# Expansionary Fiscal Policy and the Exchange Rate

## A Review

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THERE IS MUCH DISAGREEMENT among economists and policymakers on the effect of an expansionary fiscal policy on the exchange rate.[1] In part, this is so because there are many types of expansionary fiscal policy and no uncontroversial answers to basic questions concerning the effects of an expansionary fiscal policy on output and prices.[2] But, even if an expansionary fiscal policy is narrowly defined as an increase in government expenditure that is financed by raising taxes or issuing debt and that does not affect market expectations about the future course of monetary policy, its effect on the exchange rate remains subject to controversy. In this paper, the author brings together and reviews the various contributions on this subject. He shows that, notwithstanding the differences existing among exchange rate models, a few key ele-

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[1]In his survey of exchange rate models, Isard (1978, p. 26) writes: "It seems safe to assert that open-economy models have provided better insights on the exchange-rate impacts of central-bank policies than on the exchange-rate impacts of fiscal policies." Since the appearance of this survey, the disagreement on the relation between fiscal policies and exchange rate movements has persisted.

[2]For example, there is disagreement as to whether expansionary fiscal policies directly cause inflation, as to whether bond-financed increases in public expenditure are equivalent to tax-financed increases, and as to whether transitory policies have a larger impact on output than do permanent policies. Boskin (1982, p. 296) writes: "While substantial analytical and, to a lesser extent, empirical improvements have been made in our understanding of the impact of federal government activity on the performance of the economy in the short and long run, clearly nothing like a consensus is emerging and as a profession, strong mutually inconsistent views still dominate."

ments determine the sign and magnitude of the relationship between an expansionary fiscal policy and the exchange rate. The relative importance of these elements depends on the long-run effect of the expansionary policy on real output and prices, on the private market expectations about the future external debt, and on the relative substitutability of the financial assets denominated in different currencies.

The paper is organized in five sections. Section I examines the effect of an expansionary fiscal policy in an economy in which market participants view domestic and foreign financial assets as perfect substitutes, in which only traded goods are produced, and in which real wages are flexible. Section II expands the analysis by considering a situation in which the economy produces nontraded goods and one in which real wages are rigid. Section III reviews the effect of an expansionary fiscal policy in the framework of portfolio models that stress the imperfect substitutability of different assets. Section IV presents some concluding remarks. Throughout the paper, the author assumes that budget deficits are always financed by issuing debt that is denominated in the domestic currency.[3] In addition, he assumes that the "news" of the expansionary policy reaches the market when the policy is implemented. In practice, this never occurs. However, various authors (Wilson (1979), Dornbusch and Fischer (1980), Boyer and Hodrick (1982)) have shown that the main results obtained from exchange rate models are valid even though the private sector learns about a policy change before the change takes place.

## I. Monetary Models of Exchange Rate Determination

The monetary model developed by Mundell (1963) remains the basic framework of macroeconomic models of the exchange rate. For example, it is still this framework that Dornbusch (1980 a), Frenkel and Mussa (1981), and Marston (1983) have recently utilized to discuss economic policy issues in the open economy. Therefore, it is natural to begin this review by examining the effect of an expansionary fiscal policy on the exchange rate in this framework. The main feature of the framework is that the private sector views bonds denominated in domestic currency and foreign currency as perfect substitutes so that the real rates of interest on

[3]Penati (1983) analyzes the relationship among budget deficit, external official borrowing, and the exchange rate.

the two bonds are always equal. As will become clear later on, this assumption implies that the money market plays a dominant role in the analysis of exchange rate movements; that is why the exchange rate models based on this assumption can be called monetary.[4]

## EXPANSIONARY FISCAL POLICY AND MONEY MARKET EQUILIBRIUM

The effect of an expansionary fiscal policy on the exchange rate is analyzed first in an updated version of the monetary model in which domestic nominal wages and prices are rigid.[5] The model consists of a financial sector and a real sector. The equilibrium in the financial sector is described by five equations: an equation for the money market, one for the interest rate parity condition, one for the exchange rate expectations, one for the domestic price level, and one for the wealth constraint.[6]

$$M = m(r, y, w)p \qquad m_1 < 0 \qquad m_2, m_3 > 0 \tag{1}$$

$$r = r^* + \dot{s}^e/s \tag{2}$$

$$\dot{s}^e/s = \dot{s}/s \tag{3}$$

$$p = p_h^{\alpha} s^{1-\alpha} \tag{4}$$

$$pw = M + sF + B \tag{5}$$

The demand for the real stock of money ($M/p$) is a function of the domestic nominal interest rate ($r$) and two scale variables—real output ($y$) and real wealth ($w$). The domestic nominal interest rate is equal to the "world" interest rate ($r^*$), which is exogenous because the country is small, *plus* the expected change in the exchange rate ($\dot{s}^e/s$).[7] If expectations are rational, the expected change in the exchange rate is equal to the actual change, that is, $\dot{s}^e/s = \dot{s}/s$. Nominal wealth is the sum of money, net foreign assets ($sF$), and domestic government bonds ($B$). These bonds may not be considered wealth if the private sector perfectly discounts the

[4]In this section, perfect capital mobility is assumed. If there were no capital movements, so that the current account had always to be balanced, the conclusions reached in the next subsection would be reversed. For example, see Branson (1976). Zero capital mobility, however, is not pursued in this paper because it is not representative of the industrial countries.

[5]The model draws on Branson and Buiter (1983).

[6]A dot above a variable indicates time derivative.

[7]The main qualitative conclusions about the exchange rate response to an expansionary fiscal policy remain the same if the small-country model is expanded into a two-country model. See Mussa (1979).

future taxes that the government debt implies. The deflator of domestic demand ($p$) is a weighted average of the price of domestic output ($p_h$) and the index of import prices. This index is equal to the exchange rate $s$, if the convenient assumption is made that the index of foreign prices is always equal to one.

