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MONETARY POLICY UNDER DUAL EXCHANGE RATES

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ABSTRACT

This paper finds that the introduction of dual exchange rates gives the monetary authority greater independence from external constraints than it would otherwise enjoy. The monetary authority is able to influence the level of aggregate demand in the short run and to sterilize the effects of temporary foreign distrubances. In addition, the paper finds that dual rates insulate the domestic economy fully from foreign interest rate changes but do not provide insulation from speculative disturbances.

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In the past decade widespread use has been made of dual exchange rates, a policy regime in which separate exchange rates are maintained for current and capital account transactions. In many cases this regime has taken the form of a fixed current-account rate and a floating capital-account rate.[1] In general, dual rates have been used to provide temporary relief from balance-of-payments pressures, especially those arising from speculative capital flows.

Several industrialized countries implemented dual rates during the first half of the 1970s to insulate their economies from the sizable capital movements occurring during that period as the Bretton Woods system was breaking down. Protection was sought both from capital inflows and from capital outflows. France (1971-1973) and the Netherlands (1971-1974) are examples of countries adopting dual rates for the first reason, while the United Kingdom (1947-1979) adopted dual rates (applied to domestic residents only) for the second reason.

Dual rates have also been employed recently in a number of Latin American countries. Among these are Argentina (1981), Bolivia (1982), Mexico (1982), and most recently, Venezuela (1983). In these cases dual rates may be useful in providing protection from capital outflows while a viable stabilization program is implemented and made credible.

This paper extends the early work of Argy and Porter (1972) on the effects

of macroeconomic policies under alternative exchange-rate regimes. Argy and Porter use a model with demand-determined output and capital mobility that incorporates a forward exchange market. The results obtained by Argy and Porter concerning the short-run effectiveness of monetary policy under dual exchange rates are consistent with those obtained here. However, we extend their analysis in several ways. Here, expectations are determined endogenously, domestic prices are allowed to vary, and the role of accumulation through the current account is highlighted. We are thereby able to analyze both the short-run and long-run effects of various disturbances as well as the economy's dynamic adjustment path. In addition, unlike Argy and Porter, we emphasize the wealth effects of changes in the financial foreign exchange rate as an important channel through which disturbances affect the domestic economy.

Flood and Marion (1982) have also extended the Argy-Porter analysis, though in different directions than those pursued here. They focus on the role of optimal indexing in the determination of the aggregate supply function under alternative exchange rate regimes. Strong results are obtained concerning the effects of the choice of exchange-rate regime on the variation in domestic output around its desired level when the home country is small in all markets. Dual exchange rates are found to insulate the domestic economy fully from foreign disturbances. However, they find that these conclusions do not carry over to the case, analyzed here, in which the exports of the home

country depend on the relative price of domestic output.

The plan of the paper is as follows. Section I describes the model and analyzes the economy's stationary equilibrium. As is the case in Flood (1977,1978), in the absence of anticipated disturbances the adjustment of the economy to a stationary equilibrium is characterized by a current-account surplus (deficit) and a depreciating (appreciating) capital-account exchange rate. Open-market policy is analyzed in Section II, where it is demonstrated that the authorities are able to exert long-run control over the money supply and the domestic interest rate (though not the domestic price level) even in a world of perfect capital mobility. This non-neutrality of open-market policy is then contrasted to the long-run neutrality results obtained in Flood (1977) and Argy and Porter (1972). In addition, Section II demonstrates that dual exchange markets do not successfully insulate the economy from speculative disturbances and that the relationship between the current account and the capital-account exchange rate described above is reversed when future disturbances are anticipated.

Section III examines the effects of foreign demand disturbances. An increase in foreign demand for home output is found to be expansionary, even in the long run, and to result in a permanent appreciation of the current account exchange rate. This result is similar in spirit to the findings of Argy and Porter although they focus on output effects rather than price level

effects. The feasibility of sterilization policy is then explored. While authorities are able temporarily to neutralize the price level effects of external demand disturbances even in a world of perfect capital mobility, as in Swoboda (1974) it is found that no long-run policy of neutralization is possible. Section IV offers some concluding remarks.

I. The Model

We now proceed to develop a simple model of a small, open economy under a regime of dual exchange rates. The country is assumed to adopt a fixed exchange rate, e, for all current-account transactions. Capital-account transactions are assumed to be successfully segregated from current-account transactions and occur at a freely-floating rate, ε.[2] Both e and ε are domestic currency prices of foreign exchange.

Agents are assumed to allocate their financial wealth between domestic money and interest-bearing assets according to the Metzler portfolio balance rule,

$$(1) \qquad M/qk = L(r,y), \qquad L_1<0,\ L_2>0,$$

where M is the nominal money stock, r is the domestic nominal interest rate and y is real domestic product.[3] Domestic residents hold k units of the long-lived, interest-bearing asset that has a market price of q. Equation (1)

states that agents raise their holdings of cash balances relative to their holdings of interest-bearing assets whenever real output rises or nominal interest rates fall.[4]

All perfectly substitutable assets are assumed to be denominated in terms of the foreign currency whether issued at home or abroad and pay a continuous dividend stream of one unit of the foreign currency per unit time. The purchase and sale of these claims occur at the financial rate, ε . Interest payments, on the other hand, occur at the commercial rate, e, since they are current (service) account transactions. The possibility of arbitrage assures us that all claims command the same price whether sold at home or abroad,

$$(2) \qquad q = \varepsilon q^*$$

where $q^*=1/r^*$ is the foreign-currency price of the security. This condition is then used to give us a relationship between the domestic and foreign yields,

$$(3) \qquad r = (e+\dot{q}^e)/q = (e+q^*\dot{\varepsilon}^e)/\varepsilon q^* = (e/\varepsilon)r^* + \dot{\varepsilon}^e/\varepsilon$$

where a superscript e denotes an expected value, a dot denotes a time derivative, and an asterisk denotes a foreign variable. In obtaining (3) we have written the domestic interest rate as the sum of dividends and expected capital gains.[5]

We abstract from the banking system so that the money stock, consisting entirely of high-powered money, is the sum of domestic credit, D, and the domestic currency value of reserves, eR,

(4) $M = D + eR.$

Equilibrium in the assets market, which we assume to obtain continuously, may then be characterized by,

(5) $(D+eR)/\varepsilon q^{*}k = L((e/\varepsilon)r^{*} + \dot{\varepsilon}^{e}/\varepsilon, y).$

Next, we consider the goods market. Wages and prices are assumed to be fully flexible, guaranteeing that domestic output is continuously at its full-employment level. Real aggregate spending by domestic residents (expressed in terms of domestic output) is assumed to depend on real domestic income and on real financial wealth,

(6) $A = A(y^{d}, W/P), \qquad A_1>0, \; A_2>0,$

where $W = D+eR+\varepsilon q^{*}k$ denotes the nominal domestic-currency value of financial wealth, P denotes the price of domestic goods, and y^{d} denotes the real disposable income of domestic residents. Disposable income is given by the sum of domestic product and the service account.

