DM/84/50

INTERNATIONAL MONETARY FUND

Research Department

Credit and Fiscal Policies in a "Global Monetarist" Model of the Balance of Payments 1/

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August 9, 1984

Summary

The fundamental equation of the monetary approach to the balance of payments expresses the flow of foreign exchange reserves as the difference between the flow demand for money and the flow supply of domestic credit. Since this relationship is a balance-sheet identity, it should be satisfied by any properly specified macroeconomic model. Nonetheless, this fundamental equation has sometimes been interpreted to imply the hypotheses that changes in the flow of domestic credit give rise to changes in the balance of payments that are equal in magnitude but of opposite sign and that fiscal policy affects the balance of payments only through its implications for domestic credit expansion. Since these hypotheses refer to the reduced-form coefficients of certain policy variables, they cannot be established solely by reference to a balance-sheet identity. Instead, their justification has to rely on the specification of an underlying structural model.

An important question for policy is how general are the circumstances under which these hypotheses are likely to be valid. If they fail to hold, the balance of payments may depend, inter alia, on the distribution of credit expansion between financing the fiscal deficit and other types of credit, as well as on the levels of government expenditure and taxation.

It has often been claimed that the hypotheses described above can be generated by a class of models known in the literature as "global monetarist." These models are characterized by their assumptions of continuous purchasing-power and interest parity as well as flexible nominal wages. It is argued in this paper, however, that even these restrictive assumptions are not sufficient to generate the hypotheses

1/ I would like to thank Morris Goldstein, Omotunde Johnson, Mohsin S. Khan, Donogh McDonald and Luis Ramirez-Rojas for their comments. Remaining errors are, of course, my responsibility.

that the balance of payments is determined solely by the overall flow of domestic credit and that fiscal policy has no independent influence on the payments balance. For example, these hypotheses cannot hold if one assumes certain specifications of the demand for money and of private savings behavior that are plausible a priori and that have received some empirical support. In particular, if asset demands depend on wealth and conventional savings behavior is assumed, fiscal policy can have a direct independent effect on the balance of payments through its influence on the flow demand for money, even if "global monetarist" assumptions are imposed. Therefore, the class of models for which fiscal policy has no such independent effect seems to be rather narrow.

I. Introduction

The design of appropriate stabilization policies geared toward short-run and long-run balance of payments objectives under fixed exchange rates requires analysis of how fiscal and credit policies affect the balance of payments. A starting point to such an analysis is often thought to be provided by the monetary approach to the balance of payments (MABP), which, over the last two decades, has made important contributions to the analysis of the behavior of open economies under fixed exchange rates. As is known, however, the fundamental equation of the monetary approach is one which should be satisfied by any well-specified macroeconomic structural model of an open economy. The monetary approach is not itself a structural model, but rather a framework of analysis that is compatible with diverse macroeconomic models, which in turn may possess quite different implications for the effects of stabilization policies on the balance of payments and other macroeconomic variables.

To demonstrate this point in general terms, consider an economy in which the central bank is the only financial institution, and suppose that its balance sheet is given by

$$F + D \equiv M,$$

where F is the domestic currency value of the bank's net foreign assets, D is the domestic credit extended by the bank, and M is its stock of monetary liabilities, which represents the stock of money in this simple economy. Then, letting a dot over a variable denote its time derivative, the economy's balance of payments is, by definition:

$$BOP = \dot{F} = \dot{M} - \dot{D}$$

Assuming that the domestic money market is in continuous flow equilibrium, and denoting by P and L the domestic price level and real demand for money respectively, yields:

$$\dot{M} = (PL)$$

This equation, combined with the balance-of-payments identity immediately above, results in

$$BOP = \dot{(PL)} - \dot{D},$$

which is the fundamental equation of the monetary approach. Since the only structural assumption used in deriving this equation was that of flow equilibrium in the money market, any macroeconomic model using this assumption must be capable of generating the fundamental equation of the monetary approach. Because this assumption is not very restrictive, a broad class of models (including Keynesian variants) must be amenable to analysis in terms of the MABP, and the different properties exhibited by these models with regard to the effects of stabilization policies on macroeconomic variables must all be compatible with the MABP. In particular, the MABP simply describes the effects of stabilization policies on the balance of payments in terms of their impacts on the flow demand for money and/or the flow supply of domestic-source money, but it does not commmit one to any particular view regarding the effects of such policies on the balance of payments.

The purpose of this paper is to illustrate these points in the context of a particular model. The structural model most frequently associated with the monetary approach is that of "global monetarism." 1/ In such models, credit policy has a uniquely powerful effect on the balance of payments. The public's flow demand for money (hoarding) function depends on the behavior of the price level, real output, and the nominal interest rate, all of which are exogenous. Since the money market is in continuous flow equilibrium, this hoarding function determines the flow supply of money. Credit policy then determines the composition of this change between foreign source money (the balance of payments) and domestic-source money. 2/

This view has clear implications for stabilization policy. To hit a balance-of-payments target, it is necessary to forecast the flow demand for money. Subtracting from this the desired increase in net foreign

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1/ The phrase is from Whitman (1975). Early examples of such models include Johnson (1972), Mundell (1971), and Komiya (1969).

2/ In accordance with this analysis, early empirical tests of the MABP involved regressing reserve flows on the determinants of the flow demand for money and the flow of domestic credit. As Kreinin and Officer (1978) point out in their survey of this literature, an important test of the "global monetarist" model was whether the coefficient on the flow of domestic credit--denoted the "offset coefficient"-- was approximately equal to -1. This was considered to be a central prediction of the "global monetarist" approach. Fiscal variables were omitted from the reserve-flow equation.

assets yields the flow of credit that is consistent with the desired balance of payments outcome. To the extent that this entails a change in the flow of domestic credit to the public sector, adjustments will have to be made in either external borrowing by the public sector or in public sector savings.