In the real sector, it is assumed that the economy produces only traded goods. Real domestic absorption ($a$) is determined by the real interest rate ($r - \dot{p}/p$), real disposable income, real wealth, and real government expenditure on domestically produced goods ($G/p_h$). For simplicity, it is assumed that real disposable income is equal to output *minus* taxes expressed in terms of domestic goods ($T/p_h$). Because only the situation is considered in which budget deficits are financed with bonds denominated in domestic currency, $\dot{B} = G + rB - T$ is the government budget constraint. Because nominal wages are rigid, real output is demand determined; real demand, in turn, is a function of real domestic absorption and the terms of trade ($p_h/s$). An increase in the terms of trade will also be termed an appreciation in the real exchange rate. The current account of the balance of payments ($b$) is equal to the trade account *plus* the service account, which are functions of real absorption, the terms of trade, and the interest payments on the net foreign assets ($r^*F$). For simplicity, it is assumed that net foreign assets consist of short-term instruments that are automatically rolled over so that capital gains and losses that are due to exchange rate valuations can be neglected. Finally, the current account determines the rate at which the economy accumulates or decumulates net foreign assets ($s\dot{F}$).

The following equations describe the real sector:

$$a = a(r - \dot{p}/p,\ y - T/p_h,\ w) + G/p_h \qquad a_1 < 0 \quad a_2, a_3 > 0 \qquad (6)$$

$$y = y(a,\ p_h/s) \qquad y_1 > 0 \quad y_2 < 0 \qquad (7)$$

$$b = b(a,\ p_h/s,\ r^*F) = s\dot{F}/p_h \text{[8]} \qquad b_1, b_2, b_3 < 0 \qquad (8)$$

Figure 1 illustrates the model in the $r$-$s$ space when resources are less than fully employed. The $LL$, $XX$, and $FF$ schedules in the figure depict the combinations of interest rate and exchange rates that ensure equilibrium in the money market, the goods market, and the current account of the balance of payments. The schedules are derived from equations (1), (7), and (8) by setting the time derivatives equal to zero. The $LL$ and $XX$ curves are positively sloped. An increase in the interest rate creates an excess

[8]Equation (8) is obtained by dividing the balance of payments identity by $p_h$.

supply of money, and equilibrium in the money market is restored by a depreciation in the exchange rate that increases both the price level and real output.[9] In addition, the increase in the interest rate reduces the demand for output, and a deterioration in the terms of trade, which is brought about by a depreciation in the exchange rate, is needed to restore equilibrium in the market for domestic output.[10] The *FF* is negatively sloped. An increase in the interest rate induces a current account surplus by reducing domestic absorption, and an appreciation is needed to achieve a balanced current account.[11]

Initially, a balanced-budget expansionary fiscal policy is considered. The policy induces an increase in domestic output. The rise in output creates an excess demand for money that pushes up the domestic interest rate, thus appreciating the exchange rate. In Figure 1, the expansionary fiscal policy shifts both the *XX* and *LL* schedules inward, and the economy reaches a point such as *Z* in the short run. At *Z*, the current account is in deficit because domestic absorption went up and the exchange rate appreciated. In the figure, the increase in absorption shifts the *FF* curve to the right (*F'F'*).

A point such as *Z* is not a point of long-run equilibrium. In the long run, the domestic interest rate cannot diverge from the world level, which has not changed, and the current account must be balanced. This last condition ensures that the economy will reach a portfolio equilibrium in the long run, as Dornbusch (1975 a; 1976 c) and Frenkel (1976) showed.[12] The economy will be in

[9]The slope of the *LL* schedule is equal to

$$dr/ds = -[m\,\partial p/\partial s + p(m_3\partial w/\partial s + m_2\partial y/\partial s)]/(m_1 + m_2y_1a_1)p$$

The slope is positive if wealth movements are not the predominant cause of changes in private absorption and demand for money.

[10]The slope of the *XX* schedule is

$$dr/ds = -[y_1(a_2\partial y/\partial s + a_3\partial w/\partial s) + y_2\partial x/\partial s]/y_1a_1$$

where

$$x = p_h/s$$

and, as before, it is assumed that $a_3$ is sufficiently small.

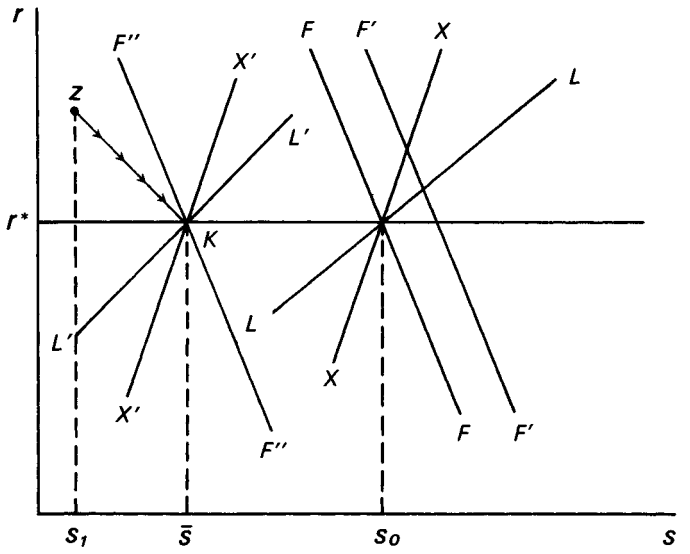
[11]The slope of the *FF* curve is

$$dr/ds = -(b_1a_2\partial y/\partial s + b_1a_3\partial w/\partial s + b_2\partial x/\partial s)/(b_1a_1 + b_1a_2\partial y/\partial r)$$

The slope is always negative, providing that $b_2$ is greater than $b_1a_2\partial y/\partial s$.

[12]In portfolio equilibrium, the private sector does not accumulate assets, and the net flow of savings must be equal to zero. Because the economy is not

FIGURE 1. EXPANSIONARY FISCAL POLICY IN MONETARY MODELS: FLEXIBLE OUTPUT




long-run equilibrium at a point such as $K$ where output has increased and the exchange rate has appreciated compared with their initial levels. The reason is that, in this model, the expansionary fiscal policy permanently raises domestic real absorption and, consequently, real output and the demand for money. Because the domestic interest rate is tied to the world rate in the long run and because the demand for money is inelastic with respect to movements of wealth, real output and the aggregate demand deflator must fall in order to restore equilibrium in the money market. The fall in these two variables is caused by a long-run appre-

growing and the budget deficit declines in proportion to gross national product (GNP), the condition of zero savings is equivalent to a balanced current account. McKinnon and Oates (1966) and Turnovsky (1976) constructed portfolio models of the open economy in which both a current account deficit and a budget deficit characterize the long-run solution, even though wealth is an argument of the expenditure function and the economy achieves portfolio equilibrium. This long-run solution occurs because the increase in the newly issued government debt exactly offsets the decline in the domestic stock of foreign bonds, which is caused by the current account deficit, thus leaving the private stock of wealth unchanged. Because these models assume that the current account is in deficit forever, the interest payments on the foreign-owned government debt are boundless. Clearly, this case can be true only if the interest payments on the government debt are neglected. See also Allen (1977) on this problem.