(7) $y^d = y + er^*q^*k/P$

Domestic residents consume both goods produced domestically and goods produced abroad. Domestic and foreign output are imperfect substitutes in consumption so that purchasing power parity does not hold. The fraction, θ, of domestic expenditure falling on domestic goods depends on their relative price. We assume the home country to be small in the market for foreign output and takes foreign prices as given ($\theta=\theta(e/P)$, $\theta'>0$).[6] However the home country is assumed to be large in the market for its output so that home country exports depend on their relative price ($X=X(e/P)$, $X'>0$). Equilibrium in the market for domestic goods is given by the equality of aggregate demand for domestic output and its fixed, full-employment supply,

(8) $y = \theta(e/P)A(y+er^*q^*k/P, W/P) + X(e/P)$.

Domestic prices are fully flexible and adjust so that the goods-market equilibrium (8) holds at each moment. This implies that the equilibrium price level can be written as a function of the determinants of aggregate demand,

(9) $P = P(\varepsilon,R;D,e,r^*,k), \qquad P_1>0, P_2>0.$

An increase in either ε or R will raise the domestic currency value of financial wealth, thereby raising demand for domestic output. An increase in prices is required to restore goods-market equilibrium by switching

expenditure away from domestic goods and by reducing the real value of both wealth and service account income.

Short-run equilibrium in the economy is characterized by the simultaneous clearing of the goods market and the assets market. Long-run equilibrium also requires balance-of-payments equilibrium. The combination of dual exchange rates and a floating capital-account rate imply that the capital account is always zero. Therefore, reserves change over time at the rate of the current-account imbalance as the central bank intervenes to keep the commercial rate, e, fixed,

$$(10)\quad \dot{R} = (P/e)((\theta(e/P)-1)A(y+er^*q^*k/P,\ W/P)+X(e/P))+r^*q^*k.$$

By noting that the equilibrium price level depends on the determinants of aggregate demand, we can combine (9) and (10) to describe the rate of reserve growth as,

$$(11)\quad \dot{R} = g(\varepsilon,R;D,e,r^*,k), \quad g_1<0,\ g_2<0.$$

An increase in either ε or R raises wealth and therefore raises domestic spending and worsens the current account. On the other hand, an increase in domestic prices also results from increases in ε and R. The expenditure-switching effect of the price increase tends to worsen the current account while the reduction in the real value of interest income and financial wealth

tends to improve the current account. It is possible to demonstrate, however, that the direct wealth effect dominates the indirect, price level effect.

Equation (11) is one of the equations of motion that we will use to analyze the dynamic behavior of the economy. In order to complete the model we need to describe the behavior of the financial rate, ε. We do so by making the strong assumption that agents posses perfect foresight so that,

$$(12) \quad \dot{\varepsilon}^e = \dot{\varepsilon}$$

Next we use the money market equilibrium condition, (5), together with the perfect foresight assumption, (12), to describe the movement of the financial rate consistent with equilibrium in the assets market,

$$(13) \quad \dot{\varepsilon} = h(\varepsilon,R;D,e,r^*,k) \qquad h_1>0,\ h_2<0.$$

An increase in the financial rate generates an excess demand for money through two channels. First, it raises the domestic-currency value of interest bearing assets. Second, it reduces the yield domestic investors receive. Money-market equilibrium then requires an increase in the rate of depreciation of the financial rate, which raises the domestic interest rate and therefore reduces money demand. Similarly an increase in reserves creates an excess supply of money and must be associated with a decrease in the rate of depreciation of the financial rate to insure that money markets clear.

