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Policy and Current Account Determination
Under Floating Exchange Rates

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Abstract

The paper analyzes the determinants of current account imbalances under floating exchange rates. An important goal of the analysis is to provide a framework within which the sources of, and the remedies for the current account imbalances between the United States, Japan, and the Federal Republic of Germany can be discussed. Particular emphasis is put on the effects of various types of government policies stressing the difference between expenditure-changing and expenditure-switching policies. Short-run and long-run considerations are investigated as well as the role played by expectations and price-level dynamics.

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I. Introduction

The purpose of this paper is to analyze the determinants of current account imbalances under floating exchange rates. Although detailed references to current policy controversies are relatively limited, an important goal of the analysis is to provide a framework within which the sources of, and the remedies for the current account imbalances between the United States, Japan, and the Federal Republic of Germany can be discussed. For this reason, particular emphasis is put on the effects of various types of government policies stressing the difference between expenditure-changing and expenditure-switching policies. We distinguish between short-run and long-run considerations and investigate the role played by expectations and price-level dynamics.

Throughout the analysis we deal with a flexible exchange rate regime which implies that, contrary to what is implicitly assumed in much of the official and popular discussions, neither the nominal nor the real exchange rate is a policy instrument. It follows that questions like, "How much must the dollar come down in order for the U.S. current account deficit to disappear?" cannot be answered unless the reason for the decline of the dollar is specified. In an attempt to investigate the effects of "talking down the dollar" we specify two types of disturbances, an exogenously imposed risk premium on U.S. dollar assets and an exogenous change in the expected future value of the dollar. We argue that these types of "policies" are inefficient as instruments of current account adjustment. We also show that many other proposed remedies, for instance, that the United States should put restrictions on goods that are imported from countries with significant trade surpluses, also have a limited impact on the current account balance of either country.

We argue that, as a general rule, expenditure-changing policies have the most direct and quantitatively strongest influence on the current account. Expenditure-switching policies, on the other hand, affect the exchange rate significantly but have only a limited impact on the current account. We also show that fiscal policy has a comparative advantage over monetary policy as an instrument for current account adjustment as opposed to domestic aggregate-demand stabilization.

The organization of the paper is as follows: Section II presents the analytical framework of the paper first by explaining why partial-equilibrium approaches to current account determination are likely to lead to misleading conclusions and then by outlining a two-country general-equilibrium model capable of explaining simultaneously, *inter alia*, the current account, the real exchange rate, and the real interest rate. In Section III, the responses of the endogenous variables to a number of shocks are derived under the assumption of price flexibility. An important distinction is made between the determinants of the rate of interest, on the one hand, and the real exchange rate and the current account on the other. The interest rate is shown to depend on

the sum of national variables (for example, the sum of national government expenditures) whereas the other two variables depend on the difference between them. It is also shown that expenditure-switching policies are not effective instruments for current account adjustment while expenditure-changing policies are.

In Section IV, the case of fixed prices and variable output is analyzed. The main difference this introduces relative to the conclusions of Section III is that monetary policy and expenditure-switching policies now become effective tools for current account adjustment. It remains true, however, that expenditure-changing policies have a relatively stronger impact.

Section V introduces elements of dynamics. Changes in net foreign asset positions owing to current account imbalances are shown to lead to longer-run exchange rate adjustments that are significantly different from the short-run responses. Dynamics are also introduced via exchange rate expectations and gradual price-level adjustments. The first appreciating and then depreciating path followed by the U.S. dollar since the early 1980s is interpreted in terms of the dynamic adjustment mechanisms introduced in the section.

Section VI pulls together the main results and relates them to present-day concerns over current account imbalances and currency misalignments.

An Appendix contains a detailed presentation of the model used in the body of the paper.

II. The Need for a Macroeconomic Perspective

Popular analysis of the determinants of current account imbalances and exchange rate movements is often based on simplified and partial analytical paradigms. As a result, the wrong questions are frequently asked and inappropriate or, at best, incomplete conclusions are drawn as the examples below will show. A major problem is that the distinction between endogenous and exogenous variables is not always made explicit-- witness questions like "what is the effect of a dollar depreciation on the U.S. current account?" In this section we first illustrate why partial equilibrium approaches are not adequate for an analysis of exchange rate movements and current account adjustment under floating exchange rates. We then present a small general equilibrium model that encompasses the most popular partial approaches and that will form the basis of the analysis in the remainder of the paper.

1. The trade balance approach

Since a major component of the current account balance is equal to the difference between the value of exports and the value of imports, it is natural to seek explanations for imbalances by attempting to explain

flows of trade in goods and services. Typically, such explanations focus on movements in some measure of the real exchange rate and on movements in output by analogy with relative price and income effects in consumer demand theory. Questions are then asked about the current account implications of changes in the exchange rate or changes in income. For instance, recently much effort has been spent on estimating the effects of the post-1985 fall in the value of the U.S. dollar and of different growth scenarios in the United States, Europe, and Japan. Answers are provided by referring to estimates of partial equilibrium price and income elasticities of demand for exports and imports. Similarly, but at a more analytical level, target-zone proposals for exchange rate management often rely on a trade balance approach to calculate the "appropriate" exchange value for currencies.

The problem with this type of analysis is that it proceeds as if the reason for exchange rate changes did not affect trade flows, or as if income growth brought about by an expansion in demand had the same effects as growth brought about by technological advances. Both suppositions are, of course, erroneous. As will be shown formally below, in an environment of floating exchange rates the general equilibrium relationship between the real exchange rate and the trade balance will depend on both the source of the change in the exchange rate and on a host of parameters in addition to the import and export demand elasticities. Similarly, the current account implications of income growth will be different depending on whether the latter is due to a shift in aggregate supply or in aggregate demand.

The trade flow approach also tends to be used by those who argue that commercial policy actions have well-defined current account implications. Restrictions on imports through tariffs or nontariff barriers are thought to improve the external balance whereas, in fact, such restrictions are likely to reduce the volume of both exports and imports leaving the difference to a large extent unchanged.

Finally, the partial equilibrium nature of the trade balance approach often implies that exchange rate and income changes are treated as exogenous variables each of which can be independently influenced by government policy. Monetary and fiscal policy measures are thus not often considered explicitly.

While the above points may seem obvious, they are not regularly taken into account in current policy analysis. For instance, one frequently sees estimates of the current account effects of past changes in the yen/dollar exchange rate without any attention being paid to the origin of these changes. Also, some of the trade legislation currently being considered in the U.S. Congress is based on the notion that trade imbalances are partly the result of commercial policy practices outside the United States and that they therefore can be redressed by corresponding trade policies in the United States.

2. The savings-investment approach

National income accounting implies that a current account surplus is equal to the difference between domestic income and domestic absorption. This difference can in turn be expressed as the sum of the public sector's budget surplus and the private sector's excess of saving over investment. Government policy (especially fiscal policy) is, in this way, brought directly to the forefront of the analysis, and intertemporal considerations are emphasized. Variations in the real interest rate, that is, the intertemporal terms of trade, and differences between current and expected future income are likely to influence both savings behavior of households and investment decisions by firms. Future income is in turn likely to depend on expectations of future changes in taxes and government spending. Fiscal policy again takes on particular importance.

While the savings-investment approach steers attention in the appropriate direction, it too can result in incomplete interpretations unless it is considered within a larger general equilibrium setting. Specifically, determinants of saving and investment, such as the real interest rate and national income, should be treated as endogenous variables that respond to exchange rate changes, to foreign as well as domestic fiscal policy actions, and to disturbances in asset markets. This suggests that a comprehensive analysis of current account determination requires a complete macroeconomic model capable of explaining simultaneous movements in a number of variables and in which both the trade-balance and the savings-investment approaches can be fully interpreted. In the following subsection we describe the outlines of such a model that will be used in the subsequent analysis.

3. A minimal general equilibrium approach

In what follows we shall be using slight variants of mainstream open economy macroeconomic models. Two countries are considered explicitly. In order to capture the effects of monetary as well as real disturbances, equilibrium conditions in asset markets will be employed alongside those in goods markets. Trade in goods as well as assets takes place.

