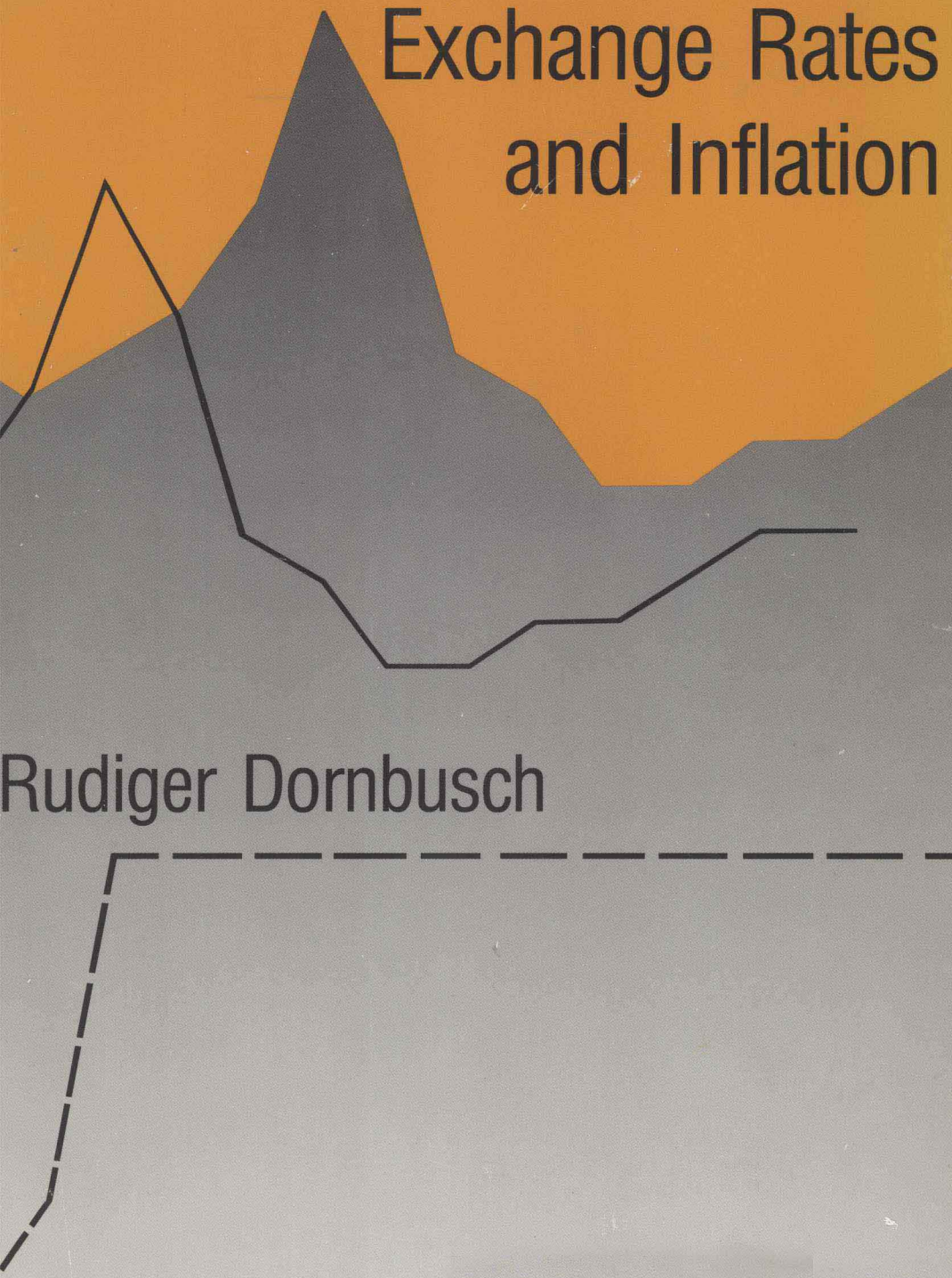
Exchange Rates and Inflation



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Introduction

This collection of essays brings together much of my scholarly work of the past fifteen years. I have selected for inclusion those papers that clarify an issue of open economy macroeconomics or open a direction of research. I have also included some simply because I like them.