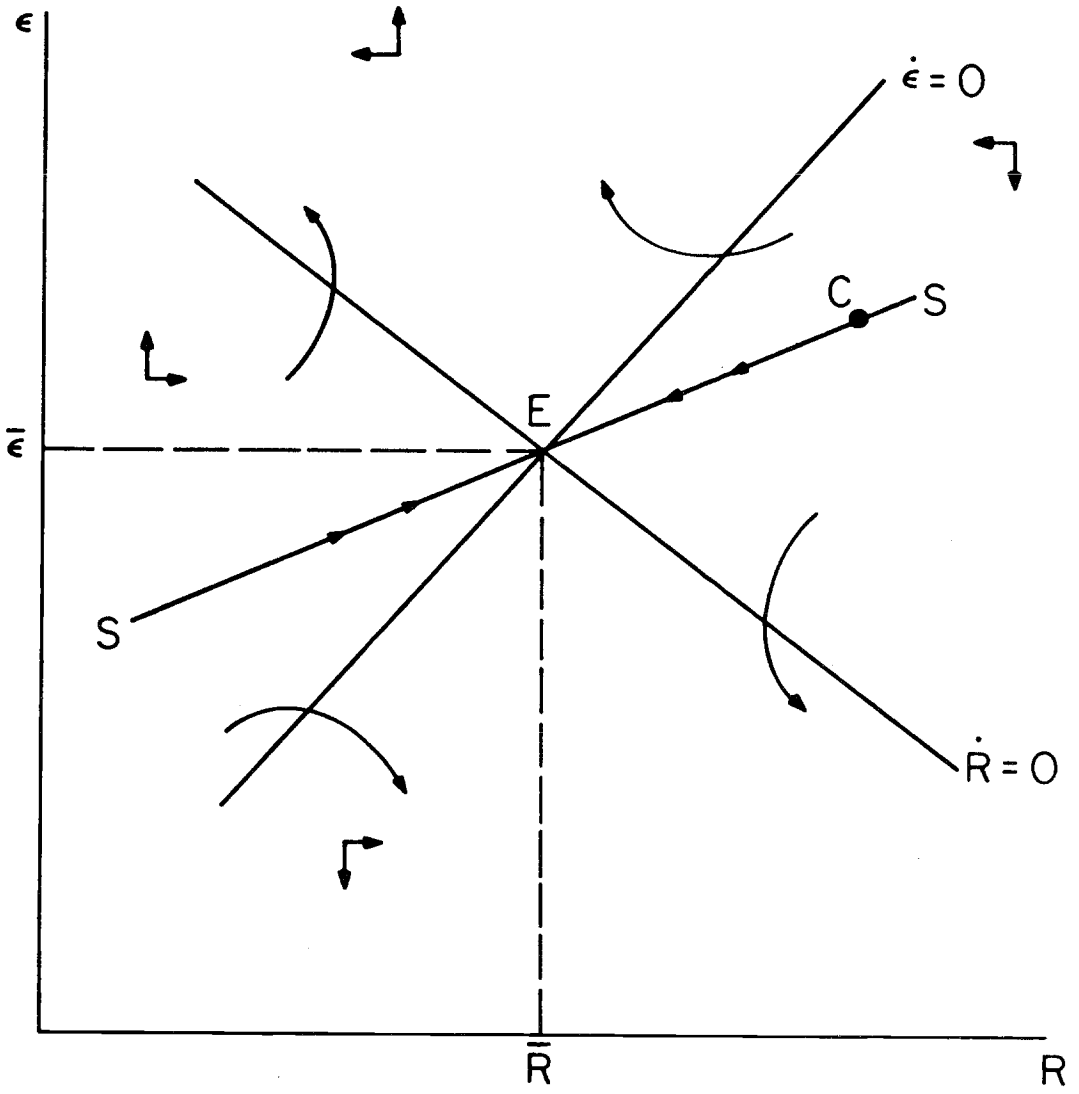
Taken together (11) and (13) describe the dynamic path followed by the economy, given the stock of domestic credit, the commercial rate, the foreign interest rate, and stock of interest-bearing assets held by the private sector. We now proceed to analyze the local stability properties of the economy in the neighborhood of a stationary state. In the course of doing so we will develop the system's phase diagram, which will prove useful in analyzing the economy's adjustment to various shocks. Linearizing the system, (11) and (13), around a steady state, $(\bar{\varepsilon},\bar{R})$, we obtain,

$$(14)\begin{bmatrix}\dot{\varepsilon}\\ \dot{R}\end{bmatrix} = \begin{bmatrix}h_1(\bar{\varepsilon},\bar{R}) & h_2(\bar{\varepsilon},\bar{R})\\ g_1(\bar{\varepsilon},\bar{R}) & g_2(\bar{\varepsilon},\bar{R})\end{bmatrix}\begin{bmatrix}\varepsilon-\bar{\varepsilon}\\ R-\bar{R}\end{bmatrix}$$

The system's determinant, $h_1g_2 - g_1h_2$, is negative implying that the system has one positive and one negative characteristic root. The system therefore exhibits saddle-point stability, a property common in rational-expectations and perfect-foresight models.

Figure 1

The phase diagram of the linearized dynamic system, (14), is found in figure 1. The $\dot{\varepsilon}=0$ locus depicts the values of reserves and the financial rate consistent with assets market equilibrium and a stationary financial rate. It is positively sloped since, as was noted above, increases in reserves generate an excess supply of money while increases in the financial rate generate an



