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Toward a Growth-Oriented Model of Financial Programming

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Abstract

This paper extends the basic monetary model that underlies the monetary approach to the balance of payments to allow for the endogenous determination of the short-run growth rate of the economy. In the extended model domestic credit expansion affects not only the balance of payments but also the output growth rate, which bears implications for the formulation of credit ceilings. Furthermore, the amount of external financing can influence both the output growth rate and the balance of payments outcome, unlike with the basic model. An integrated treatment of exchange rate adjustment involving both absorption and elasticity effects is provided.

1/ The author is indebted to several colleagues and especially Festus Osunsade for detailed and helpful comments on an earlier draft and also to participants at seminars held in the Research Department of the International Monetary Fund, The Institute for International Economic Studies, University of Stockholm, Oslo University, and Aarhus University.

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Summary

This paper attempts to contribute to the discussion of how to improve the design of adjustment programs. A basic monetary model of an open economy that is frequently associated with Fund adjustment programs is extended to allow for the endogeneous determination of the short-run output growth rate. This permits an assessment of some aspects of the short-run trade-off between the rate of growth of output and the balance of payments.

Criteria are developed for assessing the effects on these two objectives of major policy instruments involving fiscal and monetary actions, the exchange rate, and external capital inflows. Given the monetarist underpinnings of the model--especially that a stable demand for money function exists both for the short and long run--the policy effects are shown to influence not only the supply of money but also its demand. In particular, allowing the growth rate of output to vary affects the incremental demand for money and modifies the outcomes associated with policy changes in the basic monetary model. Thus, reducing the amount of bank credit lowers both the money supply and, insofar as output is also reduced, the demand for money. The hoped for improvement in the balance of payments may, therefore, be less, while the growth in output is adversely affected.

The paper examines the issue of how to attain a desired balance of payments outcome without unduly sacrificing domestic output growth rates. Where the balance of payments problem originates from a persistent shortfall in export earnings or a decline in sustainable capital inflows, a real exchange rate depreciation will be required. The short- and long-run effects of the latter differ. It is shown that under certain conditions, the bigger the exchange rate depreciation, the greater the amount of domestic credit expansion or external financing required to maintain a given growth target in the short run, before the stimulative effects of the exchange rate action on exports and import substitution take hold.

The solutions of the extended model for the amount of credit expansion generally differ from those of the basic model except in the case where the amount of external financing is consistent with the growth objective. The extended model is used to examine alternative scenarios of adjustment and financing.

I. Introduction

Fund-supported adjustment programs designed to stem deterioration in the external accounts of countries are frequently criticized for producing an excessively contractionary impact on output and employment. 1/ Conversely, it is argued that some domestic deflation is inevitable and in a context of high inflation and balance of payments constraint may be required; that countries usually seek Fund assistance in a time of crisis, requiring extreme measures; and that the absence of a Fund-supported program and of the associated catalytic effect on international lending to the country may result in even greater domestic recession, as well as supply scarcities that could simultaneously lead to sharp price escalations and an interruption of economic growth.

On closer examination, the disagreement between critics and proponents of Fund programs does not, however, appear to be about the *imbalances to be eliminated, nor about the need for corrective policies*, nor even that these policies must include elements of demand restraint and supply enhancement. Rather, the disagreement appears to be about strategies for promoting adjustment and the policies prescribed--their type, dosage, timing, and mix--and the amount of foreign financial support to be provided during the period of adjustment, both of which affect the domestic level of economic activity. 2/ To an extent, the deflationary effects of adjustment programs can be alleviated through increased foreign financing. In present international capital markets, however, such financing flows are severely constrained. It is, therefore, critical to examine whether or not the design of adjustment programs can be improved so as to avoid excessive deflation.

To the extent that a policy mix can promote the key objective of attaining a viable balance of payments position without unduly sacrificing growth and employment, it is more likely to be implemented, while any associated conditionality would be more readily accepted.

1/ See especially Bacha (1984), Buira (1983), Diaz-Alejandro (1981), Dell (1983), Dornbusch (1982), Ground (1984), Taylor (1983) for various formulations of the so-called overkill hypothesis.

2/ Disagreement over the amount of external financing required can arise from different perceptions regarding (a) the extent to which external factors and shocks generally attributed to the purview of the appropriate international institutions have created an adjustment problem for the country, and (b) the extent to which reliance is to be placed on macroeconomic policies for promoting adjustment (that require financing if excessive deflation is to be avoided) instead of the imposition of unilateral and perhaps discriminatory restrictions on the country's trade and payments. The latter of course leads to a diminution of global trade, but may be construed as a protective reaction to insulate the domestic economy from external trade related shocks, when financing is not available.

Assessing the appropriateness of a particular policy mix and comparing alternatives requires, however, that the effects of policies be measurable. Unfortunately, economic theory does not provide readily accessible formulae for evaluating alternative mixes of policies, even when the mix is limited to policies of demand restraint and exchange rate adjustments that are frequently central to Fund-supported adjustment programs.

In this paper, criteria are developed for assessing the effects on the growth of output and the balance of payments of frequently employed policy instruments, involving fiscal and monetary actions, the exchange rate, and foreign capital flows. The paper proceeds by building on a basic monetary model frequently associated with Fund-supported financial programs. 1/ As this monetary model focuses exclusively on the balance of payments, it cannot adequately explain fluctuations in the level of domestic economic activity or the domestic rate of price inflation, both of which it assumes to be exogenously determined. The analysis of these exogenous variables requires that the basic monetary model be explicitly extended to include the real sector. 2/ If this is done, it then becomes possible to respond to two further criticisms of the basic model. One criticism is that the model does not facilitate an integrated treatment of exchange rate action. 3/ Specifically, not only must arguments for an exchange rate adjustment be based on considerations outside the model, but also the effects of any exchange rate action are not fully integrated into the model (for example, in

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1/ See Rhomberg and Heller (1977) for a compendium of key studies undertaken at the Fund in the tradition of the monetary approach to the balance of payments, and Frenkel and Johnson (1976) for some outside, related studies. A major advantage of the monetary approach is the ease with which it facilitates the formulation of ceilings on domestic bank credit expansion that are an integral element of Fund-supported financial programs and arguably the control instrument that is easiest to monitor. See Guitian (1981) and also the exposition in Khan, Montiel, and Haque (1986).

2/ Such an analysis will need to go beyond the absorption approach pioneered by Alexander (1952), who relates the excess of domestic absorption over domestic income to the current account deficit, but does not explicitly allow for monetary and exchange rate effects except through the cash balance effect. While Alexander's approach appears more general than that of the monetary approach to the balance of payments, there is an issue as to how the two are related. See Section III.2 below.

3/ Buira (1983), for instance, notes that because of the highly aggregative nature of the basic monetary model, relative price effects of exchange rate adjustments cannot be taken into account.

calculating the growth in the demand for money). 1/ Second, that it does not allow for an examination of some of the effects of foreign capital inflows on domestic activity. 2/

This paper has four sections. Section II reviews the assumptions underlying the short-run predictions of the basic monetary model, especially the proposition that limiting domestic credit expansion will lead to an equal improvement in the balance of payments. In general, the assumptions are found to be fairly severe and unlikely to be widely met. Next, the appropriate treatment of an exchange rate adjustment in the context of this model is examined. Insofar as the exchange rate action affects the demand for money, modifications are required to the basic equation for estimating the amount of credit expansion consistent with a desired balance of payments outcome. In Section III, the model is extended to include the domestic real sector. The more general model throws light on the underlying real processes that connect the credit adjustment and the corresponding change in the balance of payments. In particular, it brings out the crucial role played by the (implicit) assumption that a country's exports are in infinitely elastic demand. Abandoning this assumption, but retaining all the other assumptions of the basic monetary approach, causes monetary actions to affect the growth of real output and, under certain circumstances, the domestic rate of price inflation. This affects the balance of payments outcome. For example, limiting domestic credit expansion will cause nominal income to decline and hence also the incremental demand for money, thereby precluding an equal improvement in the balance of payments. Section IV uses the extended model to examine the problem of how to attain a balance of payments target without unduly sacrificing domestic economic growth. The problem is viewed as one of ensuring satisfactory short-run dynamics, which becomes especially important when the exchange rate is adjusted and account is taken of its differing short-run and longer-run implications. A number of scenarios of adjustment and financing are examined. Section V brings out some implications for the formulation of credit ceilings in financial programs and for the

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1/ Essentially, the exchange rate adjustment's impact on the balance of payments is separately estimated. Possible effects on exports, imports, and capital flows are noted, together with their implications for the reserve target, but not the effects on the incremental demand for money, which is given once the growth and inflation targets are specified. Hence, any revision to the credit expansion calculations is mainly the result of adjustments in the reserve target.

2/ The appropriate expansion in external debt is usually assessed in terms of the implications for debt servicing (debt service ratio). This involves a comparison of prospective interest and amortization costs and the likely growth in export earnings. Endogenizing the economic growth rate makes it necessary, however, to examine the effects of various forms of financing on this variable.

temporary use of exceptional external financing. The final section presents some caveats. The Appendix contains a number of mathematical results utilized in the text.

II. The Basic Monetary Model

Fund-supported financial programs are organized around a monetary accounting framework, in which the principal entries comprise the balance sheet liabilities and assets of an appropriately consolidated monetary sector. 1/ The fundamental accounting identity that is used equates a suitably defined set of monetary liabilities (the demand for money) to a corresponding sum of domestic and foreign assets (sources of money supply). As is true of all accounting identities, there is no implication regarding causality: the identity is consistent with any number of alternative causal theories that explain movements in the monetary magnitudes. Nevertheless, in order to bring about a desired change in a particular magnitude, such as the net foreign asset position of the monetary sector, which is closely identified with the balance of payments outcome, it is necessary to have a causal theory that relates controllable magnitudes to the desired objectives. Key aspects of the basic approach and the appropriate treatment to be accorded an exchange rate adjustment are examined in this section.

1. The basic model

Although no single model is strictly adhered to in the formulation of Fund financial programs, a basic monetary model is often employed as a first step. 2/ Starting with a projection of the growth in the demand for money over a specified time period, the model determines the amount of domestic credit expansion that is consistent with a target improvement in net foreign assets (net international reserves). The underlying rationale is that if domestic sources of monetary expansion are excessive relative to the growth in the demand for money, spending will be stimulated and the balance of payments would deteriorate (see especially Polak (1957) and Robichek (1971)). Usually, several iterations are undertaken with varying money demand projections and balance of payments targets in determining the appropriate amount of

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1/ A key issue concerns the degree of consolidation. In particular, should the financial program attempt to restrain base or high-powered money created by the Central Bank, or the monetary liabilities of the entire banking sector? In what follows, the latter, broader, definition is employed in common with many Fund-supported programs.

2/ See especially the model set out in Polak (1957), Prais (1957), and Robichek (1971). A useful discussion is also provided in IMF (1981).

domestic credit expansion. The last, which is of central importance to the Fund's conditional lending, is viewed as part of a package of measures for appropriate adjustment. 1/

A stripped-down version of the model is as follows: 2/

$$(1) \quad \Delta M \equiv \Delta D + E\Delta F$$

$$(2) \quad \Delta M = \Delta M^d$$

$$(3) \quad M^d = \frac{1}{v} PY$$

$$(4) \quad \Delta M^d = \left(\frac{\Delta P}{P_{-1}} + \frac{\Delta Y}{Y_{-1}}\right) M_{-1}, \text{ 3/}$$

where M is the money stock, D represents domestic assets, E is the domestic currency price of a unit of foreign exchange, F denotes net foreign assets (reserves) valued in foreign currency units, v is the income velocity of money, P denotes the domestic price level, and Y is the real output of the economy. The symbol Δ denotes the first difference operator, while superscript d indicates demand.

The first equation represents the fundamental monetary accounting identity. This is stated here as increments per unit period, with the increment in the money supply being identically equal to the sum of the increments in domestic credit and international reserves. The second equation states that the desired increase in the money stock is always equal to the observed increase. 4/ A conventional demand for money function follows next, with velocity an assumed increasing

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1/ See Crockett (1981) and Ground (1984) on the role of other adjustment measures in Fund stabilization programs and IMF (1985) on exchange rate policies.

2/ For more elaborate versions see the studies contained in Rhomberg and Heller (1977).

3/ The presentation here follows the standard version. However, for greater accuracy in a discrete time analysis, the cross product term of the inflation rate and the output growth rate should also be included. This is done from equation (19) below, onward, but the term should be viewed as implicit in the earlier equations.

4/ This is a crucial assumption which ensures the applicability of equilibrium analysis. Although not invoked in Polak (1957), it can be readily shown to generate the same results and more expeditiously. An alternative approach is to assume short-run disequilibrium, which in turn requires the specification of an adjustment mechanism for the model to be closed. See, for example, Bergstrom and Wymer (1976), or Khan and Knight (1981).

function of the nominal interest rate, i, treated here as the opportunity cost to holding cash. Equation (4) states the incremental demand for money as equal to the growth in nominal income, on the assumption that velocity is stable. 1/

The basic model can be used to determine how much credit expansion is consistent with a given reserve target. Substituting equations (1) and (4) in (2), the amount of credit expansion is solved as

$$(5) \qquad \Delta D = \left(\frac{\Delta P}{P_{-1}} + \frac{\Delta Y}{Y_{-1}}\right)M_{-1} - E\Delta F^*$$

where * indicates a target level.

