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**MORE ON GROWTH AND THE BALANCE OF  
PAYMENTS :THE ADJUSTMENT PROCESS\***

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### THE ADJUSTMENT PROCESS

#### I. Introduction

The effect of an economy's growth on its balance of payments has been a subject which has received a good deal of attention in the recent literature in international economics. Much of this attention derives from general dissatisfaction with the theoretical and empirical aspects of the standard Keynesian analysis which argues that, via the existence of a positive marginal propensity to import, growth in a country's income will lead to an increase in imports. Hence, the argument proceeds, for given exports growth leads to a deterioration in the balance of payments.

This analysis seems subject to two main criticisms. First, as Arthur Laffer<sup>1</sup> has argued, it is inappropriate even under the "small-country" assumption to treat exports as being exogenously determined. If growth implies expansion in productive capacity - as it usually does in the balance of payments literature - then with no change in domestic absorption, exports would also be expected to increase.<sup>2</sup> Hence, there can be no presumption from the existence of a positive marginal propensity to import as to the effect of growth on the balance of payments.

A second shortcoming of the standard Keynesian analysis is its emphasis on commodity trade effects with no attention paid to asset equilibrium; whereas more recent work on the balance of payments - see H.G. Johnson's classic article<sup>3</sup>, for example - has emphasized the essential monetary nature of balance of payments phenomenon.

Incorporating asset behaviour into the model, Robert Mundell<sup>4</sup> has argued that growth results in increased liquidity requirements which, if not provided by domestic credit expansion, must be imported via improvement in the overall balance of payments position. Hence Mundell argues that growth in income will lead to an improvement in the overall balance of payments - precisely the opposite of the standard Keynesian results.<sup>5</sup> In order to achieve these results, Mundell adopts the Keynesian model so that imports become a function of desired expenditure, which in turn equals the difference between expected income and desired changes in asset holdings.

It is worth noting that in order to obtain Mundell's strong results - that an increase in the economy's rate of growth will improve its balance of payments - it is necessary to incorporate both of the above modifications into the standard analysis. Consider equation (1) below which reproduces equation (12) from Mundell.

$$[1] \quad B(t) = X(t) - m(1-k\lambda) Y(t) - a,$$

where  $B$ ,  $X$ , and  $Y$  are the balance of payments, volume of exports, and level of income respectively;  $m$  is the marginal propensity to spend on imports,  $k$  is the desired money/income ratio,  $\lambda$  is the exogenously given rate of growth of income and  $a$  is a constant. Equation [1] then gives the time path of the difference between the exogenously determined exports and the time path of imports suitably adjusted for growth in desired liquidity.<sup>6</sup> However, it is now illegitimate to treat exports as exogenous - if goods markets clear, exports must equal the excess of domestic output over domestic consumption of home goods, or

$$[2] \quad X(t) = a + (k\lambda + m - mk\lambda) Y(t).$$

Substituting into (1) yields

$$[3] \quad B(t) = k \lambda Y(t),$$

and we have Mundell's strong result that an increase in growth must improve the balance of payments.<sup>7</sup>

Two basic problems remain. First the source of growth is unspecified. If one is concerned with the effects of growth on the separate trade and current accounts it would be useful to know whether the increased income results in an increased value of the capital stock, accrues to a larger labour force, or whatever. Secondly, the strong results achieved above derive from a model with no allowance for domestic monetary policy. As Mundell's discussion recognizes, this could be introduced by simply subtracting the rate of domestic credit creation from equation (3); a more complete analysis would build the government sector directly into the model.

In a recent note in this Journal,<sup>8</sup> Rudiger Dornbusch has set out a model incorporating these two considerations. In Section II below we present a detailed discussion of his results and consider possible extensions to allow for consideration of the adjustment process involved in moving from the old steady state to the new. This extension is somewhat novel, given the preoccupation of the existing literature with comparisons of steady state positions; that is, the principle concern of the existing literature is with the effect of a change in the equilibrium level or rate of growth of income on the equilibrium balance of payments.<sup>9</sup> In as much as the longstanding conventional wisdom yielded apparently unsatisfactory answers to this question, this is indeed an interesting and useful question to pose. It is not, however, the only one of interest to policy-makers, and hence to

economic theorists. In the following section we shall try to draw attention to what happens to the actual balance of payments, thus giving special emphasis to the impact effect and ensuing transition due to exogenous changes in the growth rate. Finally, we shall briefly extend the analysis to consider the effects of monetary disturbances.