Goods market equilibrium obtains when the demand for a country's output is equal to the supply. Each of the two countries in the model specializes in the production of one good but consumes both. The demand for the domestic good can be written as the sum of private sector real absorption, government spending, and the trade balance as in (1):

$$y^d = a + g + tb \quad (1)$$

where

y^d = the demand for domestic output
 a = private sector real absorption
 g = government expenditures
 $tb = x - e \cdot im$ = the trade balance measured in terms of the domestic good
 x = real exports
 im = real (in terms of the foreign good) imports
 e = the real exchange rate = the relative price of the foreign good in terms of the domestic good = the inverse of the home country's terms of trade 1/

Analogously, aggregate demand for the foreign good is 2/

$$y^{d*} = a^* + g^* - (1/e) tb \quad (2)$$

Goods market equilibrium obtains when the demand for the two goods is equal to the supplies (y and y^*) as in (3) and (4).

$$y^d = y \quad (3)$$

$$y^{d*} = y^* \quad (4)$$

The current account balance (ca) is equal to the trade balance plus interest income on net foreign asset holdings. Letting $(b-B)$ stand for the net foreign asset position 3/ and r for the real interest rate earned, we have

$$ca = tb + r (b-B) \quad (5)$$

Given that private sector absorption is equal to consumption plus investment, that consumption equals disposable income minus saving, and that disposable income equals output net of taxes plus interest income, equations (1), (3), and (5) imply

1/ This definition of the real exchange rate seems the most natural one in a two-goods context. A frequently used alternative definition is the ratio of the two countries' general price levels expressed in terms of the same currency. It is easy to show that this is equivalent to $e^{\alpha-\alpha^*}$ where $\alpha(\alpha^*)$ is the share of the domestic good in the domestic (foreign) price index. For a further discussion, including extensions to models containing nontraded goods see Saidi and Swoboda (1983).

2/ Foreign variables are denoted by a $*$.

3/ The only nonmonetary asset that is being considered is a real asset of which domestic residents hold a quantity b . The domestic government has issued a quantity B of the same asset. The net position of the domestic economy is thus $b-B$.

$$ca = (t - g - rB) + (s - in) \quad (6)$$

where

t = real tax revenue
s = real private sector saving
in = real private sector investment

Equations (5) and (6) show that in the context of a complete model in which goods market equilibrium is maintained, the trade-balance and the savings-investment approaches to current account determination yield equivalent conclusions. 1/

Money market equilibrium is defined by equations (7) and (8) where P (P^*) stands for the domestic (foreign) price index and i represents the nominal rate of interest.

$$\frac{M}{P} = L(y, i) \quad (7)$$

$$\frac{M^*}{P^*} = L^*(y^*, i^*) \quad (8)$$

Throughout the analysis we assume perfect substitutability between domestic and foreign assets. As a consequence, domestic and foreign nominal rates of interest are linked by the interest parity condition (9):

$$i = i^* + \hat{E}^e + \lambda \quad (9)$$

In this equation \hat{E}^e stands for the expected rate of depreciation of the domestic currency 2/ and λ for an exogenously determined "risk" premium. 3/ This risk premium is introduced in an attempt to model the notion of "talking down the dollar." It is analogous to a tax on capital mobility discussed, for instance, in Buiter (1986).

1/ Note that $t-g-rB$ equals the domestic government's budget surplus.

2/ E is the nominal exchange rate measured as the domestic currency price of foreign exchange, and a circumflex stands for a percentage rate of change.

3/ In Section V we comment briefly on the consequences of introducing less-than-perfect substitutability between domestic and foreign assets by making λ a function of relative asset supplies.

Using definitions of the domestic and foreign price indices and the Fisher relationship between nominal and real rates of interest, we show in the Appendix that it is possible to derive an equation analogous to (5) but in terms of the real rates of interest and the real exchange rate as in (10) where α (α^*) is the share of the domestic goods in the domestic (foreign) price index. 1/

$$r = r^* + (\alpha - \alpha^*) \hat{e} + \lambda \quad (10)$$

In the next section the model defined by equations (1) to (10) will be used together with the assumption of exogenously given output levels (full employment) to determine first the real exchange rate and the real interest rates and then the current account. In Section IV we investigate the other extreme case in which prices are fixed but output is variable. In both cases we proceed under the assumption of static exchange rate expectations. In Section V we relax this assumption in favor of the hypothesis of long-run perfect foresight which requires a brief discussion of the steady-state properties of the model. We also introduce price adjustment rules in the form of Phillips curves.

Standard assumptions about the determinants of absorption, exports, and imports will be maintained throughout. Specifically, absorption is assumed to depend positively on disposable income and wealth and negatively on the real interest rate. The trade balance improves with increases in foreign absorption and the real exchange rate and deteriorates with increases in domestic absorption. Furthermore, to investigate the consequences of expenditure-switching policies, we assume that some government spending may fall on the import good.

The advantage of using a complete model to study the determinants of the current account will become clear as the analysis proceeds. In particular, this approach makes it necessary to state the conditions for improvements in the current account in terms of required adjustments in exogenous policy instruments rather than in terms of movement in endogenous variables such as the real exchange rate. Furthermore, it will be seen how expenditure-switching policies resulting from commercial policy actions or from changes in the commodity composition of government expenditures--that is, between expenditures on domestic goods and on imports--in some cases have no effect on the current account contrary to the impression that might be given by looking at equation (5) in isolation.

1/ The intuition behind (10) is that the expected change in e leads to interest rate differentials because the domestic real rate is defined in terms of the domestic consumption basket and the foreign rate in terms of the foreign consumption basket. Variations in the relative prices of these baskets, which depends on e and $(\alpha - \alpha^*)$, will lead to variations in the interest rate differential.

III. Medium-Term Determinants of the Current Account

In this section we consider a time horizon that is long enough for prices to clear goods markets. We also suppose that output is fixed in supply (at y^f and y^{f*}), and that we can ignore the effects of changes in net foreign asset positions on spending. In Section III.1 we also abstract from wealth effects that arise from terms of trade changes. These and other extensions of the basic analysis will be taken up in Section III.2.

1. Central results under symmetry

Before discussing the determinants of the current account balance it is necessary to examine the implications of the model for movements in the real rates of interest and the real exchange rate. We have already noted that the real rate of interest measures the intertemporal terms of trade, that is, the relative price of future and current consumption. As such one might expect it to be determined mainly by the time profile of consumption demand in relation to the time profile of supply. For a given path of output, an increase in the demand for current consumption relative to future consumption must bring about an increase in the relative price of the former, that is, an increase in the rate of interest. Similarly, an increase in current output would tend to lower the rate of interest. In an international context with integrated asset markets, such that rates of interest are equalized among countries, the source of the change in demand or supply is unimportant. To a first approximation, only world aggregates are important. 1/

The composition of demand, on the other hand, should be crucial for the real exchange rate since it measures the current relative price of foreign goods in terms of domestic goods. A switch in demand toward the foreign good or a relative fall in the supply of the domestic good would both lead to a real depreciation of the domestic currency, that is, to an increase in e . Contrary to its effect on the rate of interest, a balanced (between goods) increase in aggregate world demand or supply should have no effect on relative prices.

The intuition in the last two paragraphs is borne out by formal analysis of the model introduced in the previous section and described more fully in the Appendix. Using equations (1)-(4) and (10) with $\hat{e}^e = 0$ it is possible to derive the following expressions for the

1/ The approximation stems from the assumption that distribution effects are unimportant. In Section III.2 we shall explain how these distribution effects may modify the conclusions drawn here.

equilibrium values of the real interest rates and the real exchange rate: 1/

$$dr = \frac{1}{2a_r} \{ (1-c) d[(y^f + y^{f*}) - (g + g^*)] - d(\bar{a} + \bar{a}^*) - a_w d(B + B^*) \} + d\lambda \quad (11)$$

$$dr^* = dr - d\lambda \quad (12)$$

$$de = \frac{1}{2tb_e} \{ [1-c(1-2m)] d[(y^f - y^{f*}) - (g - g^*)] - (1-2m) [d(\bar{a} - \bar{a}^*) + a_r d\lambda + a_w d(B - B^*)] + 2(g_0 d\gamma - g_0^* d\gamma^*) + 2(\bar{d}m - \bar{d}m^*) \} \quad (13)$$

1/ Equation (11) is obtained by first adding equations (1) and (2) and noting that the trade balance (and hence the real exchange rate under the assumptions maintained in this section) disappears from the resulting expression. Using (3) and (4) this expression can be solved for the real interest rate. We also assume, for simplicity, that the government budget is kept balanced. See the Appendix for details.

For the sake of transparency it has been assumed that countries are symmetric in the sense that the partial differentials of the corresponding behavioral functions are the same. Relaxing this assumption would not change anything fundamental in the results; the main consequence would be that the simple averages of domestic and foreign variables that appear in the formulas would have to be replaced by weighted averages. Note, however, that for the assumption of equality of partial differentials to be reasonable, the countries must be approximately the same size. If they are not similar, behavioral parameters should be expressed in terms of elasticities. In this case, the solution for r becomes:

$$dr = \sigma d\lambda + (r_0 / na_0) \{ (1-c) d[(y^f + y^{f*}) - (g + g^*)] - d(a + a^*) - a_w d(B + B^*) \} \quad (11')$$

where η is the interest elasticity of absorption,

$$y^w = y^f + y^{f*} \text{ and } \sigma = y^{f*} / y^w.$$

In these expressions a_r and a_w stand for the partial effects of changes in the real interest rate and wealth, respectively, on private sector absorption, c is the marginal propensity to spend out of disposable income, and m is the marginal propensity to import out of absorption.