By changing the structure of this familiar model slightly, we can illustrate the compatibility of the monetary approach with the different roles for credit and fiscal policies generated by different macroeconomic structures.

The particular structural specifications with which this paper is concerned are the assumptions that the demand for money depends on wealth in addition to current income, and that saving can be described by a conventional life-cycle saving function.

There are, in fact, strong arguments for these specifications. The demand for money and saving functions are linked through the private sector's budget constraint. Although the demand for money refers to a stock to be held at every instant, whereas saving refers to a flow, the flow of saving must be accumulated in some form--i.e., the act of saving must have as its counterpart a flow demand for assets. Money is, of course, one of the forms in which savings may be held. To the extent that savers choose to accumulate some of their assets in the form of money, we would expect to observe a flow demand for money that is consistent with the demand for money as a stock.

This link between saving and the demand for money proves troublesome for the analysis of economies in which the commercial banking system represents the primary vehicle for the accumulation of private savings. For such economies conventional money demand and saving functions would in some instances predict that all savings would be accumulated in the form of non-money assets. For example, suppose that money demand and saving were both linked to current income, that saving is positive at this level of income, and that income does not change from this period to the next. Since the private sector is content to hold the current stock of money at the current level of income, then ceteris paribus, the demand for money will remain unchanged at the end of the period and there will be no hoarding during the period. Thus, all current saving must be accumulated in the form of non-money assets. Alternatively, suppose that the demand for money and the level of consumption both depend on permanent income, so that all transitory income is saved. Then, if the current period is one in which transitory income is positive, saving will be positive. But since the demand for money remains unchanged during the period, once again all current saving must take the form of purchasing non-money assets. In both of these cases, the specifications of the money demand

demand and saving functions are inconsistent with the view that the commercial banking system is an important vehicle for the mobilization of private saving.

Several modifications of the demand for money function have been proposed that would avoid this result. To allow for the possibility that some of the transitory income is saved in the form of money, Darby (1972) and Barro (1977) include transitory income as an additional variable in the demand for money. Likewise, recent descriptions of money as a "buffer stock" (Carr and Darby (1981)) allow for the possibility that individuals may wish to retain some portion of unexpected cash receipts in the form of money even when the fundamental determinants of the long-run demand for money remain unchanged. Finally, Tobin's (1969) "general equilibrium" approach to the demand for money achieves a similar result by incorporating wealth explicitly in the demand for money. Empirical support for this approach is provided by Goldfeld (1976), Friedman (1978), Butkiewicz (1979), and Laumas and Ram (1980) for the United States, and by Hunt and Volker (1981) for Australia.

The remainder of the paper investigates the implications for the effects of credit and fiscal policies of incorporating Tobin's specification in a global monetarist model. The model is described in Section II. The two succeeding sections describe its short-run and long-run equilibria, followed by conclusions in Section V.

II. A Simple Monetarist Model of the Balance of Payments

This section describes an articulated "global monetarist" model of the balance of payments. The model is "monetarist" in the sense that the analytical framework chosen is similar to that utilized by Johnson (1972) and Mundell (1971) in their early papers in the MABP tradition. Specifically, the economy in question is a small growing open economy with a fixed exchange rate. The domestic price level and the nominal wage are flexible, so the economy always operates at full capacity. A single, internationally-traded commodity is produced. The level of real output per capita, y, is given by:

(1) $\quad y = y(k); \; y' > 0, \; y'' < 0,$

where k is the stock of capital per worker. It is assumed that purchasing power parity holds continuously. Given the fixity of the exchange rate, this effectively pegs the domestic price level to the level of world prices, which are taken to be growing at the rate $\hat{P}_F$. (A hat over a variable will denote a proportional rate of change.) Because the domestic economy is small, the foreign nominal interest rate r_F is exogenous to it. Since it is assumed that all price expectations exhibit perfect foresight,

the expected rate of inflation, denoted π, is given by $\pi = \hat{P}_F$, and thus the real interest rate on foreign assets, defined as $\rho_F = r_F - \pi$, is exogenous to the economy. The assumptions of flexible domestic prices, purchasing power parity, and uncovered interest parity are familiar ones from early work in the global "monetarist" tradition. 1/ Finally, it is assumed that the domestic population grows at an exogenously determined rate, n, and that the labor force is a constant fraction of the population.

Note that the assumptions about world inflation and population growth mean that the domestic price level and population are continuous functions of time. Though the domestic price level is flexible and thus, in principle, susceptible to discontinuous shifts, it is prevented from behaving in that way by the purchasing-power-parity condition, which pegs it to the continuously-changing foreign price level. Thus, the domestic price level and population are effectively predetermined at any instant of time.