ciation in the exchange rate that, on the one hand, shifts spending away from domestic goods by improving the terms of trade and, on the other hand, reduces import prices.[13]

In addition to clearing the money market, the fall in output checks real domestic absorption so as to balance the current account. The decline in absorption is also due to a reduction in wealth, which is brought about by the current account deficits that the country experiences as a result of the expansionary fiscal policy. In Figure 1, the change in absorption and the fall in real wealth shift the $F'F'$ schedule to the left and the $LL$ and $XX$ to the right until they intersect at $K$. The new long-run equilibrium position is marked by the schedules $X'X'$, $L'L'$, and $F''F''$.

The result of an appreciation depends neither on whether the increase in government expenditure is financed with taxes or bonds nor on whether government bonds are net wealth, because in each case the policy will create an excess demand for goods. However, the expansionary effect of the policy, and thus the appreciation in the exchange rate, will be larger if the government debt has a strong impact on private sector wealth.

Now, turn to the dynamic path that the exchange rate follows after the fiscal shock. The expansionary fiscal policy raises the domestic interest rate, thus causing a sudden appreciation in the exchange rate. The domestic interest rate is now above the world rate; the interest rate parity condition then implies that the market, at $Z$, expects the exchange rate to depreciate. However, because expectations are rational, the market also expects the exchange rate to appreciate in the long run by an amount equal to $\bar{s} - s_0$. The expectations of a depreciation can be reconciled with the expectations of a long-run appreciation only if the exchange rate immediately appreciates in excess of the long-run appreciation. In the figure, the exchange jumps from $s_0$ to $s_1$. The greater the expectations of a long-run appreciation, the larger the sudden appreciation in the exchange rate.[14] The long-run nominal appreciation in the exchange rate will also cause an appreciation in the

[13]Ceteris paribus, the appreciation will depend on the weight of import prices in the aggregate demand deflator. The smaller the weight, the larger the appreciation. The largest appreciation will then occur in the extreme case in which exchange rate movements do not affect the aggregate demand deflator and, thus, the real stock of money. In this case, which was analyzed by Mundell (1963), the exchange rate must appreciate until output moves back to its initial level.

[14]Argy and Porter (1972) presented an early analysis of how expectations affect the impact of an expansionary fiscal policy on the exchange rate.

real exchange rate because the price of domestic output is fixed by assumption.

The result of an appreciation in the exchange rate does not depend on the assumption of domestic wage and price ridigity. Dornbusch (1976 a) extended the Mundell (1963) model by considering the case in which the price of domestic output sluggishly responds to demand pressures and output is at the full employment level in the long run.[15] In this model, as Mathieson (1977) showed, an expansionary fiscal policy causes the price of domestic output to rise, thus reducing the real stock of money. In the long run, however, the policy affects neither output nor the interest rate so that the real money stock must remain constant for the money market to be in equilibrium. As a result, the exchange rate must appreciate to offset the rise in the price of domestic output so as to leave the aggregate demand deflator unchanged.[16] As in the model of Branson and Buiter (1983), the real exchange rate will also appreciate in the long run.

The framework of the monetary model has often been used in the economic policy debate. For example, Tobin (1980, p. 52) writes:

> Substitution of fiscal for monetary restraint is "bad" for a country trying to defend its currency, a chronic plight of the United States since 1960. In the 1960s defense of the overvalued dollar took precedence over the dedication of the demand-management mix to domestic growth; this was one reason for reliance on tax stimulus during the 1961–65 recovery.

A similar framework is used in the *Economic Report of the President* (1983, p. 69):

> A tighter fiscal policy would also lower real interest rates and lead to a lower dollar. Under fixed exchange rates, budget deficits crowded out domestic investment. With a floating exchange rate they crowd out exporting and import-competing products as well.

The result of a long-run real and nominal appreciation that emerges from the monetary models rests, however, on the questionable assumption that an increase in government expenditure can permanently increase the demand for domestically produced goods and thus the demand for money in the long run.

[15]The same assumptions about prices and output dynamics are made by Turnovsky and Kingston (1977) in their analysis of the effects of various financial policies on the exchange rate.

[16]In this model, however, the immediate appreciation in the exchange rate "undershoots" the long-run appreciation. See Mathieson (1977).

Although the private sector views the goods and services provided by the government as imperfect substitutes for private consumption, a permanent increase in government expenditure causes an increase in the present value of future taxes that the private sector expects to pay.[17] This is so either because changes in government expenditure signal changes in taxes to the private sector, if the government undertakes a balanced-budget expansionary fiscal policy, or because the private sector does not expect budget deficits to last, if the government initially finances the increase in expenditure by issuing debt and is believed to maintain the posture of monetary policy. The increase in the present value of future taxes reduces the permanent disposable income of the private sector by an equal amount, thus causing a proportionate fall in private consumption. The expansionary fiscal policy will create an excess demand for goods if the increase in government consumption exceeds the fall in private consumption, which in turn depends on the size of the increase in the present value of future taxes. Because no budget deficit can be sustained for a "pure" fiscal policy, the present value of future taxes must be equal to the present value of government expenditure in the long run. Thus, in the long run, an expansionary fiscal policy will not create an excess demand for goods because private consumption will decline by an amount approximately equal to the increase in government expenditure. If private consumption quickly adjusts to changes in permanent income, a permanent increase in government expenditure will not create an excess demand for goods even in the short run.[18] The empirical evidence presented in Hall (1978) suggests that private consumption adjusts very quickly, at least in the United States.[19]

It is fair to conclude that an expansionary pure fiscal policy, which takes the form of a permanent increase in government expenditure, will have a negligible effect on the aggregate demand for goods in the long run.[20] The finding of an appreciation in these

[17]As Bailey (1971) pointed out, if the government provides the private sector with goods and services that are good substitutes for the goods that it already consumes, there will be no excess demand because the private sector will simply switch from one kind of goods to the other.