Inspecting first the solution for the real interest rates we note that what matters is world aggregate output and expenditures and not their composition between countries or between goods. The reason is simple. An increase in current output relative to current expenditures creates an excess supply of current output. In order to eliminate this excess supply, agents must be induced to consume more now. Hence, the relative price of current goods in terms of future goods must fall, that is, the real interest rate must fall. 1/ Whether the change in output or expenditures originates only in one country or is concentrated more in one of the goods than the other does not matter, since it is the need to transfer purchases between periods and not between goods that gives rise to interest rate adjustments. Another way to see this point is to notice that policies of the pure expenditure-switching type have no impact on the real interest rate. Variations in γ , the proportion of government expenditures that is imported, or in \bar{m} , an exogenous component of imports 2/ both appear in the solution for the exchange rate but not in the solution for the interest rate. On the other hand, expenditure-augmenting or expenditure-reducing policies such as changes in government spending or in private autonomous expenditures, have a strong direct impact on interest rates. Finally, we notice that "talking down the dollar" by creating a risk premium on dollar assets increases the U.S. real rate, r , and decreases the foreign real rate by the same amount. 3/ Total spending increases abroad and decreases at home.

In contrast to the interest rate, the real exchange rate responds to differences between countries in current spending and output. An increase in the output of the domestic good relative to the output of the foreign good must decrease the relative price of the former, that is, increase the real exchange rate according to our definition. Similarly, an increase in domestic relative to foreign spending will appreciate the home currency in real terms if the marginal propensity to

1/ As already noted, this explanation suggests that the time profile of an increase in output will be important in a more developed model. If, for instance, future as well as current output increased, the change in the excess supply of current relative to future goods, and hence the implication for the real interest rate, would depend on the relative sizes of the changes in output and on the discount rates of economic agents. See Frenkel and Razin (1986).

2/ Changes in \bar{m} may be brought about by policies of "opening up" the economy to foreign products.

3/ The fact that the change is by the same amount in both countries stems from the assumption of symmetry.

import is less than 1/2. ^{1/} Such variations in spending may come about either from differential changes in government expenditures ($d(g-g^*)$) or in autonomous private spending ($d(\bar{a}-\bar{a}^*)$), transfers of wealth between the countries ($d(B-B^*)$), or by the introduction of a risk premium on the foreign currency ($-d\lambda$).

Expenditure-switching policies have a direct impact on the exchange rate. Changes in the composition of either government or private spending toward the import good will depreciate the home currency in real terms.

Having obtained solutions for e and r , we are now in the position to derive an expression for the current account. Substituting from equations (11)-(13) into expression (7), one obtains after some manipulation

$$dca = \frac{1}{2} \{ (1-c) d [(y^f - y^{f*}) - (g - g^*)] - d(\bar{a} - \bar{a}^*) - a_r d\lambda - a_w d(B - B^*) \} + r_o d(b - B) \quad (14)$$

As in the case of the real exchange rate, we notice that the current account depends on differences between countries in output net of government expenditures $[(y^f - g) - (y^{f*} - g^*)]$, differences in autonomous spending, etc. However, in contrast to their influence on e , the explicitly expenditure-switching policies (dy and dim) have no impact on the current account. From this result it follows that urging a country to open its markets to foreign goods (interpreted here as implying an increase in im , the autonomous part of foreign-country imports) is an inefficient method of dealing with a current account problem under conditions of full employment. ^{2/} On the other hand, reducing domestic aggregate spending (g or a) or increasing foreign aggregate spending (g^* or a^*) will have strong effects on the current account. Introducing a wedge between domestic and foreign interest rates ($d\lambda > 0$) would also improve the current account since it increases r and decreases r^* thereby reducing domestic absorption and increasing foreign absorption.

^{1/} This is a well-known result from the literature on the classical transfer problem. An increase in domestic spending by one unit increases the demand for the domestic good by $1-m$. A decrease in spending abroad decreases the demand for the domestic good by m^* units. The total effect on the demand for the domestic good is $1-m-m^*$, which is positive if the marginal propensities to import are less than 1/2 on average.

^{2/} This statement abstracts from the indirect effects of trade liberalization on the current account through the positive influence such liberalization has on economic efficiency and full-employment output. The size and sign of these indirect effects are ambiguous.

The solutions for r and ca suggest an interesting issue of policy coordination in the event that we have two instruments (g and g^*) and two targets (r and ca). 1/ Clearly, with two independent instruments the two targets can, in principle, be reached. International policy coordination using $(g + g^*)$ to reach the interest target and $(g - g^*)$ the current account target would be one possibility. Failing such cooperation, the correct pairing of national policy instruments and targets may be important for stability. For instance, under certain conditions it can be shown that the smaller country should target the current account and that the larger country should target the world rate of interest. 2/

2. Extensions: Terms of trade and wealth effects

The results obtained so far owe much of their simplicity to the explicit neglect of the effects of international income and wealth transfers brought about by changes in the interest rate and the real exchange rate. In this section we consider briefly the sources and implications of these transfers.

Changes in the real exchange rate (that is, the terms of trade in this model) may induce at least three distinct types of transfers. The first stems from the increase in real income (measured as output divided by the absorption deflator) experienced by the country whose output has increased in price. Thus, a real depreciation of the home currency reduces domestic and increases foreign real income. While the consequences of this depreciation for interest rates are likely to be minimal, the current account of the home country is likely to improve as domestic absorption is reduced and foreign absorption increased.

A second exchange-rate-induced transfer may result from international debtor or creditor positions. Suppose that the home country is a net debtor. An increase in the relative price of the foreign good (an

1/ We assume in this paragraph that $\lambda = 0$ so that $r = r^*$.

2/ For a proof of this assertion and a more detailed discussion of issues surrounding the policy mix and policy coordination, see the accompanying paper "The Current Account and the Policy Mix Under Flexible Exchange Rates" (Genberg and Swoboda, 1987).

That the relative size of countries should be important follows from the following solution for the influence of government spending on the current account under the assumption that the interest elasticities of absorption, rather than a_r , are the same in the two countries:

$$dca = - (1-c) [\sigma dg - (1-\sigma) dg^*]$$

where, as in Section III.1, σ is the relative size of the foreign country. We see that as the home country becomes small ($\sigma \rightarrow 1$), the current account effect of its fiscal policy increases relative to that of the foreign country.

increase in e) increases the real value of that debt measured in terms of either country's consumption basket. 1/ Foreigners would be wealthier and would increase absorption whereas domestic residents would reduce theirs. The home country's current account balance would hence improve.

The last terms of trade effect we shall consider occurs if production levels depend on the relative price of the two goods. 2/ An increase in e would then increase foreign and decrease domestic output and one would expect a current account deterioration for the home country.

Combining the above-mentioned three effects reveals that the induced effects of exchange rate changes are not unambiguous as far as the current account is concerned. The particular circumstance in which a country finds itself as well as the size of parameters defining spending behavior must be known before definite conclusions can be reached.

Changes in the rate of interest have one direct and one indirect effect on the current account that have not been considered so far. The direct effect is the obvious one that arises because of international debt service payments, whereas the indirect effect occurs because changes in interest income modify absorption in the two countries. As before, the net current account impact of the two effects is ambiguous. If the home country is a debtor, a higher interest rate will lead to greater debt service payments but also to lower disposable income and reduced absorption. The former deteriorates while the latter tends to improve the current account.

IV. Unemployment and Fixed Prices

We now turn from the case of fixed output and perfectly flexible prices to the opposite extreme of fixed prices and flexible output. The fixity of prices removes the dichotomy between real and nominal magnitudes which will allow us to discuss the effects of monetary policy on both output and the current account. The responsiveness of output to aggregate demand fluctuations also renders expenditure-switching policies effective as an instrument of current account adjustment contrary to the results in the previous section. In the analysis that follows,

1/ Remember that in our model the internationally traded asset is one expressed in terms of the domestic good. If the asset represented a claim on the foreign good, the transfer effects would obviously be reversed.

2/ This dependence of production on relative prices could, for example, come about either if the foreign good was used as an input in the domestic production process or if the supply of labor was elastic with respect to the real consumption wage (W/P).

we continue to assume static exchange rate expectations and we abstract once again from the transfer effects discussed in Section III.2.

As before, it turns out to be useful to consider the determinants of the world interest rate in a first stage. This is because the assumption of perfect capital mobility makes it possible to treat the world as a closed economy IS-LM system as far as real interest rate determination is concerned.

Adding equations (1) and (2) generates the world IS curve describing goods market equilibrium in terms of the world rate of interest and world output. Similarly, adding (7) and (8) yields the world LM curve. Together the two relationships can be solved for the interest rate r^* (and hence r in view of $r = r^* + \lambda$) and world output ($y + y^*$). It should be noted that neither equilibrium condition depends on the real exchange rate or any policy variables of the expenditure-switching type. This is again a reflection of the fact that the real interest rate reacts to excess demands of current output relative to future output irrespective of the commodity composition of these excess demands. The real exchange rate, on the other hand, adjusts principally to changes in the commodity structure of excess demands.