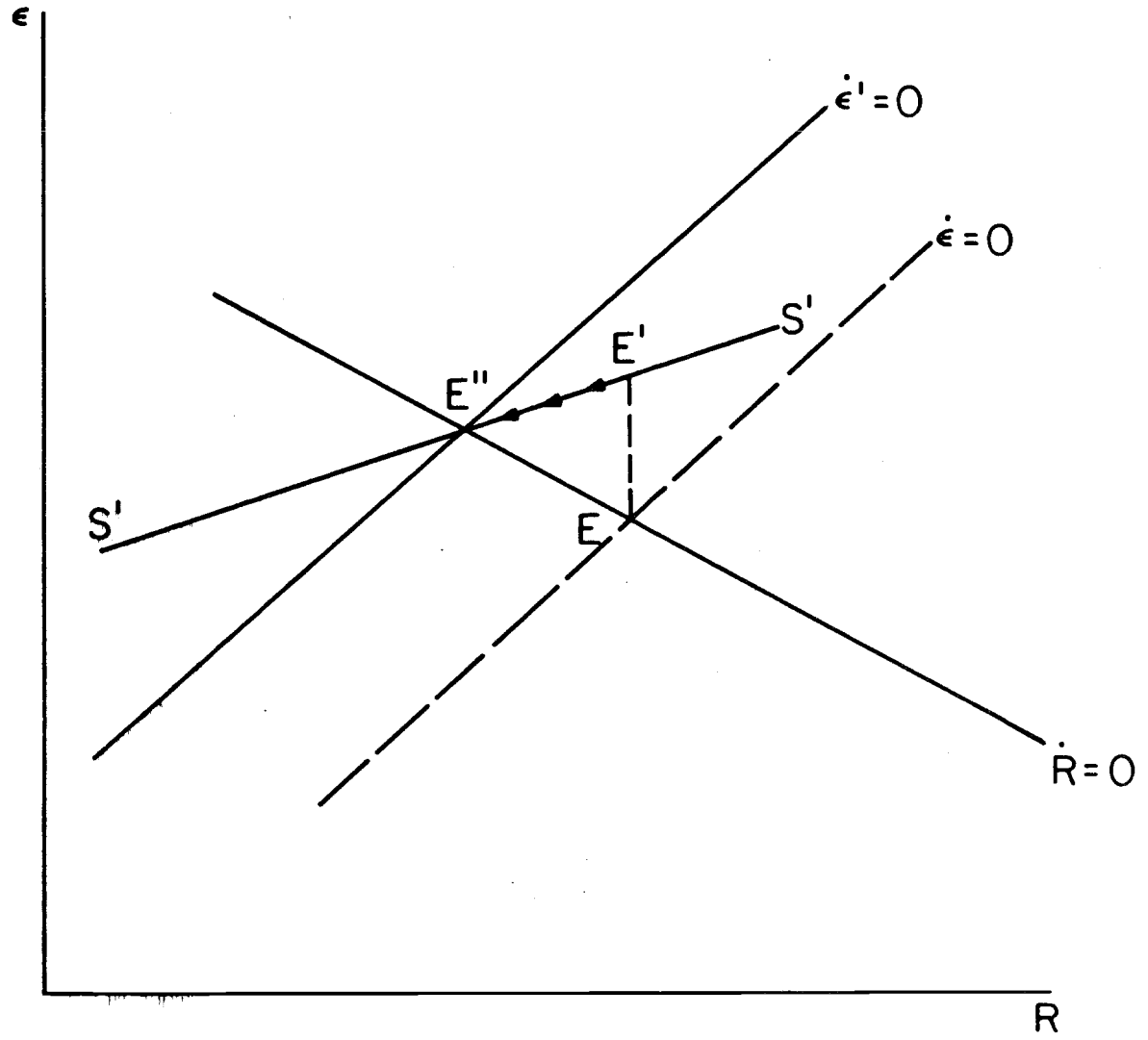
excess demand for money.[7] The $\dot{R}=0$ locus depicts the values of reserves and the financial rate consistent with equilibrium in the goods market and with a balanced current account. It slopes downward since, as was discussed above, increases in reserves and the financial rate both tend to worsen the current account through their effect on domestic wealth.[8] The stable arm of the saddle-point equilibrium is labelled SS in figure 1. We follow standard practice and assume that in the absence of anticipated disturbances adjustment occurs along the convergent path, SS. Consider the adjustment from a point like C on SS to the steady-state equilibrium, E. As reserves decline the resulting contraction of the monetary base creates an incipient excess supply of foreign exchange and therefore a fully-anticipated appreciation of the financial rate. Both the decline in reserves and the appreciation of the financial rate reduce spending over time and therefore reduce the size of the current-account deficit. The adjustment path is characterized by a current-account deficit and an appreciating capital-account exchange rate. It is of interest to note that this is the opposite relationship from that obtained by Kouri (1976) and by Dornbusch and Fischer (1980) for the case of flexible rates. This difference is due to the fact that, under flexible rates, as agents rebalance their portfolios in response to current-account surpluses an excess demand for money results since the accumulation occurs in the form of foreign assets. Here, accumulation of wealth occurs in the form of cash balances, resulting in an excess supply of money.[9]

II. Open-Market Policy and Monetary Disturbances

In this section we analyze the short-run and long-run effects of an unanticipated open-market purchase of securities by the central bank. We then turn to the effects of a "speculative attack" on the home currency. The effect of an open-market purchase is depicted in figure 2. Suppose a long-run equilibrium, such as E, is disturbed by a central bank purchase of interest-bearing assets.[10] Since the value of the increase in the stock of domestic credit is equal to the value of securities purchased, private financial wealth is unchanged at the initial equilibrium. The current account therefore remains balanced at all points along $\dot{\bar{R}} = 0$.[11] However, due to the change in relative asset supplies there is now an excess supply of money at all points on the $\dot{\varepsilon}=0$ locus. At each level of reserves a higher value of the capital-account rate is needed to restore money-market equilibrium. The $\dot{\varepsilon}= 0$ locus therefore shifts up and to the left to $\dot{\varepsilon}' =0$.

Figure 2

At the time of the purchase the incipient excess demand for foreign exchange at E causes an immediate depreciation of the financial rate and short-run equilibrium is reached at E' on S'S'. There is no immediate change in R as dual exchange markets prevent a net outflow of private capital and the financial rate overshoots its new long-run value. The wealth effect of the depreciation raises aggregate demand and moves the current account into



deficit. Over time, reserves decline and the financial rate appreciates.[12]

The increase in aggregate demand resulting from the monetary expansion results in an immediate increase in domestic prices. This price increase serves to dampen the real wealth effect of the depreciation of the financial rate and to switch demand away from domestic goods. Adjustment to the new long-run equilibrium occurs with a falling stock of reserves and an appreciating capital-account rate. The associated decline in wealth reduces absorption and therefore reduces domestic prices over time. The price decline continues until the original domestic price level is restored at E". Monetary policy is therefore able to influence domestic prices in the short run but not in the long run.

The inability of the central bank to influence the price level in the long run is not due to an inability to control the money stock. As can be seen in figure 2, the new long-run equilibrium, E", is characterized by a higher value of the financial rate. The higher financial rate implies that the domestic interest rate must be lower at E" than at E. With real output unchanged, assets-market equilibrium requires that a lower domestic interest rate be accompanied by a larger monetary base. The long-run reserve loss following an open-market purchase is therefore less than one for one.

The nonzero long-run effect of a monetary expansion on the domestic

interest rate and money stock differs from that obtained in models adopting the monetary approach to the balance of payments.[13] In these models a monetary expansion results in a current-account deficit that offsets the expansion over time. In the long run the offset is complete. This difference is due to the assumption in monetary approach models that agents hold only one asset, money.[14] All monetary operations are therefore of Metzler's second type, changes in the money supply "...without any offsetting changes in private holdings of other assets."[15] The results also stand in contrast to the long-run neutrality of money with dual exchange rates found in Flood (1977) and Argy and Porter (1972). The reason for the difference is that these authors look at type II money supply changes while here we analyze the effect of open-market operations in which money is exchanged for financial assets of equal value. As is well known, neutrality propositions derived from the analysis of type II monetary operations do not carry over to the analysis of type I (open market) operations.[16]