The permissible amount of credit expansion is simply the difference between the additional amount of money that is desired as a result of growing nominal income and the portion to be supplied through reserve accumulation.

Assigning given values to the growth in the price level and in real output in equation (5) permits an explicit quantitative solution for credit expansion. In the basic model, the growth rates of real output and of the price level are assumed to be exogenously determined. 2/ Making this assumption ensures that there is a one-to-one relationship between changes in net domestic credit and in reserves.

The reserve accumulation process of the basic model is illustrated in Figure 1. The fundamental monetary condition stated in (5) is employed to construct the trade-off line MM in the diagram. The (period) increment in money demand--the first term on the right-hand side (RHS) of (5)--fixes the intercept of the Y-axis. At the intercept, the rate of domestic credit expansion is zero, and net foreign assets

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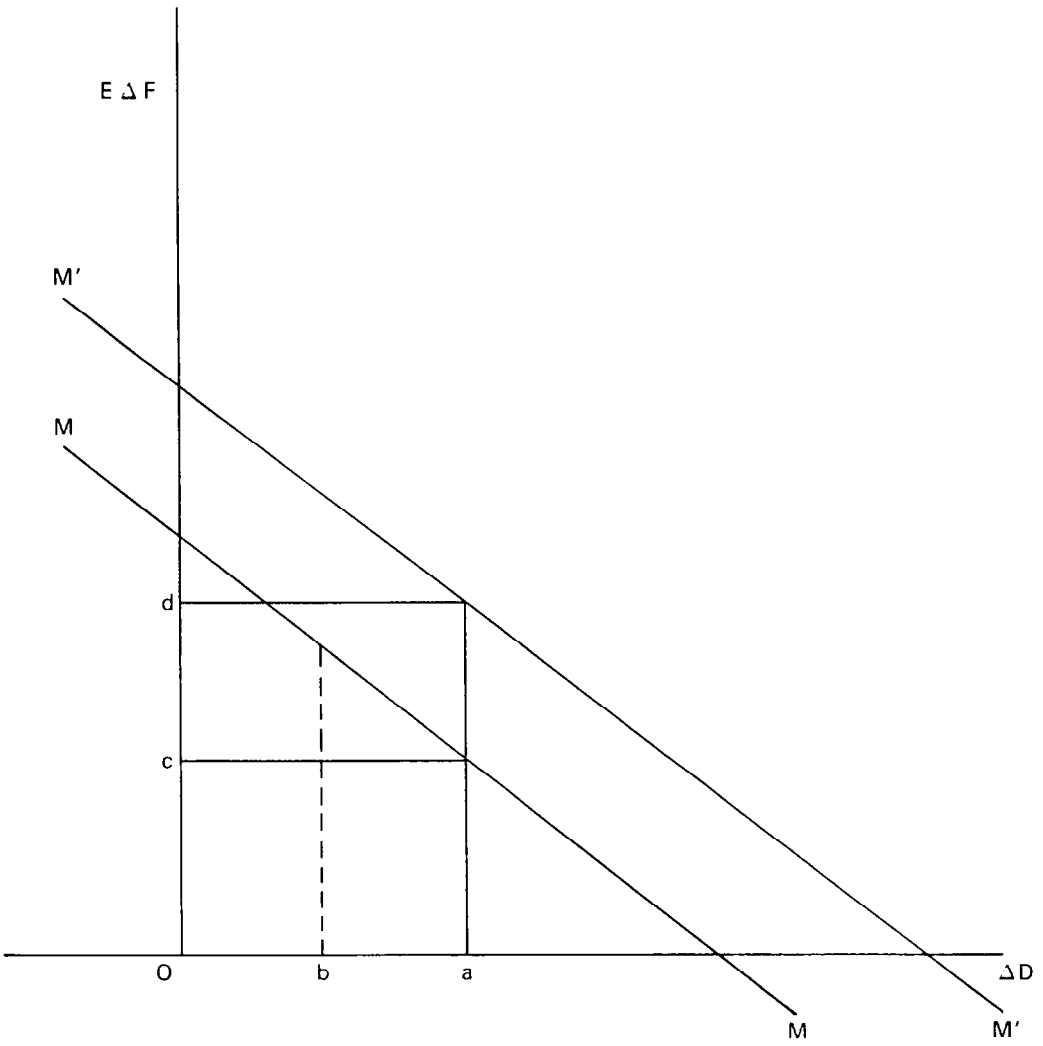
1/ This assumption features prominently in Polak (1957). In practice, lacking details to allow for expectational and other factors that shift velocity, it is often assumed to be constant at the preceding period's level. This is the same as assuming that in the short run the behavior of velocity follows a random walk.

2/ Once the incremental demand for money is given, any desired rate of $E\Delta F^*$ can be attained by manipulating ΔD. It may appear puzzling that the balance of payments outcome in this model does not depend on the level of exports or the amount of external financing, but only on the difference between the incremental demand and supply of money. As will be clarified in the next section, the model assumes that any increase in foreign financing or exports is automatically dissipated through higher imports.

FIGURE 1

RESERVE ACCUMULATION AND THE BASIC MONETARY MODEL



must increase at the same rate as money demand for monetary equilibrium to prevail. At the intersection of MM with the X-axis, however, the entire increment in money demand is met through domestic credit creation. If domestic credit creation continues to expand, then reserve accumulation would become negative, indicated by that portion of the MM line below the X-axis.

The authorities can improve the net foreign asset position in two ways. In one approach, the rate of domestic credit expansion is reduced, say, from Oa to Ob, so that more of the given incremental demand for money has to be met through the reserve accumulation process. Under the second approach, the incremental demand for money itself is increased to, say, M'M'. Keeping the amount of credit expansion unchanged, say, at Oa, forces an increase in the accumulation of reserves to meet the higher money demand. Assuming given rates of domestic price inflation and of output growth, shifts in the demand for money can only be effected by inducing a change in the real value of cash balances. If these are reduced, the incremental demand for money will rise because transactors will now desire an additional amount of cash to reconstitute the stock levels that they prefer. One approach to engineering such a stock adjustment effect is to depreciate the domestic currency, which raises the domestic price level. This approach is considered next.

2. Exchange rate action and the accumulation of international reserves

In the basic monetary model, with no distinction between tradeables and nontradeables, exchange rate adjustments do not affect relative prices but only the aggregate price level. Under the assumptions of efficient markets and a small open economy, a devaluation will immediately cause the domestic price level to jump upwards by the same proportionate amount, reducing the available supply of real balances in proportion to the devaluation. 1/ If a net excess demand

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1/ This assumes that the authorities do not distribute any local currency profits incurred on their holdings of foreign assets as a consequence of the devaluation, but impound such profits (or losses) in a central bank revaluation account. In practice, the issue of whether or not to fully sterilize the revaluation account can be a source of difficulty. For example, suppose the central bank holds foreign assets that were generated by an increase in the external liability of say, a public enterprise. Should the latter be compensated for the loss that it incurred in local currency terms? The answer will depend partly on the stabilization objectives of the authorities.

for real balances results, a stock adjustment scheme is initiated as follows: 1/

$$(6) \qquad \frac{\Delta M}{P} = \mu \left(\frac{M_{-1}}{P_o} - \frac{M_{-1}}{P} \right)$$

where μ is an assumed adjustment coefficient, $0 > \mu > 1$, while P_o and P refer to the pre-devaluation and post-devaluation price levels, respectively. 2/

In this scheme, transactors chose some rate at which to eliminate the devaluation induced discrepancy between their pre-devaluation holdings of real balances (taken initially to be in equilibrium), and the post-devaluation level. These requirements are additional to the normal incremental demand for money stated in (4) above. The speed of adjustment, represented by μ, will depend on the trade-off between the costs of illiquidity and the costs of postponing consumption (or asset conversions in a more general setting) to finance the acquisition of additional cash.

For a given value of the parameter, μ, the formula in (5) for determining the amount of credit expansion is modified, using (6), to

$$(7) \qquad \Delta D = \left(\frac{\Delta P}{P_{-1}} + \frac{\Delta Y}{Y_{-1}} \right) M_{-1} + \mu P \left(\frac{M_{-1}}{P_o} - \frac{M_{-1}}{P} \right) - E\Delta F^*$$

The only difference is that the incremental demand for money is higher because of the devaluation. As a consequence, the amount of credit expansion that is consistent with a given balance of payments target is raised. This solution differs from that obtained when a devaluation occurs, but the cash balance effect is ignored. In the latter case, the amount of credit expansion will be reduced below what

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1/ The possibility of instantaneously eliminating the excess stock demand for real balances through portfolio transactions is ignored for the present. This is appropriate if portfolios are not sufficiently diversified into alternative financial assets and, in particular, if domestic and international capital markets are not adequately integrated. However, it should be noted that even under the more general cases, a capital inflow that is induced by and eliminates the domestic stock imbalance will reduce net worth. In order to reconstitute the net worth position, a stock-adjustment or savings scheme would be once again required. The discussion in the text implicitly lumps together the transactions and asset demands for money.

2/ This construct assumes that there is no prior state of excess domestic liquidity and that expectations concerning future exchange rate adjustments are not such as to affect the target demand for cash balances. As is argued in Section III.2, however, if there is initial excess liquidity, a Keynesian buffer stock approach could be appropriate.

it would have been in the absence of a devaluation, insofar as the exchange rate adjustment raises E and (assuming a favorable impact on ΔF) increases the contribution of external monetary sources.

It should be noted that equation (7) assumes no change in the underlying inflation rate ($\frac{\Delta P}{P_{-1}}$) as a consequence of the devaluation, but only a jump in the price level from P_{-1} to P. In practice, however, since it usually takes several months for all the price effects of a devaluation to pass through to the domestic price level, it will seem during that interval as if the inflation rate has increased. 1/ The more appropriate procedure, however, is to draw a distinction between the continuing underlying rate of inflation and once-and-for-all price level effects, as is done in equation (7), in undertaking the credit expansion calculations.

The principal implication under the given assumptions is that the greater the exchange rate adjustment, the less restrictive does the credit expansion have to be in order to bring about a given improvement in net foreign assets. The inclusion of a stock reconstitution term in the incremental demand for money assumes either that the initial situation is not one of excess liquid balances, or that if there are excess balances, transactors will more willingly hold them as a result of the devaluation. In practice, considerable judgment will need to be exercised to assess whether or not the initial situation is one of excess liquidity. 2/ (A deterioration in the balance of payments, for example, could be the result of an export shortfall rather than an attempt by transactors to reduce excess liquid balances.) Furthermore, even if the initial situation is one of excess liquidity, expectations could be altered in favor of holding domestic cash balances by the initiation of a stabilization program. In such circumstances, ignoring the additional monetary requirements associated with a devaluation induced increase in the price level could lead to overkill.

It should, nonetheless, be noted that for some economies, the devaluation induced shortage in real balances can be overcome by an immediate influx of foreign money. This effect is captured in variants of the basic monetary model that incorporate a domestic capital market that is integrated to the international capital market. Essentially the cash shortage exerts upward pressure on the domestic interest rate, which attracts foreign funds as long as the interest rate differential is not offset by perceptions of increased risk or by expectations of a further depreciation of the local currency. A problem could result if the capital flow is excessive. The money supply would be affected,

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1/ The argument presented here abstracts from secondary effects of a devaluation on the wage-price process which could trigger a change in the underlying inflation rate.

2/ This judgment will also bear on whether to adopt a Keynesian buffer stock approach to the short-run analysis of macrodynamics, which is considered further in Section III.2 below.

which could have destabilizing implications. A massive capital inflow would have inflationary effects similar to those of historical gold discovery episodes, unless sterilized either by private actions (the capital inflow could simply represent an exchange of deposits held abroad for those to be held at home), or by public action involving various forms of intermediation. Imposing a ceiling on the rate of growth of the money supply might be appropriate provided there is no automatic private sterilization through the holding of larger domestic balances. Otherwise, the outcome could be excessively contractionary as attempts are made to reduce net domestic assets so as to comply with the money growth target in the face of a sharp increase in net foreign assets.

For economies with relatively open capital markets, a devaluation could be essential, together with a liberalization of interest rates and the assurances of credible stabilization policies, to stem a capital outflow that, in itself, is contractionary. 1/ Indeed, an overshooting of the exchange rate devaluation could prove helpful if it generates an expectation of a subsequent appreciation of the local currency, increasing the attractiveness of holding local currency and thereby providing an additional inducement for foreign funds to move in. Nevertheless, this benefit has to be weighed against some undesirable side-effects both from the rise in the domestic price level, which will benefit domestic debtors, particularly the government, as the issuer of domestic money liabilities, and from the higher domestic valuation of external liabilities. The last could impose a burden on domestic firms, whose liquidity position would have been eroded by the higher imported input costs, and depress domestic activity. There could also be some undesirable distributional implications. An overdepreciation of the exchange rate would unduly reward owners of foreign exchange resources, while having regressive effects on the less well-off consumers of essential imports. 2/

1/ Frequent bouts of capital outflow might suggest a premature relaxation of capital market controls, or their acknowledged ineffectiveness.