[18]For example, see the model of the current account developed by Sachs (1981).

[19]This evidence, however, has been challenged by Flavin (1981).

[20]Barro (1981) presents some evidence supporting the different impacts of permanent and transitory increases in government expenditures on the level of output.

monetary models may thus be valid for the short run but is dubious for the long run.

## EXPANSIONARY FISCAL POLICY AND THE LONG-RUN BUDGET CONSTRAINT OF THE ECONOMY

In the previous models, the finding of an appreciation was obtained by assuming, among other things, that the elasticity of the money demand with respect to wealth is low. If this elasticity is very high, a decline in wealth can restore equilibrium in the money market at a higher level of output and demand deflator, and the exchange rate does not have to appreciate. Some monetary models, like those of Dornbusch and Fischer (1980), Dornbusch (1980 b), and Boyer and Hodrick (1982), assume a strong wealth effect in the money demand so that an expansionary fiscal policy causes a depreciation in the exchange rate. It would be erroneous, however, to conclude that these models differ from the previous models only in the way in which the money demand function is specified. By de-emphasizing the excess demand for money as the main determinant of the exchange rate, these models stress another important channel through which the expansionary fiscal policy puts upward pressure on the exchange rate. When the expansionary fiscal policy takes place, the economy as a whole consumes more goods than it produces so that it receives a real transfer from the rest of the world. The transfer must be paid for eventually, as Rodriguez (1979) originally pointed out. To pay for the transfer, private consumption must be cut back and additional resources must be allocated to the production of exports. In the long run, this process implies a depreciation in the real and nominal exchange rates. If the expectations about the future current accounts, and thus the long-run real exchange rate, are the main determinants of the present exchange rate, as Mussa (1980) argued, an expansionary fiscal policy will cause an immediate depreciation in the exchange rates.

The model of Dornbusch and Fischer (1980), which assumes constant full employment, can be described by the following set of equations:

$$\bar{y} = D(s/p_h,\ w,\ \bar{y} + Tp_h) + G/p_h + X(s/p_h) \qquad D_1,\ D_2,\ D_3,\ X_1 > 0 \qquad (9)$$

$$s\dot{F}/p_h = S(w) + G/p_h \qquad S_1 < 0 \qquad (10)$$

$$p_h w = M + sF \qquad (11)$$

$$M = p_h m(r, w) \qquad m_1 < 0 \qquad m_2 > 0 \qquad (12)$$

$$r = r^* + \dot{s}/s \qquad (13)$$

where $\bar{y}$ is the constant level of output that is consistent with full employment; $D$ and $X$ are the (real) private domestic and foreign demand for domestic output; $S$ is real private savings, which are negatively related to real wealth; and, as before, exchange rate expectations are assumed to be rational. In Figure 2, the $FF$ and $LL$ schedules depict the combinations of exchange and interest rates that ensure a balanced current account and equilibrium in the money market. The schedules are derived from equations (10) and (12).[21] A balanced-budget expansionary fiscal policy initially causes an increase in the price of domestic output, given that output is at full-employment level. Because imported goods are now relatively cheaper, the domestic private sector will maintain its level of consumption by switching to imported goods so that the country will run a current account deficit. In the long run, the country must balance the current account and develop a trade surplus to service the accumulated stock of foreign debt. The trade surplus is accomplished by a depreciation in the real exchange rate and by a decline in real wealth. The decline in wealth reduces the real quantity of money demanded so that an increase in the price of domestic output is needed to clear the money market. Because the price of domestic output goes up and the real exchange rate depreciates, the nominal exchange rate will depreciate in excess of the rise in $p_h$. In Figure 2, the expansionary fiscal policy shifts the $LL$ and $FF$ schedules to the right ($L'L'$ and $F'F'$), and $\bar{s}$ is the exchange rate that prevails in the long run.

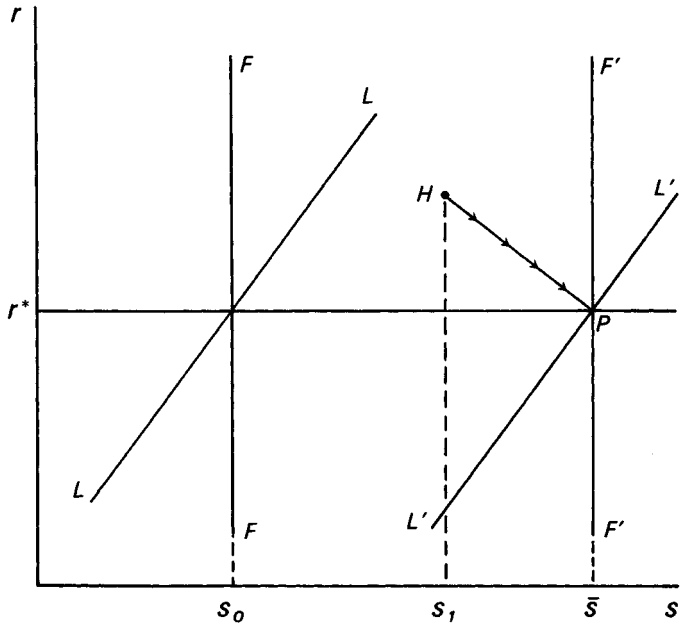
When the news of the expansionary fiscal policy reaches the market, economic agents anticipate the long-run depreciation and move away from domestic assets into foreign assets, thus depreciating the exchange rate immediately. (In Figure 2, the exchange rate jumps from $s_0$ to $s_1$.) Because the expansionary fiscal policy pushes the domestic interest rate above the world rate, the interest parity condition implies that the market expects the exchange rate to depreciate continuously during the transition to the long run. This continuous depreciation is also needed to maintain port-

[21]The slope of the $LL$ schedule is

$$dr/ds = -(m_2 F/p_h)/m_1$$

which is positive because, as in Dornbusch and Fischer (1980), $p_h$ is used to deflate nominal wealth.