## II. Impact Effects and Balance of Payments Adjustment

The take-off point for our analysis will be the model set out by Dornbusch. However, we wish to generalize his model to allow for stock disequilibrium in asset holdings and to clear up some ambiguities created by minor expositional problems in the Dornbusch paper. The basic framework is the standard one-sector model of money and growth,<sup>10</sup> adapted for analysis of an open economy. It is perhaps worthwhile deviating briefly from our main theme to elaborate on these modifications.

First, in the open economy version of the model the rate of inflation  $\pi$  would be taken as given,<sup>11</sup> whereas the rate of expansion of the nominal money stock would be endogenously determined via the balance of payments;<sup>12</sup> precisely the opposite specification to the well known closed economy models.

A second and related change in the specification is in the disposable income concept. The standard neoclassical model of money and growth embodies the assumption that the money stock is expanded via government transfer payments, and hence disposable income must include such transfer payments. In the open economy some additions to the money stock are "earned" via the exports of goods or securities, and hence must not be included in the disposable income concept. Hence, to simplify the analysis, we follow Dornbusch and drop the assumption of domestic monetary policy via transfer payments,

and instead assume that any domestic monetary policy is enacted via government purchases or sales in the market for capital goods, and the earnings on the government owned capital stock are then distributed as transfer payments.

While the usual income-output distinction found in the money and growth literature is thus not to be found in our model, nevertheless an important income-output distinction does arise in the open economy model due to debt servicing. Such debt servicing arises from the assumption of capital mobility (where it is financial instruments or claims on the capital stock, and not the capital stock itself which is presumed to move internationally). It is this income-output distinction which becomes crucial to the short-run analysis of the balance of payments which follows.

We assume a "modified small country" on a fixed exchange rate system. While the country faces a given level and rate of change of commodity prices (for simplicity, assumed equal to zero) and a given world rate of interest; we wish to allow for the possibility of domestic stock disequilibrium in asset markets at any point in time.<sup>13</sup> This stock disequilibrium will not, however, affect the values of the given world parameters, nor will any stock disequilibrium be presumed to exist in the rest of the world.

Income can then be identified with production owned by the economy whereas output refers to production located in the country, the difference being the product of the world rate of interest and the economy's net foreign asset position.

Consequently, we represent output by equation [4]:

$$[4] \quad Y = Y(K, L),$$

where  $K$  and  $L$  are respectively the quantities of (physical) capital and labour located in the country. Defining  $F$  as the net foreign asset position, income is given by equation [5].

$$[5] \quad Y_d = Y(K, L) + r \cdot F.$$

Following our earlier discussion of domestic monetary policy, we assume a government deficit,  $G$ , a constant fraction,  $g$ , of output, so:

$$[6] \quad G = g \cdot Y(K, L),$$

where  $G$  is financed by printing money and directed entirely towards capital accumulation.<sup>14</sup> Given the constant rate of interest  $r$ , the profit maximizing rate of private investment is given by that required to maintain the marginal product of capital equal to  $r$ , or

$$[7] \quad I_p = (n/\phi - g) Y$$

where  $\phi = \phi(r)$  is the equilibrium output/capital ratio and  $n$  is the constant and given rate of growth of the labour force.

As Dornbusch shows, disposable income is related to output according to:

$$[5'] \quad Y_d = Q \cdot Y,$$

where  $Q$  is a function of the parameters  $n$ ,  $g$  and  $r$  [i.e.  $Q = Q(n, g, r)$ ]. Equation [5'] derives from the fact that  $Y_d$  is equal to the sum of wage payments, government transfers and interest income.