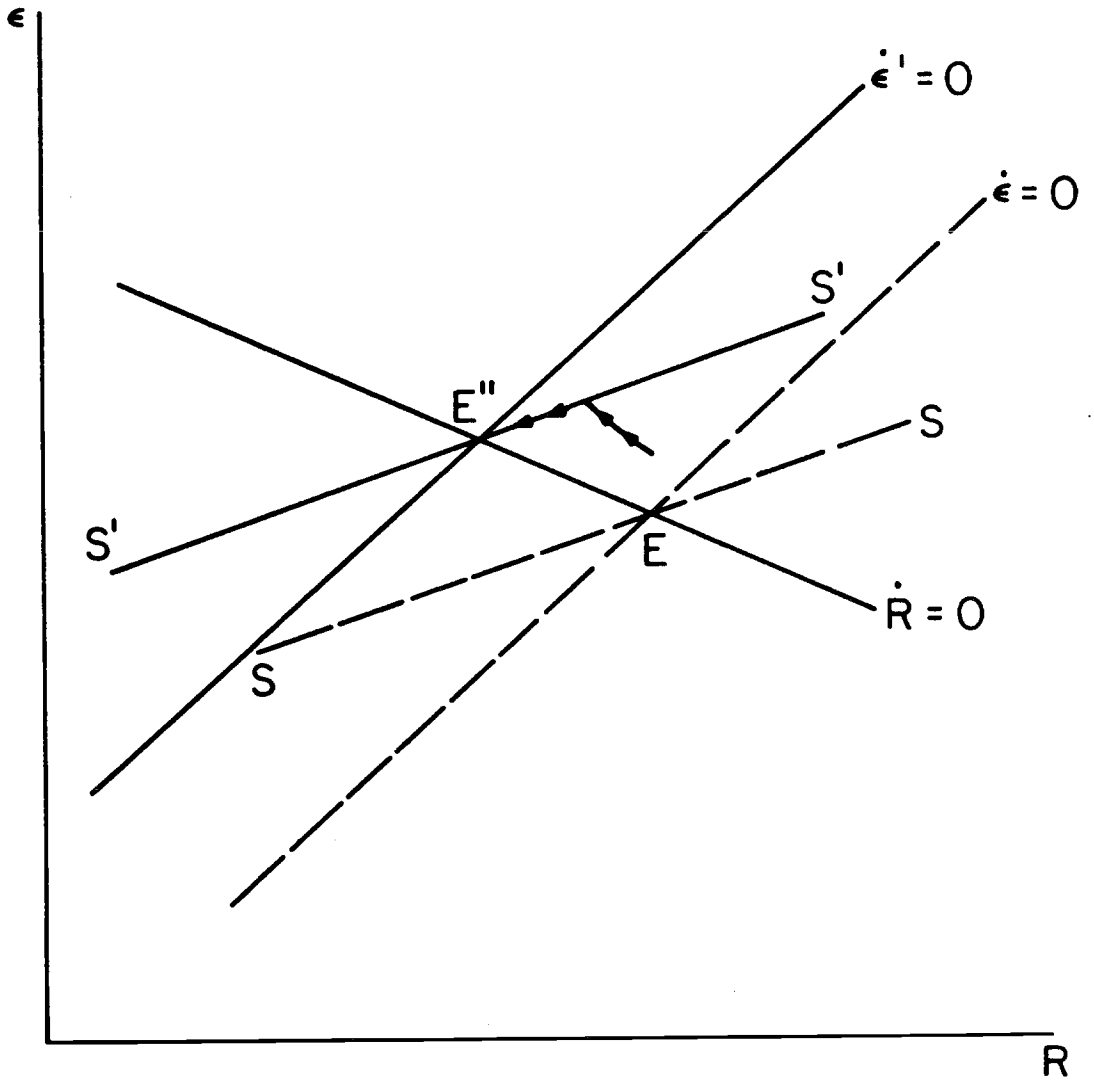
In the current context of endogenously-determined expectations it is inappropriate to model a speculative disturbance as an exogenous change in expectations about the financial rate. Instead, we model a speculative attack as a change in agents' expectations concerning future policy to be pursued by the domestic monetary authority. In particular, we suppose that at time t_0 the economy is disturbed by agents' expectation that, at some time t_1 in the future, the domestic monetary authority will engage in an open-market

expansion of the money stock.

The effect of this speculative disturbance is found in figure 3. At t_1 agents expect the economy will be on S'S', the stable arm associated with a higher stock of domestic credit. Adjustment from t_1 will proceed exactly as analyzed in the case of an unanticipated open-market purchase. Furthermore, all discrete jumps in the financial rate must be unanticipated. Any anticipated discrete jumps would imply anticipated capital gains on foreign assets at an infinite instantaneous rate that would be bid away. At t_0 the economy jumps to a point, E', as the expected future monetary ease creates an incipient excess demand for foreign exchange and results in an immediate depreciation of the financial rate. The wealth effect of the depreciation raises aggregate demand and results in an increase in domestic prices. The increase in spending also results in a current- account deficit and a loss of reserves. A current-account deficit is associated with a depreciating financial rate and rising prices as the economy responds to the expected future monetary expansion.

Figure 3

If the monetary authority does indeed engage in an open-market expansion of the money stock at t_1, adjustment continues with a continuing current-account deficit and an appreciating financial rate until the new long-run equilibrium is reached at E". If, however, expectations are not fulfilled and no change



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in the money stock occurs agents must revise their expectations. Suppose that this revision occurs sometime prior to t_1 and that agents now correctly perceive that the monetary authority plans to keep the stock of domestic credit unchanged. The financial rate must immediately appreciate and the economy jumps vertically to a point on SS, the stable branch associated with the original stock of domestic credit. The capital loss that results from the appreciation reduces absorption and prices. A current-account surplus results as the economy begins to accumulate reserves and the financial rate depreciates until the initial long-run equilibrium, E, is restored.

Dual exchange markets are therefore not successful in insulating either the current account or domestic prices from speculative disturbances.[17] The connection between the speculative disturbance and the current account and prices is through the wealth effect of the financial rate on spending.

