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CHAPTER 6 OF

THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS

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The Monetary Approach to Balance-of-Payments Theory[1]

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My purpose in this chapter is to present the main outline of a new approach to the theory of the balance of payments and of balance-of-payments adjustment (including devaluation and revaluation) that has been emerging in recent years from several sources. Concretely, this new approach is to be found on the one hand in the change in policy orientation adopted by the British government under pressure from the International Monetary Fund after the failure of the devaluation of 1967 to produce the expected improvement in the British balance of payments, the theoretical basis for the new orientation being traceable back to the work of the Dutch economist J. J. Koopmans; and on the other hand to the theoretical work of my colleague at the University of Chicago, R. A. Mundell, and his students—though it is only fair to note that economists elsewhere have been working along similar lines. Its essence is to put at the forefront of analysis the monetary rather than the relative price aspects of international adjustment.

To put the new approach in perspective, it is helpful to go back to the origins of balance-of-payments theory in the work of David Hume, and specifically to his contribution of the analysis of the price-specie-flow mechanism. Hume was concerned to refute the concentration of the mercantilists on the objective of accumulating precious metals within the country, and their consequent recommendation of policies designed to bring about a surplus on the balance of payments. His analysis, couched in terms relevant to the

[1] Reprinted from H. G. Johnson, *Further Essays in Monetary Theory* (London, George Allen & Unwin, 1972).

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emerging new approach to balance-of-payments theory, showed that the amount of money in a country would be adjusted automatically to the demand for it, through surpluses or deficits in the balance of payments, induced by the effects on relative national money price levels of excess supplies of or excess demands for money. Hence the mercantilist desire to accumulate 'treasure' was in conflict with the basic mechanism of international monetary adjustment and could only be *ephemerally* successful.

Three points are worth noting about the price-specie-flow mechanism at this stage. Firstly, in contemporary terminology, it assumes (in line with the stylised facts of that time) that all money is 'outside' money (precious metals); i.e. there is no commercial or central banking system capable of creating money not backed by international reserves, domestic money and international reserves being the same thing. Secondly, the mechanism of adjustment focuses on international transactions in goods, as distinguished from securities, a characteristic that has remained dominant in balance-of-payments theory. Thirdly, in the detailed analysis of the mechanism there is a rather awkward compromise between the assumption of a closed and of an open economy, in which it is assumed that domestic prices can vary from purchasing-power parity under the influence of imbalances between money demand and money supply, but that such variations give rise to changes in trade flows which alter the balance of payments and hence the domestic stock of money in the longer run. As we shall see, the new approach to balance-of-payments theory, while basically Humean in spirit, places the emphasis not on relative price changes but on the direct influence of excess demand for or supply of money on the balance between income and expenditure, or more generally between total acquisition and disposal of funds whether through production and consumption or through borrowing and lending, and therefore on the over-all balance of payments.

Hume's analysis ran in terms of an automatic mechanism of international adjustment motivated by money flows and consequential changes in national money price levels. The subsequent elaboration of the theory, up to and partly through the 1930s, retained the general notion of automaticity while adding in the complications required by the existence of credit money provided by commercial banks and of central banking based on partial inter-

national reserve holdings, and by the possibility of attraction or otherwise of international short-term capital movements through international interest-rate differentials. In addition, Cassel contributed the purchasing-power-parity theory of the equilibrium determination of the values of floating exchange rates.

In the 1930s, under the stimulus on the one hand of the collapse of the international regime of fixed exchange rates and the emergence of mass unemployment as a major economic problem, and on the other hand of the Keynesian revolution—which altered the basic assumptions of theory from wage and price flexibility with full employment to wage rigidity with normal mass unemployment—a new approach to balance-of-payments theory emerged, one which viewed international adjustment not as an automatic process but as a policy problem for governments. The key problem, the classic article on which is Joan Robinson's essay on the foreign exchanges, was the conditions under which a devaluation would improve a country's balance of payments. On Keynesian assumptions of wage rigidity, a devaluation would change the real prices of domestic goods relative to foreign goods in the foreign and domestic markets, thereby promoting substitutions in production and consumption. On Keynesian assumptions of mass unemployment, any repercussions of these substitutions on the demand for domestic output could be assumed to be met by variations in output and employment and repercussions of such variations on to the balance of payments regarded as secondary. Finally, on the same assumption, together with the general Keynesian denigration of the influence of money on the economy and concentration on the short run, the connections between the balance of payments and the money supply, and between the money supply and aggregate demand, could be disregarded. Attention was therefore concentrated on the 'elasticity conditions' required for the impact effect of a devaluation—i.e. of the associated change in relative real prices—to be an improvement in the balance of payments. These conditions were, for a simple model with perfectly elastic supplies and initially balanced trade, that the sum of the elasticities of home and foreign demand for imports should exceed unity (the so-called 'Marshall–Lerner condition'); and for more complex models assuming independent elasticities of demands for imports and supplies of exports, a fearfully complex algebraic expression, cumbersome but challenging to derive and explore.