2/ Even in the full employment context of the basic monetary model an excessive depreciation of the exchange rate could prove contractionary, just as a currency demonetization. A shock that shifts the price level sharply upwards, while the money stock is kept constant, forces velocity up. If payments practices are slow to change, and there is an insufficiency of "idle" money balances, a severe economic contraction would ensue. During this process, savings or time deposits held with the banking system would be depleted, the currency to deposit ratio would rise, and note denominations would become inadequate in the face of higher transactions prices. To offset any excessive depreciation induced price level shock, the money stock would have to be increased by an appropriate amount. As this will need to be done over a short interval of time, there would in flow terms be a sharp monetary expansion, which could be misinterpreted as an inflationary development.

III. An Assessment and Extension of the Basic Monetary Model

As presented above, the basic monetary model does not contain an explicit account of how a reduction in the amount of credit expansion affects expenditures, nor how the improvement in the current account of the balance of payments occurs. To explain the equilibrating transactions that occur in the market for goods and services, it is necessary to build more structure into the basic model. This is undertaken below by setting up a simple flow of funds framework that relates, for the sectors concerned, financial (monetary) transactions to income and expenditure flows. The required demonstration proceeds by constructing an absorption function that explains expenditure behavior of the residents of an economy. In retaining monetarist assumptions, it is shown how a reduction in credit reduces absorption by the same amount and results in an excess supply in the market for goods and services. It is then shown that in order to generate the fundamental result of the basic monetary model (that a reduction in credit will result in an equiproportionate improvement in the balance of payments), the excess supply in the market for goods and services must be fully eliminated through the current account of the balance of payments. However, this is only possible under the small open economy assumption, where the country confronts an infinitely elastic foreign demand for its goods. The section contains an assessment of the limitations of the basic monetary model, following which alternative adjustment mechanisms for disposing of an excess supply in the market for goods and services are considered.

1. A flow of funds specification

To make explicit the underlying real sector adjustments of the basic monetary model, a simple flow-of-funds formulation is constructed as follows:

Monetary sector

$$(1) \qquad \Delta M^s = \Delta D + E\Delta F.$$

External sector

$$(8) \qquad E\Delta F^s = PX - EP_f Z + E\Delta K.$$

Real domestic sector

$$(9) \qquad Y + \frac{1}{P}(\Delta D + E\Delta K) = A + \frac{\Delta M^d}{P}.$$

In addition to the variables earlier defined, K represents the (net) external liabilities of residents; X is exports, Z is imports, and P_f is the price of imports in foreign currency units (assumed in what

follows to be standardized at unity); A stands for absorption by residents, including government. 1/ Subscript f denotes the foreign sector, while superscript s stands for supply.

The monetary sector constraint (1), as noted earlier, simply states the accounting relationship between the increase in the money supply and in domestic and foreign sources of money. It is assumed that the exchange rate is not freely floating and that money supply responds (passively) once the amount of credit expansion is determined. 2/ The external sector constraint (8) states that the flow supply of foreign exchange that the banking sector accumulates (denominated in domestic currency units) equals the sum of the current account surplus and net capital inflows.

The real sector constraint (9) states that expenditures of residents on goods and services, A, and the additional cash desired to be accumulated, ΔM^d, are financed by income Y together with borrowings from the domestic banking system ΔD and from abroad $E\Delta K$. Retaining the assumptions of the basic monetary model, the level of output Y is given, while the incremental demand for money is determined (once the output growth rate and the inflation rate are given). The amount of credit extended is a policy variable, and it is assumed that the foreign capital flow is exogenously given. As a result absorption A is residually determined. This particular implication is of considerable importance as it serves to define a fundamental distinction between monetarism, under which transactors attempt to hold just the right amount of cash balances at all times, and a Keynesian approach, which emphasizes the buffer stock function of cash balances in enabling expenditure patterns to be maintained (in the short run). 3/

1/ For present purposes it is not necessary to distinguish between the private sector and the government sector and the separate determinants of their behavior, nor to further distinguish between the household and business sectors. The array of financial instruments provided here, however, is the minimum needed for the more extended analysis. In a monetary analysis, the stabilizing role of fiscal policy is measured by the amount of credit extended to the government. Given the importance of such credit arrangements, Fund programs invariably contain subceilings on the share of government in total credit expansion. See Tanzi (1987) and Khan, Montiel, and Haque (1986) for a further discussion.

2/ As of December 31, 1985, 99 member countries of the Fund pegged their currencies to a single currency or to a currency basket. Members are increasingly adopting floating exchange rate systems in the context of Fund programs. Several analytical issues arise, which are, however, beyond the scope of this paper.

3/ Some implications of the distinction for determining the appropriate amount of credit expansion are brought out subsequently.

The monetarist absorption function takes the form

$$(10) \quad A = Y - \frac{1}{P}(\Delta M^d - \Delta D - E\Delta K).$$

To complete the model, the behavior of exports and imports needs to be specified. 1/ Given the small country assumption of the basic monetary model, exports are in infinitely elastic demand abroad with respect to their price. Among the admissible import functions, the simplest is, perhaps, to assume that imports are a proportional function of absorption. 2/

$$(11) \quad \frac{EZ}{P} = z(e)A, \qquad z'(e) < 0$$

where $e = EP_f/P$, *or the relative price of the exportable in terms of* the import good. 3/ Standardizing the assumed constant import price P_f at unity ensures under the present small country and efficient market assumptions that $E = P$ and hence that $e = 1$. The domestic price level (which is also the nominal price of exports here) equals the foreign price level converted into domestic currency units, $P = EP_f$.

On consolidating the sectoral constraints (1), (8), and (9) and placing real economy transactions on the left-hand side (LHS) and financial transactions on the right-hand side (RHS), the aggregate economy wide constraint is defined (in real terms) as

$$(12) \quad Y - A - (X - \frac{EP_f}{P} Z) = \frac{1}{P}(\Delta M^d - \Delta D - E\Delta F).$$

As will be recalled, the RHS of (12) is simply the fundamental condition of the basic monetary model (see equation (5)), which requires for continuing monetary equilibrium that it be equated to zero. The LHS of (12), which describes the state of demand in the market for goods, is also then equal to zero.

1/ In the standard monetary approach to the balance of payments no distinction is drawn between the various components of the current account of the balance of payments. However, for our purposes it will be useful to consider exports and imports separately, although the analysis is not affected.

2/ While making imports a proportional function of national income or output is even simpler, such a formulation is inappropriate. This is because it does not take account of the direct impact of fluctuations in absorption on import demand, but only the indirect impact through induced output fluctuations.

3/ e is the real exchange rate. Since the nominal exchange rate is expressed in units of domestic currency per unit of foreign exchange, an increase in e represents a depreciation of the real exchange rate.

The nature of the underlying real sector equilibrating mechanism can be seen, for example, by reducing the amount of credit expansion by 100 units. As is evident from equation (10), absorption will also decline by 100 units. 1/ In turn this will reduce imports. Given a normal propensity to import, z, that is less than unity, an excess supply of goods will be generated. For equilibrium to be restored in the goods market, exports will have to rise to take up the slack. Given that export demand is infinitely elastic for the small open economy, an incipient decline in the price of exports suffices to bring about the adjustment. 2/ The decline of 100 units in absorption leads to an improvement of the same amount in the balance of payments and full employment of resources continues to prevail.

2. An assessment of the basic monetary model

The basic model's principal implication--that a reduction in absorption will automatically lead to an improvement in the current account of the balance of payments of the same amount--can be rigorously justified only for a small open economy that is not subject to external trade barriers. For such an economy, resources are always fully employed, while in a stable exchange rate environment the domestic price level is pegged to the world price level.

1/ A reduction in the "sources" of finance reduces the "uses" of finance. Since, by assumption, the monetary demand must always be met, other outlays will have to decline.

2/ If real credit is reduced by 100 units, absorption falls by 100 units, and with a propensity to import of, say, one fourth, imports will drop by 25 units. Given no feedback effects of credit reduction on output in the basic model, an excess supply of 75 units of domestic output is generated, which will need to be exported for continued full employment equilibrium. If this occurs, the current account of the balance of payments improves by 100 units, as does the net foreign assets position, given unchanged capital flows. Obviously, the higher the propensity to import, the smaller the burden of adjustment on exports. However, if for some reason exports cannot be expanded, the entire adjustment will have to be borne by imports and full employment equilibrium will not be possible. In the present example, absorption will have to decline by as much as 400 units in order to reduce imports by 100 units so as to improve the balance of payments by the same amount. An excess supply of 300 units of domestic output would then result. This problem is adverted to by Bacha (1984).

In practice, however, the small country assumption that a country's exports confront an infinitely elastic demand is unlikely to be met. 1/ The current account of the balance of payments cannot, therefore, be expected to automatically adjust by the amount needed to take up the slack generated by pursuing a contractionary credit policy.

In variants (for example, with nontraded goods), any excess of the domestic inflation rate over the international rate causes the real exchange rate to appreciate and sets in motion automatic equilibrating adjustments similar to those under Hume's price-specie-flow mechanism. Just as with the pegged price-level case, the balance of payments deteriorates causing the flow supply of money to decline and now the domestic inflation rate. The automatic adjustment process, can be hastened by discretionary restraints on the amount of credit expansion. The discretionary approach to disinflation is straightforward: a target inflation rate is selected (lower than the current rate) and using the basic monetary equation (5), the appropriate amount of domestic credit expansion is determined. Provided there are no inertial elements to inflation (rigid expectations or contractual wages, for example) the inflation adjustment would be painless. Where institutional and other rigidities are persent, restraining credit creation to both improve the balance of payments and to reduce the domestic inflation rate could result in economic contraction. A multidimensional problem is generated, involving multiple targets and the need for additional instruments to ensure their attainability, and the basic model has to be expanded accordingly.

One puzzle with the basic monetary model is the apparent lack of any influence on the balance of payments and on domestic economic activity of variations in foreign capital inflows. This is readily resolved by noting from the absorption function stated in equation (10), that any decline, say, in net foreign capital inflow causes an equivalent fall in absorption. The resulting excess supply in the goods market is eliminated through an improvement of the same amount in the current account of the balance of payments. The overall balance of payments is unaffected, since the improvement in the current account offsets the deterioration in the capital account. Domestic economic activity is also unaffected as the reduction in domestic absorption is offset by an increase in foreign absorption. 2/

1/ The more usual case is one of product differentiation in exports and foreign demands that exhibit varying price elasticities, typically low in the short run but becoming larger over time. See Goldstein and Khan (1985) for evidence that as the time period lengthens the responsiveness of exports and imports to a real exchange rate adjustment increases.

2/ It follows that if an objective of policy is to improve the current account of the balance of payments, the basic model indicates that an appropriate restraint on foreign borrowing would complement domestic credit restraint.

Another issue concerns the relationship between Alexander's absorption approach and the monetary approach to the balance of payments as portrayed by the basic model. The basic equation in Alexander's (1952) formulation for determining the balance of payments, using present terminology, is

$$E\Delta F = PY - PA. \quad 1/$$

Substituting for absorption in this expression by recourse to equation (10) and simplifying results in the fundamental equation of the monetary approach:

$$E\Delta F = \Delta M^d - \Delta D.$$

Alexander's finding that an improvement in the balance of payments can only result from reducing absorption is thus fully consistent with the basic monetary model's prescription that domestic credit expansion must be reduced. Whereas the basic monetary model identifies the instrument for compressing absorption (and thereby facilitates the calculation of the appropriate amount of credit expansion), the absorption approach explains how the balance of payments improvement comes about. The absorption function set out in (10) above provides the bridge.

Another issue concerns the assumption of the basic monetary model that transactors are always on their demand for money curve and that their expenditures are always adjusted to ensure this property. Suppose, however, that transactors wish to maintain a desired expenditure profile, at any rate in the short run. The amount of money holdings would then have to adjust to accommodate expenditure. The alternative monetary and buffer stock approaches yield different implications with regard to the appropriate rate of credit expansion. This is readily seen in the context of the basic monetary model, which is set out below, but with one adaptation to yield a buffer stock model.

a. $Y - A = \frac{1}{P}(\Delta M - \Delta D - E\Delta K)$

b. $A = aY + \frac{\Delta D}{P}$ 2/

c. $P = E$

d. $\Delta F^* = X - Z + \Delta K$

e. $Y - A - (X-Z) = 0$

1/ Alexander's formulation did not explicitly consider foreign borrowing. Hence, to ensure comparability, this is suppressed in the demonstration that follows.