Before turning to the effects of demand disturbances we briefly analyze the effect of an increase in the foreign interest rate.[18] First consider the assets market. An increase in the foreign interest rate creates an excess supply of money at the initial equilibrium both by raising the domestic interest rate and by reducing the value of financial wealth (recall $q^*=1/r^*$). The financial rate is therefore bid up as agents attempt to raise their holdings of interest-bearing assets. A depreciation of the financial rate proportional to the increase in the foreign interest rate will restore

equilibrium in the assets market since both the initial domestic interest rate and the initial value of wealth will be restored. A proportional depreciation of the financial rate will also bring about current-account balance since both wealth and the service account will then be unchanged. Dual rates therefore completely insulate the domestic price level and the current account from changes in foreign interest rates.[19]

III. Demand Disturbances and Internal Balance

In this section we examine the effects of an unanticipated exogenous increase in export demand and then examine the feasibility of using monetary policy to pursue an internal balance goal in the face of this external disturbance.[20] It will be seen that an external demand disturbance will permanently alter domestic prices and that the domestic monetary authority may temporarily neutralize the price level effects of external demand disturbances, even in world of perfect capital mobility. An attempt to use monetary policy to maintain an internal-balance goal in the face of permanent external disturbance is ultimately self-defeating.

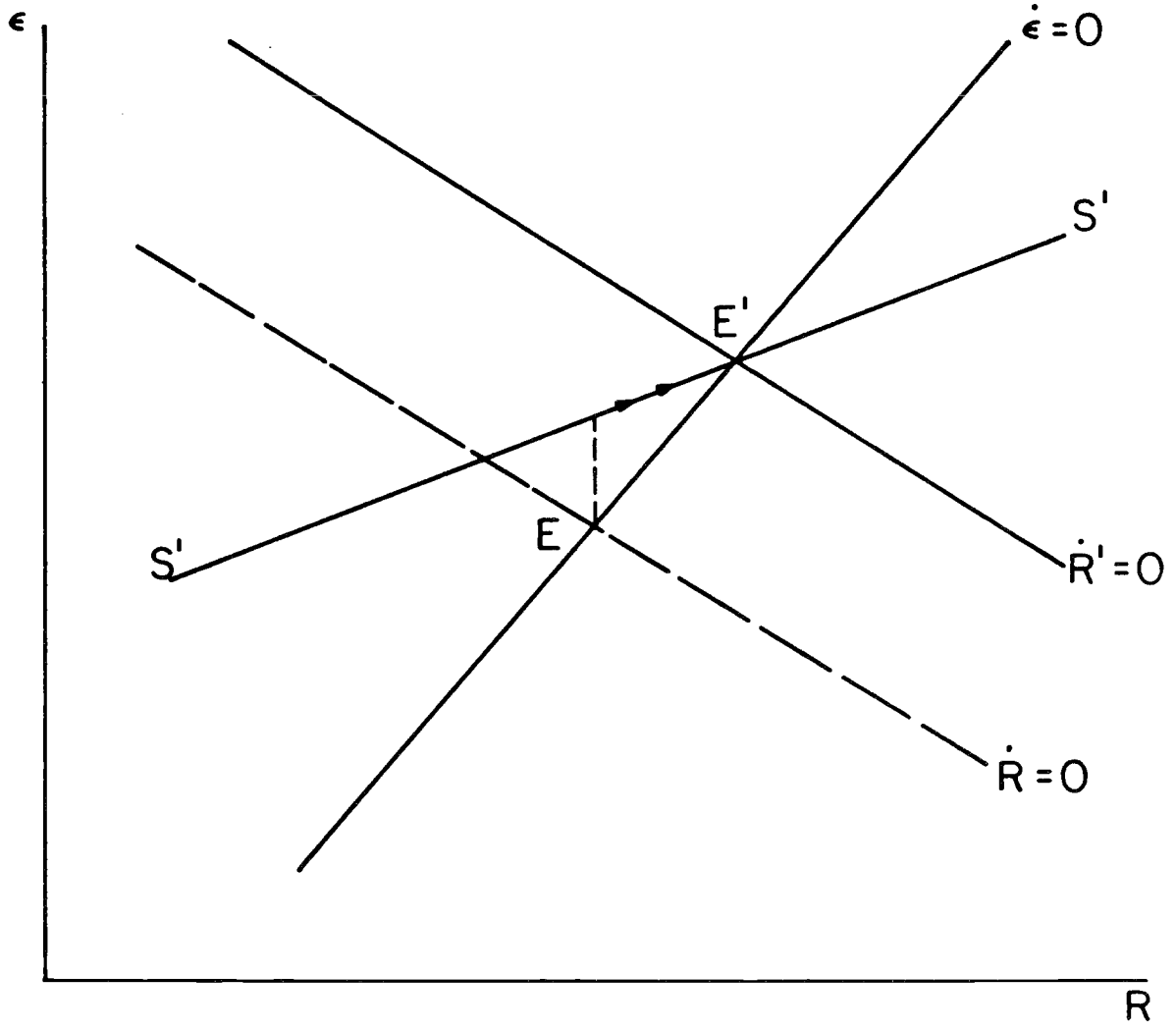
The effect of an unanticipated increase in export demand is found in figure 4. The increase in export demand creates a current-account surplus at the initial equilibrium and a higher financial rate or a higher stock of reserves is needed to raise wealth and, therefore, increase aggregate demand and domestic prices to restore external balance. The $\dot{R}=0$ locus therefore

shifts up and to the right. The increase in foreign demand has no direct effect on assets markets so that all points on the original $\dot{\varepsilon}=0$ locus remain consistent with assets-market equilibrium and a stationary financial rate.

Figure 4

Following the foreign demand shock the current account moves into surplus. The resulting growth in reserves raises the domestic money stock, requiring a depreciating financial rate to clear the assets market. The expectation of a depreciating financial rate raises the domestic interest rate. Since initially the domestic money supply is unchanged, the rise in the domestic interest rate creates an incipient excess supply of money (excess demand for foreign exchange) that must be removed by an initial upward jump in the financial rate. The combination of accumulating reserves and a rising exchange rate imply that domestic prices are rising along the adjustment path, reducing the current-account surplus over time. The new long-run equilibrium is characterized by a permanently higher price level and an appreciated real commercial exchange rate that serves to switch expenditure away from domestic goods.

Suppose the monetary authority attempts to resist the inflationary pressure resulting from the foreign demand shock. By adopting an internal balance goal of price stability the monetary authority, in effect, makes the domestic price level exogenous and the stock of domestic credit endogenous.