1. The private sector

The private sector holds four assets: domestic money, foreign interest-bearing assets, domestic credit extended to the private sector, and real capital. The real per capita values of private holdings of these assets are given by m, f_P, d_P, and qk respectively, where q is the relative price of installed capital goods in terms of consumption goods (i.e., Tobin's q). The subscript P (for private sector) is omitted from m and k because it is assumed that only this sector holds domestic money and real capital. The private sector's real per capita net worth (w_P) is thus given by:

$$w_P \equiv m + f_P + qk - d_P.$$

It is convenient to define:

$$(2) \qquad a_P \equiv m + f_P - d_P$$

where a_P can be interpreted as the real per capita value of the sector's net stock of nominal (financial) assets. Thus w_P becomes:

$$(3) \qquad w_P \equiv a_P + qk$$

It is assumed that only the foreign asset is held internationally. This means that all asset swaps with foreigners are ruled out. In implementing the policy of pegging the exchange rate, however, the central

1/ These are considered to be the defining characteristics of the "global monetarist" analytical framework both by Whitman and by Kreinin and Officer.

bank stands ready to buy and sell foreign assets in exchange for domestic money in discrete amounts. Since such swaps are of the form: $dm = -df_P$, by (2) the total of gross nominal assets held by the private sector remains unaffected by these transactions. Since credit policy involves setting the rate of growth of credit to the private and public sectors ($\hat{D}_P$ and $\hat{D}_G$ respectively--a capital letter denoting the nominal value of the variable in question) the nominal stock of credit outstanding to each sector is predetermined. Thus the private sector's stock of gross nominal assets, its capital stock, and its stock of liabilities to the central bank are all subject only to continuous changes. Since the same is true of the domestic price level and labor force, the per capita real magnitudes a_P, k, and d_P are predetermined.

The private sector faces a portfolio allocation problem. Assuming that all nonmonetary assets are considered to be perfect substitutes, the sector will be in portfolio equilibrium when:

$$(4) \qquad m = L(-\pi, \rho_F, y, w_P); \; L_1 > 0, \; L_2 < 0, \; L_3 > 0, \; 1 > L_4 > 0$$

and

$$(5) \qquad q = (y' + \dot{q})/\rho_F.$$

Equation (4) states that the per capita real demand for money increases with the own real return on money (the nominal return on money is set at zero), the per capita level of real GDP, and private sector wealth. It decreases with the real rate of return on competing assets, which, given the perfect substitutability assumption, must be ρ_F for all nonmoney assets. This condition is stated by equation (5) for the real capital stock. It is derived from:

$$\rho_F = \frac{y'}{q} + \frac{\dot{q}}{q},$$

where y' is the marginal product of capital. This equation states that the real rate of return on physical capital, consisting of the marginal product and the expected capital gain $\dot{q}/q$ 1/, must equal the rate of return on foreign assets.

1/ The actual change in q is used due to the perfect foresight assumption.

In addition to deciding how to allocate its portfolio, the private sector has to choose the rate at which it wishes to accumulate assets, subject to the budget constraint:

$$(6) \qquad \dot{a}_P + (\pi + n)a_P + i \equiv (y + r_F[f_P - d_P] - t_P) - c_P$$

where i is investment, t_P is (lump-sum) taxes paid by the private sector, and c_P is private consumption, all in real per capita terms. $[\dot{a}_P + (\pi + n)a_P]$ is the real per capita value of this sector's net accumulation of nominal assets and $(y + r_F[f_P - d_P] - t_P)$ is a concept akin to the private sector's real per capita disposable income, except that it excludes capital gains on nominal assets as well as on existing physical capital. Thus (6) states that private expenditure for the net accumulation of assets is constrained by saving out of current income.

To complete the description of private sector decisions, let asset accumulation behavior be governed by:

$$(7) \qquad c_P = c(y_L - t_P, -\pi, \rho_F, w_P);\ 0 < c_1 < 1,\ c_2 < 0,\ c_3 < 0,\ c_4 > 0$$

$$(8) \qquad \dot{k} = h(q - 1);\ h' > 0,\ h(0) = 0$$

Equation (7) is a conventional life-cycle consumption function in which y_L is real per capita labor income, which in turn is an increasing function of k. Consumption depends positively on household resources but negatively on the rate of return to saving. Equation (8) is a "q" type investment function which states that the private sector will seek to change its endowment of capital per person when $q \neq 1$. Per capita real investment is given by:

$$(9) \qquad i = j\,(\dot{k}) + nk;\ j(0)=0,\ j'>1,\ j''>0.$$

The function j captures the adjustment costs associated with changes in the stock of capital per worker. This "Penrose-Uzawa" effect explains why the stock of capital per worker can be such that the marginal product of capital $y'(k)$ differs from the real rate of interest ρ_F for periods of finite length and provides the underlying rationale for the function h introduced in equation (8) (see Uzawa (1969)).

2. The Central Bank

The central bank is the only financial institution in our model. Its balance sheet takes the form:

$$(10) \qquad 0 \equiv f_B + d - m$$

where the subscript B identifies central bank holdings of foreign assets (international reserves). As indicated before, at a given moment d is a predetermined variable, the result of past credit policy. f_B and m are endogenous variables, determined by the public's portfolio decisions as long as the fixed-exchange rate policy regime remains in effect.

Note that according to (10), the central bank has no net worth. We assume that all its current income is transferred to the treasury. Thus its flow transactions are subject to separate constraints on current and capital accounts:

$$(11) \qquad 0 \equiv r_F(f_b + d) - t_B$$

$$(12) \qquad bop \equiv \hat{F}_B f_B \equiv \hat{M}m - [\hat{D}_P(d_P/d) + \hat{D}_G(d_G/d)]d \equiv \hat{M}m - \hat{D}d$$

Equation (11) determines the income transferred to the treasury, t_B, which is the sum of the bank's net real interest earnings and the inflation tax extracted from the private sector. Equation (12) defines the real per capita value of the balance of payments or the real per capita value of the change in the bank's foreign assets. This, in turn, is equal to the real per capita value of the difference between the flow of monetary liabilities and the flow of credit. The basic tools of credit policy are the rates of growth of credit to the private and public sectors ($\hat{D}_P$ and $\hat{D}_G$ respectively). They are under the control of the central bank.