2/ Here a indicates the proportion of national income that residents wish to spend.

The principal difference between this model and the basic monetary model is in the specification of the absorption equation b (see also equation (10) above). Part of absorption is assumed to be a proportional function of income, while part is induced through credit expansion (e.g., investment). On using the relations set out in a-d to substitute in the equilibrium condition e, the solution for the credit expansion variable is obtained.

$$\frac{\Delta D}{M_{-1}} = (1-a)(1+g)(1+q)v_{-1} + \frac{E\Delta K}{M_{-1}} - \frac{E\Delta F^*}{M_{-1}}, \text{ 1/}$$

where v_{-1} is the previous period's income velocity of money and g and q refer, respectively, to the growth rate and domestic inflation rates. This solution is quite different from that of the basic monetary model (see equation (5)). In particular, it requires that credit be made available to facilitate the absorption of external financing flows. The buffer stock approach is not pursued further here. It should be noted, however, that if transactors are liquidity constrained, the monetarist approach would appear appropriate.

3. Alternative adjustment mechanisms for equilibrium

If exports are no longer in infinitely elastic demand, eliminating an imbalance in the market for goods requires that either domestic prices or output, or both, adjust. If output is in fixed supply and markets are organized on auction lines--the standard assumption of the classical quantity theory of money--equilibration is via price adjustments. The price of the exportable would decline by the amount needed to exhaust the excess supply. Such could be the case with agriculture exports, the supply of which is limited once the harvest is over. However, in a Keynesian short-run context of sluggish price adjustment, typically the case with manufactured products, equilibration would be through quantity adjustments. In practice, different sectors of the economy can exhibit either or both of the alternative short-run adjustment patterns, although for the long run it is usual to expect that classical price mechanisms will prevail. 2/

a. A closed economy variant

Before analyzing the alternative adjustment mechanisms in an open economy context, it is useful to review their operation in the basic closed economy quantity theory of money model. As before, continuous

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1/ This derivation uses the property that $\frac{PY}{M_{-1}} = (1+g)(1+q)v_{-1}$.

2/ In order to deal adequately with simultaneous adjustments in prices and quantities, the supply-side of the model will need to be more elaborately formulated than here. See Gylfason and Radetzki (1985) for one approach.

monetary equilibrium prevails when the incremental demand for money is equated to its supply, which now consists solely of the domestic credit creation of the monetary authorities.

$$\Delta M^d = \Delta D. \quad 1/$$

Using equation (4) to substitute for the incremental demand for money

$$(13) \qquad \left(\frac{\Delta P}{P_{-1}} + \frac{\Delta Y}{Y_{-1}}\right) M_{-1} = \Delta D.$$

In an auction market context, and assuming static long-run expectations, the solution for the inflation rate that ensures continuous monetary equilibrium follows from (13):

$$(14) \qquad q = \frac{\Delta D}{M_{-1}} - g,$$

where for terminological convenience, q refers to $\frac{\Delta P}{P_{-1}}$ and g to $\frac{\Delta Y}{Y_{-1}}$. The inflation rate equals the difference between the rate of credit creation and the rate of growth of output. Given velocity and the rate of growth of output, the rate of inflation and the rate of credit creation are then directly correlated.

Alternatively, if output is not in fixed short-run supply but can vary depending on the rate of capacity utilization, the output growth rate would be determined by simply turning around equation (14). In a Keynesian short-run setting, the inflation rate, being the outcome of ongoing wage and other cost raising adjustments, would be exogenous. Hence, the effect of reducing the rate of credit creation is to reduce the rate of growth of output. 2/

1/ This can be derived from the basic model set out in equations (1)-(4) by suppressing the external sector. The linkage with the goods market is established by noting from equation (12) that in a closed economy the aggregate economy constraint reduces to

$$Y-A = \frac{1}{P} (\Delta M^d - \Delta D),$$

where $A = Y - \frac{1}{P} (\Delta M^d - \Delta D)$. Absorption deviates from output if there is an imbalance between the desired addition to cash and its supply. The latter is eliminated by the requirement that monetary flow equilibrium prevails, forcing absorption by residents to equal domestic output (as it should in a closed economy).

2/ This is through a reduction in aggregate demand. By allowing for credit, say as working capital, in the production process, output could decline because of supply considerations as well.

b. An open economy version

To formulate an open economy variant, which allows for an excess demand for output to leak out via imports, thereby reducing pressure on domestic supply, a number of expressions are required. Define the domestic price level as a geometric average of the price of the exportable P_x and of the import good P_f.

$$(15) \quad P = P_x^{1-z} (EP_f)^z,$$

where 1-z is an assumed constant equal to the share of the domestic good in expenditure, and the subscript x refers to the exportable. The rate of change in the domestic price level follows from time differentiating the preceding expression

$$q = (1-z)q_x + z \lambda q_f,$$

where the q's refer to rates of inflation, and $\lambda = \Delta E/E_{-1}$ is the proportional rate of change in the nominal exchange rate. Abstracting from both continual exchange rate adjustments and international price inflation, λ and q_f can be set equal to zero so as to focus on the relation between the proportional rate of change in the domestic price level and the price of domestic output

$$(16) \quad q = \alpha q_x.$$

Next, let exports be an increasing function of the real exchange rate

$$(17) \quad X = X(e) \qquad X' > 0,$$

where the symbol ' denotes differentiation with respect to the function's argument. For greater generality, the import demand function is reformulated to include exports as well,

$$(18) \quad EZ = z(e)\ PA + z(e)\ P_x X. \ 1/$$

(1) Domestic output as an adjustment variable

As before, the equilibrium solution of the model is found from equating the RHS of equation (12) to zero

$$\Delta M^d - \Delta D - E\Delta F = 0.$$

Using equation (9) to substitute for the change in net foreign assets and equation (4) to substitute for the incremental demand for money and rearranging, the preceding expression reduces to

$$(19) \quad (q+g+gq)M_{-1} = \Delta D + (P_x X - EZ) + E\Delta K.$$

1/ Manufactured exports generally include a substantial import content although this may not be true of primary exports.

Next, substituting for imports using equation (18) and equation (10) derive

$$(20) \quad g(1+q)+q = \frac{\Delta D}{M_{-1}} + \frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}} - \left(\frac{z}{1-z}\right)\frac{PY}{M_{-1}}.$$

The nominal gross national product term decomposes into the product of price and output growth terms as follows:

$$(21) \quad PY = (1+q)(1+g)\, P_{-1}Y_{-1}.$$

Using (21) and the definition of velocity $v \equiv \frac{P_{-1}Y_{-1}}{M_{-1}}$ (together with the assumption that velocity is stable), equation (20) can be solved for the output growth rate,

$$(22) \quad g = \frac{1-z}{(1+q)(1-z(1-v))}\left[\left(\frac{\Delta D}{M_{-1}} + \frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}}\right) - \frac{z}{1-z}(1+q)v - q\right].$$

According to equation (22), the short-run output growth rate is stimulated by increases in domestic bank credit, exports, and foreign capital inflows. Monetary leakages via imports and the need to maintain higher transactions balances as nominal income rises are, however, depressive influences. This reduced form solution for g shows the various possibilities for influencing the growth outcome. Thus, if there is a decline in exports that threatens the growth rate, higher borrowing from abroad could provide an offset that would restore a desired rate of growth. 1/

Using the equilibrium condition to solve for the growth rate, rather than for the balance of payments as was done earlier, requires that the latter be separately determined. The rate of accumulation of foreign assets can be solved from the basic balance of payments equation,

$$(23) \quad \Delta F = \frac{P_x X}{E} - Z + \Delta K.$$

Using equations (10), (18), and (21) to substitute for imports,

$$(24) \quad \Delta F = \frac{M_{-1}}{E}\left[(1-z)\left(\frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}}\right) - z\,\frac{\Delta D}{M_{-1}} + z(1+q)(1-v)g + zq(1-v) - zv\right].$$

1/ The solution here is for the demand determined short-run growth rate, underlying which there is a presumed longer-term growth generating process, that is considered in more detail in the next section.

As is to be expected, higher exports and foreign capital inflows improve the balance of payments. An increase in either credit or output growth or inflation will, however, worsen the balance of payments, as each of these factors tends to increase imports. 1/ This is directly evident in the case of higher credit. It is less evident when output growth increases. On the one hand, higher output growth increases the incremental demand for money, which will reduce absorption and improve the balance of payments. This is a standard result of the monetary approach to the balance of payments. 2/ However, it neglects the effect of higher output growth on the level of income of transactors (see equation (10)). Generally, only part of the income increase will be desired as an addition to cash balances. Hence, on balance, net absorption increases, which accounts for the deterioration in the balance of payments. 3/

On substituting the solution for the growth rate provided by equation (22) into equation (24), a reduced form solution for foreign asset accumulation is derived,

$$(25) \qquad \Delta F = \frac{M_{-1}}{E}\left[\frac{1-z}{1-z(1-v)}\left(\frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}}\right) - zv\,\frac{\Delta D}{M_{-1}} - zv\right].$$

Unlike with the basic monetary model, the extended monetary model demonstrates that the balance of payments outcome is dependent on foreign trade and the amount of external financing and not just on the rate of domestic credit expansion. An increase in exports and foreign borrowing or a reduction in imports will also improve the balance of payments. It is also of interest to note that the inflation rate q does not feature in the reduced form solution, indicating a neutral effect on the balance of payments. This is because a higher rate of inflation, say, reduces the rate of growth of output (see equation (22)), and thus absorption, which offsets the former's direct stimulative effects on absorption. 4/

(2) The rate of inflation as an adjustment variable

Although the concern here is with the trade-off between the balance of payments and the level of economic activity, for the sake of completeness the solution for the pure demand-determined inflation

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1/ It is assumed that $v > 1$, which is generally the case.

2/ See especially Mundell (1968), Chapter 9.

3/ Mundell's well-known result of higher growth improving the balance of payments in a monetary model, which he contrasted with the Keynesian result of growth worsening the balance of payments, thus has to be qualified in the context of a more general monetary model.

4/ The analysis abstracts from adjustments in inflationary expectations that induce changes in desired levels of real balances and the associated effects on transitional absorption behavior. Such effects can sometimes be crucial to the short-run dynamics.

rate is provided. This is obtained in symmetric fashion to the derivation of g starting with equation (20).

$$(26) \qquad q = \delta \left[\frac{\Delta D}{M_{-1}} + \frac{E\Delta K}{M_{-1}} + \frac{XP_{x-1}}{M_{-1}} - (1-z(1-v))g - zv \right] \underline{1}/$$

where $$\delta = \frac{1-z}{(1+g)(1-z(1-v)) - XP_{x-1}/M_{-1}}$$

It can be shown that δ is positive, provided velocity is greater than unity. Equation (26) indicates that in the short run the rate of inflation is worsened by higher credit expansion, capital inflows, and exports, all of which serve to add to aggregate demand. With the output growth rate now exogenously given, the resulting excess demand is eliminated through a higher rate of inflation. An increase in the now exogenous rate of growth of output reduces aggregate excess demand and lowers the inflation rate.

A fuller treatment of inflation requires that, in addition to the demand elements, account be taken of underlying expectations, trends in money supply growth, wage-price indexation schemes, and so on. 2/

IV. Some Policies for Reconciling the Balance of Payments and Growth Objectives

Generalizing the basic monetary model to allow for two objectives makes explicit the problem that pursuit of one objective--an improvement in the balance of payments--could be at the expense of another objective. Such conflicts arise especially when the economy is subject to shocks and raise difficult questions as to the appropriate choice and use of policy instruments for their amelioration. At the outset it is important to distinguish between policies intended to promote longer-term goals, such as an exchange rate adjustment, and short-run policies that are intended to cushion the adverse effects of shocks, such as foreign borrowing. In what follows, the focus is on the possible conflict between the growth and balance of payments objectives and the appropriate design of policies for resolving the conflict.

1/ This derivation makes use of the property stated in equation (16), $q = \alpha q_x$.

2/ However, if the economy can be conveniently divided into a predominantly auction market sector and a "customer" or (fixed price) market sector, the present model can be applied separately to each of these sectors and then aggregated.

1. A perspective on the growth objective

As is well known, the level of output of an economy and its growth rate reflects the operation of several different forces. In a longer-term context, the rate at which basic productive factors, such as capital, labor, and technology, grow are critical to the determination of the secular growth rate. The efficiency with which such factors are combined is also a critical element, as is the appropriate choice of activity. In the short run, the scope for changing these elements is limited. A maximal level of output and growth rate is thus defined by what may be termed the inertia of supply-side factors that is consistent with prudent capacity utilization.

