-statistics shown in parentheses.

² A word of caution about this relationship: the equation suggests that causation has run principally from exchange rates to intervention. Causation could run the opposite way (with opposite sign) from intervention to the exchange rate.

Profitability. I argued in Chapter 2 that where markets are inefficient or where there are restrictions on the use of, or access to, information, intervention is potentially profitable for the central banks. An obvious way, therefore, to evaluate the success of intervention in these instances is to see if intervention was in fact profitable.

Unfortunately, there are difficulties in carrying out this test. First, it is not easy to determine how much intervention is actually motivated in this way. As we have already seen, there are other reasons for intervention. Second, monthly measures of intervention are suspect, so that refined calculations of profitability may be subject to a substantial margin of error. Third, one should apply the test only to periods during which net intervention was zero. This application would be most consistent with the spirit of intervention animated by the motives mentioned above and would also avoid difficulties associated with valuing initial and terminal stock positions. Fourth, even if there was no net intervention over a given period, there is still the difficulty of determining which interest rates to use and how to do the actual calculations.

Despite these difficulties, some modest use of these calculations can probably be justified. Although they may not be very accurate, the calculations may still give us some idea of the degree to which intervention was profitable. If intervention was profitable, there would be a reasonable presumption that it was also stabilizing.³ Finally, if other objectives were important in motivating intervention, these calculations may be indicative of the costs, if any, associated with the pursuit of those objectives.

For each country, I selected only periods over which net intervention was close to zero. The periods that met this criterion for each country are shown in Table 15.⁴ Bearing in mind the way in which the periods were selected, we can view the exercise as amounting to arbitrage on an uncovered basis. Therefore, two considerations are relevant in calculating the profitability of intervention: the difference in interest rates and the exchange rates at the times when the transaction is initiated and reversed. To take a concrete illustration, suppose that a central bank buys dollar reserves at given exchange rates over successive months and that these reserves are sold subsequently, again over successive months, at a different exchange rate. For each reserve transaction, we can calculate the gain or loss on the

³ This assertion goes back to Friedman's contention that destabilizing speculators would necessarily lose money. The counterclaim is that speculators can make profits and yet stabilize exchange rates (see Friedman, 1953; Schadler, 1977; Sohmen, 1969, Chap. 3; and Yeager, 1976, Chap. 14).

⁴ The period October 1973 to April 1977 for Germany was also one where "net intervention" was very close to zero. But much of the intervention here was associated with the joint float and the data become particularly unreliable for use by our method.

interest differential over the relevant time period (e.g. from investment in dollars as against domestic investment), as well as the gain or loss on the difference between the exchange rates. The base period for the calculation in each case is the date on which the initial purchase of dollars took place, the assumption being that the earliest purchases are liquidated first.

Table 15 shows the results of these calculations. There are three instances of success, where the central banks would have profited from their net interventions, but also instances of failure, where the central banks would have incurred losses on their transactions. There is an instance of success on both fronts, interest rates and exchange rates, in the U.K. case from March 1978 to December 1979, and there is an instance of failure on both fronts in the Japanese case from March 1973 to October 1977. Perhaps the most interesting conclusion to be extracted from the table is that intervention over extended periods was relatively unsuccessful on the criterion of profitability (in the Japanese case from March 1973 to October 1977 and in the U.K. case from September 1974 to December 1977)⁵ but was relatively successful in all three countries over the shorter recent periods, when intervention was relatively quickly reversed.⁶

TABLE 15
PROFITS AND LOSSES ON INTERVENTIONS^a

	<i>Profit (+) or Loss (-)</i>		<i>Total</i>
	<i>On Interest-Rate Differential</i>	<i>On Exchange Rates</i>	
Germany:			
Mar. 1978–May 1979	+	-	+
Japan:			
Mar. 1973–Oct. 1977	-	-	-
Nov. 1977–Dec. 1979	+	-	+
U.K.:			
Sept. 1974–Dec. 1977	+	-	-
Mar. 1978–Dec. 1979	+	+	+

^a Data were very slightly adjusted to ensure that net intervention was zero.

⁵ Calculations made for Germany for the period October 1973 to April 1977 also showed losses but, as already indicated, the data here are particularly unreliable.