3. The public sector

Fiscal policy consists of setting t_p and real per capita public consumption, c_G. (The public sector is assumed to undertake no investment.) In addition, the public sector determines the real per capita value of its rate of accumulation of foreign assets, $\hat{F}_G f_G$ (which may be negative.) These three variables must be chosen subject to the public sector budget constraint:

$$(13) \qquad \hat{F}_G f_G \equiv (t_P + t_B + r_F[f_G - d_G] - c_G) + \hat{D}_G d_G$$

According to (13), the public sector's accumulation of foreign assets equals current public savings plus the flow of credit to the public sector.

The model is completed by specifying how the economy's stock of foreign assets evolves over time. Summing the budget constraints (6), (11), (12), and (13) yields:

$$(14) \qquad ca \equiv \hat{F}f \equiv y + r_F f - (c_P + i + c_G)$$

Thus the current account is defined as the real per capita value of the economy's accumulation of foreign assets, which in turn is the difference between national income $(y + r_F f)$ and absorption $(c_P + i + c_G)$.

III. Short-Run Equilibrium

In the short-run, the values of a_P, k, and f are determined by past values of equations (6), (9), and (14) respectively. The current values of d_P, d_G and f_G are determined directly by past policy choices. Given these predetermined variables and the current policy stance, in the form of the vector $(\hat{D}_P, \hat{D}_G, F_G, c_G, t_P)$, the model determines equilibrium values for bop, ca, and the remaining endogenous variables. Our immediate interest is on the effect of changes in the policy vector on the short-run equilibrium value of bop.

The examination of this issue is simplified by working with a special case of the model at hand. If new capital can be costlessly installed, q = 1 must hold at every instant. In this case investors will adjust the capital stock continuously so as to satisfy:

$$(5') \qquad y'(k) = \rho_F$$

Let k* denote the value of k that satisfies (5'). In the frictionless world now under consideration, the equation for private investment becomes:

$$(8') \qquad i = nk^*.$$

Finally, the private sector's real per capita net worth becomes:

$$(3') \qquad w_P = a_P + k^*.$$

The remainder of the paper will consider only the special case in which new capital can be costlessly installed and equations (5'), (8'), and (3') replace their corresponding unprimed versions. 1/

Before analyzing the determination of the balance of payments in short-run equilibrium, we must solve for the short-run equilibrium values of certain endogenous variables. First, substituting (1) and (3') in (4) the stock demand for money can be expressed as:

$$(4')\ m = m(a_P, \bar{-}\pi, \rho_F);\ 1 > m_1 > 0,\ m_2 > 0,\ m_3 < 0.$$

Using (2) and (4') the demand for foreign assets is:

$$(15)\ f_P = a_P - m\,(a_P, \bar{\ }\pi, \rho_F) + d_P$$
$$= f_P(a_P, d_P; \bar{\ }\pi, \rho_F);\ 0 < f_{P1} < 1,$$
$$f_{P2} = 1,\ f_{P3} < 0,\ f_{P4} > 0.$$

Substituting (3') in (7) and recalling that y_L is an increasing function of k:

$$(7')\quad c_P = c(t_P, a_P, \_\pi, \rho_F);$$
$$0 < -c_1 < 1,\ c_2 > 0,\ c_3 < 0,\ c_4 < 0.$$

Finally, define s as:

$$(16)\quad s \equiv (y + r_F[f_P - d_P] - t_P) - (c_P + i).$$

s is the real per capita value of private saving in the form of nominal assets. Substituting (1), (15), (7'), and (8') in (16) permits the short-run equilibrium value of s to be written as:

1/ The more general version of the model is analyzed in an earlier draft of this paper.

$$(16') \quad s \equiv s(t_P,\ a_P,\ \bar{\pi}\ ,\ \rho_F);\ s_1 < 0,\ s_2 < 0,\ s_3 = ?,\ s_4 > 0.$$

An increase in taxes paid by the private sector reduces s because it reduces disposable income more than it does consumption. An increase in the net nominal wealth of the private sector has an effect on s which is ambiguous in principle. Private consumption increases according to (7'), but so does private disposable income, since f_P is an increasing function of a_P The consumption effect will be assumed to dominate, so $s_2 < 0$. Note that the private sector's budget constraint can be written in the form:

$$(17) \quad \dot{a}_P = s(t_P,\ a_P,\ \bar{\pi},\ \rho_F) - (\pi + n)\ a_P$$

The condition that $s_2 < 0$ is sufficient (though not necessary) to guarantee the stability of (17). An increase in π has an ambiguous effect on s for the case in which $(f_P - d_P)$ is positive (i.e., if the private sector is a net creditor), because disposable income is augmented by an increase in interest receipts while consumption increases. Finally, the direct effect of an increase in ρ_F is to increase s (through increased disposable income in the net creditor case and reduced consumption), but its indirect effects through k* are ambiguous. Since k* falls, disposable income is reduced by $\rho_F dk^*$. Simultaneously, however, both consumption and investment fall (by $(c_4+n)dk^*$). The first effect tends to reduce the accumulation of nominal assets, while the second tends to increase it. The positive sign associated with s_4 in (16') reflects the supposition that ρ_f is not "too large," so that the second effect is dominant.

We now turn to the determination of the balance of payments in short-run equilibrium. Writing (12) in the form:

$$bop = \dot{m} - \hat{D}d + (\pi + n)m,$$

supposing that the world rate of inflation and the foreign real interest rate are constant over time, and then differentiating (4') with respect to time and substituting above yields:

$$bop = [m_1\dot{a}_P + m_2\dot{k} + (\pi + n)m] - \hat{D}d.$$

Finally, using (17) and recalling that with $q = 1$, $\dot{k} = 0$:

$$(12') \quad bop = [m_1 s(t_P, a_P, \bar{\pi}, \rho_F) - m_1 (\pi + n) a_P + (\pi + n) m] - (\hat{D}_P d_P + \hat{D}_G d_G)$$

Equation (12') is the reduced-form expression for the real per capita balance of payments in the model. The expression in square brackets is the real per capita value of the flow demand for money. Equation (12') can be used to establish the following propositions:

a. An increase in the flow of credit to the <u>private sector</u> will cause the balance of payments to deteriorate <u>pari passu</u>.

