

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

PRINCETON STUDIES
IN INTERNATIONAL FINANCE

PRINCETON STUDIES IN INTERNATIONAL FINANCE are published by the International Finance Section of the Department of Economics of Princeton University. While the Section sponsors the Studies, the authors are free to develop their topics as they wish. The Section welcomes the submission of manuscripts for publication in this and its other series, ESSAYS IN INTERNATIONAL FINANCE and SPECIAL PAPERS IN INTERNATIONAL ECONOMICS. See the Notice to Contributors at the back of this Study.

Victor Argy is Professor of Economics at Macquarie University in Sydney, Australia. From 1969 to 1972, he was Chief of Financial Studies Division at the International Monetary Fund in Washington. He has since served as a Consultant to both the OECD and the IMF. He has written several articles in professional journals and is the author of a recent book, *The Postwar International Money Crisis: An Analysis* (1981).

PETER B. KENEN, *Director*
International Finance Section

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

INTERNATIONAL FINANCE SECTION

EDITORIAL STAFF

Peter B. Kenen, *Director*

Ellen Seiler, *Editor*

Linda Wells, *Editorial Aide*

Kaeti Isaila, *Subscriptions and Orders*

Library of Congress Cataloging in Publication Data

Argy, Victor E.

Exchange-rate management in theory and practice.

(Princeton studies in international finance, ISSN 0081-8070; no. 50)

Bibliography: p.

1. Foreign exchange administration.	I. Title.	II. Series.
HG3851.A74 1982	332.4'56'01	82-12015

Copyright © 1982 by *International Finance Section, Department of Economics, Princeton University.*

All rights reserved. Except for brief quotations embodied in critical articles and reviews, no part of this publication may be reproduced in any form or by any means, including photocopy, without written permission from the publisher.

Printed in the United States of America by Princeton University Press at Princeton, New Jersey.

International Standard Serial Number: 0081-8070

Library of Congress Catalog Card Number: 82-12015

CONTENTS

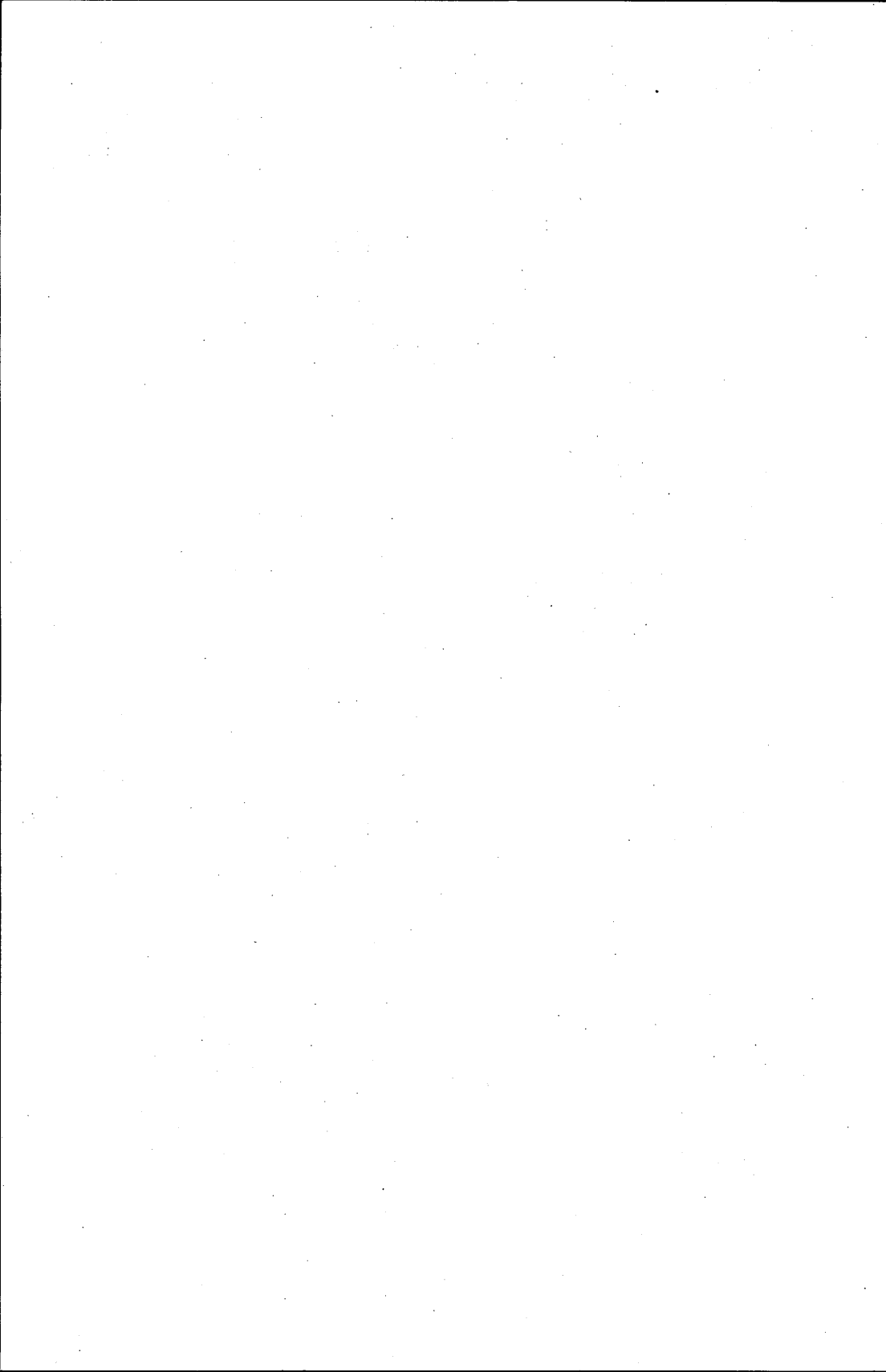
ACKNOWLEDGMENTS	vii
INTRODUCTION	1
 <i>Part I The Techniques and Theory of Exchange-Rate Management</i>	
1 TECHNIQUES OF MANAGING EXCHANGE RATES	5
Foreign-Exchange Intervention: Some Issues	5
The Use of Monetary Policy to Manage Exchange Rates	10
The Use of Capital Controls to Manage Exchange Rates	11
2 THEORETICAL RATIONALE FOR EXCHANGE-RATE MANAGEMENT	13
The Promotion of Allocative Objectives	13
The Promotion of Intertemporal Distributional Objectives	18
The Promotion of Stabilization Objectives	20
Rules for Exchange-Rate Management	26
 <i>Part II Experience with Exchange-Rate Management</i>	
3 GERMANY	33
Phase 1: April 1973 through 1975	33
Phase 2: 1976 through 1978	39
Phase 3: 1979	43
4 JAPAN	46
Phase 1: March 1973 through 1975	46
Phase 2: 1976 through 1978	51
Phase 3: 1979	52
A Summary Perspective on Japan's Exchange-Rate Policy	54
5 THE UNITED KINGDOM	55
Phase 1: 1973 through 1976	55
Phase 2: 1977 through 1979	63
6 SUMMARY, EVALUATION, AND CONCLUSIONS	67
An Evaluation of Intervention	67
Use of Financial Policy and Monetary Intervention	74
Use of Capital Controls	76
ANNEX: THE THREE-ASSET CASE	81
REFERENCES	83