We write the stock demands for money and bonds as:

$$[8] \quad L = \ell(r) \cdot Q \cdot Y,$$

and



$$[9] F = f(r) \cdot Q \cdot Y + \alpha,$$

where  $\alpha$  is a shift parameter to be ignored for now. These in turn imply the following flow demands where we have allowed for the possibility of stock disequilibrium:

$$[10] \dot{L} = n \cdot \ell \cdot Q \cdot Y - \lambda_0 \hat{M},$$

$$[11] \dot{F} = n \cdot f \cdot Q \cdot Y - \lambda_1 \hat{F},$$

where  $\hat{M}$  and  $\hat{F}$  are the excess stock supplies of money and bonds respectively, and  $\lambda_0$  and  $\lambda_1$  are the speed of adjustment coefficients (with dimension time<sup>-1</sup>).

Domestic flow supplies of money and bonds respectively are given by equations [12] and [13].

$$[12] \dot{M} = G = g \cdot Y,$$

$$[13] \dot{F}_d = I_p = (n/\theta - g) Y,$$

where [13] derives from the assumption that all private domestic investment is financed by issuing bonds, i.e., bonds are "equity" instruments.

The various balance of payments accounts can now be represented by considering the equilibrium conditions in the appropriate markets. The overall balance of payments surplus  $B$  must be just sufficient to meet the excess of the flow demand for money over the domestic flow supply, or:

$$[14] B = [\ell nQ - g] Y - \lambda_0 \hat{M}.$$

The trade balance surplus is the excess of domestic output over expenditure:

$$[15] T = Y - (Y_d - \dot{L} - \dot{F} + G + I_p) \\ = Y [1 - Q - n/\phi + nQ(\ell + f)] - \lambda_0 \hat{M} - \lambda_1 \hat{F}.$$

The service account surplus is the difference between income and output:

$$[16] Z = (Q-1) Y,$$

and finally, the capital account surplus will be the excess of the domestic flow supply of bonds over the flow demand, or:<sup>15</sup>

$$[17] \dot{F}^0 = [n/\phi - g - nfQ] Y + \lambda_1 \hat{F}.$$

Using essentially this model Dornbusch examines the effects of a once-for-all change in the rate of growth of income on the overall balance of payments and the various components. However, there are some expositional difficulties and a closer examination is warranted here since a more precise exposition will be seen to render insights into the adjustment process.

Dornbusch's analysis confirms that an increase in the steady state growth rate at time  $t_1$  means that both the flow demand and the domestic flow supply eventually grow at the new, higher rate, and hence so does their difference - the balance of payments surplus. Hence this surplus must eventually exceed (algebraically) what it would have been in the absence of the change in the growth rate, and in this sense growth must improve the overall balance of payments. However, the effects on the individual trade and capital accounts are ambiguous.<sup>16</sup>

Consideration of the impact effects generated by the once-for-all increase in the growth rate yields the conclusion that the growth rate of the balance of payments initially differs from its new steady state value. The increase in  $n$  causes an upward 'blip' in the flow demand for money (and bonds) as can be seen by equations (10) and (11). However, as Dornbusch notes, the increase in  $n$  leads to a reduction in the government's share of

the capital stock. Thus the domestic flow supply of bonds grows more rapidly than the flow demand, resulting in a steady deterioration over time of the net foreign asset position. The resulting increase in debt servicing requirements then gives rise to a reduction in  $Q$ , the income-output ratio. Dornbusch's analysis is somewhat misleading on this point -- he mistakenly attributes the fall in  $Q$  to the reduction in government transfers. However, under the assumptions of the model whereby all earnings on government owned capital stock are redistributed, government owned capital stock is - from an income generating point of view - just one form in which domestics hold claims on the world capital stock. This indicates that as long as private domestic asset behavior is not affected by the government's share in the capital stock, (i.e.  $\alpha = 0$  in equation [9]), then a fall in the government's share reduces  $Q$  not by reducing transfer payments, but by the fact that some of the stock which was initially government (and hence domestically) owned is now owned by foreigners, and hence must now be serviced.<sup>17</sup>