Since $\hat{D}_P d_P$ does not appear in the expression in square brackets in (12') it follows that $d(bop)/d(\hat{D}_P d_P) = -1$. The private sector simply uses the increased flow of credit to purchase foreign assets, so the deterioration in the balance of payments occurs through the capital account. This can be shown in two ways. By substituting (7') and (8') in (14), we see that the current account is unaffected by changes in $\hat{D}_p d_p$, so the deterioration in bop implied by (12') must come through the capital account. Alternatively, by differentiating (15) with respect to time and substituting from (17) and (8'), the induced change in the capital acccount can be shown directly.

b. An increase in the flow of credit to the <u>public sector</u> that is offset by reduced public sector borrowing abroad will cause the balance of payments to deteriorate <u>pari passu</u>.

Recall that a change in the flow of credit to the public sector must be offset by a change in $[\dot{f}_G + (\pi + n) f_G]$, t_B, or c_G, due to the government budget constraint. Obviously, if the first of these terms changes--i.e., if the public sector turns from foreign to domestic borrowing--in the short run the capital account and thus bop will deteriorate by the amount of the reduced capital inflow to the public sector.

c. An increase in the flow of credit to the public sector used to finance an increase in public expenditure will cause the balance of payments to deteriorate by an equal amount.

From (12'), $d(bop)/d(\hat{D}_G d_G) = -1$. The deterioration in the balance of payments takes place because the increased flow of credit is used to finance additional imports. Again, this can be shown in two ways. The capital account of the public sector is unchanged by assumption. Using the procedure outlined in connection with the first proposition, it can be shown that the capital account of the private sector is also unaffected. Thus, the change must come through the current account. More directly, again by substituting (7') and (8') in (14), we have $d(ca)/dc_G = -1$.

d. An increase in the flow of credit to the public sector used to finance a reduction in taxation will cause the balance of payments to deteriorate by <u>less</u> than than the change in the flow of credit.

From (12'):

$$\frac{d(bop)}{d(\hat{D}_G d_G)} = -(m_1 s_1 + 1) > -1$$

since $m_1 > 0$, $s_1 < 0$. and $dt_P/d(\hat{D}_G d_G) = -1$. In this case, the flow demand for money is <u>not</u> exogenous with respect to the policy actions undertaken. The reason is that the reduction in taxation increases private saving and thus the private sector's desire to accumulate money balances. The increased flow demand for money partly offsets the negative effect of the increase in the flow of credit on bop. In this case, the deterioration in bop will occur partly through the current account and partly through the capital account. From (14), the change in the current account is $c_{P1} d(\hat{D}_G d_G)$, reflecting the private sector's use of a portion of the tax cut to finance increased imports. The change in the capital account is, from (15), $f_{P1} s_1 d(\hat{D}_G d_G)$, where $s_1 d(\hat{D}_G d_G)$ is the fraction of the tax cut that is saved by the private sector, and $f_{P1} s_1 d(\hat{D}_G d_G)$ is the amount of these savings invested in foreign assets. But since $s_1 = -(1 + c_{P1})$ and $f_{P1} = (1 - m_1)$:

$$\begin{aligned} d(bop) &= (c_{P1} - f_{P1} s_1) d(\hat{D}_G d_g) \\ &= [-(1 + s_1) + (1 - m_1) s_1] d(\hat{D}_G d_g) \\ &= -(m_1 s_1 + 1)\, d(\hat{D}_G d_G), \end{aligned}$$

as indicated above.

e. Changes in public consumption financed by changes in taxes on the private sector, as well as changes in private taxation financed by public sector borrowing abroad, will affect the balance of payments in the short run, even though domestic credit policy remains unaltered.

This proposition follows directly from (12'), since t_P appears in the term in square brackets. Regardless of whether the change in taxation is offset in equation (13) by changes in public consumption or in public external borrowing, the effect on bop of a change in taxes on the private sector is given by:

$$d(bop) = m_1 s_1 dt_P$$

As in previous cases, it is possible to determine the extent to which the effect operates through the current and capital accounts.

The results of this section may be summarized as follows: Consider a forecast of the flow demand for money conditional on unchanged fiscal and credit policies. Call this forecast $(\hat{M}m)_e$. Let bop* denote the desired balance of payments outcome. Then, if the structure of the economy is as described in the previous section, to achieve the target bop* it is neither necessary nor sufficient to choose the credit policy:

$$\hat{D}d = (\hat{M}m)_e - \text{bop}^*.$$

The reason for this is that $\hat{M}m$ is not invariant to certain changes in fiscal policy, which may be undertaken either in conjunction with the indicated credit policy or independently of it.

IV. Long-Run Equilibrium

The previous section analyzed the short-run impact of credit and fiscal policies on the balance of payments in our modified "global monetarist" model. It is important to ascertain whether fiscal policy can have a permanent impact on the balance of payments. To this end, the present section analyzes the long run properties of the model. Three propositions are established about the long-run role of credit and fiscal policies in the model of Section II.