FIGURE 2. EXPANSIONARY FISCAL POLICY IN MONETARY MODELS: FIXED OUTPUT




folio equilibrium in the face of the loss of net foreign assets that is caused by the current account deficits. Because the exchange rate depreciates both in the long run and immediately after the announcement of the deficit, the initial jump in the exchange rate is less than the depreciation that prevails in the long run ($\bar{s} - s_0$ in the figure). A similar result is obtained by Boyer and Hodrick (1982) with a somewhat different model.[22]

Obstfeld (1981) showed that an expansionary fiscal policy causes an immediate depreciation in the exchange rate in a model where households maximize the expected present value of their

[22]In their model, the demand for the real money stock depends on the domestic interest rate and real wealth but not on domestic output; private sector savings are a function of the discrepancy between actual and desired wealth; desired wealth is positively related to disposable income; and disposable income is negatively related to the expansionary fiscal policy because, with a deficit, economic agents anticipate the future tax liabilities associated with the issue of government debt. In the model, an expansionary fiscal policy permanently reduces the private sector disposable income and, hence, desired wealth. As a result, less money is demanded. The equilibrium in the money market is restored by a depreciation that causes an increase in the price level.

utility functions.[23] His result does not depend on the specification of the money demand function but, as in Dornbusch and Fischer (1980) and Boyer and Hodrick (1982), the depreciation is the consequence of the long-run budget constraint that the economy faces. In Obstfeld (1981), households maximize the present value of their utilities ($V$), which are functions of real consumption ($c$) and real money balances ($m$), subject to the wealth and income constraints—equations (15) and (16), respectively.

$$V = \int_0^{\infty} U(c, m)e^{-\Delta t}dt \tag{14}$$

$$p_h w = M + sF \tag{15}$$

$$\dot{w} = \bar{y} + r^*F/s - c - G/p_h - \pi m \tag{16}$$

where $\Delta$ is an increasing function of utility; the price of domestic goods is always equal to the exchange rate, that is, $p_h = s$; $\bar{y}$ is the full-employment level of output; government expenditure ($G$) is always equal to government transfers;[24] and $\pi$ is the expected inflation rate.

Because government expenditure does not enter the utility function, a balanced-budget expansionary fiscal policy, which is expected to be permanent, does not affect either the level of private sector consumption or real money balances in the long run.[25] As a result, the country must sustain both the same level of private consumption and a higher level of government expenditure. Because of the budget constraint, the higher level of domestic absorption can be sustained only if the country increases its net holding of foreign assets so that the larger interest income finances the higher level of government expenditure.[26] An expansionary fiscal policy will then cause an immediate fall in private consumption. The fall induces a current account surplus that allows the country to accumulate the net foreign assets needed to finance the higher level of absorption. Because real cash balances

[23]See also Hodrick (1982).

[24]In Obstfeld (1981), government expenditure differs from transfers because the authorities can finance a deficit through money creation, which is kept constant here.

[25]The result of a depreciation does not change if households' utility depends on the level of government expenditure and if the marginal utility of government expenditure does not exceed the marginal utility of private consumption (Obstfeld, 1981).

[26]This result can easily be seen in equation (16) by setting $\dot{w} = 0$ and by recalling that $c$ and $\pi m$ are constant in the long run.

and consumption move together on the optimal path toward long-run equilibrium, the fiscal policy causes an immediate fall in cash balances that is brought about by a depreciation. Soon after, the exchange rate begins to appreciate until it reaches its initial level.

A crucial assumption of this model is that consumers are infinitely lived or, equivalently, that bequest is a major determinant of private savings so that the burden of financing higher government expenditure cannot be shifted to future generations. Although there is much disagreement on the validity of this assumption, it seems that intergenerational transfers indeed account for a large fraction of accumulated capital in the United States (Kotlikoff and Summers, 1981).

Summing up, an expansionary fiscal policy exerts opposite pressures on the exchange rate in the monetary models. Some models stress the relationship between the expansionary fiscal policy and the demand for money. If the expansionary policy increases the demand for money, an appreciation in the exchange rate is needed to restore money market equilibrium. Other models stress the fact that, as a result of the expansionary policy, the economy consumes more than it produces during a given period, thus accumulating debt vis-à-vis the rest of the world. To repay the debt, the economy must undergo an adjustment process that entails a depreciation in the exchange rate. The expectations of a future depreciation, in turn, put downward pressure on the present exchange rate. Unfortunately, it is impossible to ascertain which factor predominates on theoretical grounds.

The uncertainty about the effect of an expansionary fiscal policy on the exchange rate is not likely to be resolved by the simulations obtained for macroeconometric models. First, an expansionary pure fiscal policy is not easily defined in practice; second, even though a satisfactory definition is found, it is difficult to isolate the impact of a fiscal shock on the exchange rate from the impact of a monetary shock; and, third, empirical studies generally fail to capture the impact of expectations on private sector portfolio decisions.

In addition to these methodological difficulties, the empirical evidence thus far has been inconclusive. In the RDX2-MPS model, which links a model of the U.S. economy to a model of Canada, a debt-financed fiscal expansion that leaves the money supply constant appreciates the exchange rate (Helliwell and Padmore, 1982). By contrast, in the U.S. Federal Reserve multicountry model, which studies the interactions among U.S., U.K.,

Canadian, German, and Japanese economic variables, an increase in real government expenditure that leaves the monetary base constant causes a depreciation in the exchange rate. The depreciation ranges from 0.1 percent for the Canadian dollar to 1 percent for the U.S. dollar (Haas and Symansky, 1983). In Fair's (1982) multicountry model, in which the reaction functions of the authorities are endogenously determined, an increase in government expenditure in the United States depreciates the dollar vis-à-vis all the major currencies after six quarters even though the increase raises both short-term and long-term interest rates. After two quarters, however, the dollar appreciates against the deutsche mark but depreciates against the yen.

## II. Nontraded Goods and Rigid Real Wages

In the models in Section I, only traded goods were produced domestically and real wages were flexible. However, the traded goods sector seldom accounts for more than 40 percent of the GNP in the industrialized countries.[27] In addition, economists and policymakers have shifted their focus to the problem of real wage rigidity since the first oil shock. These features of the real world can be incorporated into the monetary model by elaborating the real sector.