A collection of essays reaching back fifteen years is a curious matter, given the pace and passion with which our profession creates and destroys schools of thought. Younger readers will be unaccustomed to the near absence of the rituals of maximization. They will find that the analysis covers many of the same problems they study, and often the results are similar to those they are finding today. In turn, what was written in the 1970s on open economy macroeconomics finds its ancestry in some form in the literature of the interwar period and even the late nineteenth century. It helps to have that broad perspective to recognize that most sensible things have been said before simply because the problems are old and interesting.

Fifteen years is a long time. The length is marked by the profession's passage from global monetarism to the new classical economics. Over time my interests, and some beliefs, have changed very much. As a student, and early in my career, models and results were exciting, and there could not be enough of it. Today my interest is mostly in policy and policy-oriented research. The difference is subtle: in modeling, the main interest is in the structure and the implications; in policy-oriented research, by contrast, the central issue is to capture a problem, even if one does not write down the whole maximization problem. That is a weakness of the policy approach, and it might even be enough to reject it altogether. I do not think so. On the contrary, there is a broad complementarity between modeling and identifying and "painting" issues.

Although much of policy-oriented open economy macroeconomics stands unproved, I am impressed with near-complete sterility of the intertemporal

approach in the face of actual policy issues. Perhaps, as it matures in the hands of some of the excellent scholars now working in that mode, it will come to yield a richer harvest.

I have accumulated in the past years more debts than the United States and all of Latin America combined. My students, at the University of Chicago, the University of Rochester, and since 1975 at MIT have been an unqualified pleasure. They have taught me, one way or the other, and they have given me the satisfaction of helping them learn and grow. There are many I would like to thank. I must also acknowledge among my own teachers and early colleagues some who have been especially important: Alexander Swoboda, Harry Johnson, Lloyd Metzler, Al Harberger, Ron Jones, Kark Brunner, and Michael Mussa. It is clear from my work that Robert Mundell has left his footprints all over it, and I will always be grateful for his teaching.

Since 1975 I have had the privilege to be part of MIT's Department of Economics. I cannot imagine a better place to do economics, and I must thank those of my senior colleagues who over the years shaped it into so civilized and excellent a place. Special thanks must go to Paul Samuelson and E. Cary Brown.

Special thanks go to Stan Fischer and Eliana Cardoso. Stan started as one of my thesis advisers and even today he occasionally rejects a draft. His warm friendship and support have been invaluable. Eliana has helped with love and advice and with almost unreasonable patience. I would finally like to acknowledge the generous editorial assistance of Carol McIntire who prepared the manuscript and saw this book through the publication process.

Contents

I Exchange Rate Theory

Introduction to Part I

This first part of the collection brings together a number of essays that sought to clarify major issues or break new ground.

The first essay, which comes from my Chicago Ph.D. dissertation in the full bloom of the monetary approach to the balance of payments, had as its purpose to show what exactly is the role of money in the context of devaluation. Work by Kemp and Hahn had discussed the monetary economics of devaluation in as formal a manner as possible and demonstrated clearly the implications of homogeneity. But they had made a simple problem more obscure than necessary. The first essay might be accused of the opposite, but at least it shows starkly that under conditions of full employment and price flexibility, devaluation works only to the extent that money is not fully accommodating. Moreover it makes it clear that this is a short-run result. Over time, as money is being accumulated via the balance of payments, the economy returns to the initial real equilibrium.

The second essay discusses the role of real exchange rates in the context of international transfers. It is shown that the Robinson-Metzler-Bickerdike elasticity condition emerges as the criterion for the impact of a transfer on the terms of trade under special conditions. The model in which this occurs is one with traded goods, home goods, and income effects concentrated on the home goods market. The interest of the model is to highlight the "partial equilibrium" context in which elasticity formulas such as those derived by Bickerdike, Robinson, and Metzler do emerge.

The essay on the real and monetary effects of exchange rates integrates a broad range of approaches to devaluation. In the context of a model with home and traded goods, it is shown that a trade balance problem can be thought of as overspending, excessively high product wages in the traded goods sector, or an overvalued real exchange rate. By showing the general equilibrium of spending decisions, home goods market, and labor market equilibrium, these various perspectives appear as alternative facets of the same disequilibrium.