Familiar propositions can be derived from this framework. Increases in government expenditures or in autonomous private expenditures raise the world interest rate and world output. Increases in the supply of money also expand output but lower the rate of interest. An increase in λ , the risk premium on domestic assets, leads to an increase in r , a decrease in r^* but no change in $y + y^*$ since the contractionary effect at home is offset by expansion abroad.

At this point it is useful to point out that the effect of, say, fiscal policy on the rate of interest is the same regardless of where it originates provided that the size of the policy is measured in absolute terms. This is a consequence of fully integrated international capital markets and does not depend on the assumption of symmetry. If the size of a fiscal policy is measured as a fraction of GNP then its impact will vary proportionately with the relative size of the country. In the limiting case of a small domestic economy the effect of changes in domestic variables becomes negligible and the interest rate will be exogenously determined except for the risk premium. As we now turn to the solution for the exchange rate, the current account balance, and the distribution of output between countries this small-country case will be dealt with first. Since all of the important results remain without significant modification in the two-country situation, the analytical simplicity introduced via the small-country assumption is particularly appealing. 1/

1/ In addition to the simplified exposition afforded by the small-country case, it is introduced here in anticipation of the analysis of exchange rate, price level, and current account dynamics in Section V which becomes unmanageable in the full model.

1. The small-country case

For a given foreign interest rate and a given level of foreign absorption, equations (1) and (7) define goods- and money-market equilibrium for the home economy. These are drawn in Chart 1 as the IS and LM curves, respectively. The IS curve is upward-sloping since a real depreciation of the home currency (an increase in e) increases the demand for domestic goods and has to be accompanied by an increase in output for goods-market equilibrium to be maintained. In the money market, an increase in e increases the domestic price level 1/ and reduces the real supply of money. Output must fall to maintain equilibrium, so the LM curve is downward sloping. 2/

Current account equilibrium is maintained along the CA schedule. A real depreciation leads to a surplus which is offset by an increase in income. CA is flatter than IS because as output expands along CA, there will be an excess supply of domestic output which can only be removed by a further depreciation of the domestic currency. Points above CA correspond to surpluses in the current account and points below to deficits.

With the help of Chart 1 we can now study the exchange rate, current account, and output consequences of various disturbances. To save space we shall concentrate on those that generate different outcomes compared to the full-employment situation analyzed in Section III, namely a domestic monetary expansion and an example of an expenditure-switching policy. 3/ The consequences of a change in λ will also be considered.

A domestic monetary expansion will shift the LM curve to the right (Chart 2); domestic output will increase, the currency will depreciate, and the current account will improve. A switch in demand from foreign goods toward domestic goods owing to a change in the composition of government spending or to a commercial policy action is depicted in

1/ The size of the increase is proportional to the weight of the import good in the domestic price index.

2/ Note that while our model obviously belongs in the Mundell-Fleming tradition, it differs slightly from the standard formulation in that our LM curve is downward sloping in the real exchange rate-output space whereas in the traditional model it is vertical. The reason is that in the original version nominal money balances were deflated by the fixed price of domestic output rather than by the domestic price index as done here. It would not be difficult to adjust our results to take into account this difference.

3/ The effect of other disturbances such as a fiscal expansion or changes in foreign monetary and fiscal policy can easily be analyzed with the help of the diagram. As far as the current account and the real exchange rate are concerned, the results are very similar to those obtained in the flexible-price case.

Chart 3. The impact effect is a real appreciation, a current account surplus and an expansion of domestic output.

As these two examples illustrate and contrary to the full-employment case, variable output renders effective for current account adjustment even policies that do not directly influence aggregate absorption. Monetary policy "works" because it brings about a real depreciation of the domestic currency that in turn switches expenditures toward the domestic good. Domestic output then expands and makes room for a current account improvement. Policies that explicitly alter the commodity composition of demand operate through the same channel.

An increase in λ , finally, increases r since r^* is fixed by the small-country assumption. As a consequence the demand for money falls and LM shifts to the right (Chart 4). The increase in r also reduces the demand for domestic output and shifts IS to the left, while CA is displaced to the right as absorption diminishes. Short-run equilibrium implies a depreciation of the home currency, an increase in output, and a current account surplus.

Before turning to the two-country case, it is useful to compare the relative effectiveness of monetary and fiscal policy for current account and domestic income adjustment in the present context where both policies have a nonnegligible impact on these variables. The reason for our interest in this issue derives from the literature on the assignment problem and Mundell's principle of effective market classification. According to that principle, a policy instrument must be assigned to the target upon which it has the largest relative influence in order to ensure convergence toward optimal instrument setting when there is limited information about the exact structure of the economy. We have shown elsewhere ^{1/} that, in the context of the original Mundell-Fleming model, the proper assignment under flexible exchange rates is for fiscal policy to look after external balance (the current account) and for monetary policy to ensure internal balance (full employment or price stability). The reason for this assignment rule is that fiscal policy has a relatively stronger impact on the current account compared with monetary policy. Since the Mundell-Fleming model contains some rather restrictive assumptions (notably that the price of domestic output is fixed and that money market equilibrium is independent of the exchange rate), it is of interest to know if this assignment is also valid under more general conditions. The answer, in short, is yes. Fiscal policy has a comparative advantage with respect to current account adjustment if the expression

^{1/} See "The Current Account and the Policy Mix Under Flexible Exchange Rates," op. cit.