Then as  $Q$  falls due to the deterioration in the net foreign asset position, the flow demand for real balances grows more slowly than the flow supply, i.e., more slowly than the new steady state growth rate. During the adjustment period, the balance of payments surplus consequently grows at a rate less than the steady state rate.<sup>18</sup> Possible adjustment paths are illustrated in Figure 1 where the increase in the growth rate is seen to lead to a "blip" in the flow demand for real balances, and hence in the balance of payments surplus; where  $B(t_1)_+$  represents the balance of payments at the "end of the instant"  $t_1$  under the assumption of no instantaneous change in  $Q$ , and  $B(t_1)_-$  is the balance of payments at the "start of the instant."

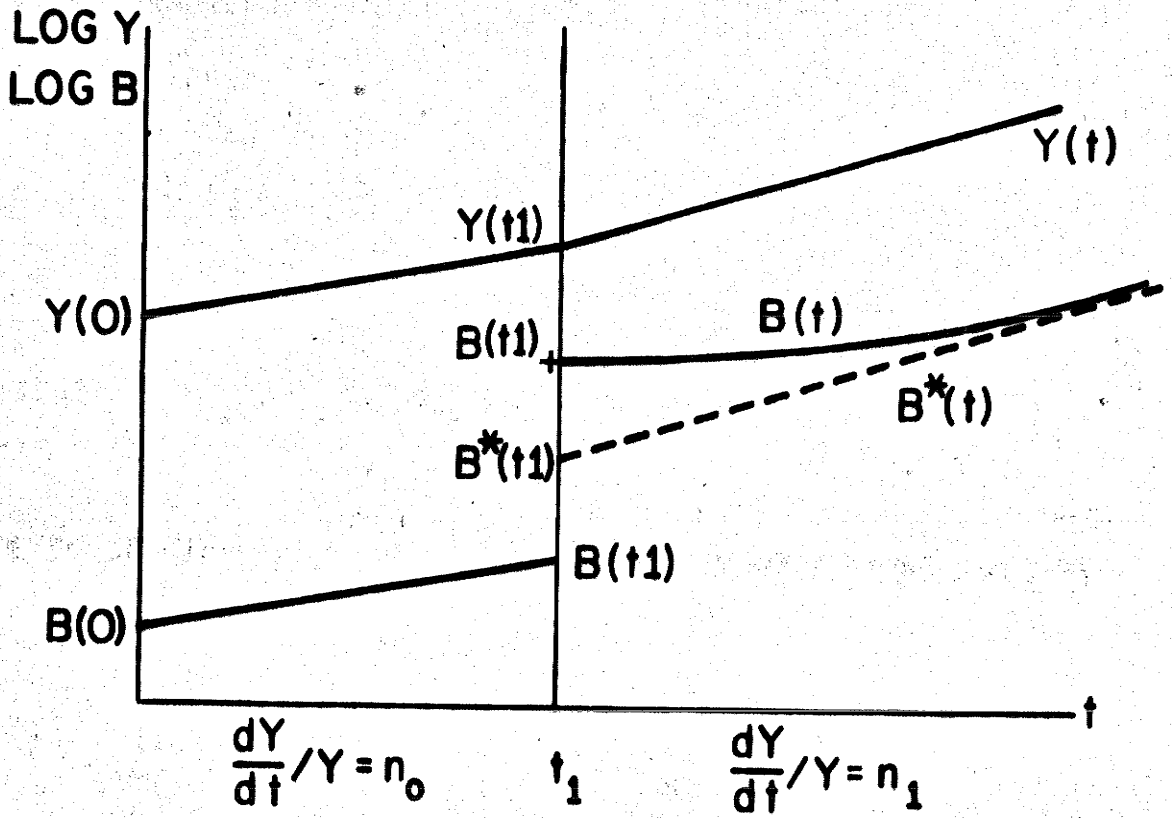


FIGURE 1

The dotted line  $B^*(t)$  represents the equilibrium balance of payments achieved when  $Q$  has attained its steady state value and there are no non-zero excess stock supplies of assets.