This model has been rediscovered several times over in various places: it dates back at least to the work of John E. Cairnes who used it in the late nineteenth century to discuss the influence of gold discoveries on Australia. It was well known in the interwar period in the work of R. G. Hawtrey or Bertil Ohlin, Carl Iversen, and Sir Roy Harrod. Since then it has been rediscovered as an Australian model, a Scandinavian model, and many times over as a Latin American model. The reason is that it captures a critical fact: an increase in absorption leads to trade problems and real appreciation, and a reduction in profitability in the traded goods sector. The fact is so common that not surprisingly the model keeps being rediscovered.

"Expectations and exchange rate dynamics" is the best-known paper in this collection. By combining sticky prices and instantly adjusting, forward-looking asset markets, it captured an essential feature of how live economies operate. The particular assumptions about the money supply process and all the details of the model are surely oversimplified, but the basic message that exchange rate volatility reflects the fact that exchange rates are determined in asset markets stands up well.

This first part concludes with a recent paper on exchange rates and prices. The impressive development of industrial organization, with ready to manipulate models such as those of Dixit and Stiglitz or Salop, could not leave open economy macroeconomics untouched. The obvious question was in the field of exchange rates: if some firms in an industry have a cost disturbance and others do not, what happens to the equilibrium price structure? That is in fact the question when, for reasons unrelated to a particular industry, the exchange rate changes but wages do not. The answer, as we see in this paper, is that the degree of substitution, the extent of oligopoly, market segmentation, and functional form of the demand curve are among the determinants. Among the interesting conclusions of this research is the idea that the typical model of a small country may be quite inappropriate: if "small country" means few distributors, then oligopoly models rather than perfect competition may be the appropriate framework for discussing tariffs or exchange rate effects. Of course, the model presented here only characterizes the short run. In the longer run there is entry and costs will become endogenous, and these considerations —via expectations and strategic pricing decisions—will already affect the short run. Work by Paul Krugman and by Giuseppe Bertola is fruitfully developing these broader ideas.

1 Devaluation, Money, and Nontraded Goods

This chapter develops a monetary approach to the theory of currency devaluation.[1] The approach is "monetary" in several respects. The role of the real balance effect is emphasized, and a distinction is drawn between the relative prices of goods, the exchange rate, and the price of money in terms of goods. Furthermore money is treated as a capital asset so that the expenditure effects induced by a monetary change are spread out over time and depend on the preferred rate of adjustment of real balances.[2] The latter aspect gives rise to the analytical distinction between impact and long-run effects of a devaluation.

The first part of this chapter develops a one-commodity and two-country model of devaluation. The simplicity of that structure is chosen quite deliberately to emphasize the monetary aspect of the problem as opposed to the derivative effects that arise from induced changes in relative commodity prices. Trade is viewed as the exchange of goods for money or a means of redistributing the world supply of assets. A devaluation is shown to give rise to a change in the level of trade and the terms of trade, the price of money in terms of goods.

In the second part the implications of the existence of nontraded goods are investigated, and induced changes in the relative prices of home goods enter the analysis.

1.1 Devaluation in a One-Commodity World

In this section we develop a purely monetary approach to devaluation in discussing a two-country, two-monies, and one-commodity model.[3] This stripped down model abstracts from the complexities of distribution and

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substitution effects that may arise from changes in relative commodity prices and places primary emphasis on the real balance effect.

The Model

We assume that money is the only marketable asset and that real income (output) is in fixed supply in each country. The demand for nominal balances in each country is assumed to have the Cambridge form[4]

$$\begin{aligned} L &= kP\bar{y}; \\ L^* &= k^*P^*\bar{y}^*, \end{aligned} \tag{1}$$

where

$k, k^* =$ the desired ratios of money to income,

$\bar{y}, \bar{y}^* =$ real outputs,

$P, P^* =$ the money price of goods in terms of domestic and foreign currency,

and where an asterisk denotes the foreign country. Given the exchange rate, e, the domestic currency price of foreign exchange, arbitrage ensures that

$$P = P^*e. \tag{2}$$

With respect to monetary policy we assume that the nominal quantity of money in each country M, M^*, is initially given and that governments abstain from changing domestic money supplies except as it is necessary to maintain a pegged exchange rate. Accordingly the rate of increase in the domestic money supply is given by the trade balance surplus, B:

$$\dot{M} = B = -e\dot{M}^*. \tag{3}$$

Desired nominal expenditure in each country, Z, Z^*, is equal to money income less the *flow* demand for money, H, H^*, where the latter is assumed proportional to the *stock* excess demand

$$\begin{aligned} Z &= P\bar{y} - H, \\ Z^* &= P^*\bar{y}^* - H^*, \end{aligned} \tag{4}$$

$$\begin{aligned} H &= \pi(L - M) = H(P, M), \\ H^* &= \pi^*(L^* - M^*) = H^*(P^*, M^*), \end{aligned} \tag{5}$$

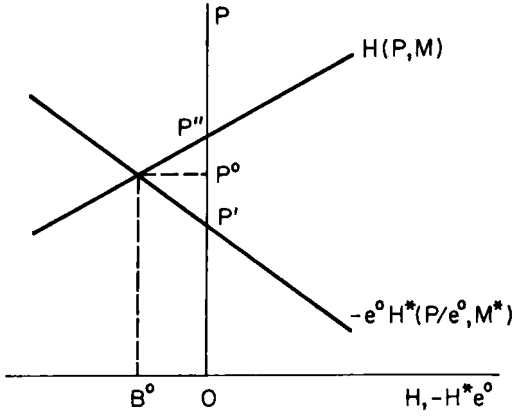

Figure 1.1

and where π and π^* are the domestic and foreign rates of adjustment. The expenditure functions in (4) imply a short-run marginal propensity to spend out of income smaller than unity while in the long run, when monetary stock equilibrium is attained, the average propensity to spend equals unity.

In figure 1.1 we show the domestic rate of hoarding, H, and the foreign rate of dishoarding, $-H^*$, as a function of P the domestic currency price of goods. The schedules are drawn for given nominal money supplies in each country and an exchange rate e^0. With the nominal quantity of money given, hoarding in the home country is an increasing function of the price level. An increase in the price level creates a stock excess demand for money and causes expenditure to decline relative to income as the community attempts to restore the real value of cash balances. It follows that we may view the hoarding schedule alternatively as the flow demand for money or the excess supply of goods (in nominal terms). By the same reasoning the foreign rate of dishoarding, given the exchange rate, is a decreasing function of the home price level. We note that the distribution of the money supplies underlying figure 1.1 is not compatible with balance of payments equilibrium. Foreign monetary stock equilibrium would obtain at P' while for domestic monetary equilibrium the price level would have to be equal to P''.

Consider now the conditions of short-run equilibrium. In order for the world goods market to clear, we require that world income equal world expenditure or equivalently that the home country's rate of hoarding equal the foreign country's rate of dishoarding.

$$H = -H^* e^0. \tag{6}$$

The equilibrium is shown in figure 1.1 at a domestic currency price of goods P^0; a higher price level would leave a world excess supply of goods and a lower price level a world excess demand for goods. We observe, too, that the short-run equilibrium at P^0 implies a trade balance deficit for the home country equal to B^0. That deficit, in the absence of sterilization, as we assume, redistributes money from the home country to the rest of the world. The reduction in the domestic nominal quantity of money reduces real balances at the initial price level and thereby causes planned hoarding to decrease and conversely abroad. In terms of figure 1.1 this implies that the hoarding and dishoarding schedules shift to the right, a process that continues over time until they intersect between P'' and P' on the vertical axis. At that time exchange of money for goods ceases since each country has achieved its preferred asset position and spends at a level equal to its income.

The Short-Run Effects of a Devaluation

Consider now the short-run or impact effect of a devaluation on the part of the home country. A devaluation changes the equilibrium relationship between price levels in the two countries. Differentiating equation (2), we obtain

$$\hat{P} = \hat{P}^* + \hat{e}, \tag{7}$$

where a $\hat{}$ denotes a relative change in a variable. Equation (7) informs us only about the relationship between changes in the price levels at home and abroad; we have to investigate the equilibrium condition in the world goods market in order to determine what the actual change in the price level in each country will be. For that purpose we turn to figure 1.2 where we show the world economy in initial long-run equilibrium at a domestic currency price of goods P^0.