Because of various inefficiencies and bottlenecks, the currently attainable maximal levels of output and growth rate could be well below the efficient levels. On the one hand, structural policies will be needed to remove the inefficiencies and to redirect resources in the economically most efficient direction, while at the same time renewing and expanding the productive base. Such reforms could range from adjustments in various administered prices that distort the relative price structure and incentives and taxes that further distort decision making to expenditure outlays to provide needed infrastructure. These policies generally take longer to achieve their effects, while a critical factor in determining the short-run level of economic activity is the state of aggregate demand. Formulating an appropriate demand management policy in the context of a longer-run reform of the productive capacity of the economy appears essential to success. 1/

The short-run and longer-term considerations are schematized in equations (27a) and (27b), the first part of which deals with the determinants of the long-run growth rate and the second part with the actual growth rate.

$$(27a) \quad g^* = a_0 T^* + a_1 K^* + a_2 L^*$$

where g^* is the long-run growth rate, T^* refers to the rate of technological progress, K^* represents the secular rate of capital accumulation, and L^* is the long-run rate of growth of the labor force.

$$(27b) \quad g = (1-\alpha)g^* \qquad 0 \leq \alpha < 1$$

where g is the actual growth rate, given the structurally imposed capacity constraints.

1/ For a discussion that focuses on the fiscal elements, see Tanzi (1987).

The actual growth rate is determined by reference to equation (22), which reflects primarily demand management influences. The reconciliation between the short-run and long-run growth rates is provided by solving for α, the capacity utilization factor. To the extent possible, policy should be directed to ensuring that g is continuously close to g* (α=0), while at the same time maintaining g* at its maximal rate. In the short-run, inadequacies in demand management could result in the level of capacity utilization being so low (α closer to 1), as to constitute a disincentive to efforts to enlarge the productive base, with the consequence that g* could suffer.

Alternatively, efforts to increase g* through structural reforms could be thwarted if there is excess demand such that incentives for adjustment are blunted. It may be necessary for the actual growth rate to be somewhat depressed so as to create the conditions for a release of resources from declining sectors to the emergent ones. Considerable deliberation must, therefore, be exercised in selecting the short-run growth rate for output that is consistent with restructuring requirements, and the corresponding calibration of demand management policies.

2. Illustrating the trade-off between growth and the balance of payments

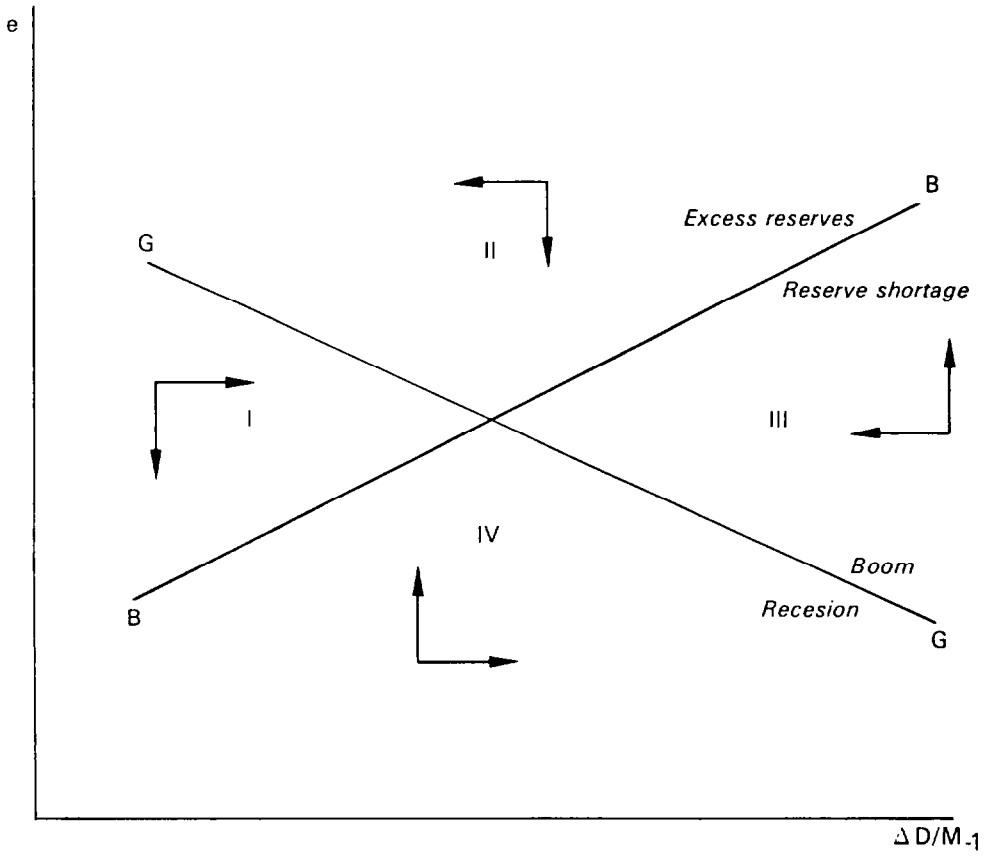
The possible trade-off between growth and the balance of payments objectives is determined by the structure of the economy. For the model at hand, the trade-off can be conveniently undertaken in terms of Figure 2. 1/ Equation (22) is solved for that combination of values of the real exchange rate e and credit expansion $\frac{\Delta D}{M_{-1}}$, that are consistent with the target rate of growth g*, given that all other policy and exogenous variables are unchanged. This combination of values is shown as the line GG in Figure 2. On differentiating equation (22), its slope is found to be negative (see the details presented in the Appendix).

(28)
$$\left.\frac{de}{d(\Delta D/M_{-1})}\right|_{GG=0} = -\frac{\partial g^*/\partial(\Delta D/M_{-1})}{\partial g^*/\partial e} < 0$$

1/ The approach adopted is similar to that contained in the pioneering contribution of Swan (1960), although the analysis here is more formal and the underlying monetary model quite different from that used implicitly by Swan.

FIGURE 2

REAL EXCHANGE RATE AND DOMESTIC CREDIT IN THE EXTENDED MODEL



To maintain the target rate of growth, any appreciation of the real exchange rate (e declines) that shifts demand away from domestic output has to be offset by an increase in credit so as to stimulate demand. 1/

The slope of the external balance line, BB, in Figure 2, is determined by inserting the target value of the rate of reserve accumulation ΔF^* in equation (25). This slope is determined to be positive (see Appendix).

$$(29) \quad \left| \frac{de}{d(\Delta D/M_{-1})} = - \frac{\frac{\partial \Delta F^*}{\partial (\Delta D/M_{-1})}}{\frac{\partial \Delta F^*}{\partial e}} > 0 \right|_{BB = 0}$$

A real exchange rate appreciation will worsen the balance of payments by shifting demand away from domestic production toward imports. To offset this credit and thus aggregate demand must be reduced.

The point of intersection of the BB and GG curves indicates the exchange rate level and the amount of domestic credit expansion that will ensure the fulfillment of both targets. Positions below the GG line are associated with a recession. This is so because for a given real exchange rate, and thus a given pattern of foreign and domestic demand for the domestic output, the rate of credit expansion is too low and depresses absorption. As is indicated by the horizontal arrow in Figure 2, increasing the rate of credit expansion will help overcome the recession. The converse follows for points above the GG line, which are associated with boom or excess aggregate demand conditions.

Turning to external balance, positions below the BB line indicate shortfalls from the reserve target. This is so because for a given rate of domestic credit expansion and thus absorption, imports are excessive. A devaluation is helpful, as this would move the economy closer to the BB line. This action is represented by the vertical arrow. In the converse case of an overfulfillment of the reserve target, an appreciation will restore external equilibrium.

1/ The preceding analysis is undertaken in terms of marginal changes. With regard to the exchange rate in particular, temporary stock adjustment effects (shifts in the stock demand for money) from discrete movements in the exchange rate of the type considered in Section II are not considered at this stage, which could be viewed as the analysis of a longer run, when these effects have worked themselves out. Such effects are considered subsequently, when examining the implications for credit ceilings.

Under the conditions represented in Figure 2, the most efficient pairing of instruments and targets is to assign the credit instrument to the domestic activity target and the exchange rate to the reserve accumulation target. 1/ The intersection of the two lines in Figure 2 demarcates four regions denoted by Roman numerals. The characteristics of each region are summarized in Table 1, together with the direction of use of policy instrument. In region IV, for example, the economy suffers from an economic recession and a balance of payments deficit. To stabilize the economy, a depreciation of the real exchange rate is required. The appropriate amount of credit expansion will depend on the initial position of the economy and could involve either an increase or a reduction in moving to the long-run equilibrium amount.

3. Some policy responses to shocks

The diagram in Figure 2 can be used to illustrate a variety of alternative situations, of which two that occur frequently are examined here.

a. A domestic shock and aggregate demand management

The first situation concerns an internally induced imbalance, for example, an increase in government expenditure. Given the monetarist underpinnings of the model, the outcome will depend on how the increased expenditure is financed. For an expansionary effect, it will have to be financed by credit rather than taxes. 2/ Such an action will cause the economy to shift from an initial equilibrium point, such

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1/ This conclusion is based on the method employed by Mundell (1962) in his classic statement of the principle of effective market classification. Essentially, instruments should be paired with the target on which they have the greater impact. A stable pairing occurs when any undesirable side-effect on other targets are overcome by the instruments assigned to these targets.

2/ Following Barro's (1974) reformulation of Ricardo's equivalence theorem, which states that deficits do not matter (because a lower deficit brought about by a tax increase has identical effects to that of a higher deficit financed by borrowing as the private sector will discount to the present the future tax liabilities implicit in the interest burden associated with the higher debt), a considerable literature has developed to support the view that only increases in government expenditure can be expansionary. Nevertheless, this view is extreme. Private individuals may choose to shift the higher future tax burden associated with an increase in debt service charges to future generations for a variety of reasons including a belief that technological progress will make it easier for them to pay higher taxes. If so, an increase in borrowing will be more expansionary than an increase in current taxes, and deficits matter.

Table 1. Choice of Instrument Settings

Region in Figure 2	State of Economy Regarding		Use of Instrument	
	Internal balance	External balance	Credit instrument	Exchange rate
I	Recession	Surplus	+	-
II	Boom	Surplus	-	-
III	Boom	Deficit	-	+
IV	Recession	Deficit	+	+

Source: Figure 2.

Note: The sign + indicates either a further expansion in credit or a further depreciation of the exchange rate.

as a_0, to a point such as H in Figure 3. There is, however, no displacement in the two balance lines as the underlying structural conditions have not changed, but only a situation of disequilibrium has been created. At a disequilibrium point, such as H, there is excessive domestic demand (the economy is booming) and the balance of payments is in deficit. The only policy adjustment required is to reduce the rate of domestic credit expansion to that implied by a_0. (Since the growth rate will be at its target level at a_0, the solution of the basic model can be used to determine the appropriate amount of credit.) However, if the economy were at a point such as H', owing to persistent excess demand that aggravated domestic inflation and reduced international competitiveness, there is need for both an exchange rate depreciation and credit restraint, a policy response similar to that required to deal with an external shock.

b. An external shock and exchange rate action

Suppose next an external shock that takes the form of a permanent loss of exports. 1/ Both the GG and BB schedules will be affected. The collapse in exports will depress domestic economic activity, which can, however, be offset by an increase in credit. This causes the internal balance line GG to shift outwards and to the right, as in Figure 4. The export shortfall will also reduce the rate of reserve accumulation below the target rate. As this is assumed to be a permanent shortfall, it will, therefore, be necessary to devalue the exchange rate in order to restore the target rate. Since this requires an increase in e, the external balance, or BB line, will be shifted upward and to the left. The displacement in the equilibrium intersection point will, therefore, be from a_0 to a point such as a_1, in Figure 4.

The new point of intersection indicates that restoring the growth rate and balance of payments targets will require a permanent real exchange rate depreciation, although the implications for credit expansion in the new equilibrium are ambiguous. Failure to adjust the policy instruments--the exchange rate here--will keep the economy in the deficit-recession region (by reference to a_1). This cannot be a permanent solution as the country will both run out of reserves and damage its long-run growth potential. (While adjustment might be postponed, it is inevitable.)

1/ An equivalent analysis could be undertaken for the case of a permanent deterioration in the terms of trade or a long-term reduction in foreign capital inflow or, with a slight modification of the model, an increase in debt service charges.