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(Much of the interest in this body of work lay in the related questions of whether a devaluation that improved the balance of payments would necessarily turn a country's terms of trade against it, and increase domestic employment.)

The so-called 'elasticity approach' to devaluation proved demonstrably unsatisfactory in the immediate post-war period of full and over-full employment, owing to its implicit assumption of the existence of unemployed resources that could be mobilised to produce the additional exports and import substitutes required to satisfy a favourable impact effect. Recognition of this by the profession came in three versions. One was carping at the irrelevance of 'orthodoxy theory' (which the elasticity approach really was not), generally associated with the recommendation of exchange controls and quantitative import restrictions as an alternative to devaluation. The second was S. S. Alexander's 'absorption approach', which argued essentially that a favourable effect from devaluation alone, in a fully-employed economy, depends not on the elasticities but on the inflation resulting from the devaluation in these conditions producing a reduction in aggregate absorption relative to aggregate productive capacity. One part of the mechanism that might bring this about in Alexander's analysis is worth mentioning as foreshadowing the new approach to be discussed below; the 'real balance effect', by which the rise in prices consequent on the excess demand generated by devaluation deflates the real value of the domestic money supply and so induces a reduction in spending out of income.

The presentation of the 'absorption approach' as an alternative to the 'elasticity approach' led to considerable controversy and extensive efforts to reconcile the two. The truth lies, however, in recognition that a fully employed economy cannot use devaluation alone as a policy instrument for correcting a balance-of-payments deficit. It must use a combination of devaluation—to obtain an allocation of foreign and domestic demand among domestic and foreign output consistent with balance-of-payments equilibrium—and deflation—to match aggregate domestic demand with aggregate domestic supply. More generally, it must use a proper combination of what I have elsewhere called 'expenditure-reducing' and 'expenditure-switching' policies. This general principle is developed at length in James Meade's classic book on *The Theory of International Economic Policy:*

The Balance of Payments, though it was known before. It constitutes the third, and most useful, version of recognition of the inadequacies of the 'elasticity approach' as well as providing a synthesis between that approach and the 'absorption approach', that is logically satisfactory (though not economically satisfactory from the point of view of the new monetary approach). Unfortunately, Meade presented his analysis in terms of a short-run equilibrium analysis, and on the assumption that the policy-makers understood the theory as well as he did, both of which characteristics made the book extremely inaccessible to policy-makers and may help to account for the bumbling of British demand-management policy after the devaluation of 1967. Also, following the tradition of British central banking and monetary theory, Meade identified monetary policy with the fixing of the level of interest rates, a procedure that automatically excludes consideration of the monetary consequences of devaluation by assuming them to be absorbed by the monetary authorities (this is the reason for the economic objection to the Meade synthesis mentioned above).

Subsequent to the work of Meade and others in the 1950s, the main development in conventional balance-of-payments theory has been the development of the theory of the fiscal-monetary policy mix, following the pioneering contributions of R. A. Mundell. In the general logic of the Meade system, a country has to have two policy instruments if it is simultaneously to achieve internal and external balance (full employment and balance-of-payments equilibrium). In Meade's system, the instruments are demand management by fiscal and/or monetary policy, and the exchange rate (or controls or wage-price flexibility). What if wages are rigid, and controls and exchange rate changes are ruled out by national and international political considerations? A solution can still be found, at least in principle, if capital is internationally mobile in response to interest rate differentials. Fiscal expansion and monetary expansion then have the same effects on the current account, increasing imports and possibly decreasing exports, but opposite effects on the capital account, fiscal expansion increasing domestic interest rates and attracting a capital inflow and monetary expansion having the opposite effect, so that the two policies can be 'mixed' so as to achieve a capital account surplus or deficit equal to the current account deficit or surplus at the level of full employment of the economy. This

extension of the Meade approach has lent itself to almost infinite mathematical product differentiation, with little significant improvement in quality of economic product, and will not concern us further, except to note that theoretical investigation of the model led naturally into the question of what would happen if capital were perfectly mobile, and specifically the implications of this assumption for the ability of the monetary authority to control the domestic money supply.