### NONTRADED GOODS

In this section, the author follows Boyer (1978), who extended the monetary model to consider the situation in which the economy produces nontraded goods.[28] However, unlike Boyer, the author assumes that domestic and foreign bonds are perfect substitutes; in the next section, he concentrates on less than perfect substitutability. If the economy produces nontraded goods, there is an additional market that has to be cleared and thus an additional equation in the model. That equation describes the excess private demand for nontraded goods, which depends on the real interest rate, the level of real wealth, the relative price of traded

[27]The size of the traded goods sector can be approximated by the ratio of the value added in agriculture, mining, and manufacturing to the gross domestic product at factor costs.

[28]Dornbusch (1975 b), Floyd (1979), and Genberg and Kierzkowski (1979) also study the relationship between fiscal policy and the exchange rate movements in a model with nontraded goods.

to nontraded goods ($s/p_n$), and real disposable income. To avoid an unnecessary complication, it is generally assumed that the domestic price of traded goods is equal to the exchange rate because there is perfect substitution between domestic and foreign traded goods; their prices are then linked by purchasing power parity. As a result, the relative price of traded to nontraded goods replaces the terms of trade in the real sector of the model. Equilibrium in the market for nontraded goods can then be expressed as

$$n(r - \dot{p}/p,\ w,\ s/p_n,\ y - T/p_h) + G/p_n = 0$$
$$n_1 < 0 \qquad n_2,\ n_3,\ n_4 > 0 \tag{17}$$

Equation (17) shows that the exchange rate affects this market by changing real wealth and the relative price of traded to nontraded goods. An additional assumption is that the economy is always at full employment and that changes in the relative price do not directly affect the demand for money.[29] Consequently, the excess demand for traded goods becomes

$$y(a,\ s/p_n) = \bar{y}$$

where $\bar{y}$ is the full-employment level of output. The aggregate demand deflator ($p$) is now a geometric average of the exchange rate and the price of nontraded goods, or

$$p = {p_n}^{\alpha} s^{1-\alpha}$$

The author focuses here on the comparative statics because, as before, the dynamics of the exchange rate are determined by the interest parity condition. The polar case is considered in which the increase in expenditure, which an expansionary fiscal policy brings about, falls entirely on nontraded goods. This increase causes an excess demand for nontraded goods, thus raising its relative price. The rise stems from an increase in $p_n$ and by an appreciation in the exchange rate. If the nominal price of nontraded goods is more responsive to the conditions in this market, which is a reasonable assumption, the increase in $p_n$ will exceed the fall in import prices owing to the appreciation, thus causing an

[29]Because the economy produces traded and nontraded goods, total output can be expressed in terms of either one. Thus, for any given production of traded and nontraded goods, changes in their relative price affect total output, and thus the demand for real cash balances. It is assumed that this effect is negligible. An alternative way to solve the problem is to choose a numeraire arbitrarily. For example, see Dornbusch (1976 b).

increase in the aggregate demand deflator.[30] The change in the relative price will make traded goods cheaper, thus causing a current account deficit.[31] The deficit, together with the increase in the demand deflator, will reduce real wealth. Can this be an equilibrium position? The anwer is affirmative because the fall in real wealth will clear the excess demand for traded goods and will maintain equilibrium in the money market with an unchanged interest rate and a higher demand deflator.

In this model, the expansionary fiscal policy causes an appreciation in the exchange rate because the appreciation adjusts the relative price to the change in the structure of aggregate demand that the policy induces. In practice, although the size of the nontraded goods sector is large in many industrial countries, it is doubtful that an expansionary fiscal policy can put significant and sustained upward pressure on the exchange rate in this way. First, the polar case, in which the policy drastically affects the structure of aggregate demand, is instructive but unrealistic because expansionary fiscal policies in various countries tend to have an even impact on the markets of both traded and nontraded goods. Second, it is unlikely that an expansionary fiscal policy generates a persistent excess demand for goods, as pointed out in Section I. Although the model cannot say anything about the medium-term and long-term effects of the policy on the rate, it provides useful information on how the structure of the real sector and the nature of government expenditure condition the short-run response of the exchange rate to an expansionary fiscal policy.

### RIGID REAL WAGES

This section considers an economy in which real wages are rigid. The problem of the rigidity of real wages has come to the forefront of economic analysis because strong trade unions and indexation systems have fixed the level of real wages in many industrial countries since the beginning of the 1970s. This new development in the labor market has triggered several papers, which include Casas (1975), Argy and Salop (1979), Sachs (1980), and the survey

[30]A similar assumption is made by Mundell (1971) in his analysis of a devaluation in a model with nontraded goods.

[31]If the expansionary fiscal policy is temporary so that the relative price of domestic goods is expected to decline after a while, then the current account deficit will be dampened by an increase in the domestic real rate above the world rate that will induce consumers to defer their expenditures (Dornbusch, 1983).

by Kouri (1982), that have reanalyzed the effects of financial policies in monetary models, where the assumption of real wage rigidity replaces that of nominal wage rigidity. In these models, an equation such as equation (7) in this paper continues to represent the aggregate demand for traded goods. However, there is now an equation for the supply of traded goods ($y_s$) that is a function of the level of real wages ($k$)—assumed to be fixed—and of the terms of trade, which, in turn, are a function of the nominal exchange rate.

$$y_s = y_s(k, p_h/s) \qquad y_{s1}, y_{s2} < 0 \qquad (18)$$

Equilibrium in the goods market is now obtained by substituting equation (6) in equation (7) and by equating equation (18) to equation (7). The new insight contained in these models is that fiscal policy can affect the supply of output by changing the exchange rate and, consequently, the terms of trade. A policy that causes the exchange rate to depreciate will reduce output. This is so because a nominal depreciation causes a deterioration of the terms of trade and an increase in the aggregate demand deflator. Nominal wages go up in the same proportion as the demand deflator so as to keep real wages constant. As a result, the ratio of nominal wages to producer prices, which are equal to the prices of traded goods produced domestically, will also increase, thus squeezing profits. The profit squeeze reduces output.

An expansionary fiscal policy causes a current account deficit by expanding aggregate demand. Output initially increases, thus driving up interest rates and inducing an appreciation in the exchange rate that causes the current account deficit to deteriorate even further. So far, the initial impact of an expansionary fiscal policy is the same as for rigid nominal wages. However, there are now differences in the way in which the economy achieves a balanced current account and develops the trade surplus that is needed to service the larger stock of external debt. As before, the current account deficit reduces wealth and thus absorption, but, unlike the situation described in Section I, a depreciation in the exchange rate that increases the ratio of wages to producer prices is needed to bring output back to its initial level. As Sachs (1980) showed, in the long run the economy needs a trade surplus to service the accumulated foreign debt so that the long-run level of output will be lower than the level that prevailed before the fiscal shock. As a consequence, the exchange rate will depreciate in the long run.