FIGURE 3

POLICY ADJUSTMENTS AND A DOMESTIC SHOCK

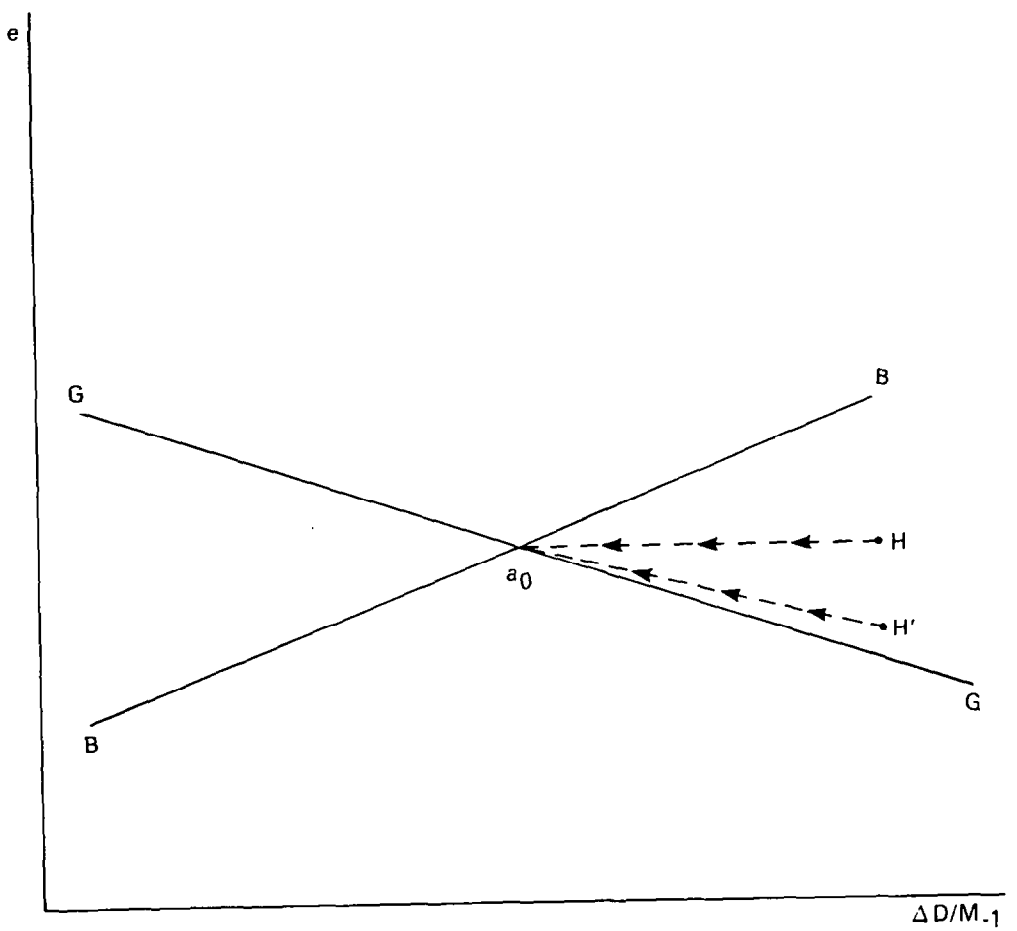
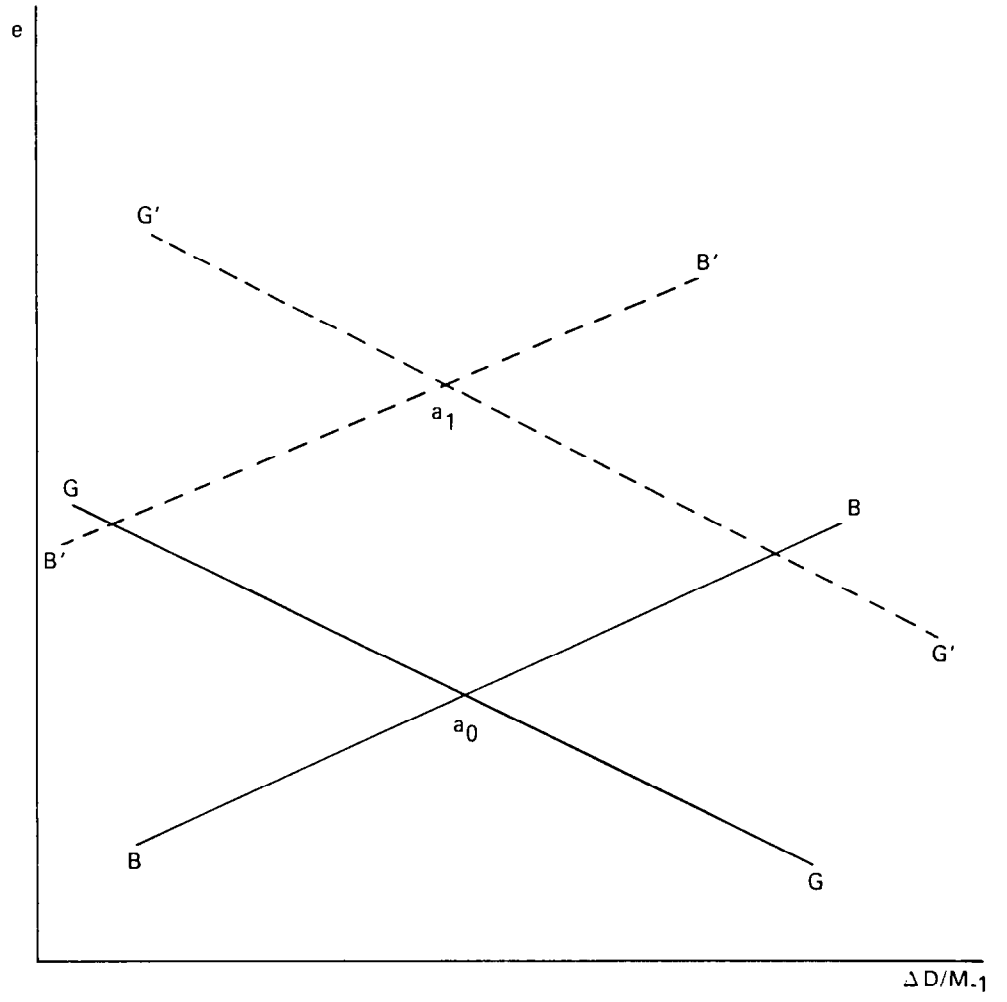


FIGURE 4

POLICY ADJUSTMENTS AND AN EXTERNAL SHOCK



4. Allowing for sluggish adjustment responses

In practice, merely changing the policy instrument settings is unlikely to induce an immediate, smooth transition of the economy to the new equilibrium. In part, this is because the economy's response to a relative price change, such as an exchange rate adjustment, can be very sluggish. 1/ Because of structural bottlenecks and other impediments, exports and imports may respond at a very slow pace to a devaluation, at least in the initial stages. To develop the analysis of the transition, it is convenient to distinguish between an "effective" exchange rate adjustment and a "notional" adjustment. Thus, from the outset, the real exchange rate could have been adjusted by the full amount, say to a_1 in Figure 4, but the economy responds over time as if exports and imports were adjusting fully at each point in time to a smaller real exchange rate adjustment. Initially, however, the economy will be subject to the full cash balance effect, which depresses demand. A sequential analysis is needed to describe the transitional shift in curves to the equilibrium position at a_1 that takes account of the two competing forces. Equations (22) and (25), modified below to include the term $\frac{z\Delta E\mu}{E_o}$ to capture the impact on the demand for money of the exchange rate adjustment, will need to be separately solved during the transition. 2/

$$(22)' \qquad g = \frac{1}{1+q}\left[\frac{1-z}{1-z(1-v)}\left(\frac{\Delta D}{M_{-1}} + \frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}} - q - z\frac{\Delta E}{E_o}\mu\right)\right] - \frac{zv}{1-z(1-v)}$$

1/ Begg (1983) discusses empirical evidence from certain industrial countries that point to a response period of several years following a real exchange rate adjustment. Kaldor (1983) and others have commented on the especially slow response in developing countries, pointing to the structural dimensions of the problem.

2/ This term is derived as follows: From the demand for money function $M^d = \frac{1}{v} PY$, substitute for P using equation (15) to yield, $M^d = \frac{1}{v} P_x^{1-z} E^z Y$. Differentiating with respect to the real exchange rate, $\frac{dM^d}{dE} = \frac{zM^d}{E}$. Assuming an initial situation of monetary balance and a discrete adjustment in the exchange rate, money demand is affected, $\frac{\Delta M^d}{M_{-1}} = z\frac{\Delta E}{E_o}$. This, however, is the full amount of the desired adjustment, of which only a proportion μ, $0<\mu<1$ is demanded per period.

$$(25)' \qquad \Delta F = \frac{M_{-1}}{E}\left[\frac{1-z}{1-z(1-v)}\left(\frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}}\right) - \frac{zv}{1-z(1-v)}\left(\frac{\Delta D}{M_{-1}} - \frac{z\Delta E\mu}{E_o}\right)\right] - \frac{zv}{1-z(1-v)}$$

According to equation (22)', the depreciation induced increase in the demand for money depresses the actual rate of growth. Over time, however, this contractionary effect will be offset by the stimulative effects of the exchange rate depreciation (in shifting demand toward domestic production) and eventually disappears when the additional demand for money has been satisfied. From equation (25)', the additional demand for money improves the balance of payments temporarily, with the effect once again disappearing when the additional demand for money is satisfied. While the temporary improvement in the balance of payments is from the expenditure reducing effects of the exchange rate adjustment, the permanent improvement over time is the result of expenditure switching effects.

An issue for short-run policy is posed as a required exchange rate depreciation could have an excessively contractionary effect, unduly contracting aggregate demand and employment. In turn this could delay the eventual recovery process by providing a disincentive for investments, both by depressing savings and reducing the returns to investing. To offset these undesirable effects a temporary increase in the rate of credit expansion will be required, that will need to be reversed, however, once the stimulative effect of the exchange rate adjustment on domestic production begins to manifest itself. 1/

5. The temporary financing of adjustment

If the pursuit of an appropriate short-run credit policy is constrained by a lack of reserves or access to international financing, a quicker improvement in the current account is forced. To revert to

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1/ Such a policy is unlikely to aggravate the underlying rate of inflation, which would have been consistent with a given state of aggregate demand that has now been temporarily reduced by the depreciation. If the rate of inflation is also to be reduced then appropriate policies will have to be in place to ensure the new target rate, for example, a prices and incomes policy for inflation of the inertial variety (see Liviatan (1986)). The (lower) amount of credit expansion is solved by reference to the target rate of inflation. While in a flow sense, the underlying fiscal deficit and other sources of monetary creation will have to be reduced, the stock effects of a depreciation will require a temporary increase in monetary flows, which would be added on. For a formal analysis of stock-flow dynamics, see Chand and Onitsuka (1985).

the example of a permanent shortfall in exports, the equilibrium of the economy is shifted from point a_o in Figure 5 to a_1. To comply with a situation of reserve inadequacy, credit expansion will have be cut by the amount a_ob. This pushes the economy on to the new B'B' line, but external balance is attained at the expense of domestic activity. The export shortfall itself induces a recession, which is measured by the distance a_oc, where c lies on the new G'G' schedule. To this must be added the recession created by the cutback in domestic credit of a_ob, which pulls imports down so as to restore equilibrium in the balance of payments.

If a devaluation is now undertaken of the size needed to restore equilibrium at a_1, the economy would, in the short run, be moved to a position off and to the left of the B'B' line, say to d, further aggravating the recession. The last effect could be avoided by adjusting the real exchange rate gradually to its new equilibrium level at a_1, following the arrows on the B'B' curve. If, however, because of the need to restore confidence and to reverse a capital outflow a big adjustment in the exchange rate is required, a compensatory expansion in credit will be needed to offset the additional recession and to bring the economy back to B'B'. 1/ The adjustment pattern along the B'B' line in Figure 5 requires zero external financing. This, however, is an extreme solution that relies only on reducing domestic output in order to improve the balance of payments.

Figure 6, panel (A), illustrates a scenario in which a recession, required to comply with the balance of payments constraint, results in a permanent welfare loss, measured by the output forgone before regaining the natural or target level of growth, g*. As such a policy could hamper the restructuring of the economy (which usually requires additional resources that are more readily available in an expanding economy), a country might prefer to protect the domestic economy and bring about the required import compression through permanent

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1/ In a context of slow adjustment that is dictated by the economic structure, the distinction between the sources of fundamental disequilibrium, whether external or internal, becomes irrelevant, at any rate with regard to the amount of adjustment that is required. The strategy of adjustment could, however, be different, depending on the origin of the shock, since a situation of excess demand requires credit restraint, whereas such action in a context of export shortfall could aggravate the recession that may have already been induced.

controls. 1/ This would, however, be undesirable as it implies a loss of some of the gains from specialization, both for the country and for the world at large and a decline in efficiency. For the country, the permanent institution of controls would reduce the potential rate of growth below g*. 2/

An alternative to the permanent imposition of controls would be to impose controls for a limited duration, but to combine it with an exchange rate depreciation of the amount needed to (eventually) overcome the export shortfall. This scenario is illustrated in panel (B) of Figure 6. The exchange rate depreciation is accompanied by an expansion in credit that helps offset some of the recession, while the controls limit the immediate damage to the balance of payments. In effect, the controls substitute for a domestic recession needed to comply with the balance of payments constraint. 3/ Compared with the situation under permanent controls, in which the growth potential is permanently damaged, removing the temporary controls (once the devaluation's stimulative effect becomes effective) restores g*. Compared with the case of zero external financing (with no controls), avoiding recession in the short run results in a smaller welfare loss.