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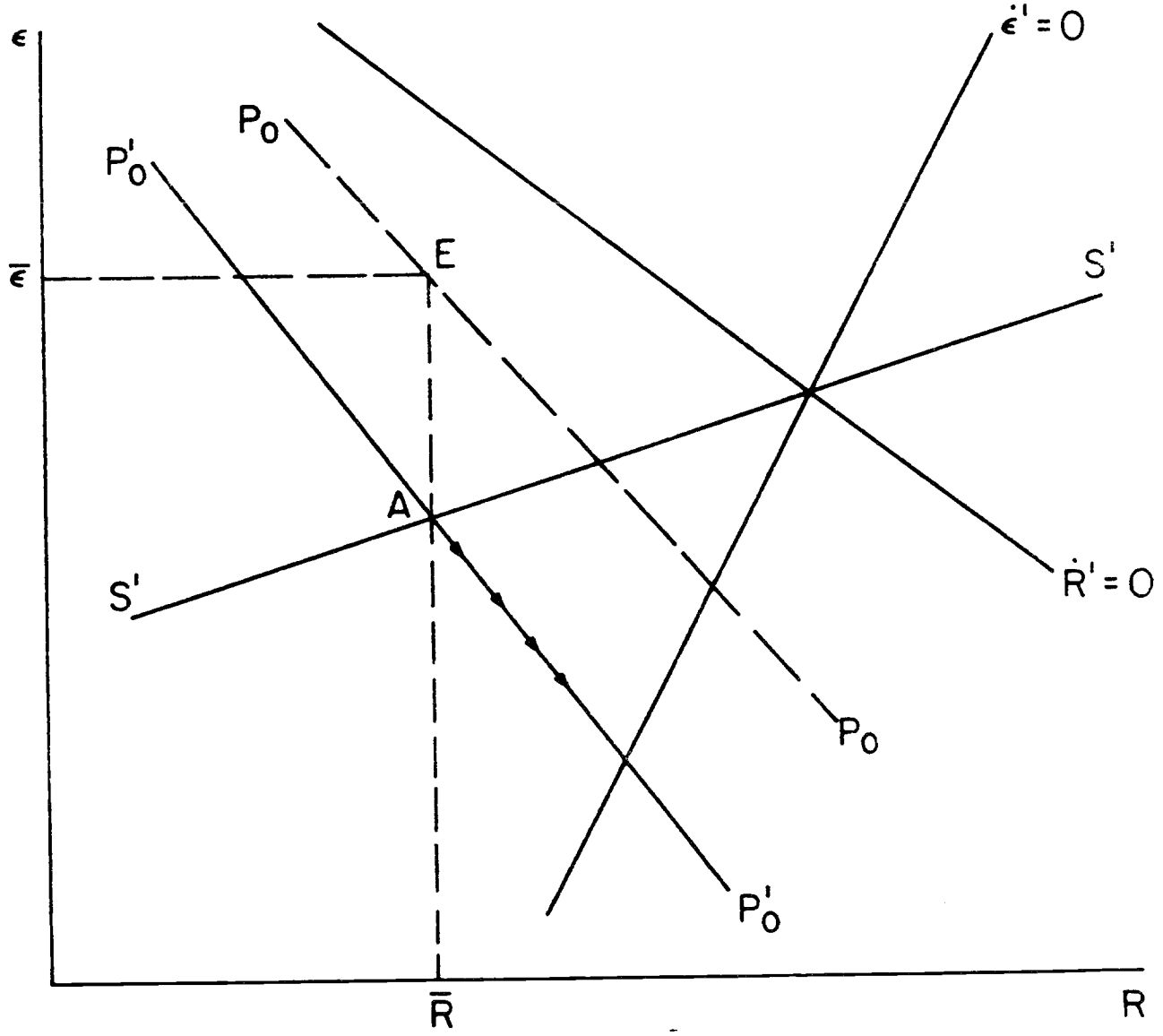
To aid in the analysis we introduce an internal balance locus, labelled P_0P_0 in figure 5. If prices are held at their initial level, absorption becomes a function of the level of wealth only. For a given level of export demand internal balance therefore requires that wealth be constant. The slope of the internal balance schedule is then,

$$(15) \qquad \left.\frac{d\varepsilon}{dR}\right|_{P_0P_0} = -\frac{e}{q^*k}$$

At the initial equilibrium, E, the expansionary effect of the increase in export demand raises prices above P_0. A decrease in ε or in R is required to reduce domestic spending and restore internal balance. The internal balance schedule shifts down and to the left to $P_0'P_0'$. Since prices are now higher than P_0 the monetary authority must engage in an open-market sale of securities. This contraction in the money stock leads to an appreciation of the financial rate and the economy jumps to A, the only point on the saddle path S'S' associated with the newly reduced money supply that also satisfies the internal balance condition. The expenditure-reducing impact of the open-market sale increases the current-account surplus above that resulting from the export expansion alone. The central bank must sterilize these inflows through further open-market sales to maintain internal balance. During the sterilization process the economy moves down and to the right along $P_0'P_0'$.

Figure 5



Two questions naturally arise. First, is sterilization more or less than complete? Second, is the use of monetary policy to maintain internal balance a feasible long-run policy? Since open-market sales are being used to keep wealth constant, movement along $P_0'P_0'$ is characterized by a constant rate of appreciation

$$(16) \qquad \dot{\varepsilon} = -(e/q^*k)\dot{R}$$

and the domestic interest rate must therefore be rising as ε falls. A rising domestic interest rate is consistent with money-market equilibrium only if the money stock is falling. Sterilization must therefore be more than complete and the rate of decline in the stock of domestic credit must exceed the rate of reserve accumulation.