⁶ See also Taylor (1980), who finds that since the float many central banks have incurred large losses on their intervention. His methodology is different, however. He does not select only periods when net intervention was zero, and so some reassessment of purchases and sales is required.

Table 16 documents in more detail the case of successful intervention by the United Kingdom between March 1978 and December 1979. Dollars were first sold and then repurchased. It is clear from the table that, in general, the monetary authorities sold dollars when the dollar was relatively strong and bought them again when the dollar had weakened. By investing in sterling instead of dollars, moreover, they earned a higher interest rate. Furthermore, from July to October 1979, the monetary authorities bought dollars when the dollar was relatively weak and sold them when it strengthened. This relatively small transaction, however, would have yielded losses on the interest differential, since the U.K. interest rate was higher than the U.S. rate.

To sum up the U.K. case, had private speculators sold dollars initially

TABLE 16
INTERVENTION, INTEREST-RATE DIFFERENTIALS, AND EXCHANGE-RATE TRENDS
IN THE UNITED KINGDOM, MARCH 1978-OCTOBER 1979

	<i>Amount of Intervention^a (in millions of dollars)</i>	<i>Interest-Rate Differential (U.K. - U.S.)</i>	<i>Mean Exchange Rate (\$ per £)</i>
1978:			
Mar.	- \$ 281	-0.47	1.86
Apr.	- 2,115	0.54	1.83
May	- 650	1.88	1.82
June	- 62	2.37	1.86
July	+ 328	2.38	1.93
Aug.	- 151	1.30	1.94
Sept.	+ 63	1.28	1.97
Oct.	+ 107	2.22	2.09
Nov.	- 332	2.57	1.95
Dec.	+ 155	2.37	2.03
1979:			
Jan.	+ 59	2.83	2.00
Feb.	+ 168	2.78	2.02
Mar.	+ 1,017	2.01	2.07
Apr.	+ 675	1.64	2.06
May	+ 303	1.88	2.07
June	+ 599	4.55	2.17
July	+ 1,111	4.22	2.28
Aug.	- 146	3.68	2.25
Sept.	- 431	3.13	2.20
Oct.	- 417	1.33	2.08

^a Data were slightly adjusted to ensure that net intervention was zero (November and December 1979 were dropped and July 1979 was slightly adjusted).

and bought them back subsequently, they would presumably have made profits and would probably have stabilized the exchange rate at the same time.

Exchange-rate stabilization. I report next the results of work designed to evaluate the degree to which intervention stabilized exchange rates. I take intervention to be stabilizing if it pushed the exchange rate in the direction of its "long-run" level. The "long-run" exchange rate is defined in two ways: in terms of PPP and in terms of a 6-month, 12-month, or 18-month centered moving average of the effective exchange rate.⁷ The first definition has well-known weaknesses. The second has the weakness that one-sided intervention over the essentially arbitrarily selected period will disguise the true long-run rate.

Table 17 shows the results for the PPP test. For Germany, net intervention was stabilizing in all three periods when there were sustained deviations from PPP. Whenever the effective rate was above the PPP rate, for example, the monetary authorities tended to buy reserves in a way that dampened the deviation. For Japan, there was only one period when net intervention appeared on this test to be destabilizing, but it was protracted, running from July 1974 to October 1977. Although the yen was below PPP, the monetary authorities tended to buy reserves and thus pushed the yen farther away from PPP. For the United Kingdom, there was one extended period (April 1974 to March 1976) when intervention may have been destabilizing. In all other periods, intervention appears to have been stabilizing.⁸ Again we note that the three countries' intervention was stabilizing by this test in the most recent periods.

Table 18 shows the results of regressing intervention against the percentage deviation of the effective exchange rate from PPP for the entire period. For all three countries, the coefficient of the independent variable is positive, but it is not significant in Germany and Japan, and the overall explanatory power for these two countries is also very poor. Only for the United Kingdom is the coefficient significant with satisfactory explanatory power.