The effect of a devaluation is shown in figure 1.2 by an upward shift in the foreign dishoarding schedule. For foreign monetary stock equilibrium to obtain, given the nominal quantity of money, the foreign currency price of goods would have to remain constant which in turn by (7) implies that the domestic price level would have to increase in the same proportion as the exchange rate, a price change equal to $(P'' - P^0)/P^0$. The domestic hoarding schedule, on the contrary, is unaffected, and domestic monetary stock equilibrium would continue to obtain at a domestic price level P^0. It

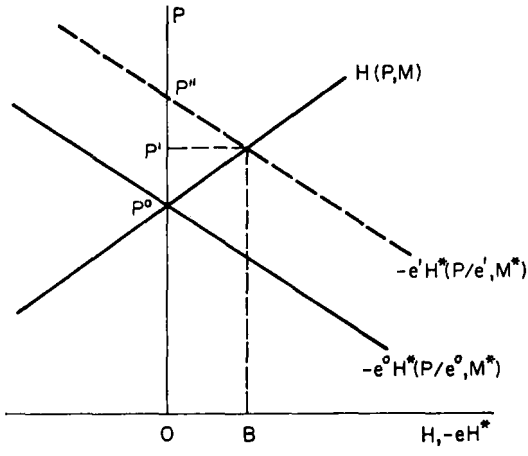

Figure 1.2

is observed from figure 1.2 that at an unchanged domestic price level there would be a world excess demand for goods due to the increase in foreign real balances and expenditure while at an unchanged foreign price level there would be a world excess supply of goods due to the decrease in domestic real balances and expenditure. It follows that in order for the world goods market to clear the price level, changes will have to be distributed in such a manner as to reduce domestic absorption and increase foreign absorption by an equal amount.

The equilibrium increase in the domestic price level is equal to $(P' - P^0)/P^0$, while the foreign price level declines in the proportion $(P'' - P^0)/P^0$. We note that both the domestic and foreign currency price of goods change less than proportionately to the rate of devaluation and that the distribution of price changes depends on the relative slopes of the hoarding schedules.

Given these price changes, foreign real balances have increased and the real value of domestic balances has decreased, thereby causing foreigners to dishoard in order to decumulate their capital gains and domestic residents to save in order to restore the real value of their cash balances. The home country's balance of payments surplus is equal to *OB* and causes a redistribution of the world money supply.

The formal criterion for the price changes and the balance of payments can be developed by differentiating the goods market equilibrium condition

$$\pi(kP\bar{y} - M) + e\pi^*\left(\frac{k^*P\bar{y}^*}{e - M^*}\right) = 0 \tag{6'}$$

with respect to P and e holding the nominal quantity of money constant in each country. The relative change in the domestic price level is

$$\hat{P} = \frac{\pi^*M^*e}{\pi M + \pi^*M^*e}\hat{e}. \tag{8}$$

Defining the world money supply, which is measured in terms of domestic currency $\overline{M}$,

$$\overline{M} = M + eM^* \tag{9}$$

and the domestic and foreign country's share in the money world supply, σ and σ^*, we can rewrite (8) as

$$\hat{P} = \frac{\pi^*\sigma^*}{\pi\sigma + \pi^*\sigma^*} - \hat{e} \geq 0. \tag{8'}$$

Substituting (8') in (7), we obtain the effect of a devaluation on the foreign price level:

$$\hat{P}^* = \frac{-\pi\sigma}{\pi\sigma + \pi^*\sigma^*}\hat{e} \leq 0. \tag{10}$$

Equations (8') and (10) show the distribution of price changes to depend on relative effective size where effective size is the product of the speed of adjustment and the share in the world money supply. In the small country case ($\pi\sigma/\pi^*\sigma^* = 0$), the home country price level increases in the same proportion as the exchange rate.

The home country's trade balance surplus is obtained by differentiating the flow demand function for money with respect to the price level and substituting (8) to yield

$$dB = dH = \pi M\left[\frac{\pi^*M^*e}{\pi M + \pi^*M^*e}\right]\hat{e} > 0. \tag{11}$$

Equation (11) confirms that the balance of payments unambiguously improves.

The Long-Run Effects of Devaluation

The long-run effects of devaluation on nominal money supplies and price levels may be interpreted with the help of figure 1.3. In quadrants II and IV