The need for controls can be fully obviated, provided adequate foreign financing is available to the country. The availability of such financing enables it to depreciate the real exchange rate

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1/ Even if imports were complementary to domestic production, it could pay to forgo such production rather than to initiate a general recession in order to bring about the import reduction. Although, as is widely recognized, controls breed inefficiency, if structural rigidities and bottlenecks prevent a satisfactory market-based solution, they might be perceived as less damaging than other available options. In the earlier literature, for example, Alexander (1952) and Swan (1960), the occasional use of quantitative controls to promote adjustment was often countenanced. Controls and other nonprice mechanisms of rationing are introduced in times of war or great stress, when market imbalances are huge and the equilibrating price responses would be very large, thereby bearing undesirable macroeconomic consequences. In the longer run, as the imbalances decline, controls would be progressively dismantled.

2/ In terms of Figure 5, the economy is effectively constrained to remaining at a point, such as a_0, through a downward revision of the target rate of growth. Note, however, that for some developing countries, the external terms of trade may be injurious and result in a misallocation of domestic resources that could have been better employed to meet domestic needs directly. See especially Alexander (1952) for an elaboration of this argument.

3/ However, should imports be complementary to domestic production, a supply induced recession would be unavoidable.

FIGURE 5

FINANCING AND ADJUSTMENT

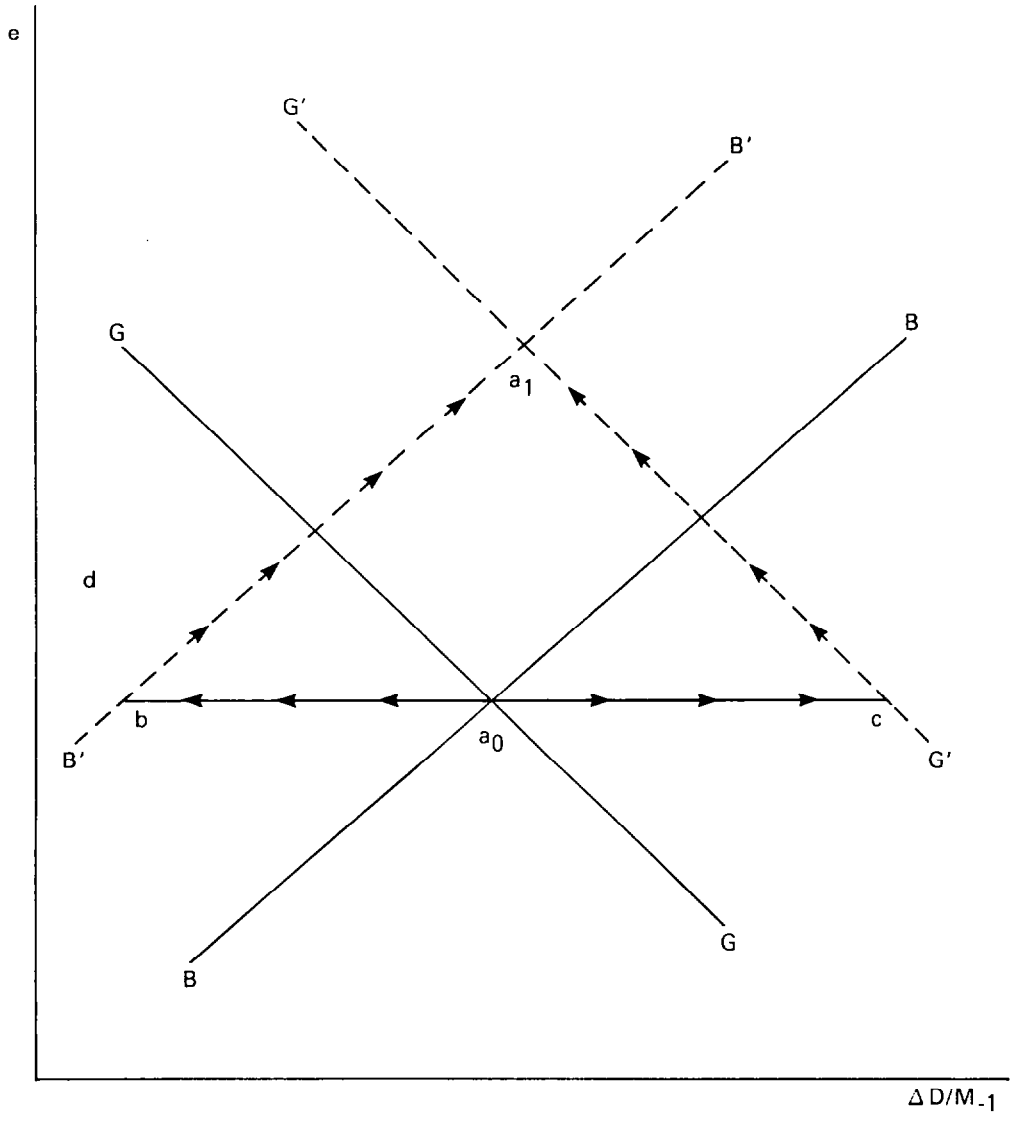
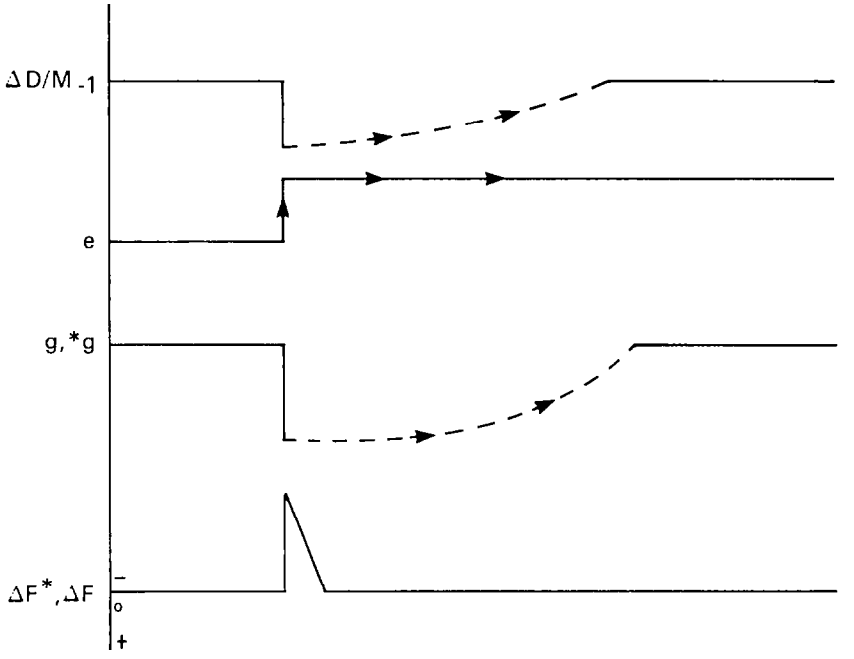


FIGURE 6

GROWTH AND THE BALANCE OF PAYMENTS: SOME SCENARIOS

(A) ZERO EXTERNAL FINANCING AND NO CONTROLS



(B) ZERO EXTERNAL FINANCING WITH CONTROLS

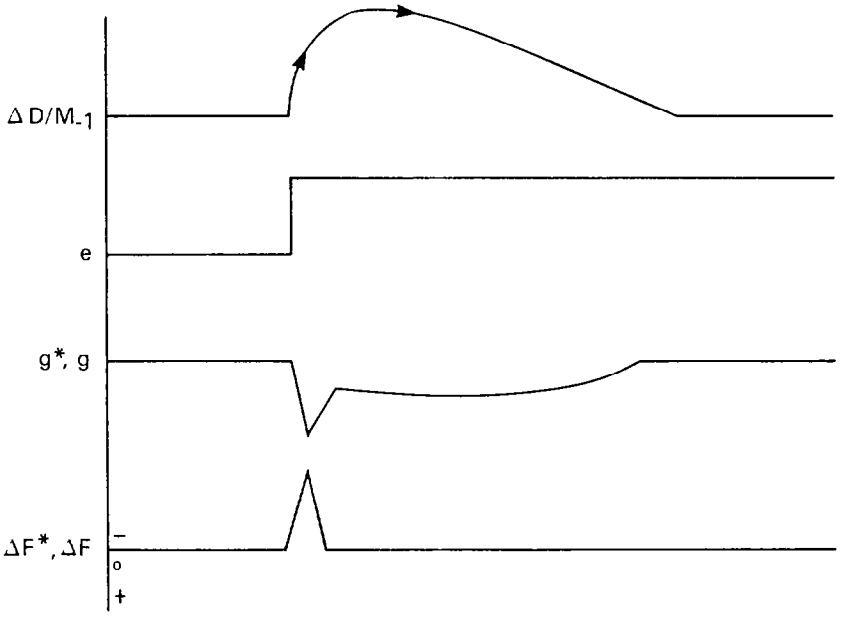
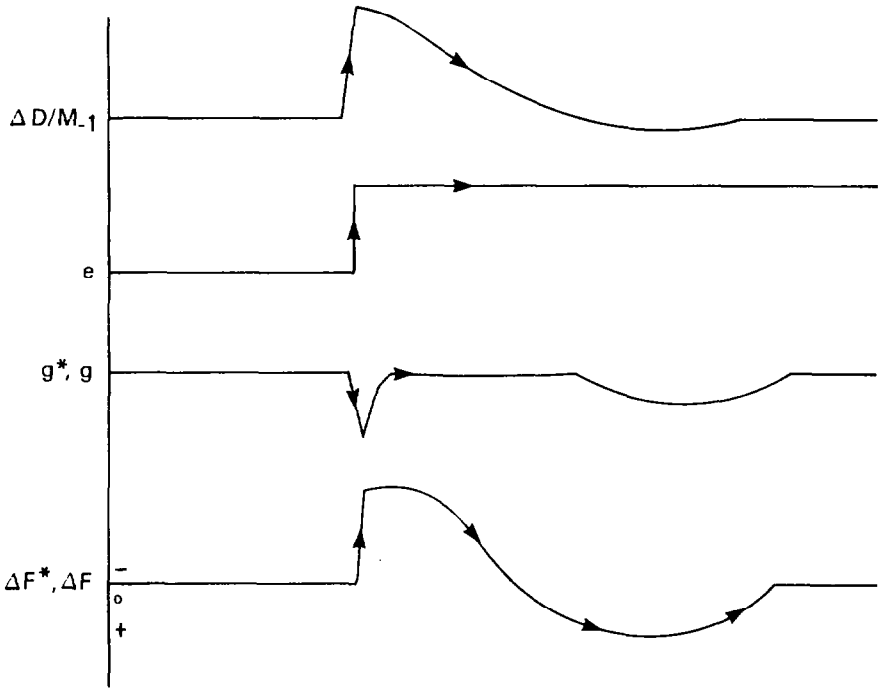


FIGURE 6 (continued)

GROWTH AND THE BALANCE OF PAYMENTS: SOME SCENARIOS

(C) ADEQUATE EXTERNAL FINANCING AND NO CONTROLS



sufficiently to offset eventually the export shortfall and to service the new external debt incurred, without paying the price of a recession. It is essential that the temporary external financing be combined with an adjustment strategy, otherwise the outcome would be simply to push the economy to a point such as c in Figure 5, preventing a recession in the short run, but at the cost of a higher external debt, the future servicing of which further aggravates the initial balance of payments problem. 1/ Panel (C) of Figure 6, illustrates the case where adequate foreign financing is provided to support the exchange rate adjustment. Because of the availability of foreign exchange, a more expansionary domestic credit policy could be temporarily pursued to prevent an excessive recession as a consequence of the initial expenditure reducing effect of the exchange rate adjustment. In terms of Figure 5, the economy's adjustment path would be pushed closer to the new G'G' line, which it follows in the transition to a_1. As the exchange rate effects become more stimulative, the indicated scenario in panel (C) of Figure 6 provides for some subsequent reduction in the amount of credit expansion and of external financing. The balance of payments, which initially was allowed to become negative, moves into surplus so as to repay part of the external financing accommodation, before attaining its long-term equilibrium value.

V. Some Calculations of Credit Ceilings and External Financing Flows

Operating with the basic monetary model, the amount of credit creation that is consistent with a given reserve accumulation target was derived as just the difference between the incremental demand for money and the reserve accumulation target (see equation (5)). For the extended model, the derivation of the appropriate amount of credit expansion and of temporary external financing is more complicated, as the incremental demand for money itself can be affected by the policies pursued, and a number of assumptions need to be clarified. It is assumed at the outset that a real exchange rate adjustment has been made of the magnitude necessary to ensure eventual external balance. 2/ The full relative price effects are assumed to occur over time and involve the cumulation of partial effects in each short-run period in the transition (starting immediately after an exchange rate adjustment).

1/ See Balassa (1986) for a discussion of how inwardly oriented developing economies pursued the latter strategy in response to the two oil shocks. Outwardly oriented developing countries combined prudent recourse to external financing with a policy of depreciating sufficiently in real terms and succeeded in overcoming the contractionary oil related shocks through buoyant exports and efficient import substitution.

2/ If this is not the case, then the analysis is simplified by the absence of the stock adjustment term and the elasticity effects on exports and imports.