The first proposition is that credit policy determines whether a steady-state equilibrium with a fixed exchange rate exists. Second, if such an equilibrium does exist, credit and fiscal policies will determine the steady-state stock of reserves and the long-run balance of payments. Credit and fiscal policies can be used to achieve a desired stock of reserves in the long run. Third, if no such equilibrium exists, credit and fiscal policies determine the timing of the crisis that results in the collapse of the fixed parity. These policies also determine certain characteristics of the economy under the successor regime of flexible rates.

1. The existence of a steady state under fixed rates

The evolution, over time, of the the private sector's stock of physical capital and net nominal assets is governed by equation (17). The steady-state value of a_P is defined implicitly by setting $\dot{a}_P = 0$ in (17). This implies:

$$(18) \quad a_P^* = a_P(t_P, \rho_F, \pi); \; a_{P1} < 0, \; a_{P2} > 0 \;\; a_{P3} = ?$$

Thus, given an initial value of d(0), the long-run equilibrium stock of reserves depends on fiscal policy in the form of t_P and on the trajectory followed by credit policy between the present and the moment when it is brought to its long-run equilibrium value $\hat{D} = \pi + n$.

Since f_B is constant in the long run, $\dot{f}_B = 0$. This means that $\hat{F}_B = (\pi + n)$. Using (12) and (10') we therefore have the long-run balance of payments bop* given by:

$$\begin{aligned} bop^* &= (\pi + n)f_B^* \\ &= (\pi + n)[m^*(t_P, \rho_F, \pi) - d^*]. \end{aligned}$$

In the long run, therefore, the balance of payments depends on fiscal policy in the form of t_P, on the initial stock of domestic credit, and on the path of credit policy on the way to long-run equilibrium.

We conclude that, in the model under discussion, fiscal and credit policies jointly determine the balance of payments, both in the short run and the long run.

3. Timing an exchange crisis

Given t_P, if the rate of growth of domestic credit is fixed such that $\hat{D} \neq \pi + n$, d will be changing continuously. The most interesting case empirically is the one which arises when $\hat{D} > \pi + n$. This entails a continuous increase in d. Since m approaches the constant value m*, it follows from (10') that, from an initial position with $f_B > 0$, f_B will be driven toward zero as d increases. When d = m, the central bank's exchange reserves will be exhausted and it will no longer be able to support the currency. From that point on, the exchange rate must float.

Before examining the implication of credit policy for the characteristics of the transition to the new exchange regime, consider briefly the nature of steady state equilibrium under floating rates. If we use the definition of s given by (16) in equation (17), it becomes evident that $\dot{a}_P = 0$ requires $(\dot{f}_P - \dot{d}_P) = 0$ and therefore $\dot{m} = 0$. This means that the steady state (actual and expected) rate of inflation under flexible rates must be $(\hat{D} - n)$. Determining the new steady-state configuration of the endogenous variables now simply entails revising the value of π from $\hat{P}_F$ to $\hat{D} - n$ in the relevant equations (while retaining $f_B = 0$) 1/. Thus, the role of the rate of growth of credit in the new policy regime is to determine the

1/ The balance of payments will, of course, be zero.

rate of inflation. Its effect is to alter the steady-state configuration of the economy, both directly through π and indirectly through the effect of π on a_P^*.

Krugman (1979) has shown that, in an economy with perfect foresight and flexible prices, such as the one we are concerned with, the end of the fixed-rate regime will be reached when the central bank still possesses a finite stock of reserves--a sudden speculative attack will absorb the remaining stock of reserves, making f_B jump discretely from some finite value to zero rather than approaching zero asymptotically. The reason for this is that, at the moment the fixed rate is abandoned, if $\hat{D} - n > \hat{P}_F$, the domestic rate of inflation will jump. (See the Appendix.) By (3) this will cause individuals to wish to exchange money for foreign assets. Since the central bank no longer makes such exchanges, however, the nominal stock of money cannot change instantaneously. Thus the real stock must change through a discrete change in the price level. However, this entails a corresponding discrete change in the exchange rate and a large capital loss for speculators caught holding money. Since no speculators would willingly be caught in such a position, and since the assumption of perfect foresight means that no speculator could be surprised in such a position, this scenario is ruled out. The transition must take place without a discrete change in the price level. This can only be so if the transition takes place at a point in time such that, if speculators suddenly acquired all of the central bank's remaining reserves, the remaining stock of money would be exactly that which the private sector demands at the new rate of inflation. In this case, no discrete change in the price level is required to reconcile the public to its existing cash balances. Thus, under perfect foresight a discrete change in the stock of money in the form of an exchange crisis takes the place of a discrete change in the price level.

To determine when the exchange crisis will take place, let $\hat{P}_c$ denote the domestic rate of inflation immediately following the crisis, which occurs at the undetermined time t_c. The Appendix shows that after the crisis, the domestic rate of inflation will behave according to:

$$\text{(A1)} \quad \hat{P} = P(a_P, \hat{D}-n, a_P^{**}); \; P_1 > 0, \; P_2 > 0, \; P_3 > 0,$$

where a_P^{**} is the value of a_P in the floating-rate steady state. To simplify matters, suppose that our economy reaches a quasi-steady state under fixed rates before the onset of the crisis--i.e., $a_P(t_c) = a_P^*$, though $d > 0$. Then the time at which the crisis will occur is given by:

$$L[-P(a_P^*, \hat{D}-n, a_P^{**}), \rho_F, y(k^*), a_P^* + k^*] = m(t_c) - f_B(t_c)$$
$$= d(t_c),$$

since $m - f_B$ represents the stock of money that would remain in the possession of the private sector if it were to suddenly acquire f_B. The second equality results from (10). Since:

$$d(t_c) = d(0)e^{(\hat{D} - \pi - n)t_c}$$

we have

$$\frac{dt_c}{d\hat{D}} = - \frac{L_1(P_2 + P_3 a_{P3}) + t_c d(t_c)}{(\hat{D} - \pi - n)d(t_c)} < 0 \text{ if } (\hat{D} - \pi - n) > 0.$$

Thus, given that the rate of credit growth is excessive for the achievement of a steady state with fixed rates, an increase in the rate of growth of domestic credit will advance the date for the collapse of the fixed exchange rate. An increase in $\hat{D}$ will both accelerate the depletion of reserves and reduce the post-crisis real per capita demand for money, by increasing the post-crisis rate of inflation. Both effects serve to accelerate the crisis.