To recapitulate, the essential structure of what may be termed the standard model of balance-of-payments theory is a Keynesian model of income determination, in which flows of consumption and investment expenditure are determined by aggregate income and demand-management policy variables (taxes and expenditures, and interest rates), and the level of exports and the division of total expenditure between domestic and foreign goods (imports) are determined by the exchange rate which fixes the relative real prices of exports relative to foreign prices and of imports relative to domestic prices. By choosing a proper mix of demand-management policies and the exchange rate, the authorities can obtain full employment consistently with any current account surplus or deficit. The net current account surplus (or deficit) is equal to the excess (or deficiency) of the economy's flow of production over its flow of absorption, or to the excess (or deficiency) of its exports over its imports, or to its net excess (deficiency) of the flow of savings in relation to the flow of investment. By convention, but by no means necessarily, the current account surplus or deficit is identified with the overall balance-of-payments position; it is easy enough to add in the determination of the balance on capital account by the differential between domestic and foreign interest rates, as is in fact done in the theory of the fiscal–monetary policy mix.

The basic assumption on which this system of balance-of-payments analysis rests, and which forms the point of departure of the new 'monetary' approach to balance-of-payments theory, is that the monetary consequences of balance-of-payments surpluses or deficits can be and are absorbed (sterilised) by the monetary authorities so that a surplus or deficit can be treated as a flow equilibrium. The new approach assumes—in some cases, asserts—that these monetary inflows or outflows associated with surpluses or deficits are not sterilised—or cannot be, within a period relevant to policy analysis—

but instead influence the domestic money supply. And, since the demand for money is a demand for a stock and not a flow, variation of the supply of money relative to the demand for it associated with deficit or surplus must work towards an equilibrium between money demand and money supply with a corresponding equilibration of the balance of payments. Deficits and surpluses represent phases of stock adjustment in the money market and not equilibrium flows, and should not be treated within an analytical framework that treats them as equilibrium phenomena.

It should be noted, however, that this criticism applies to the use of the standard model for the analysis and policy prescription of situations involving deficits or surpluses; where the standard model is used for the analysis of the policies required to secure balance-of-payments equilibrium, it is generally not subject to this criticism because by assumption the domestic money market will be in equilibrium. But even in this case the fiscal–monetary mix version of it is open to criticism for confusing stock adjustment in the market for securities, in response to a change in interest-rate differentials between national capital markets, with a flow equilibrium.

In order to obtain flow-equilibrium deficits or surpluses on the basis of stock adjustments in the money market (and also possibly the securities market) it is necessary to construct a model in which the need for stock adjustments is being continuously re-created by economic change—in other words, to analyse an economy or an international economy, in which economic growth is going on. This is one of the important technical differences between the new 'monetary' models of the balance of payments and the standard Keynesian model—and a potent source of difficulty in comparing the results of the two types of analysis.

A further difference between the two types of models is that the 'monetary' models almost invariably assume—in contrast to the emphasis of the standard model on the influence of relative prices on trade flows—that a country's price level is pegged to the world price level and must move rigidly in line with it. One justification for this assumption is that, at least among the advanced industrial countries, industrial competition is so pervasive that elasticities of substitution among the industrial products of the various countries approximate more closely to infinity than to the relatively low numbers implicit in the standard model. Another and more sophisticated justification

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is derivable from the general framework of the monetarist approach, namely that changes in relative national price levels can only be transitory concomitants of the process of stock adjustment to monetary disequilibrium and that in the longer-run analysis of balance-of-payments phenomena among growing economies attention should be focused on long-run equilibrium price relationships—which for simplicity can most easily be taken as constant.