The principal short-run instruments for adjusting the macroeconomic outcome are then the amounts of domestic and external credits that are extended.

Rearranging the reduced form solution for the growth rate stated in equation (22)', the amount of credit expansion for a particular interval of time that is consistent with a given target rate of growth g* can be derived as

$$(30)\quad \frac{\Delta D}{M_{-1}} = q + \frac{(1+2q)zv}{1-z} + (1+q)g^*\left(1+\frac{zv}{1-z}\right) - \frac{(1-z(1-v))}{1-z}\left(\frac{P_X X}{M_{-1}} + \frac{E\Delta K}{M_{-1}} - \frac{z\Delta E_\mu}{E_o}\right).$$

This equation solves for the amount of credit expansion given values of parameters, such as the inflation rate q, the import propensity z, velocity v, and values of variables, such as export earnings and foreign capital inflows. If the exogenously given inflation rate is lowered, the amount of credit expansion required to preserve g* is lower as now more of the nominal aggregate demand will be absorbed by output rather than prices. However, a decrease in export earnings or in foreign capital inflows is contractionary and the amount of credit expansion has to increase to preserve the target rate of growth. An exchange rate depreciation, whose assessed stock adjustment effect is contractionary will necessitate a higher credit flow so long as the relative price effect on exports and the import parameter z do not provide full offsets. More credit expansion is also needed if the growth rate target is revised upward, all else remaining unchanged.

Proceeding in a similar manner, the amount of external borrowing that is consistent with a given target balance of payments can be solved from the balance of payments reduced-form equation (25)'.

$$(31)\quad \frac{E\Delta K}{M_{-1}} = \frac{zv}{1-z} + \frac{(1-z(1-v))}{1-z}\frac{E\Delta F^*}{M_{-1}} - \frac{P_X X}{M_{-1}} + \frac{zv}{1-z}\left(\frac{\Delta D}{M_{-1}} - \frac{z\Delta E_\mu}{E_o}\right).$$

According to this equation, a reduction in exports requires proportionately more external borrowing to preserve a given balance of payments target. A reduction in the amount of credit expansion depresses growth but improves the balance of payments, indicating that less external borrowing is required. This is also the case with the contractionary stock-adjustment effect of an exchange rate depreciation that improves the balance of payments. If the target improvement in the balance of payments is revised upward, more external borrowing is required, all else being equal.

The preceding confirms that the two major instruments for short-run policy of domestic and external credit have quite different implications with regard to growth and the balance of payments. From equation (30), for a given growth target there is a negative trade-off between domestic credit expansion and external borrowing.

$$(32) \quad \left| \begin{array}{l} \dfrac{\partial(\Delta D/M_{-1})}{\partial(E\Delta K/M_{-1})} = -\dfrac{(1 - z(1-v))}{1-z} < 0. \\ \\ g = g^* \end{array} \right.$$

However, from equation (31) maintaining a given balance of payments target imposes a positive trade-off between the two instruments.

$$(33) \quad \left| \begin{array}{l} \dfrac{\partial(\Delta D/M_{-1})}{\partial(E\Delta K/M_{-1})} = \dfrac{1-z}{zv} > 0. \\ \\ E\Delta F = E\Delta F^* \end{array} \right.$$

The target preserving trade-off curves are depicted in Figure 7. Given the negative slope of the growth target trade-off line and the positive slope of the balance of payments target line, there is a unique intersection of the two. The instrument values at this intersection ensure the simultaneous attainment of both targets.

To solve for the amount of domestic credit expansion at the intersection point e in Figure 7, substitute the solution in equation (31) for the external borrowing variable into equation (30),

$$(34) \quad \frac{\Delta D}{M_{-1}} = (g^*+q+g^*q) + z\frac{\Delta E\mu}{E_o} - \frac{E\Delta F^*}{M_{-1}} .$$

This solution is similar to that obtained in equation (7) for the basic monetary model. 1/ The only substantive difference is that the effect of the exchange rate adjustment is here weighted by z--the share of foreign goods in the price level. (In the basic monetary model, z equals 1, since by assumption domestic output and foreign output are identical.) The solution for credit expansion of the extended model reduces to that of the basic model, when policies are in place to ensure that the growth rate is at its targeted level. In particular, this requires that an adequate amount of external financing be present.

1/ As was noted earlier, the cross product term g*q should be included in the basic monetary equation to match the derivations under the extended model. The exchange rate induced money-stock adjustment term included in equation (7) is identical to its reformulated counterpart in equation (34).

If, however, the actual net external financing is smaller, say the amount shown as point b in Figure 7, a conflict between the growth and the balance of payments objectives is introduced. It is no longer appropriate to employ equation (34) for calculating the amount of credit expansion (even when amended to include a stock-adjustment term for any contemporaneous foreign exchange depreciation). As was indicated in the preceding section, the solution for the amount of credit expansion will now depend on which of the two targets it is desired to uphold. If the growth target is to be preserved, the amount of credit expansion has to be increased to that implied by point c in Figure 7, rather than e or e'. Quantitatively, the solution for the required amount of credit expansion is obtained by reverting to equation (30), in which the new, lower value of net external finance has been inserted. 1/

Preserving the balance of payments objective requires instead that the amount of domestic credit expansion be reduced to that of point d in Figure 7. Quantitatively, the solution is obtained from equation (31), by inserting the new value for net external financing and solving for the domestic credit variable. This solution requires that the amount of domestic credit expansion be less than that implied by continued reliance on the fundamental monetary equation (34) and is simply a consequence of recognizing that the growth target is no longer attainable.

Should the implications for growth be regarded as too adverse, but the balance of payments constraint cannot be eased through additional external financing (including the effects of any debt rescheduling), the only short-term recourse is to introduce controls so as to reduce the import propensity z. Equations (30) and (31) can be solved for the implied value of z. A corollary is that the greater the degree of liberalization that is sought, the greater the amount of (concessional) external financing that will be required to maintain an acceptable rate of growth.

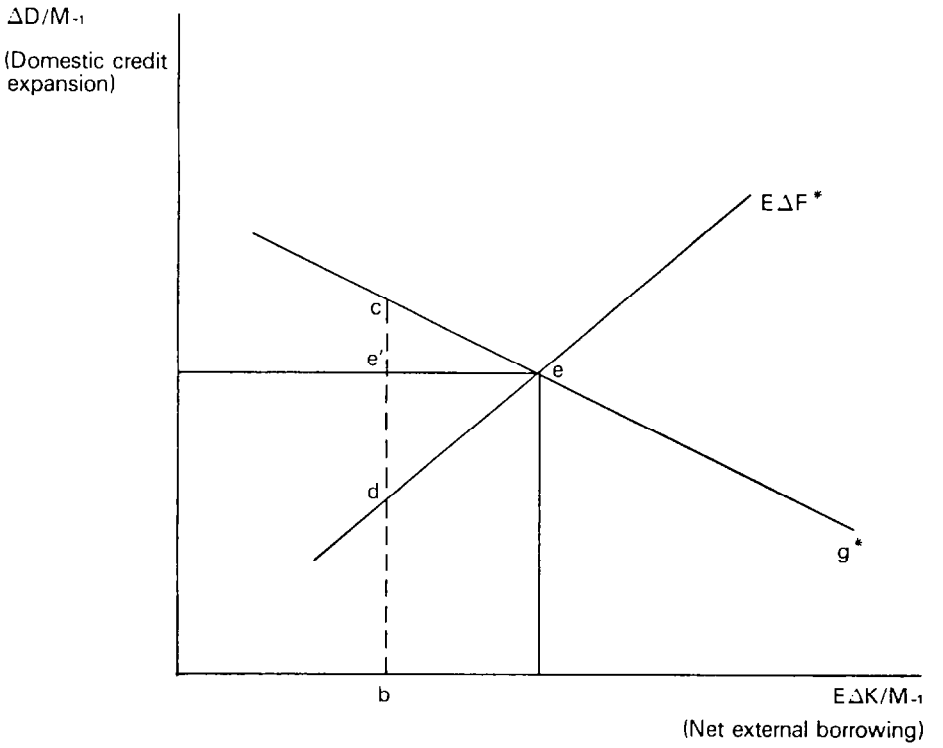
VI. Conclusion

The basic monetary model is a one-dimensional model, in which the focus is on the balance of payments objective. An extended, two-dimensional, generalization of this model was provided in the paper. This permitted an assessment of some aspects of the short-run trade-off between the rate of growth of output and the balance of payments. It also permitted an integrated treatment of adjustments in the real

1/ To this solution must be added credit to provide for the stock-adjustment term generated by a contemporaneous depreciation.

FIGURE 7.

TARGETS AND INSTRUMENTS



exchange rate. Formulas were derived to show the effects of domestic credit expansion and external financing on the output growth rate and on the balance of payments, respectively. The solutions provided differ from those of the one-dimensional model, despite assuming the same demand for money function. Concerning the domestic credit instrument, the solutions indicated that consistency with a given target rate of growth requires that the amount of domestic credit expansion be higher, the greater the degree of exchange rate depreciation and the larger the shortfall in external financing. This, however, would aggravate the balance of payments outcome, and unless additional temporary external financing is made available (to cover the period before the exchange rate adjustments take hold), the country may choose to introduce transitional controls on trade and payments, which is undesirable for global efficiency, or sacrifice its growth objective, which may be politically unacceptable.

The analysis has been developed on the assumption that a short-run stable demand for money function exists. It is, however, conceivable that transactors treat their cash balances as a buffer so as to avoid undue short-run fluctuations in their spending, thereby buying time to make the expenditure adjustments required to maintain a longer-run stable relationship between their money holdings and key variables, such as the level of nominal income. If so, a reduction in domestic credit creation could be offset by drawings from the buffer rather than by a cutting back of expenditure. While this may not be the only explanation of short-run money demand behavior, it is consistent with evidence that the income velocity of money is more volatile in the short run. As was indicated in Section IV, a particular consequence is to modify the formulation of credit ceilings for the short run.

Finally, it should be stressed that the extended model developed in this paper is an intermediate stage model. Further extensions are required to endogenize the inflation rate and longer-run growth processes. The formulations that were derived implicitly assume that appropriate policies are being pursued to ensure that the latter can be treated as exogenous. When analyzing the short run, such assumptions appear more defensible than assuming that the output growth rate is unaffected. But if this were not the case, an analysis of higher dimensionality would be necessary to ensure the attainability of a viable balance of payments, the short-run and long-run growth objectives, and an acceptable rate of inflation.

Mathematical Derivations

To establish the slope of the growth rate target line in Figure 2, differentiate equation (22) to yield:

$$(1)\quad \frac{\partial g}{\partial e} = \frac{-z'v}{(1+q)(1-z(1-v))^2}\left(\frac{\Delta D}{M_{-1}} + \frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}} + 1 - q\right)$$

$$+ \frac{(1-z)}{(1+q)(1-z(1-v))}\left(\frac{P_x X'}{M_{-1}} + \frac{P_x \Delta K}{M_{-1}}\right) > 0$$

where the symbol ' indicates differentiation of a function with respect to its argument. The impact of the real exchange rate increase on the growth rate is unambiguously positive in the long run, provided the inflation rate $q < 1$. This is because only the relative price effects of the real exchange rate depreciation remain. However, in the short run the expenditure and hence growth reducing term $z\frac{\Delta E}{E_o}\mu$ must be netted against the effects shown above and it is possible for $g < 0$.

$$(2)\quad \frac{\partial g}{\partial(\Delta D/M_{-1})} = \frac{1-z}{(1+q)(1-z(1-v))} > 0$$

To establish the slope of the balance of payments equilibrium line in Figure 2, differentiate equation (25) to yield:

$$(3)\quad \frac{\partial \Delta F}{\partial e} = \frac{-1}{e}\Delta F + \frac{M_{-1}}{E}\left[\frac{-z'v}{(1-z(1-v))^2}\left(\frac{P_x X}{M_{-1}} + \frac{E\Delta K}{M_{-1}}\right)\right]$$

$$- \frac{M_{-1}}{E}\frac{z'v}{(1-z(1-v))^2}\left(1 + \frac{\Delta D}{M_{-1}}\right) + \frac{M_{-1}(1-z)}{E(1-z(1-v))}\left(\frac{P_x X'}{M_{-1}} + \frac{\Delta K}{P_x M_{-1}}\right) > 0 .$$

Provided ΔF is negative (the balance of payments is initially in deficit), the above expression is unambiguously positive in the long run. However, in the short run terms appear involving $\frac{\Delta E}{E_o}\mu$ that concern the expenditure reducing effect, which provides some offset. Thus, the favorable impact on the balance of payments of a reduction in the import propensity z is diminished to the extent expenditures are reduced. Such effects are unlikely to dominate the basic direction of improvement in the balance of payments, which is stated here in foreign currency units. Finally,

$$(4)\quad \frac{\partial \Delta F}{\partial(\Delta D/M_{-1})} = -zv\frac{M_{-1}}{E} < 0 .$$

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