Similarly, to establish the effect of fiscal policy on t_c we have:

$$\frac{dt_c}{dt_p} = - \frac{L_1(P_1 a_{P1}^* + P_3 a_{P1}^{**}) - L_4 a_{P1}^*}{(\hat{D} - \pi - n)\, d(t_c)}$$

$$= \frac{-L_1 P_3 a_{P1}^{**} + (L_4 - L_1 P_1)a_{P1}^*}{(\hat{D} - \pi - n)\, d(t_c)} < 0 \text{ if } (\hat{D} - \pi - n > 0,$$

since $L_1 P_3 < 0$, both a_{P1}^{**} and a_{P1}^* are negative and the appendix establishes $(L_4 - L_1 P_1) > 0$. Thus an increase in taxation also accelerates

the crisis, essentially by reducing the stock of money the public will wish to hold at the moment of transition. (This makes the numerator negative in the above expression.) Since the stock of money available for the public to hold at this moment is equal to the stock of credit outstanding, and since this stock increases over time as long as $(\hat{D} - \pi - n)$ is positive (thus making the denominator positive above), any reduction in the private sector's post-crisis demand for money must make the crisis come sooner. An increase in taxation has this effect because it reduces the public's net demand for nominal assets in the floating rate steady state (implying more inflation during the transition period and in particular, a higher rate of inflation at the moment of crisis, other things equal) and in the quasi-steady state in effect prior to the crisis. As shown in the Appendix, the latter effect, which is captured in the second term of the numerator above, will also reduce the post-crisis demand for money.

V. Conclusion

The thrust of the argument in this paper is that, in the type of economy under examination, fiscal and credit policies have separate and independent effects on the balance of payments in both the short run and the long run. In terms of the "fundamental equation" of the MABP, fiscal policy operates through the flow demand for money, and credit policy through the flow supply of domestic-source money. The implication is that it will not, in general, be possible to hit a balance of payments target by forecasting the flow demand for money in the absence of fiscal and credit policy changes and then setting credit policy accordingly--at least not if changes in private taxation are also contemplated. Proper conduct of stabilization policy in this model requires that the effect of changes in taxation on private saving and of the latter on the flow demand for money be taken into account.

It is not hard to construct alternative models in the "global monetarist" spirit in which these conclusions would need to be modified. Three examples come to mind.

For the first example, consider a Barro (1974) world in which the government is a "veil" and the cost to the private sector of financing the government budget is given by c_G. Equation (7) becomes:

$$c_p = c_p\,(y_L - c_G, -\pi, \rho_F, f + qk).$$

In this case fiscal policy retains a direct effect on the balance of payments, but this effect now operates through c_G, rather than t_p.

Second, in an "ultra-rational" world (see David and Scadding [1974]), in which the government is a veil and public consumption is regarded as a perfect substitute for private consumption, (7) becomes:

$$c_p = c_p\ (y_L, -\pi, \rho_F, f + qk) - c_G.$$

This restores the exclusive role of credit policy in determining the balance of payments in a "global monetarist" framework. 1/

Finally, the simplest way to restore the primacy of credit policy is to omit private wealth as an argument in the money demand function (4) and revert to a pure "transactions" view of the demand for money.

These cases serve to confirm that the effects of credit and fiscal policies on the balance of payments are specific to the structure of the economy under consideration. There is simply no substitute for identifying this structure if stabilization policies are to be designed appropriately. This paper has focused on the roles of private saving and portfolio allocation decisions in this context. In particular, if private savings behavior is affected by government fiscal measures, and if the private sector seeks to continue to accumulate some of these savings in the form of money even at constant relative rates of return and constant or declining real income, then the simple relationship between credit policy and the balance of payments postulated in "global monetarist" models will fail to hold. Even within the analytical framework of these models, the achievement of "external balance" will involve the simultaneous interaction of fiscal and credit policies.

1/ These conclusions with regard to the role of fiscal policy in the Barro and ultra-rational worlds assume that the demand for money depends on private (and thus national) net worth. In these two worlds, this differs from "net private marketable assets" by the amount of the government's net worth. If the demand for money instead depended on the stock of net private marketable assets (which represents the "balance sheet constraint" on private holdings of money), then both tax and expenditure policies would affect the balance of payments in the Barro world. Furthermore, fiscal policy would have a larger impact on the balance of payments in the ultra-rational world than in either the Barro world or the model analyzed in the paper.

Appendix

The purpose of this appendix is to investigate the determination of the domestic rate of inflation at the instant of transition from fixed to flexible exchange rates. The steady-state rate of inflation under flexible rates is $(\hat{D} - n)$(p. 24). The text assumes that the fixed-rate system reaches the quasi-steady state value a_p^* before the crisis. Assuming that $a_{p3} < 0$ in (22), the steady-state value of ap under flexible rates (call it a_p^{**}) will be smaller than a_p^*. Since a_p is a continuous function of time, it follows that the economy enters the flexible rate regime in a nonsteady-state configuration. In particular, a_p is too high. The new steady state will be approached gradually over time. The present concern is with the behavior of the domestic inflation rate along this path.