The results of tests using the alternative measure of the long-run exchange rate, the centered moving average, are summarized in Table 19. These indicate that intervention was stabilizing, on balance, over the whole period, strikingly so in the case of Germany and the United Kingdom. The coefficient of the percentage deviation from the moving average is consis-

⁷ Wonnacott (1980) uses a test of the second kind for U.S. intervention. Using a twelve-month centered moving average, he finds that U.S. intervention was, on balance, stabilizing.

⁸ Note that the PPP test may be particularly inappropriate for the United Kingdom from late 1977 because of the development of North Sea oil (see Figs. 11 and 12).

TABLE 17
INTERVENTION AND DEVIATIONS OF THE EFFECTIVE EXCHANGE RATE
FROM PPP, 1973-79

	<i>Sign of Deviation^a</i>	<i>Sign of Net Intervention^b</i>
Germany:		
Mar. 1973-June 1975	+	+
July 1975-Feb. 1976	-	-
Mar. 1976-Dec. 1979	+	+
Japan:		
Mar. 1973-Nov. 1973	-	-
Dec. 1973-June 1974	+	+
July 1974-Oct. 1977	-	+
Nov. 1977-Mar. 1979	+	+
Apr. 1979-Dec. 1979	-	-
U.K.:		
July 1973-Mar. 1974	-	-
Apr. 1974-Mar. 1976	+	-
Apr. 1976-Apr. 1977	-	-
May 1977-Dec. 1979	+	+

^a + (-) indicates that the effective rate was higher (lower) than PPP rate.

^b + (-) indicates that, on balance, the central bank bought (sold) reserves.

tently positive: the larger the deviation, the greater was the intervention in the appropriate direction.

Conclusions. The results are mixed. On the criterion of profitability, interventions that summed to zero were apparently successful when they were limited to fairly short periods but relatively unsuccessful over very long periods. On the criterion of stability and using the tests described above, there is suggestive evidence that intervention was stabilizing.⁹

Use of Financial Policy and Monetary Intervention

From 1973 to 1975, Germany's financial policies were free of the external constraint; such intervention as was undertaken was usually sterilized. In 1976, however, intervention commitments under the joint float forced the German authorities to adopt a more expansionary monetary stance for external purposes. The same thing may have happened in 1978, when there

⁹ It is important to note that, whereas profitable intervention in relatively free markets carries a presumption that markets are inefficient and that intervention has stabilized exchange rates, a demonstration that intervention has been stabilizing does not imply either inefficiency or that there were unexploited profits.

TABLE 18
INTERVENTION AND PERCENTAGE DEVIATIONS OF THE EFFECTIVE
EXCHANGE RATE FROM PPP, 1973-79

Country	Independent Variable:			DW ^a
	Constant	% Deviation from PPP	\bar{R}^2	
Germany	- 12.6 (0.2)	143.5 (1.1)	0.02	1.95
Japan	83.9 (0.45)	18.4 (0.89)	0.10	2.00
U.K.	-156.7 (0.93)	33.7 (1.9)	0.33	2.07

^a After Cochrane-Orcutt correction.
t-statistics shown in parentheses.

TABLE 19
INTERVENTION AND PERCENTAGE DEVIATIONS OF THE EFFECTIVE EXCHANGE RATE
FROM THE CENTERED MOVING AVERAGE, 1973-79

Averaging Period	Independent Variable:			DW ^a
	Constant	% Deviation from Centered Moving Average	\bar{R}^2	
Germany:				
6-month	270.3 (0.8)	1,152.7 (3.6)	0.18	2.00
12-month	238.1 (0.57)	576.6 (2.2)	0.16	2.01
18-month	228.9 (0.48)	677.0 (2.5)	0.23	1.96
Japan:				
6-month	75.6 (0.51)	137.4 (1.4)	0.09	1.98
12-month	132.1 (0.83)	104.7 (1.6)	0.10	2.03
18-month	169.4 (0.99)	44.3 (0.87)	0.06	1.97
U.K.:				
6-month	- 8.2 (-0.06)	174.8 (3.1)	0.39	2.10
12-month	55.1 (0.32)	115.7 (2.2)	0.36	2.11
18-month	6.4 (0.03)	89.9 (1.6)	0.33	2.13

^a After Cochrane-Orcutt correction.
t-statistics shown in parentheses.

was large-scale intervention in support of the U.S. dollar. Finally, by late 1979 and into 1980, there were again signs that German interest rates were being adjusted, in part at least, to counteract external trends.