LIST OF TABLES

1. Effects of an Increase in the Oil Bill	19
2. Built-In Properties of Alternative Monetary Regimes for Stabilizing Output	23
3. Background Facts on Germany, 1973-79	34
4. Changes in the Net External Position of the Deutsche Bundesbank (Balance of All Transactions) Due to Intervention, April 1973-December 1975	37
5. Changes in the Net External Position of the Deutsche Bundesbank (Balance of All Transactions) Due to Intervention, January 1976-December 1979	40
6. Growth in German Monetary Aggregates: Targets and Outcomes, 1974-79	42
7. Background Facts on Japan, 1973-79	47
8. Growth in Japanese Monetary Aggregates: Selected Targets and Outcomes	47
9. Background Facts on the United Kingdom, 1973-79	56
10. U.K. Official Borrowing, 1973-79	59
11. Contribution of North Sea Oil and Gas to U.K. Balance of Payments, 1973-79	64
12. Growth in U.K. Sterling M-3: Targets and Outcomes, 1976-80	65
13. Gross and Net Intervention in Germany, Japan, and the United Kingdom, 1973-79	68
14. Intervention Equations, March 1973-December 1979	69
15. Profits and Losses on Interventions	71
16. Intervention, Interest-Rate Differentials, and Exchange-Rate Trends in the United Kingdom, March 1978-October 1979	72
17. Intervention and Deviations of the Effective Exchange Rate from PPP, 1973-79	74
18. Intervention and Percentage Deviations of the Effective Exchange Rate from PPP, 1973-79	75
19. Intervention and Percentage Deviations of the Effective Exchange Rate from the Centered Moving Average, 1973-79	75