This point has sometimes been put in terms of the positive charge that the standard model rests on 'money illusion', in the sense that it assumes that workers will accept a reduction in their real standard of living brought about by a devaluation which they would not accept in the form of a forced reduction of domestic money wages. An alternative version of this charge is that the standard model assumes that workers can be cheated out of their real marginal product by devaluation. The charge, however, is incorrect: if rectification of a balance-of-payments deficit requires that the domestic marginal product of labour in terms of foreign goods falls, because the price of domestic goods relative to foreign goods must be reduced in the foreign and home markets to induce substitution between these goods favourable to the balance of payments, it requires no money illusion but only economic realism for the workers to accept this fact. Applications of the standard model to the case of devaluation, however, do require the assumption of money illusion if the elasticities of substitution between domestic and foreign goods are in fact high (approximately infinite), and it is nevertheless assumed that wages will remain unchanged in terms of domestic currency. For in this case it is being expected that workers will be content to accept wages below the international value of their marginal product, and that employers will not be driven by competition for labour in the face of this disequilibrium to bid wages up to their marginal productivity levels. The issue therefore is not one of the standard model wrongly assuming the presence of money illusion on the part of the workers, but of its possibly wrongly assuming low elasticities of substitution between domestic and foreign goods—which is an error in empirical assumptions rather than in model construction.

One further difference between the two types of model of balance-of-payments theory is worth noting. Whereas the Keynesian model assumes that employment and output are variable at (relatively)

constant prices and wages, the monetary models assume that output and employment tend to full-employment levels, with reactions to changes taking the form of price and wage adjustments. This difference mirrors a broader difference between the Keynesian and quantity theory approaches to monetary theory for the closed economy. The assumption of full employment in the monetary balance-of-payments models can be defended on the grounds that these models are concerned with the longer run, and that for this perspective the assumption of full employment is more appropriate than the assumption of general mass unemployment for the actual world economy since the end of the Second World War.

I now turn from the discussion of theoretical issues in model construction to an exposition of some monetarist models of balance-of-payments behaviour in a growing world economy. The models to be constructed are extremely simple, inasmuch as they concentrate on the overall balance of the balance of payments, i.e. on the trend of international reserve acquisition or loss, and ignore the composition of the balance of payments as between current account, capital account and over-all balance, as well as the question of changes in the structure of the balance-of-payments accounts that may occur as a country passes through various stages of economic growth. Nevertheless they will, I hope, provide some interesting insights into balance-of-payments phenomena.

To begin with, it is useful to develop some general expressions relating the growth rates of economic aggregates to the growth rates of their components or of the independent variables to which they are functionally related. These can be established by elementary calculus, and are merely stated here. In the formulas, g is the growth rate per unit of time of a subscripted aggregate or variable, A and B are components of an aggregate, $f(A, B)$ is a function of A and B, and η denotes the elasticity of the aggregate defined by the function with respect to the subscripted variable. Then we have

$$g_{A+B} = \frac{A}{A+B} g_A + \frac{B}{A+B} g_B$$

$$g_{A-B} = \frac{A}{A-B} g_A - \frac{B}{A-B} g_B$$

$$g_{AB} = g_A + g_B$$

$$g_{A/B} = g_A - g_B$$

$$g_{f(A,\ B)} = \eta_A g_A + \eta_B g_B$$

(where η denotes an elasticity).

I begin with a discussion of monetary equilibrium in a single country, maintaining a fixed exchange rate with the rest of the world, assumed to be growing over time, and small enough and diversified enough in relation to the world economy for its price level to be the world price level, and its interest rate the world interest rate. (Differentials between domestic and foreign price indices, or between domestic and foreign interest rates, could readily be allowed for, provided they are assumed fixed by economic conditions.) In addition, it is assumed that the supply of money is instantaneously adjusted to the demand for it, because the residents of the country can get rid of or acquire money either through the international market for commodities or through the international securities market. Which mechanism of adjustment of money supply to money demand prevails will determine the way in which monetary policy affects the composition of the balance of payments, but that is a question not pursued in the present analysis.

The consequence of these assumptions is that domestic monetary policy does not determine the domestic money supply but instead determines only the division of the backing of the money supply the public demands, between international reserves and domestic credit. Monetary policy, in other words, controls the volume of domestic credit and not the money supply; and control over domestic credit controls the balance of payments and thus the behaviour of the country's international reserves.