Japan used exchange controls to retain monetary control throughout most of the period, despite the fact that Japanese intervention was on an even larger scale than German intervention. Japan's financial policies, however, were not entirely free from the external constraint. The more expansionary financial policies resumed in 1978 may have owed a little to the strong external position. In 1974 and again in 1979, financial policy was partly directed at correcting the deteriorating external position. Finally, toward the end of the period, Japan became more financially integrated with the outside world and there were some signs of diminished monetary independence.

The United Kingdom's monetary (and, to a smaller extent, fiscal) stance was the least independent of the three. In general, certainly until late 1977, domestic interest rates tended to be adjusted in light of external developments, rising or falling with U.S. interest rates and, given U.S. rates, rising or falling as sterling weakened or strengthened. After October 1977, however, there was substantially more monetary independence.

Use of Capital Controls

Japan made the most extensive use of capital controls, as a means of offsetting persistent current-account developments and of protecting its own monetary policies. Toward the end of the period and into 1980, however, these controls were significantly liberalized.

In Germany, restrictions on inflows were tightened during 1973 but then progressively dismantled, and they had been largely abandoned by 1975. There was a half-hearted attempt to reintroduce them in 1978, but it was quickly reversed.

Until 1979, exchange controls in the United Kingdom were tilted toward discouraging net outflows. In 1976, when sterling was very weak, these controls were tightened, but in 1979, when sterling was strong (but also for ideological reasons), the controls were progressively dismantled.

How effective were these controls? One way to evaluate their effectiveness is to focus on developments in the component of the capital account at which the controls were directed. The obvious weakness of this approach is that these effects may be offset by developments in "freer" components of the capital account. A second way is to evaluate effectiveness econometrically by explicitly allowing for controls in a capital-flow equation. Apart from the difficulties of explaining capital flows econometrically and representing the controls as explanatory variables, this method is clearly applicable only when the capital controls are varied over time. Finally, one can

look at trends in the covered interest differential in relation to the nature of the controls. If there are restrictions on net outflows, for example, one would look to see if the covered differential tends to favor investment overseas; if so, one might infer that opportunities for profiting from overseas investment are effectively restricted. If one observes changes in the covered interest differential associated with changes in the controls (e.g. new restrictions on inflows associated with the opening up of a covered differential favoring domestic investment), there would be presumptive evidence of effectiveness. One obvious difficulty with this last approach is that controls tend to be introduced during "crises," when one might expect to see departures from covered interest parity in any event (see Frenkel and Levich, 1977).

It is evident that there is no foolproof method of evaluating the effectiveness of controls. One has to rely on judgment, together with whatever evidence is available. Unfortunately, despite the importance of the issue, the literature remains somewhat sparse and controversial.¹⁰ Even in the countries in which controls have operated, official opinion is sharply divided on their effectiveness.¹¹

German experience over the period 1970-73 provides an almost classic illustration of the frequently made comment that controls tend to proliferate and extend beyond their original boundaries to close loopholes in earlier controls. After reviewing Germany's experience over those years in detail, Baumgartner (1977, p. 39) concludes with considerable skepticism about the usefulness and effectiveness of controls:

In order to reduce capital inflows caused by the relatively higher degree of monetary tightness in the domestic economy, Germany first introduced discriminatory minimum reserve requirements against the growth (and subsequently also against the level) of banks' liabilities to non-residents, and required prior authorization for the sale to non-residents, of money market paper and for *en pension* transactions regarding domestic fixed-interest securities for money market investment. Soon these measures had to be supplemented by a cash deposit for non-bank borrowing abroad (tightened in several stages) and the prior authorization requirement was extended step-by-step to cover all kinds of securities (including shares) in an effort to close loopholes that were widely used for evading the regulations. Finally, borrowing by non-bank residents from non-residents, certain inward direct investment, and the cession of claims to non-residents were restricted administratively, and banks were requested not to sell to non-residents their portfolio holdings of deutsche mark bonds of foreign issuers. These measures aimed at containing capital imports, whether induced by differing monetary

¹⁰ See Argy (1971), Baumgartner (1977), Dooley and Isard (1980), Hewson and Sakakibara (1975, 1977), Mills (1972), and the references cited in these papers.