Chart 1

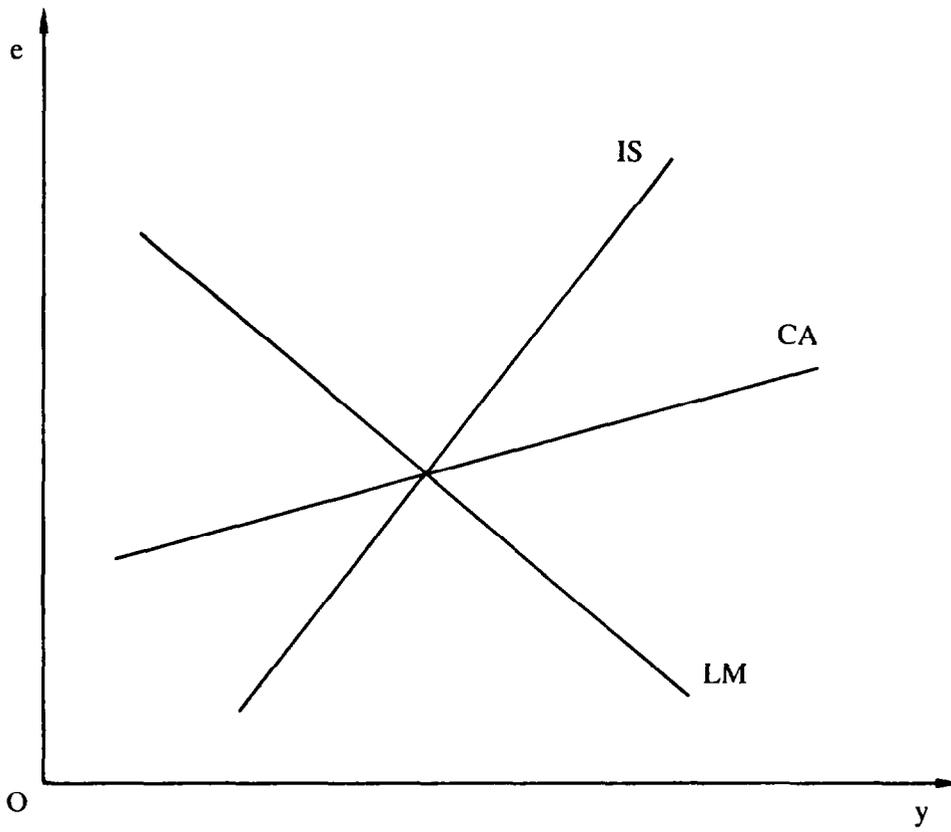




Chart 2

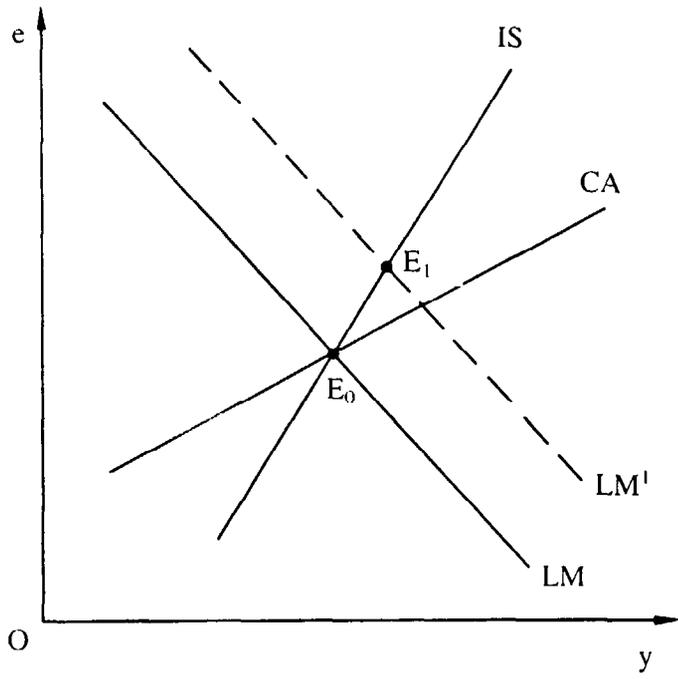


Chart 3

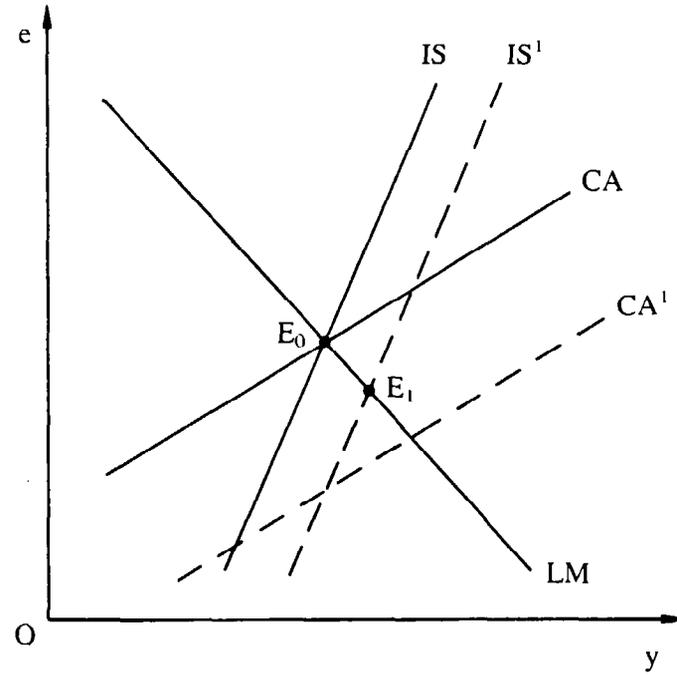
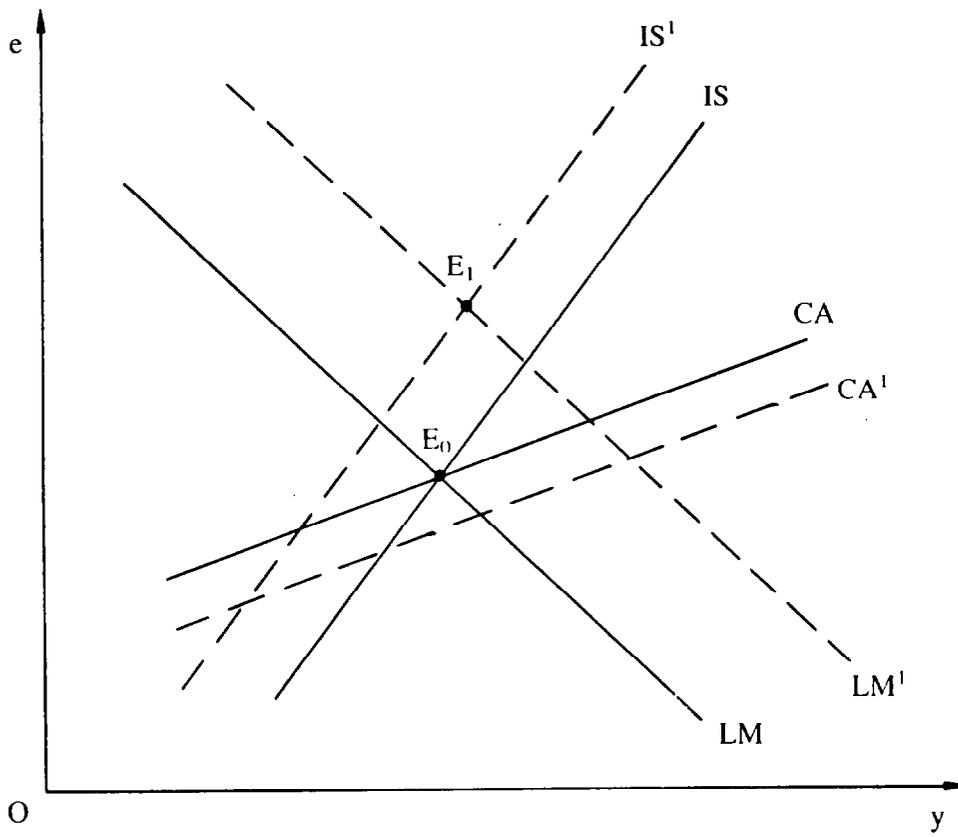




Chart 4





$$R = \frac{\left[\frac{dca}{dg} \right]}{\left[\frac{dy}{dg} \right]} - \frac{\left[\frac{dca}{dM} \right]}{\left[\frac{dy}{dM} \right]}$$

is positive. It can be verified ^{1/} that in the model used in this section this is indeed the case. Furthermore, incorporating into the model an aggregate supply structure based on a labor market in which there is some degree of wage indexation ^{2/} does not alter this result. Fiscal policy should still be assigned to the external balance target whether nominal wages are completely rigid or completely indexed to the domestic consumer price index. Finally, the result does not depend critically on the static expectations assumptions. Introducing forward-looking expectations as in Section V.2 below does not alter the assignment rule if relative-price elasticities of export- and import-demand functions are sufficiently large, and if the steady-state effect of a fiscal expansion that falls on the domestic good is to increase its relative price.

2. The two-country case

Solving for the real exchange rate and the current account in the two-country case is slightly more complicated in the fixed-price than in the flexible-price case in view of the interaction between the money and goods markets. However, the mathematical analysis results in solutions that look very similar, as equations (A25) and (A26) in the Appendix indicate. As before, the exchange rate and the current account depend on differences between the policy instruments in the two countries. In addition, the qualitative effects of fiscal policy, autonomous changes in private sector spending, changes in the risk premium, and wealth transfers are the same as in the full-employment case. Expenditure-switching policies also have the expected influence on the real exchange rate. What is really new in the fixed-price environment is that monetary policy now influences both the real exchange rate and the current account and that expenditure-switching policies may influence the current account. Both types of influence go in the direction that the small-country analysis should lead us to expect. A monetary expansion leads to a depreciation of the currency and an improvement of the current account. Switching expenditure patterns toward the import good also depreciates the currency but deteriorates the current account. ^{3/}

^{1/} The computations can be obtained from the authors upon request.

^{2/} As in Sachs (1980).

^{3/} Note that for the last two disturbances, the home currency depreciates in real terms. The current account, however, improves in one case and deteriorates in the other. This shows that the correlation between e and ca can be positive or negative depending on the sources of the disturbances.

Furthermore, domestic output will fall and foreign output will increase indicating that restricting trade can be used as a beggar-thy-neighbor policy.

V. Steady State and Dynamics of Adjustment

Until now the analysis has proceeded on the assumption that the distribution of asset stocks between countries is given. But current account imbalances do, of course, imply capital transfers. Over time these transfers will alter the relative wealth positions of the two countries and hence the composition of world spending. Adjustment in the exchange rate will have to take place. Changes in wealth and disposable income (as a result of changes in debt service payments) also alter the relative levels of absorption between countries and hence the current account balance. Eventually this adjustment mechanism will bring about a steady-state equilibrium characterized by a balanced current account and constant values of all other endogenous variables. In Section V.2 we shall investigate the difference between this equilibrium and the short-run equilibria discussed in Sections III and IV especially with respect to the implied values for the real exchange rate. It will be shown that, in a number of important cases, the impact and steady-state responses of the exchange rate to exogenous disturbances will be substantially different.

In Section V.2 we discuss briefly other sources of dynamics resulting from exchange rate expectations on the one hand and price level dynamics on the other. The purpose of doing so is, in the former case, to illustrate how the short-run results may be influenced and modified by the long-run properties of the model and by expectations of future policy actions, and, in the second case, to provide a link between the flexible-price results in Section III and the fixed-price results in Section IV.