LIST OF CHARTS

1. Effective Exchange Rates and Relative Prices in Germany	35
2. Dollar Exchange Rates and Relative Prices in Germany	36
3. Dollar Exchange Rates and Intervention in Germany	38
4. German and U.S. Interest Rates	44
5. Interest-Rate Differential, Forward Discount, and Net Covered Differential in Germany	45
6. Effective Exchange Rates and Relative Prices in Japan	48
7. Dollar Exchange Rates and Relative Prices in Japan	49
8. Dollar Exchange Rates and Intervention in Japan	50
9. Japanese and U.S. Interest Rates	53
10. Interest-Rate Differential, Forward Discount, and Net Covered Differential in Japan	53
11. Effective Exchange Rates and Relative Prices in the United Kingdom	57
12. Dollar Exchange Rates and Relative Prices in the United Kingdom	58
13. Dollar Exchange Rates and Intervention in the United Kingdom	59
14. U.K. and U.S. Interest Rates	60
15. Interest-Rate Differential, Forward Discount, and Net Covered Differential in the United Kingdom	61



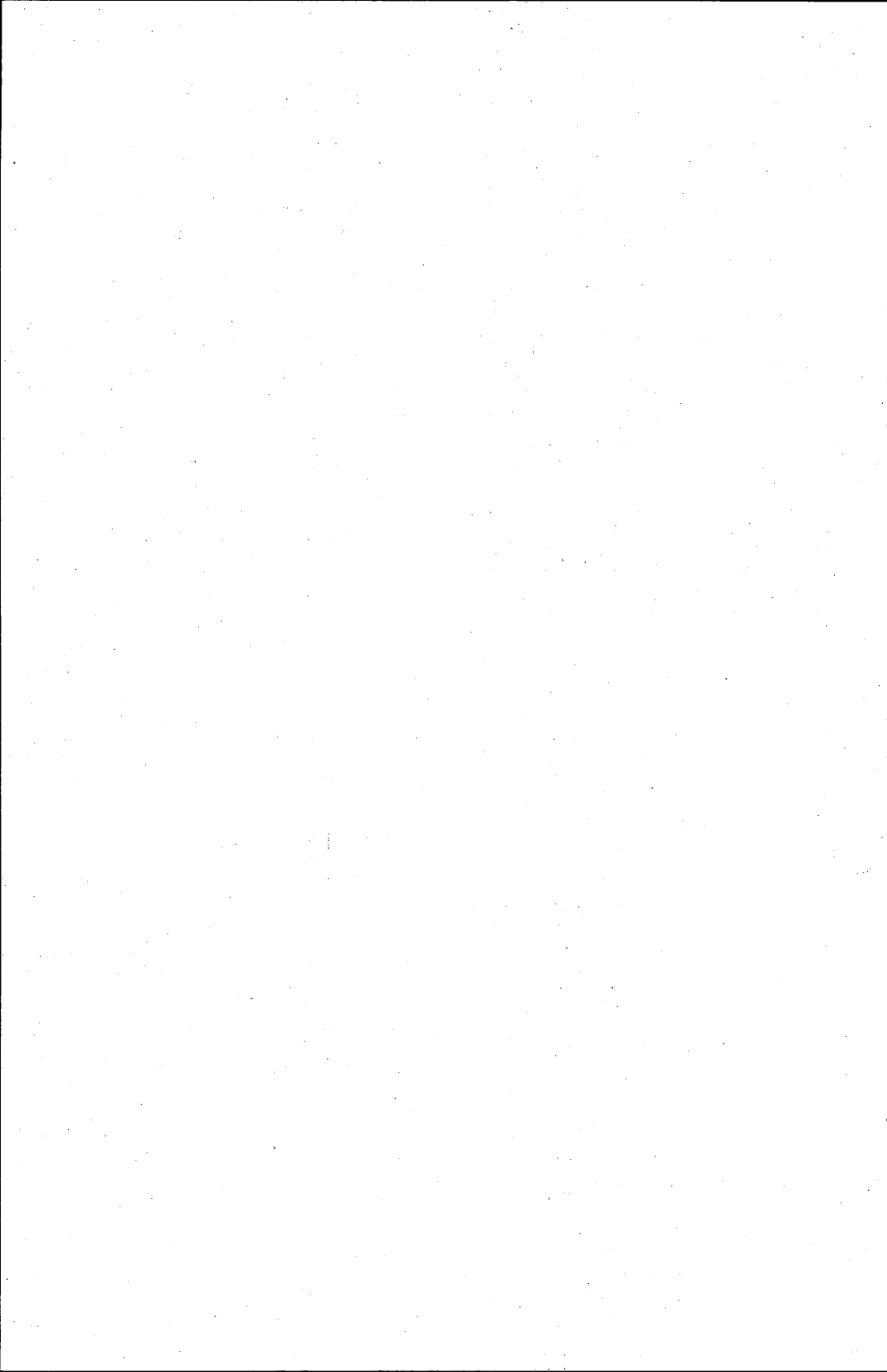
ACKNOWLEDGMENTS

Financial support for this study was provided by the Committee for Economic Development of Australia, Macquarie University, and the Reserve Bank of Australia.