¹¹ This is my impression from talking to central bankers.

conditions or exchange rate expectations, and were complemented in this respect by the restriction of approvals for the payment of interest on bank deposits of non-residents.

Econometric studies of the effectiveness of German capital controls reach very similar conclusions. A study by Hewson and Sakakibara (1977, p. 664), covering the period January 1968 to April 1973, concluded:

While it is acknowledged that these results—based on equations in which some of the capital control variables were dummies—should be interpreted with caution, the consistency and robustness of the results for all equations estimated seem to support the contention that while the German capital controls program was effective with regard to an important range of items in the capital account, its effectiveness was undermined by offsetting movement in items which were either uncontrolled or not entirely restricted.

The only evidence that appears to conflict with this judgment comes from an examination of the covered differential. After 1974, when the Germans began to dismantle the controls, the covered differential was close to zero in nearly all months. By contrast, in 1970-73, when the controls were in operation, there was a significant covered differential in favor of investment in Germany most of the time; this margin was very large during 1973, when restrictions on inflows were most severe (see Fig. 5 above). This suggests that the restrictions may have prevented the exploitation of profitable investment opportunities in Germany.

Japan's economy was less closely integrated with the rest of the world, and capital movements were more tightly controlled. There is some presumption that the controls were largely effective in Japan's case. To illustrate, consider Japan's experience in the years 1977-79, reviewed in Chapter 4.

From mid-1977, capital controls were directed at discouraging inflows and encouraging outflows. In March 1978, these inward controls were tightened further. The reserve requirement against increases in free yen deposits was raised to 100 per cent, leading to a sharp fall in the interest rate paid on those deposits. Purchases by nonresidents of Japanese securities with a maturity of less than five years and one month were forbidden. From April 1978, the trend on that account changed radically, despite the continuing basic strength of the yen. Monetary inflows in March amounted to some \$1.9 billion, but by April these were replaced by a net monetary outflow of some \$1.9 billion. Up till March, net purchases by nonresidents grew rapidly; in the months that followed, through November, there were net sales. More generally, the tightening of controls in March served to reverse the sharp rise in the yen for the next two months. In March alone, official reserves increased by some \$5 billion; in April, they fell by some

\$1.7 billion. The trend in the covered differential favoring investment in Japan also appears to support these conclusions (see Figs. 9 and 10).

From early 1979, when the yen began to weaken, capital controls were tilted toward encouraging net inflows. As we saw, the restrictions on bank inflows and on nonresidents' purchases of domestic securities were eased. In the (relevant) second and third quarters of 1979, long-term outflows were some \$2.5 billion below the same quarters of 1978; also, the short-term capital account (including monetary movements) improved in the course of these two quarters by some \$7.5 billion. These changes occurred despite the facts that the interest differential had shifted in the meantime in favor of overseas investment and that expectations had become considerably less favorable to the yen. During 1979, too, the covered differential shifted significantly in favor of overseas investment, which was being restricted at the time.

Finally, the case of the United Kingdom is problematical. Because of its historically close financial and trade links with the rest of the world and the freedom offered to nonresidents to move capital in and out of Britain, there were, inevitably, large offsets to restrictions on outflows, particularly at times when interest-rate differentials or exchange-rate expectations provided strong incentives. Nevertheless, there is evidence that controls had some effect. First, the covered differential has tended in general to favor overseas investment, which was being restricted by the regulations (see Fig. 15). Second, when the controls were gradually dismantled in 1979, there was a universal expectation that sterling would weaken (Morgan Guaranty, 1979). To what extent this expectation was actually realized is very hard to determine because other important developments coincided with the relaxation of controls and served to favor sterling (e.g. high domestic interest rates and the oil-price increases).