This result must be interpreted with caution because it is based on the highly questionable assumption that real wages are rigid even in the long run. There is now evidence (for instance, Sachs (1979)) that real wages do respond to economic conditions, at least in the medium run. Nonetheless, these models show that when real wages are rigid, as is frequently true in many industrial countries, the output effect of an expansionary fiscal policy on the exchange rate would be dampened, or even neutralized.

## III. Portfolio Models of Exchange Rate Determination

Portfolio models of exchange rate determination differ from monetary models because they assume that bonds denominated in domestic currency are imperfect substitutes for bonds denominated in foreign currency. The lack of perfect substitution implies that the real rate of return on the two types of bond can differ so that the interest rate parity condition ceases to characterize the long-run equilibrium of the economy. Because bonds denominated in the domestic currency and the foreign currency are viewed as different assets, there are different demand functions for each of them. These demands depend on the domestic and foreign interest rates, the expected depreciation in the exchange rate, the level of real output, and the stock of nominal wealth. The financial sector is thus described by six equations that replace equations (1) and (2) of the typical monetary model:[32]

$$M = m(r, r^*, \dot{s}^e/s, y)W \qquad m_1, m_2, m_3 < 0 \qquad m_4 > 0 \quad (19)$$

$$B = b(r, r^*, \dot{s}^e/s, y)W \qquad b_1 > 0 \qquad b_2, b_3, b_4 < 0 \quad (20)$$

$$B^* = sb^*(r, r^*, \dot{s}^e/s, y^*)W^* \qquad b_1^* > 0 \qquad b_2^*, b_3^*, b_4^* < 0 \quad (21)$$

$$sA = f(r, r^*, \dot{s}^e/s, y)W \qquad f_1, f_4 < 0 \qquad f_2, f_3 > 0 \quad (22)$$

$$B^T = B + B^* \quad (23)$$

$$W = M + B + sA \quad (24)$$

where $W$ and $W^*$ are the nominal stocks of domestic and foreign wealth, $B$ and $B^*$ are the bonds denominated in domestic currency held by residents and nonresidents, $B^T$ is the outstanding stock of these bonds, and $A$ is the stock of bonds denominated in foreign currency held by residents. By substituting equations (20) and (21) in equation (23) and using the definition of wealth, two

[32]Portfolio models of exchange rate determination have been also derived in a utility-maximization framework. For example, see Dornbusch (1980 a).

equations determine the equilibrium in the financial sector: the money market equation and the equation for the bonds denominated in domestic currency. These two equations are shown in Figure 3 by the *LL* and *BB* schedules. As before, the *LL* schedule is upward sloping.[33] By contrast, the *BB* schedule is negatively sloped: an increase in the interest rate creates an excess demand for domestic bonds, which is cleared by an appreciation that reduces the value of $B^*$.[34] The *XX* and *FF* schedules continue to describe the real sector.[35]

To analyze the impact of an expansionary fiscal policy on the exchange rate in portfolio models, the author initially follows Henderson (1977; 1979), taking his assumption that the policy leaves the expected long-run exchange rate constant.[36] An expansionary fiscal policy increases output and the price level, and leads to a current account deficit. The rises of output and of the price level increase the demand for transactions balances. A larger proportion of any given wealth will be held in the form of money. Thus, the output and price effect of an expansionary fiscal policy induces an excess demand for money and an excess supply of bonds denominated in both domestic and foreign currencies. The financial market will be re-equilibrated by an increase in the interest rate and an appreciation in the exchange rate. The excess supply of bonds denominated in foreign currency, and thus the exchange rate appreciation, also depends on whether they are closer substitutes for bonds denominated in domestic currency or for money. If the degree of substitution between the two kinds of bond is high, the increase in the interest rate, which is needed to clear the money market, will have a large impact on the excess supply of bonds denominated in foreign currency, and this will be

[33]In the portfolio model, the slope of the *LL* schedule is

$$dr/ds = -[(m_4\partial y/\partial s)W + m\,\partial W/\partial s]/(m_1 + m_4\partial y/\partial r)W$$

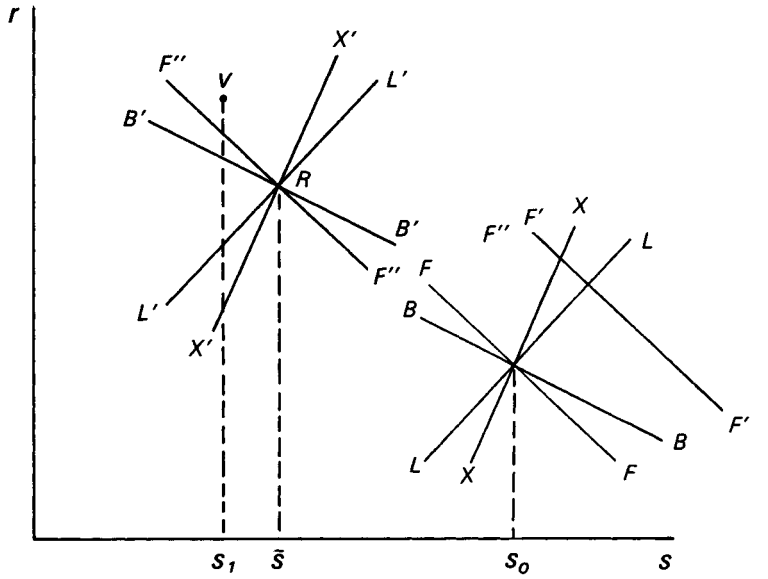
[34]The slope of the *BB* schedule is

$$dr/ds = -[W(b_4\partial y/\partial s) + b\,\partial W/\partial s + b^*W^*]/[(b_1 + b_4\partial y/\partial r)W + sW^*b_1^*]$$

[35]Because nonresidents hold domestic-currency bonds, the current account is equal to $-\dot{B}^* + s\dot{A}$ so that the *FF* schedule is now obtained by setting $-\dot{B}^* + s\dot{A} = 0$.