After the balance of payments jumps to  $B(t)_+$ ,  $Q$  begins to fall, creating an excess stock supply of real balances. It is the gradual change in the income-output ratio, and the corresponding change in desired asset stocks relative to output that is the crux of the adjustment process. The excess stock of real balances causes the flow demand for real balances to be reduced [see equation (7)], and the balance of payments deteriorates accordingly. Hence  $B(t)$  is less steeply sloped than  $B^*(t)$ , and  $B(t)$  approaches  $B^*(t)$  from above as the stock disequilibrium is eliminated.<sup>19</sup>

The increase in  $n$  has been shown to have an ambiguous long-run effect on the capital account, and similarly the impact effect may be positive or negative.<sup>20</sup> Since  $Q$  is falling in the adjustment process, the capital account will approach its equilibrium path from above as excess stocks of bonds are eliminated, and the flow demand for bonds falls relative to the flow supply. That is, if the long-run effect is to improve the capital account, the impact effect will exceed the long-run effect, whereas if the long-run effect is a deterioration in the capital account, the impact effect will be greater algebraically, and possibly positive.

A more striking illustration of the importance of considering impact effects and short-run behaviour of the economy is when we consider the effect of a change in monetary policy through an increase in the size of the government deficit. As can be seen directly from equation [12], the domestic flow supply of real balances rises immediately. The flow demand, however, rises only slowly with  $Q$  which rises as domestic claims - public and private - on

the world capital stock are increased. The impact effect then is to reduce the balance of payments surplus (or possibly even to generate a deficit), while the long-run effect may be to increase the surplus if  $Q$  rises by enough so that the flow demand increases by more than the flow supply of real balances. Hence the impact effects on the overall balance of payments could now well be in the opposite direction to the long-run effect, and in any case we would expect some "cyclical" adjustment in the balance of payments.

This rather surprising result that expansionary monetary policy could lead to an improvement in the balance of payments merits further attention, and is explained by recognition of the fact that in the present model expansionary monetary policy also entails an increase in government spending on capital goods. This in turn gives rise to an exactly offsetting reduction in private investment and hence a reduction in the domestic flow supply of bonds, generating an improvement in the net foreign asset position over time;  $Q$  rises and the flow demands for assets increase relative to the flow supplies. When  $Q$  has risen to its new equilibrium value,  $Y_D$  will have risen relative to  $Y$  and domestic absorption will hence have increased causing a deterioration in the trade balance; the capital account will also deteriorate since the domestic flow demand for bonds has risen and the domestic flow supply has fallen. The service account will improve due to the rise in  $Q$ , and, of course, the net effect on the overall balance of payments is ambiguous - both the flow demand for and supply of money have risen.<sup>21</sup> Two possible time paths for the flow demand for real balances and corresponding balance of payments paths for a given change in the government deficit are illustrated in Figure 2, case a being the case where the

eventual increase in  $\dot{L}$  is sufficient to cause the equilibrium balance of payments surplus to increase.

### III. Concluding Comments

We have developed the "monetary approach" to growth and the balance of payments emphasizing the role of asset market equilibrium. Further we have demonstrated this approach to be capable of yielding insights into the short-run or transitional effects on the balance of payments of various exogenous disturbances. It is hoped that the above examples show the importance of considering impact effects and adjustment processes when looking at balance of payments or any other macroeconomic phenomena, and that future research will reflect such considerations.