Note first that the domestic rate of inflation cannot be lower than P_F at the inception of flexible rates, since this would have been foreseen by speculators and would precipitate a rush into domestic currency, so that f_B would have increased and the expectation of a change in the exchange regime would not have been validated. Second, if the process of transition is to make economic sense, the new steady-state must be a saddlepoint. If it were globally stable, the domestic rate of inflation upon the inception of the new system would be indeterminate, since the new steady state could be reached from any initial rate of inflation. If it were globally unstable, the new steady-state would never be reached. Finally, the stable arm through $(\hat{D} - n, a_p^{**})$ (see Figure 1) cannot have a negative slope. This would mean that the inflation rate would jump at the moment of transition, but to something less than its new steady-state value $\hat{D} - n$. Since the rate of inflation would be less than the rate of increase of the nominal per capita money supply during the approach to the new steady-state, the real per capita money supply m would increase along this path. This cannot be, because since $\hat{D} - n > P_c$ and $a_p^{**} < a_p^*$, by (4) m must be lower in the new steady state than it is at the moment of transition. Thus the stable arm must have a positive slope.

The transition must therefore be as depicted in Figure 1. When the exchange crisis hits, the economy is at A. At time t_c, the inflation rate jumps discretely to $\hat{P}_c > \hat{D} - n > \hat{P}_F$, at B on the stable arm S'S'. The approach to the final equilibrium at C involves a gradual decrease in the rate of inflation to its steady-state value $\hat{D} - n$. An increase in $\hat{D} - n$, and/or decrease in a_p^{**} would shift S'S' up and to the left thus displacing B vertically upwards and increasing $\hat{P}_c$. 1/ An increase

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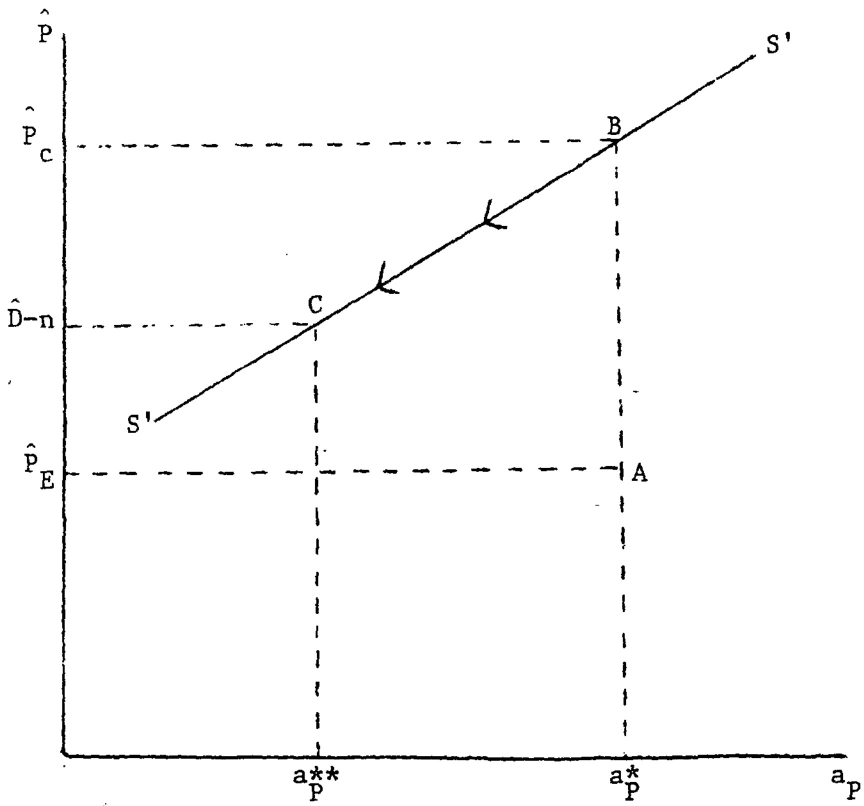
1/ Note that the new stable arm cannot intersect the old. If such an intersection existed, the same combination (π, a_p) would be associated with different m's at the intersection point, since the steeper path would start with a lower m and experience greater inflation prior to the intersection. Since the other determinants of the demand for money are constant, this cannot occur. Thus if the new path is above the old at any point, it must be so along its whole range.

Figure 1. Transition to a Floating Rate Steady State



in a_p^* causes A to move to the right along the horizontal line from $\hat{P}_F$ and thus causes B to move to the northeast along S'S', increasing $\hat{P}_C$. Thus:

$$\text{(A1)}\quad \hat{P} = P(a_p, \hat{D}-n, a_p^{**});\ P_1 > 0,\ P_2 > 0,\ P_3 < 0,$$

and at time t_C:

$$\hat{P}_C = P(a_p^*, \hat{D}-n, a_p^{**}).$$

Furthermore, note that since S'S' has a positive slope during the transition to a_p^{**}, $\hat{P} > \hat{D} - n$. This means that the real per capita stock of money falls as the economy approaches C from B--i.e., movement to the southwest along S'S' is associated with lower m and, since continuous money-market equilibrium is assumed, lower L (see equation (4)). Likewise, movement to the northeast along S'S', which is associated with an increase in a_p, implies an increase in L. Thus:

$$\left.\frac{dL}{da_p}\right|_{S'S'} > 0.$$

But using (4) and (A1):

$$\left.\frac{dL}{da_p}\right|_{S'S'} = -L_1P_1 + L_4$$

Therefore $L_4 - L_1P_1 > 0$. This inequality is used on page 19 of the text.

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