The question of the long-run feasibility of the internal-balance target depends on whether the current account surplus can be eliminated over time and a new long-run equilibrium established with $P=P_0$. So long as the monetary authority maintains its internal balance goal, the rate of reserve accumulation is given by,

$$(17) \quad \dot{R} = (P_0/e)((\theta(e/P_0)-1)A(y+er^*q^*k/P_0, W/P_0)+X(e/P_0))+r^*q^*k$$

The viability of the internal balance goal is determined by,

$$(18)\quad \frac{d\dot{R}}{dt} = (\theta(e/P_0)-1)A_2\dot{W}/P_0 = 0$$

Since wealth is being held constant, the inflow of reserves is unabated by sterilization and the central bank will eventually deplete its holdings of interest-bearing assets.[21] While successful in sustaining P_0 as a temporary equilibrium, the central bank only changes the composition of its balance sheet in the long run. Monetary policy alone is incapable of achieving an internal-balance goal in the face of an external demand disturbance. The contribution of dual exchange markets is to allow short-run internal-balance goals to be achieved in a world of perfect capital mobility.[22]

IV. Concluding Remarks

The adoption of a two-tier exchange-rate regime gives the monetary authority greater independence from external constraints than it would otherwise enjoy. If the authorities are successful in forcing only and all capital-account transactions through the financial exchange market, the capital account is zero in the absence of intervention in that market. When the current-account rate is pegged reserve losses are limited to those resulting from current-account imbalances. The possibility of central bank control over the money stock then arises. This control may be used to influence the level of aggregate demand in the short run and to sterilize

temporarily the effects of foreign disturbances. It should noted, however, that these results are derived in an idealized setting that abstracts from important practical problems such as incomplete segmentation that are frequently encountered in implementing dual exchange rates.

By limiting reserve losses to current-account imbalances a dual exchange rate regime is in some respects similar to a fixed exchange rate regime in the absence of capital mobility. In another important respect, however, the two regimes are very different. The financial foreign exchange rate provides an important link between the domestic economy and foreign disturbances that is absent when capital is immobile.

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[1]In several instances some current account transactions (especially imports deemed to be nonessential) are channelled through the floating-rate market. See the International Monetary Fund's Annual Report on Exchange Restrictions.

[2]Fleming(1974) and Lanyi(1975) discuss the difficulties that arise in implementing controls that are effective in segregating the two markets. One source of incomplete segmentation is movements in trade credit, commonly referred to as leads and lags. Cumby (1983) examines data from the United Kingdom and finds that trade credit movements are sensitive to changes in interest rate differentials but that extremely large differentials are required to induce movements comprising a large fraction of reserves. Bhandari (1982) and Macedo (1982) examine models assuming incomplete segmentation. It should also be pointed out that we abstract from the important issue of the credibility of the fixed commercial exchange rate. In particular, we do not allow for the possibility that increases in the premium on financial foreign exchange may lead to speculation concerning a future devaluation of the commercial rate.

[3]We use domestic product rather than domestic income to simplify the analysis and therefore ignore the effects of the service account on the transactions demand for money.

[4]Employing the Metzler rule is equivalent to assuming that the fraction of real financial wealth that agents allocate to holdings of real cash balances and interest-bearing assets depends on the nominal interest rate and on real output. The Metzler rule enables us, however, to simplify the analysis somewhat.

[5]The foreign-currency price of the security is assumed to be constant.

[6]The foreign price level will be normalized to one throughout.

7

$$\left.\frac{d\varepsilon}{dR}\right|_{\dot{\varepsilon}=0} = -\frac{h2}{h_1} = \frac{e/q^*k}{L-L_1(e/\varepsilon)r^*}$$

8

$$\left.\frac{d\varepsilon}{dR}\right|_{\dot{R}=0} = -\frac{g_2}{g_1} = -\frac{e}{q^*k}$$

[9]Flood (1978) obtains this result in a model where the home country is small in all markets and the domestic price level linked to the exogenous foreign price level by purchasing power parity.

[10]Throughout the paper we will assume that domestic credit policy may be implemented without regard to fiscal policy and without any direct effects on the structure of production. This assumption is clearly not valid for all countries and institutional arrangements.

[11]The open-market purchase will reduce the interest income of the private sector. We assume that the interest payments the central bank gains by the purchase are redistributed to the private sector as lump-sum transfer payments so disposable income is unchanged.

[12]It is interesting to note that since the expected appreciation of the financial rate reduces the domestic interest rate a smaller initial depreciation (and, therefore, a smaller degree of overshooting) is needed to restore short-run equilibrium than would be the case if expectations were static. In the case of static expectations the economy jumps to a point on $\dot{\varepsilon}'=0$ vertically above E.

[13]See for example Dornbusch (1974).

[14]The importance of the one-asset assumption in monetary-approach models of the effects of devaluation is examined in Obstfeld (1981).

[15]See Metzler (1951,p.97).

[16]The distinction between the two types of monetary operations depends on

the assumptions made about the public's treatment of income streams resulting from the central bank's holdings of interest-bearing assets. See Obstfeld (1982) for a discussion of this point.

[17]This result differs from the conclusions reached in Swoboda (1974) and Dornbusch (1976) due to their assumption that changes in the financial rate have no effect on absorption. Here wealth effects play a central role.

[18]Since the foreign price level is being held constant while the foreign interest rate is rising, the shock we are analyzing must be due to a combination of disturbances to the foreign goods market and the foreign assets market that leaves aggregate demand for foreign goods, and therefore the foreign price level, unchanged. An advantage of the extended small country analysis employed by Flood (1979) and Flood and Marion (1982) is that the analysis focuses directly on the source of disturbances.

[19]Argy and Porter (1974) and Marion (1981) also find that dual rates insulate the domestic economy from changes in the foreign interest rate. As is apparent from the discussion above, Marion's assumption that domestic and foreign assets are imperfect substitutes is not essential to her results. However, as Marion points out, the assumption that domestic residents hold consuls rather that short term foreign assets is crucial to the result. Flood and Marion (1982) use an extended small country analysis and therefore do not analyze the effects of foreign interest rate disturbances. Instead, they

focus on shocks to foreign productivity and to the foreign money supply.

[20]The internal balance goal is assumed to be a domestic price level target. This use of the term differs from Meade's (1951,p.104) use of the term to refer to a domestic employment target.

[21]A similar approach is followed by Obstfeld (1980) who examines the behavior of $d\dot{R}/dR$.

[22]Swoboda (1974) reaches similar conclusions concerning the long-run viability of sterilization.