FOOTNOTES

- \* Without implicating him in my analysis, I would like to acknowledge my all-too-obvious indebtedness to Rudiger Dornbusch for many helpful discussions.
1. Arthur Laffer, "An Anti-Traditional Theory of the Balance of Payments Under Fixed Exchange Rates," forthcoming, American Economic Review.
  2. Of course, in the standard two-sector Heckscher-Ohlin pure theory model of trade, exports will increase or decrease depending on whether growth is pro-trade or anti-trade biased. See Harry G. Johnson, Money, Trade, and Economic Growth, Unwin 1962, pp. 75-99. However, in that model trade is balanced and hence growth has no effect on the balance of payments. Here, we are more concerned with the "absorption model" in which assets are being accumulated or decumulated.
  3. Harry Johnson, International Trade and Economic Growth, Unwin (1958), pp. 153-168.
  4. Robert Mundell, International Economics, MacMillan (1968), Ch. 9.
  5. Citing examples of slow growing countries such as the United States and Britain experiencing chronic payments deficits, and of fast growing countries such as Japan and Germany enjoying perpetual surpluses, Mundell claims his results to be more in line with the "facts". However, the above examples do not reflect precisely on the theoretical issue involved which is not concerned with cross-country differences in international payments positions but rather with how a change in (the rate of growth of)



income will affect any one country's balance of payments position. Thus a more correctly formulated empirical test would incorporate time-series phenomena.

6. As Frank Reid, a Queen's graduate student, has pointed out to me, retaining the exogenous exports assumption and writing  $Y(t) = Y_0 e^{\lambda t}$ , differentiation of (1) with respect to  $\lambda$  yields the result that only the impact effect of an increase in the growth rate need be positive - the long run effect would still be negative.

It is now apparent that the traditional or Keynesian analysis has been set up as somewhat of a straw man. A fair representation of that analysis would recognize its primary concern with the behavior of the balance of payments over the business cycle, and for such purposes the assumption of a constant level of exports may well be appropriate. The recent analysis is more concerned with the secular behavior of the balance of payments along an equilibrium growth path. Of course, the criticism of the Keynesian model for its lack of consideration of monetary phenomenon is still valid.

7. As is well known, from an accounting viewpoint, the balance of payments also equals the excess of domestic income over expenditure, and also must equal the excess of domestic hoarding over domestic credit creation. From Mundell's accounting, both of these approaches would also give rise to equation (3).
8. Rudiger Dornbusch, "Notes on Growth and the Balance of Payments," Canadian Journal of Economics, 4, (August, 1971), pp. 389-395.

9. An early treatment by Ryutaro Komiya, "Economic Growth and the Balance of Payments," Journal of Political Economy, 77, (Feb. 1969), pp. 35-48, claims to deal with short-run or impact effects, but doesn't allow for stock disequilibrium. However, the framework of analysis is quite different, and the usefulness of his paper is diminished by the stock-flow confusions stemming apparently from that author's use of a Hicks-Patinkin period type analysis.
10. For an excellent statement of the standard model, see David Levhari and Don Patinkin, "The Role of Money in a Simple Growth Model," American Economic Review, 58 (1968), pp. 713-753.
11. Note that the very strong limitation of maintaining the world inflation rate is imposed by the one-sector technology. Even assuming the existence of many goods grouped into a composite good doesn't resolve the problem, since the Hicks aggregation theorem requires constant relative prices, and hence even the prices of non-traded goods must inflate at the given world rate. For simplicity, we assume a world inflation rate of zero.
12. Of course, some expansion of the money stock can be specified in assumptions about domestic monetary policy but the net rate of expansion is endogenous.
13. Dornbusch, Growth and the Balance of Payments, p. 389, states that "...the small country assumption... implies that the assets and goods markets are in equilibrium all the time...". This seems too restrictive, and we assume only that domestically generated disturbances do not disturb equilibrium in the rest of the world. The existence of such excess

supplies must depend ultimately on the existence of "adjustment costs" in the economy. For a more complete discussion and development of the model in a closed economy context, with reference to the Keynes-Wicksell vs. neo-classical controversy, see my "Short-Run Adjustment in Models of Money and Growth," forthcoming American Economic Review, December 1972.