[36]As in monetary models, an expansionary fiscal policy will probably generate expectations of a long-run depreciation that, in turn, will put upward pressure on the exchange rate in the short run. Because this expectation effect is the same as in monetary models, it has been disregarded here.

FIGURE 3. EXPANSIONARY FISCAL POLICY IN PORTFOLIO MODELS




an additional source of appreciation in the exchange rate. For example, Branson, Halttunen, and Masson (1977), Genberg and Kierzkowski (1979), and Branson (1979) have stressed the importance of the high degree of substitution between bonds denominated in domestic and foreign currency in the analysis of the exchange rate response to an expansionary fiscal policy. Bisignano and Hoover (1982) presented some empirical evidence supporting this view.

Figure 3 shows how a balanced-budget expansionary fiscal policy works in a portfolio model. The policy shifts the $XX$ and $LL$ schedules to the left and the $BB$ to the right. In the short run, the economy will then be at a point, such as $V$, where the interest rate has increased and the exchange rate has appreciated. The increase in output shifts the $FF$ curve to the right ($F'F'$), thus causing the current account to deteriorate even further. The current account deficit that the country experiences at $V$ will shrink the supply of bonds denominated in foreign currency to domestic residents. To restore portfolio equilibrium, the exchange rate will depreciate so as to maintain the domestic value of $A$. In this way, the depreciation will also cause a decline in wealth, which will move the four

schedules back toward their initial positions. A long-run equilibrium position may occur at such a point as $R$ where a new set of schedules will intersect ($X'X'$, $L'L'$, $B'B'$, and $F''F''$).

So far, the channel through which an expansionary fiscal policy appreciates the exchange rate is the same as in monetary models: an expansionary policy increases output and/or prices, thus affecting the demand for financial assets. However, in portfolio models, the expansionary policy can cause the exchange rate to depreciate through other channels (Henderson (1978)). Kouri (1976) argued that the current account deficit, which is induced by the expansionary fiscal policy, transfers wealth to foreigners. Because investors in each country hold a larger fraction of their wealth in bonds denominated in the domestic currency, the transfer will create an excess supply of bonds denominated in domestic currency, thus causing the exchange rate to depreciate. Girton and Henderson (1977), Isard (1978), Dooley and Isard (1982), and Obstfeld (1983) have shown that there is another important way in which an expansionary fiscal policy depreciates the exchange rate, if the policy causes a budget deficit and if government bonds are net wealth. Under these assumptions, a deficit increases private sector wealth. If investors wish to maintain the composition of their portfolios in the face of this increase in wealth, the expansionary fiscal policy will cause an excess supply of domestic-currency bonds and an excess demand for money and foreign-currency bonds. This excess demand will push the interest rate up and will bring about a depreciation in the exchange rate.[37]

Because in portfolio models the diversification effect works in the opposite direction to the output effect, the uncertainty about the relationship between an expansionary fiscal policy and the exchange rate must be resolved by the empirical evidence. The output effect was discussed in Section I. As to the diversification effect, the evidence is rather weak. Although Hansen and Hodrick (1980) and Cumby and Obstfeld (1981) could not reject

[37]This approach is well summarized by Tobin (1982, p. 121): "A U.S. government deficit increases the supply of Treasury obligations. Some of them may be bought by taxpayers as the best hedge against the taxes they foresee will be needed to service the debt. But most likely there is a net increase in private wealth, and at prevailing interest and exchange rates, U.S. investors will not wish to absorb all of it in government bonds or even in dollar assets. An increase in the dollar interest rate on bonds and a decline in the dollar against other currencies will place some of the bonds overseas. This is a rationale for the time-honored conservative view that loose fiscal policy endangers or actually depreciates the currency."

the hypothesis that bonds denominated in various currencies are perfect substitutes, Rogoff (1983) failed to find any clear evidence that the exchange rate is systematically related to the actual and expected relative supplies of bonds denominated in various currencies. Dornbusch (1980 a) pointed out that the deutsche mark appreciated steadily from 1973 to 1979 despite the fact that the ratio of the debt of the Federal Republic of Germany to that of the U.S. Government (valued both in dollars and in the respective currencies) nearly tripled during this period. Furthermore, the supply of Germany's government debt far exceeded the additional demand for deutsche mark that was induced by the wealth transfer toward Germany caused by the sustained surpluses of that country's current account. Thus, if the diversification effect had been strong, the deutsche mark would have depreciated. However, on theoretical grounds, Dooley (1982) and Tobin (1982) argued that many empirical studies on the portfolio theory might not have used the appropriate variables. On empirical grounds, Artus (1983) provided some empirical support to the portfolio theory by showing that the current account developments in the two countries played an important role in the determination of the deutsche mark/U.S. dollar rate. Even though the existing studies on the portfolio theory are far from conclusive, the impression that emerges is that the portfolio theory finds little support in data.

## IV. Summary and Conclusions

This paper shows that a few elements can explain the uncertain relationship between an expansionary fiscal policy and the exchange rate. Unfortunately, neither the theory nor the empirical evidence can determine which element predominates. If the expansionary policy increases output and prices, by inducing an excess demand for goods, it will create an excess demand for money. The nominal and real exchange rates will then appreciate to clear the money market. Because it is questionable that an expansionary fiscal policy can induce a steady excess demand for goods, this result is probably relevant for the short run but not for the long run.

The money demand does not always play a predominant role in the analysis of the relationship between the exchange rate and fiscal policy. A number of models focus on the fact that an expansionary fiscal policy cannot increase real output in the long run

and that the policy temporarily pushes a country beyond the frontier of its production possibilities. Because a country cannot violate its budget constraint in the long run, it must undergo an adjustment process that entails a nominal and real depreciation in the exchange rate. The expectations of this future depreciation put downward pressure on the present exchange rate.

The structure of the real sector will also condition the response of the exchange rate to a policy change. An expansionary fiscal policy will tend to depreciate the exchange rate if real wages are rigid and to appreciate it if government expenditure falls predominantly on nontraded goods. Finally, if bonds denominated in domestic currency and foreign currency are imperfect substitutes, an increase in the budget deficit will create a relative abundance of bonds denominated in domestic currency. As a result, the private sector will diversify its portfolio by moving into assets denominated in foreign currency, thus causing the exchange rate to depreciate.

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