1. Steady-state equilibrium

Reconsider the effects of a domestic fiscal expansion. We have already shown that such a policy leads, on impact, to a real appreciation of the domestic currency and a current account deficit. As a result of financing this deficit, there will be a transfer of assets abroad. Domestic wealth decreases as does disposable income. ^{1/} Since the opposite changes are taking place in the foreign country, domestic absorption will fall and foreign absorption will increase. The deficit in the current account will thus diminish over time, and the home currency will start to depreciate. This process of adjustment will continue until the current account is back in balance. At this stage, the

^{1/} Disposable income falls as a result of the increased debt service payments brought about by the emerging net debtor position of the home country.

trade account must be in surplus to finance the deficit on the debt service account. The real exchange rate has depreciated relative to the impact equilibrium and may even have depreciated relative to the initial equilibrium. 1/

A similar analysis of government spending can be carried out for changes in private sector absorption, a or a^* , changes in the risk premium on domestic assets, λ , and changes in the outstanding stocks of government bonds, B or B^* . In the Appendix it is shown that, in each of these cases, the steady-state response of the real exchange rate is the opposite of the short-run response. This suggests that in any interpretation of historical movements in real exchange rates it is crucial to take into account the dynamic influences brought about by current account adjustments. Otherwise, seemingly unexplainable exchange rate paths would be unaccounted for. As an example one might mention the appreciation of the dollar in the early 1980s followed by the depreciation that started in the first quarter of 1985. It has been suggested that an explanation of the appreciation that emphasizes the expansionary fiscal policy in the United States relative to the rest of the world in the early 1980s cannot explain the depreciation after 1985 since there was no drastic change in relative fiscal policies about that time. Hence, the argument continues, the fiscal policy explanation is unconvincing. Without wanting to suggest that only fiscal policy mattered in this episode, it is of interest to point out in this context that the general shape of the dollar's movement corresponds to the dynamic response to a fiscal expansion that our analytical model implies. 2/ The model also predicts that the current account of the United States

1/ The outcome is ambiguous as equation (A31) in the Appendix shows. The reason is that the increase in government spending not only increases aggregate spending in the home country but also switches expenditures toward the domestic good. This tends to increase its relative price, that is, to appreciate the domestic currency in real terms. The redistribution of income and wealth toward foreigners as a result of current account financing increases foreign spending and switches world demand toward the foreign good. This tends to depreciate the domestic currency. Which of the two effects dominates cannot be determined a priori. For a more detailed discussion of these issues, see Genberg and Kierzkowski (1979) and Sachs and Wyplosz (1984).

2/ Extending this framework to incorporate imperfect substitutability between domestic and foreign assets provides another reason for the turnaround of the dollar given an unchanged fiscal deficit. If the risk premium λ is a positive function of the supply of U.S. government debt, then a continuous budget deficit in the United States will lead to increases in λ over time. As we have seen, this will lead to a depreciation of the home currency in our model. Furthermore, if government debt is at least partly considered to be net wealth, and if wealth has a positive impact on spending, the budget deficits will tend to increase private sector absorption and delay the improvement in the U.S. current account.

should have improved. The fact that it has not yet done so suggests that elements other than the working out of the effects of previous fiscal impulses are at work, and/or that the dynamic adjustment path is more complicated than in our stylized theoretical model.

2. Exchange-rate expectations and price-level dynamics

The assumption of static expectations that we have adopted in the foregoing analysis is a convenient analytical simplification, but it hides some potentially important and interesting effects of policy changes. To illustrate these, suppose we make the alternative assumption that agents form their expectations on the basis of the difference between the long-run (steady-state) value of the exchange rate and the current value in the manner formulated in Dornbusch (1976).

$$\hat{e}^e = \theta (\bar{e} - e) \quad (15)$$

Inserting this equation into the real interest parity equation yields

$$r = r^* + (\alpha - \alpha^*) \theta (\bar{e} - e) + \lambda \quad (16)$$

From this it is immediately clear that events that are anticipated to take place in the future will (through \bar{e}) have an immediate effect on interest rates and hence on the current equilibrium of the economy. Two illustrations of this will be given shortly.

Equation (16) also suggests another way in which to model the idea that policymakers can influence the value of a currency without undertaking any concrete policy changes. ^{1/} Suppose the authorities could, by the appropriate statements, convince the public that \bar{e} is different from what they previously estimated it to be. Let the initial estimate be \bar{e}_0 and the modified one $\bar{e}_0 + d\bar{e}$. Introducing this into (16) gives

$$r = r^* + (\alpha - \alpha^*) \theta (\bar{e}_0 - e) + \lambda + (\alpha - \alpha^*) \theta d\bar{e} \quad (17)$$

which shows that influencing expectations directly in the manner introduced here amounts, for analytical purposes, to the same thing as introducing the risk premium λ . Our previous analysis of this case thus carries over to the present formulation.

^{1/} This is again the "talking-down-the-dollar" idea.

To show the consequences of introducing expectations as in (15) into our model, consider again the small-country version discussed in Section IV.1, 1/ and the effect of a domestic fiscal expansion. With static expectations the impact effect is to move the economy from E_0 to E_1 in Chart 5. Now we assume that agents react to the fact that the steady-state value of the real exchange rate has changed. To be specific, suppose \bar{e} has fallen. In this case, the LM curve must shift downward to LM' . 2/ As a result, the effects of the fiscal expansion are a larger appreciation of the domestic currency and a smaller change in output (point E_2). Expectations of future exchange rate adjustments have thus modified the nature of the short-run equilibrium.

If we allow for the current account mechanism described in the previous section and a gradual adjustment of prices in response to the relationship between current output and full-employment output, the economy would move over time along a path from E_2 to \bar{E} experiencing in the process a buildup of foreign debt, increasing prices, and an improving current account balance.

Consider now an expected future fiscal expansion. Before the government expenditures actually increase, the only effect on the economy is that which comes from the influence of a change in \bar{e} on expectations. As before, the LM curve shifts immediately, and we get a temporary equilibrium at a point like E' in Chart 5. 3/ The mere expectation of a fiscal expansion thus appreciates the currency, creates a current account deficit, and reduces output. When the actual expansion takes place, the economy first moves to a point like E_2 and then over time to the steady-state equilibrium at E .

It has been suggested (see Branson (1985)) that the anticipation of fiscal policy changes may have significantly influenced movements of the dollar in the early 1980s. The analysis of the previous paragraph illustrates a possible mechanism through which such anticipation may have operated and suggests that forward-looking expectations may be of substantial importance for the short-run dynamics of the exchange rate and the current account.

1/ The discussion that follows draws heavily on Camen and Genberg (1987).

2/ The reason is that a fall in \bar{e} relative to e reduces the domestic interest rate according to (16). For a given money supply and at the original level of output, this creates an excess demand for money which must result in a decrease in e , which is to say that the LM curve shifts downward.

3/ In this figure we have not taken into account the effect of changes in \bar{e} on the IS curve. Doing so would complicate Chart 5 but would not alter any of the points that we wish to make here. See Camen and Genberg, op. cit., for a fuller discussion.

Let us finally illustrate the influence of expectations effects by analyzing a successful attempt to depreciate the home currency by, say, convincing the public that fiscal policy will be tightened in the future thus inducing the populace to revise upward its estimate of the steady-state value of e . Suppose further that the announcement was made when the economy was at point E_3 on the adjustment path from E_2 to E in Chart 5. In Chart 5 the reaction to the announcement would be to increase domestic output, 1/ improve the current account, and depreciate the currency as the economy jumps to a point like E_4 . The gain would be partially reversed in the future as the announcement effect wears off and as the dynamics of the current account and price level take over. The steady-state equilibrium would still be at E .

VI. Implications for Current Policy Controversies

We conclude this overview of current account determination and the role of government policy by relating some of our major results both to general issues about the reform of the international monetary system and to specific controversies about policies to deal with current imbalances between the United States, on the one hand, and the Federal Republic of Germany and Japan on the other.