14. In terms of Dornbusch's model, we assume  $m = 1$ .
15. These are basically the equations in Dornbusch with minor adaptations. The current account is given by  $C = Z + T$ . The reader can check for consistency by showing  $B = Z + T + \dot{F}^0$ . Note that in [14], setting  $g = \hat{M} = 0$  yields essentially our equation [3].
16. The long-run effects are found by setting  $\hat{M} = \hat{F} = 0$  in equations [14] thru [17] and differentiating, yielding Dornbusch's equations on top of p. 93. In terms of our model, these are:

$$d(B/Y)/dn = \ell Q(1+e) > 0.$$

$$d(T/Y)/dn = Q(\ell+f) - 1/Q + eQ [n(\ell+f)-1]/n \gtrsim 0.$$

$$d(\dot{F}^0/Y)/dn = 1/Q - fQ(1+e) \gtrsim 0,$$

where  $e$  is the elasticity of  $Q$  with respect to  $n$ ,  $-1 < e < 0$ .

[Dornbusch defines his  $e$  to be the negative of ours].

The impact effects on the various capital accounts may be found by setting "e" equal to zero in the above steady state solutions (assuming no instantaneous change in  $Q$ ). Any inter-run effect could be found by allowing for the (incomplete) change in  $Q$ , or by substituting a "short-run" elasticity,  $\epsilon_T$ , for  $e$  in the above equations;  $-1 < e < \epsilon_T < 0$ .

17. The interesting possibility arises that if domestic asset holders consider public and private owned capital stock as close substitutes; then the fall in government owned capital stock would shift the domestic private demand upward ( $\alpha > 0$  in equation [9]), and  $Q$  would fall less than before. For the case of "perfect substitutes," so that domestic asset preferences were defined only over the total of government and private claims,  $Q$  would not change.
- Dornbusch also writes that the flow supply of money is unaffected by the change in  $n$ , whereas he clearly means the flow supply relative to output is unchanged.
18. Note that our discussion gives rise to the possibility of two different interpretations of the flow demands for assets given by equations [10] and [11]. The first would interpret  $Q$  as the steady state  $Q$  so that the first terms in [10] and [11] give the steady state flow demands and the second terms provide for the adjustment of actual to desired real balances. The alternative interpretation would use the actual current value of  $Q$  and the first term would give the demand derivative from the "short run" demand for money. The second term would then allow for the adjustment of the short term demand for money as  $Q$  changes, and we might substitute  $\psi_0(\dot{Q})$  and  $\psi_1(\dot{Q})$  for  $\lambda_0 \hat{M}$  and  $\lambda_1 \hat{F}$ . See Purvis, "Short Run Adjustment," for further discussion.
19. If, "during the instant"  $t_1$ ,  $Q$  were to fall, then the instantaneous shift in  $B(t)$  would not be as large. It seems unlikely under our assumptions that  $B(t)$  would "overshoot" causing cyclical adjustment since that would imply  $B(t)$  growing faster than  $B^*(t)$  during part of the adjustment process. For this to occur would require further assumptions on expectations.

20. As already noted, the impact effects on the various accounts may be found by setting "e" equal to zero in the steady state solutions (see Fn. 16 above). This follows from the fact that  $Q$  differs from its steady state value when portfolios are out of equilibrium, and hence  $Q$  adjusts to its new equilibrium value only as stock equilibrium in asset holdings is achieved.

21. The steady state solutions are given by:

$$d(B/Y)/dg = (en\ell Q - g)/g \gtrsim 0$$

$$d(T/Y)/dg = eQ[n(\ell+f)-1]/g < 0$$

$$d(\dot{F}^0/Y)/dg = - (enfQ + g)/g < 0$$

$$d(Z/Y)dg = eQ/g$$

where  $e$  is now the elasticity of  $Q$  with respect to  $g$ ,  $0 < e < 1$ . It is obvious from the above formulations that the impact effect ( $e=0$ ) is only on the capital account, and the other accounts are only effected as  $Q$  rises due to the net capital outflow.

Note that we are again assuming that private domestic asset preferences are expressed independent of public (government) domestic claims on the world capital stock. If some substitutability were allowed for the increase in  $g$  would shift the demand for bonds down and reduce the likelihood of an improvement in the overall balance of payments.