From this review, we can draw the following conclusions about the experience of the three countries. Most of the evidence suggests that controls were largely ineffective in Germany. By contrast, there is a strong presumption that they were largely effective in Japan. The United Kingdom may be an intermediate case; despite important loopholes, controls had some residual effect. We can also conclude that capital controls are much more likely to be effective when directed at offsetting trends in the current account than when directed at offsetting differences in financial conditions.

Finally, and most important, with growing interdependence through the Euromarkets, trade, and the spread of multinationals, past experience with controls may no longer be a reliable guide to their effectiveness. Japan's more recent dismantling of controls may have been inspired as much by growing frustrations with controls as by the increasing international pressures being placed on Japan. Whatever the evidence of the past, then, it

appears that capital controls are likely to be even less effective under today's conditions. This is also the conclusion reached by a very recent GATT (General Agreement on Tariffs and Trade) study. In its summary of this study, the IMF said: "For capital controls to be effective, [GATT] argue[s], restrictions would have to directly cover every aspect of a country's international transactions—a proposition that is highly unlikely to succeed in a market economy" (IMF, 1980b, p. 372).

ANNEX
THE THREE-ASSET CASE

Consider an economy where three financial assets are available to non-bank residents: domestic money, domestic bonds, and foreign bonds. The sum of these three is assumed to comprise the total of financial wealth. With exchange rates assumed fixed, residents decide on the proportion of their financial wealth to hold in each of these assets, basing their decisions on domestic and foreign interest rates.

The model can be set out formally as follows:

$$\frac{M}{W} = -b_1rd - b_2rf \quad (\text{A-1})$$

$$\frac{D}{W} = b_3rd - b_4rf \quad (\text{A-2})$$

$$\frac{A}{W} = -b_5rd + b_6rf \quad (\text{A-3})$$

$$W = M + A + D, \quad (\text{A-4})$$

where M is volume of money, W is wealth, rd and rf are domestic and foreign interest rates respectively, D is domestic assets denominated in domestic currency, and A is foreign assets denominated in foreign currency.

This says that a rise in the domestic interest rate will lead to a reduction in the combined share of wealth held in money and foreign assets and an equivalent increase in the share of wealth held in domestic assets ($b_1 + b_5 = b_3$). At the same time, an increase in the foreign interest rate will lead to a reduction in the combined share of wealth in money and domestic bonds and an equivalent increase in the share of wealth held in foreign assets ($b_2 + b_4 = b_6$).

Consider, first, the case where the foreign interest rate falls and there is sterilization. In this case $\Delta M = \Delta W = 0$ and $\Delta A = -\Delta D$. The solution can be derived directly from equation (A-1):

$$\frac{\Delta rd}{\Delta rf} = -\frac{b_2}{b_1} \quad (\text{A-5})$$

It is evident that if $b_2 = 0$ (no excess demand for money is created by the fall in the foreign interest rate), the demand for domestic bonds will exactly match the supply and the interest rate will be unchanged.

If the surplus comes from the current account (C) (with $\Delta r_f = 0$) then $\Delta M = 0$, $\Delta W = C$, and $\Delta D = C - \Delta A$. The solution is

$$\frac{\Delta rd}{C} = \frac{M}{b_1 W^2} \quad (\text{A-6})$$

In both cases, then, as indicated in the text, the domestic interest rate will rise.

We now compare monetary intervention with monetary policy for a fall in the foreign interest rate (see pp. 10-11 above).

With monetary intervention, $\Delta M = -\Delta A$. In this case, the solution, from (A-2), is

$$\frac{\Delta rd}{\Delta r_f} = \frac{b_4}{b_3} \quad (\text{A-7})$$

The fall in the foreign interest rate will lead to a fall in the domestic interest rate.

With monetary policy, $\Delta D = \Delta M$, and the solution, from (A-3), becomes

$$\frac{\Delta rd}{\Delta r_f} = \frac{b_6}{b_5} \quad (\text{A-8})$$

Since $b_6 > b_4$ and $b_5 < b_3$, it follows that the fall in the domestic interest rate is greater in the second than in the first case, as argued in the text.

Without essential difficulty but by complicating the mathematics, one could add a third domestic asset (say, equities) to the model. The results in the text could be proven easily for this case too.¹

¹ For a formal presentation and discussion of the four-asset case, see Argy (1981b).

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