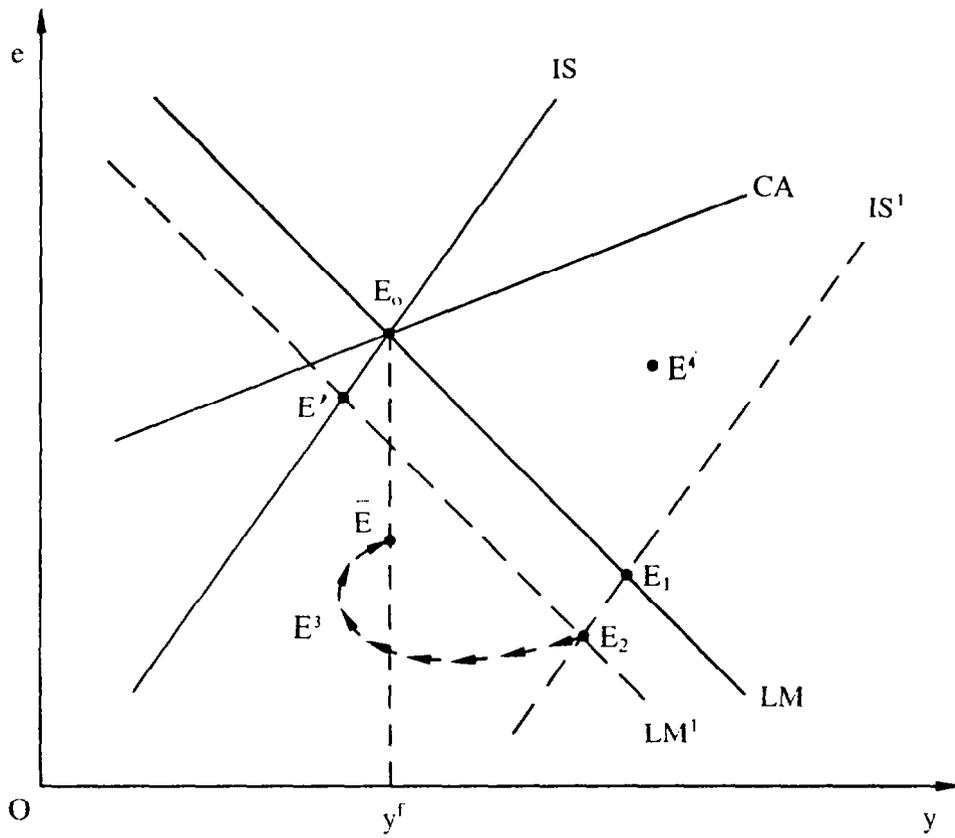
In our analysis we have emphasized repeatedly the need to focus policy discussions on the appropriate setting of policy instruments and not on the values of endogenous variables that may have the character of an intermediate target. Hence, one should not ask what value of the dollar is appropriate in light of such a goal, but rather what are the most effective tools for reaching the adopted targets and what are suitable values of the implied policy instruments.

An implication of this general proposition is that attempts to manipulate exchange rates by relying on expectations effects of policy announcements are undesirable. While such announcements may have some desired effects in the specific circumstances, these are bound to be short lived. In the medium to long run there is no substitute for genuine policy adjustments, and announcements that are not adhered to may well undermine confidence and stability. Similarly, we would argue that commercial policy should not be used to attain output or current account targets. The reason is that commercial policy will have only a temporary effect on output and current account. As this effect disappears in the longer run, the commercial policy initiative may be judged a failure. 2/ Thus, although it is clearly desirable that countries should open their markets to foreign goods and not

1/ In a two-country setting this would be at the expense of foreign output.

2/ Recall that in Section III we showed that expenditure-switching policies do not influence the current account in a full-employment context.

Chart 5





discriminate in favor of domestic production, we would argue that the case for trade liberalization should be made on its own merits and not as a tool for current account adjustment or employment creation lest such arguments be used in other circumstances to restrict trade.

A second implication is that proposals to establish target zones for real exchange rates in order to limit currency misalignments and current account imbalances can not be designed without taking account other major elements of government policy. As we have emphasized throughout, fiscal policy has a significant impact on both the current account and the real exchange rate of a country. Agreement on "appropriate" values of exchange rates hence implies agreement on the appropriate stance of fiscal policy.

At a more specific level our results agree with what has now become a commonplace conclusion: to the extent that existing current-account disequilibria are to a significant measure due to international imbalances in fiscal policy, the appropriate response is to redress these imbalances. Our analysis has taken us a bit further, however, in that we have also stressed the importance of aggregate world fiscal policy for real interest-rate movements. If world interest rates are not judged to be too low at present, current account adjustment should not be achieved with increases in government spending in Japan and the Federal Republic of Germany without corresponding reductions in the United States. If credible commitments could be made that fiscal consolidation would be forthcoming, a case could perhaps be made on aggregate demand grounds that policies should err on the side of expansion at present. But since such commitments have been made and broken in the past, the desirable expansionary effects may not materialize.

Our analysis also implies that it is very unlikely that long-lasting current account imbalances are due to commercial policy practices. Such policies are of the expenditure-switching type that were shown to influence relative prices but not the current account. It follows that remedies to existing trade imbalances are not to be found in such policies either. Their main long-term effect would be a reduction in the overall volume of international trade and hence in the benefits that countries derive from such trade.

Finally, we reiterate the importance of adopting a dynamic and somewhat longer-run perspective than is typically done when we try to interpret current account and exchange rate movements. We have shown how current account evolution implies quite different short-run and long-run responses to a given policy. Trying to decide whether an economy is on the "right" path or whether its currency or international trade position is out of line with the "fundamentals" is thus a very delicate and difficult task. A good dose of modesty is definitely called for. Stressing a few basic points as we have tried to do in this paper and adopting a longer-run horizon for the evaluation of policy would seem prudent.

The results in Sections III and IV of the main text are based on the following two-country model: 1/

$$y^d = a(\bar{a}, y^{\text{disp}}, r, b) + g + \text{tb}(a, a^*, \gamma g, \gamma g^*, e, \bar{im}, \bar{im}^*) \quad (\text{A1})$$

$$y^{\text{disp}} = y + rb - t \quad (\text{A2})$$

$$t = g + rB \quad (\text{A3})$$

$$\frac{M}{P} = L(y, i) \quad (\text{A4})$$

$$P = p^{\alpha} (E \cdot p^{d*})^{1-\alpha} \quad (\text{A5})$$

$$e = \frac{EP^{d*}}{p^d} \quad (\text{A6})$$

Equation (A1) defines the demand for the domestic good as the sum of private sector absorption, government spending, and the trade balance. The functional relationships need no explanation except possibly for the presence of b , the stock of nonmonetary assets held by the private sector, in the absorption function and the terms γg and \bar{im} in the trade balance. The first of these variables is supposed to capture a wealth effect on spending whereas γ refers to the proportion of government spending that is imported, and \bar{im} to private sector autonomous imports. The latter two variables will be used to investigate the effects of changes in the composition of demand.

Equations (A2) and (A3) define disposable income and tax revenues of the government. The latter are assumed to be set so as to balance the government budget continuously. Together the equations imply

$$y^{\text{disp}} = y + r(b - B) - g \quad (\text{A2}')$$

Monetary equilibrium is defined in equation (A4) where the main noteworthy element is the presence of a price index comprising both the domestic good and the importable as the deflator of nominal money balances. This price index is defined in (A5) as a geometrically weighted average where the weights α and $1 - \alpha$ are assumed to reflect

1/ For the definitions of the symbols see the Table in this Appendix.

domestic consumption shares. Since the marginal propensity to import, m , also reflects the consumption share of importables we shall assume that $m = 1 - \alpha$. The real exchange rate, e , is defined in (A6) as the relative price of importables in terms of domestic output. Used in combination with (A5) the domestic price index can also be written

$$p = p^d e^{1-\alpha} \quad (\text{A5}')$$

A corresponding set of equations describes the foreign country:

$$y^{d*} = a^* (\bar{a}^*, y^{\text{disp}*}, r^*, b^*) + g^* - \frac{1}{e} tb (\dots) \quad (\text{A7})$$

$$y^{\text{disp}*} = y^* + \frac{1}{e} r b^* - t^* \quad (\text{A8})$$

$$t^* = g^* + (1/e) r B^* \quad (\text{A9})$$

$$y^{\text{disp}*} = y^* + (1/e) r (b^* - B^*) \quad (\text{A8}')$$

$$M^*/P^* = L^*(y^*, i^*) \quad (\text{A10})$$

$$P^* = (P^d/E)^{\alpha^*} p^{d*} e^{-\alpha^*} \quad (\text{A11})$$

$$\bar{P}^* = p^{d*} e^{-\alpha^*} \quad (\text{A11}')$$

Equilibrium in the goods markets obtains when demand for the two goods is equal to the corresponding supplies as in (A12) and (A13).

$$Y^d = y \quad (\text{A12})$$

$$y^{d*} = y^* \quad (\text{A13})$$

Furthermore the holdings of government bonds must be equal to the outstanding stock, that is,

$$b + b^* = B + B^* \quad (\text{A14})$$

This relationship can be rewritten so as to show explicitly that the net international credit position of the home country, $b-B$, is equal to the net debtor position of the foreign country.

$$b - B = - (b^* - B^*) \quad (A15)$$

Uncovered interest parity is assumed to hold up to a term λ which is introduced to capture a risk premium on domestic assets.

$$i = i^* + \hat{E}^e + \lambda \quad (A16)$$

Defining $r = i - \hat{P}^e$ and $r^* = i^* - \hat{P}^{*e}$ and using (A5') and (A11') this condition can be rewritten in terms of real interest rates and the real exchange rate as in (A17)

$$r = r^* + (\alpha - \alpha^*) \hat{e}^e + \lambda \quad (A17)$$

Finally, the current account balance, which must be equal to the change in asset holdings, is the sum of the trade balance and the debt service balance.

$$\dot{ca} = \dot{b} = tb (\dots) + r (b - B) \quad (A18)$$

Solutions for the Full-Employment Case
With Given Distribution of Assets

Assuming that full-employment output in each country is constant, we have

$$y = y^f \quad (A19)$$

and

$$y^* = y^{f*} \quad (A20)$$

With prices perfectly flexible the model dichotomizes into a real part determining r , e , and ca and a monetary part determining P and P^* . We shall concentrate here on the solutions for the real variables.