I have benefited from comments from Peter Jonson, John Townend, the Bank of Japan, Percy Ip, Albert Knobl, Harry Vittas, and Duncan Ripley. None of these is, of course, responsible for errors in the text. Research assistance was provided by Muthi Semudram and Bryan Buchanan.

Chapter 2 was partly written while I served as a consultant at the Organization for Economic Cooperation and Development for three months during 1981. In those months I had helpful discussions with numerous colleagues. I am grateful to the OECD for allowing me to use some of this material.

The study is a substantially revised version of a larger study that was published as a monograph by the Committee for Economic Development of Australia in February 1982. I am grateful for permission to use parts of that original study.



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.

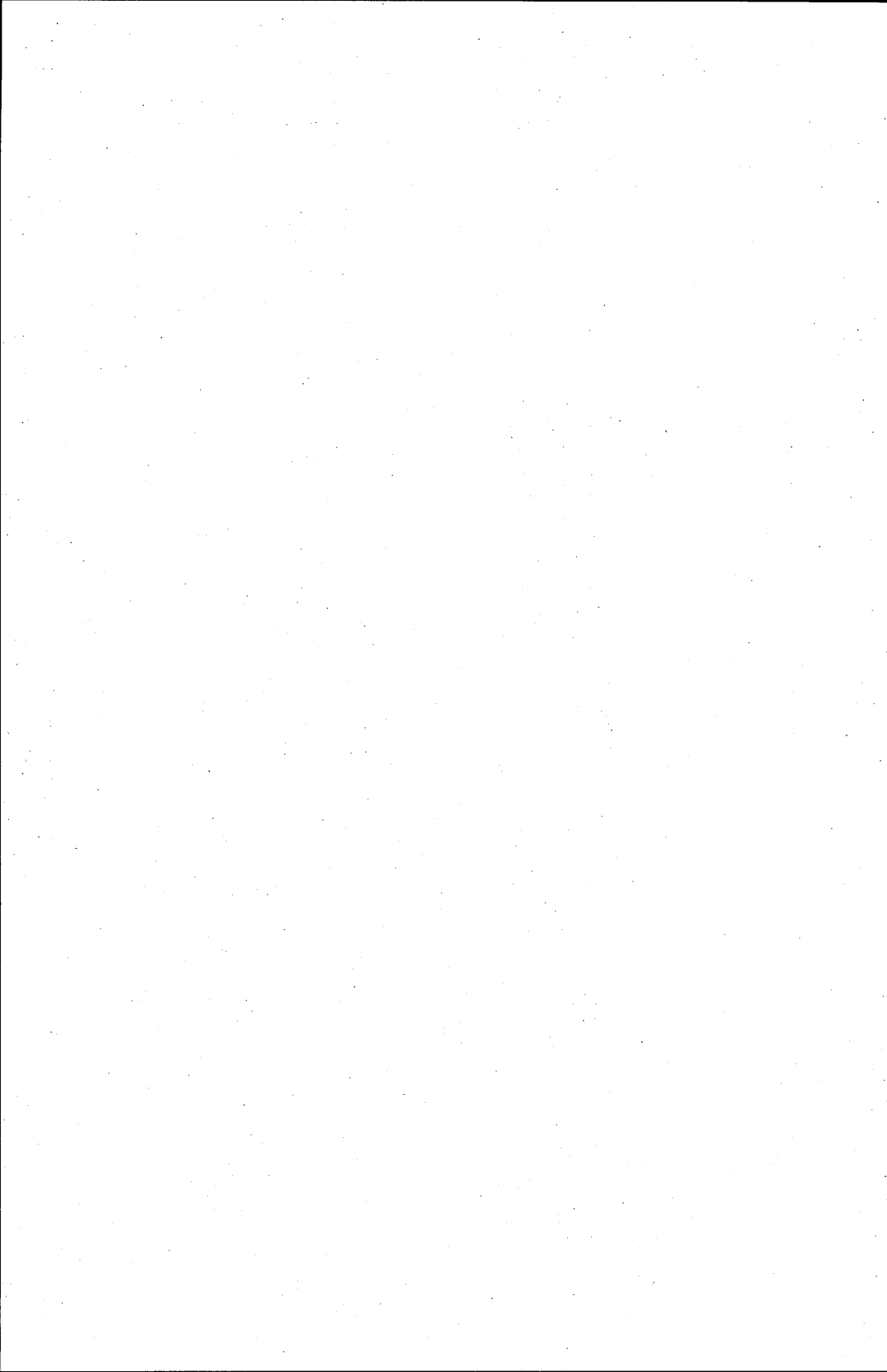
As in the case of Bretton Woods, however, there is a distinction to be made between the idealized free float and the way flexible rates have actually functioned since 1973. Exchange rates have been managed in a va-

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