To solve for the real interest rate we add (A1) and (A7) and make use of the equilibrium conditions in the goods markets. Linearizing the resulting system around

$$e = p^d = p^{d*} = 1 \text{ and } tb = b - B = 0$$

yields

$$y^f + y^{f*} = \bar{a} + \bar{a}^* + c(y^{\text{disp}} + y^{\text{disp}*}) + a_r r + a_r r^* \\ + a_w (b + b^*) + (g + g^*)$$

Using the definitions of disposable income and equations (A15) and (A17) we obtain, in view of the static expectation assumption ($\dot{e}^e=0$),

$$(1-c)(y^f + y^{f*}) = \bar{a} + \bar{a}^* + 2a_r r - a_r \lambda + (1-c)(g + g^*) \\ + a_w (B + B^*)$$

Solving for the real interest rate yields

$$r = \frac{1}{2a_r} \{ (1-c)[(y^f + y^{f*}) - (g + g^*)] - (\bar{a} + \bar{a}^*) \\ - a_w (B + B^*) \} + \lambda \quad (\text{A21})$$

$$r^* = r - \lambda \quad (\text{A22})$$

Subtracting (A7) from (A1) and using (A21) the solution for the real exchange rate may be simplified to

$$e = \frac{1}{2tb_e} \{ [1-c(1-2m)] [(y^f - y^{f*}) - (g - g^*)] - (1-2m)[(\bar{a} - \bar{a}^*) \\ + a_r \lambda + a_w (B + B^*)] + 2(g_o \gamma - g_o^* \gamma^*) + 2(\bar{i}m - \bar{i}m^*) \} \quad (\text{A23})$$

Using the solutions for e in (A18) we finally obtain the expression for the current account.

$$ca = \frac{1}{2} \{ (1-c) [(y^f - y^{f*}) - (g-g^*)] - (\bar{a} - \bar{a}^*) - a_r \lambda - a_w (B-B^*) \} + r_o (b-B) \quad (A24)$$

Fixed prices, variable output, and given assets stocks

Using the assumptions that p^d and p^{d*} are fixed and that output is demand determined but maintaining all other assumptions from the full-employment case, it is possible to derive the following expressions for r , e , and ca .

$$dr = \frac{1}{2\Delta_1} \{ (1-c)d(M + M^*) - (1-c) L_y d(g+g^*) - L_y d(\bar{a}+\bar{a}^*) - (\frac{1}{2} - m) L_y a_w d(B + B^*) \} + \frac{1}{2} d\lambda \quad (A25)$$

$$de = \frac{(1-c)}{\Delta} \{ \frac{1}{2} [1-c(1-m)] d(M-M^*) - \frac{1}{2} \Delta_3 d\lambda - (\frac{1}{2} - m) L_y a_w d(B - B^*) - \frac{1}{2} L_y [1-c(1-2m)] d(g-g^*) - (\frac{1}{2} - m) L_y d(\bar{a} - \bar{a}^*) + L_y (g_o d\gamma - g_o^* d\gamma^*) + L_y d(\bar{i}m - \bar{i}m^*) \} \quad (A26)$$

$$dca = \frac{1}{2} \frac{tb_e (1-c)}{\Delta} \{ (1-c)d(M - M^*) - (\Delta_1 + a_r \Delta_2) d\lambda - a_w (L_y + \Delta_2) d(B - B^*) - (L_y + \Delta_2) (1-c) d(g - g^*) - (L_y + \Delta_2) d(\bar{a} - \bar{a}^*) - \frac{(1-c)}{m} \Delta_2 (g_o d\gamma - g_o^* d\gamma^*) - \frac{(1-c)}{m} \Delta_2 d(\bar{i}m - \bar{i}m^*) \} + r_o d(b - B) \quad (A27)$$

$$\Delta = (1 - c)\{(1 - \alpha) [1 - c(1 - 2m)] + tb_e L_y\} > 0$$

$$w_1 = a_r L_Y + (1 - c) L_i < 0$$

$$\Delta_2 = 2m \frac{1 - \alpha}{tb_e} > 0$$

$$\Delta_2 = [1 - c(1 - m)] \Delta_1 + 2m L_Y a_r < 0$$

Dynamics

As it stands, the model contains one inherent source of dynamics, namely the international redistribution of assets stocks as a result of current account imbalances (equation (A18)). In Section V of the main text we introduced two additional sources stemming from gradual price adjustment and exchange rate expectations. We specify the former in the form of Phillip's curves

$$\hat{p}^d = \psi (y^d - y^f) \quad (\text{A28})$$

and

$$\hat{p}^{d*} = \psi^* (y^{d*} - y^{f*}) \quad (\text{A29})$$

Exchange rate expectations are assumed to obey the same mechanism as in the Dornbusch (1976) analysis of exchange rate dynamics, that is,

$$\hat{e}^e = 0 (\bar{e} - e) \quad (\text{A30})$$

where \bar{e} is the steady-state value of the real exchange rate.

The full dynamic solution of the two-country model is analytically intractable. Below we present only the steady-state solution which is important for a number of points made in the text.

Our solution (A21) for the real interest rate in the full-employment case is also the steady-state solution since the assumption of symmetry implies that asset redistribution does not alter aggregate spending. By subtracting (A7) from (A1) and by setting $b = 0$ in (A18) we obtain two additional equations that determine the steady-state values of e and b . In matrix form these equations can be written

$$\begin{aligned}
\begin{bmatrix} t b_e & a_w (1-2m) \\ t b_e & r_o - 2m a_w \end{bmatrix} \begin{bmatrix} \bar{e} \\ \bar{b} \end{bmatrix} &= \begin{bmatrix} 1/2 (1-c) + mc \\ mc \end{bmatrix} [(y^f - y^{f*}) - (g - g^*)] \\
&+ \begin{bmatrix} -1/2 (1-2m) \\ m \end{bmatrix} (\bar{a} - \bar{a}^*) + \begin{bmatrix} -(1/2) (1-2m) a_r \\ m a_r \end{bmatrix} \lambda \\
&+ \begin{bmatrix} 1/2 a_w (1-2m) \\ r_o - m a_w \end{bmatrix} B + \begin{bmatrix} 1/2 a_w (1-2m) \\ -m a_w \end{bmatrix} B^* \\
&+ \begin{bmatrix} 1 \\ -1 \end{bmatrix} [(g_o \gamma - g_o^* \gamma^*) + (\bar{im} - \bar{im}^*)] \quad (A31)
\end{aligned}$$

$$\Delta \equiv \begin{bmatrix} t b_e & a_w (1-2m) \\ t b_e & r_o - 2m a_w \end{bmatrix} = t b_e (r_o - a_w) < 0$$

The last inequality follows from the assumption that $a_w > r_o$ which is necessary for stability.

The steady-state responses of e and b to the exogenous variables can easily be calculated from (A31). We shall give the explicit expressions for the change in \bar{e} due to shocks to g , a , λ , and B for the purpose of comparing the steady-state effects and the impact effects given in (A23).

$$\frac{d\bar{e}}{dg} = -\frac{1}{tb_e} \left[\frac{1/2 (1-c) (2 ma_w - r_o)}{a_w - r_o} + mc \right]$$

$$\frac{d\bar{e}}{da} = -\frac{1}{\Delta} \left[\frac{1}{2} - m \right] r_o > 0$$

$$\frac{d\bar{e}}{d\lambda} = -\frac{1}{\Delta} \left[\frac{1}{2} - m \right] r_o > 0$$

$$\frac{d\bar{e}}{dB} = -\frac{1}{\Delta} a_w \left[\frac{1}{2} - m \right] r_o > 0$$

Comparing these solutions with the corresponding ones from (A23) we note that the steady-state effects definitely have the opposite sign from the impact effects for shocks to \bar{a} , λ , and B. For the fiscal shock the steady-state may also have the opposite sign, but even if it does not, the steady-state adjustment will definitely be smaller than the impact effect. In each case we have examples of overshooting.

Table 1. Definitions of Symbols

a	real private sector absorption
\bar{a}	autonomous part of a
b	private sector holdings of government bonds
\bar{b}	steady-state value of b
B	supply of government bonds
e	real exchange rate
\bar{e}	steady-state value of e
E	nominal exchange rate
g	real government expenditures
i	nominal rate of interest
\bar{i}_m	autonomous part of imports
M	money supply
P	consumer price index
p^d	nominal price of the domestic good in local currency
r	real rate of interest
t	real tax revenue
tb	balance of trade in real terms
y	supply of the domestic good
y^d	demand for the domestic good
y^{disp}	real disposable income
y^f	full-employment output of the domestic good
γ	share of government spending that is imported
λ	risk premium on domestic assets

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