The demand for money may be simply specified as

$$M_d = pf(y, i)$$

where M_d is the nominal quantity of domestic money demanded; y is real output; i is the interest rate or alternative opportunity cost of holding money; p is the foreign and therefore domestic price level; and multiplication of the demand for real balances, $f(y, i)$, by p

assumes the standard homogeneity postulate of monetary theory. The supply of money is

$$M_s = R + D$$

where R is the international reserve and D the domestic credit or domestic assets backing of the money supply. Since by assumption M_s must be equal to M_d,

$$R = M_d - D$$

and

$$g_R = \frac{1}{R} B(t) = \frac{M_d}{R} g_{M_d} - \frac{D}{R} g_D$$

where $B(t) = dR/dt$ is the current overall balance of payments. Letting $r = R/M_s = R/M_d$, the initial international reserve ratio, and substituting for g_{M_d},

$$g_R = \frac{1}{r}(g_p + \eta_y g_y + \eta_i g_i) - \frac{1-r}{r} g_D.$$

Simplifying by assuming constant world prices and interest rates,

$$g_R = \frac{1}{r} \eta_y g_y - \frac{1-r}{r} g_D$$

i.e. reserve growth and the balance of payments are positively related to domestic economic growth and the income elasticity of demand for money, and negatively related to the rate of domestic credit expansion. Simplifying still further by assuming no domestic growth ($g_y = 0$),

$$g_R = -\frac{1-r}{r} g_D$$

i.e. reserve growth and the balance of payments are inversely related to the rate of domestic credit expansion.

These results are to be contrasted with various Keynesian theories about the relation between economic growth and the balance of payments. According to one such theory derived from the multiplier analysis, economic growth must worsen the balance of payments through increasing imports relative to exports; this theory neglects the influence of demand for money on export supply and import demand and on the international flow of securities. According to another and more sophisticated theory, domestic credit expansion will tend to improve the balance of payments by stimulating investment and productivity increase and so lowering domestic prices in relation to foreign prices and improving the current account through the resulting substitutions of domestic for foreign goods in the foreign and domestic markets. This theory begs a number of questions even in naïve Keynesian terms; in terms of the present approach it commits the error of attempting to deduce the consequences of domestic credit expansion from its presumed relative price effects without reference to the monetary aspect of balance-of-payments surpluses and deficits.

Henceforth the analysis will be simplified by assuming that world interest rates are constant, so that the growth of demand for real balances depends only on the growth of real output (the growth of demand for nominal money balances depends of course also on the rate of change of the price level). This assumption can be justified on the grounds that real rates of return on investment are relatively stable, and that money rates of interest in a longer-run growth context will be equal to real rates of return plus the (actual and expected) rate of world price inflation or minus the (actual and expected) rate of world price deflation.

The foregoing model was concerned with one small country in a large world economy. The next model considers monetary equilibrium in the world system as a whole. For initial simplicity it is assumed that there is a single world money, i.e. there is no national credit money supplementing international reserves. This assumption does considerable violence to reality, but it can be rationalised on the assumption that each national economy's domestic banking system can be compressed into a functional relation between its real output and its demand for real international reserves. The essential difference between this model and the preceding one is that the world price level becomes endogenous instead of exogenous, determined by the

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relation between the growth rates of demand for and supply of international reserves.

For the world economy, the growth rate of demand for international money, assuming the homogeneity postulate as before, is

$$g_{Md} = \sum_i w_i \eta_{yi} g_{yi} + g_p$$

where the w_i are initial country shares in the world money supply. Equilibrium requires $g_{Md} = g_{Ms}$, where g_{Ms} is the growth rate of the world money supply. This requirement determines the rate of change of world prices,

$$g_p = g_{Ms} - \sum_i w_i \eta_{yi} g_{yi}.$$

The growth rate of an individual country's holdings of international money (which is also its balance-of-payments surplus, or deficit if negative, as a proportion of its initial reserves) is

$$\begin{aligned} g_{Mj} &= \eta_{yj} g_{yj} + g_p \\ &= \eta_{yj} g_{yj} + g_{Ms} - \sum_i w_i \eta_{yi} g_{yi} \\ &= g_{Ms} + (1 - w_j)\left(\eta_{yj} g_{yj} - \sum_{i \neq j} \frac{w_i}{1 - w_j} \eta_{yi} g_{yi}\right) \\ &= g_{Ms} + (1 - w_j)(\eta_{yj} g_{yj} - \overline{\eta_{yi} g_{yi}}) \end{aligned}$$

where the bar denotes the average product of income elasticity of demand for real balances and rate of growth of real income in the rest of the world, or

$$g_{Mj} = g_{Ms} + \eta_{yj} g_{yj} - \overline{\eta_y g_y}$$

when the bar denotes the average product of the two terms for the whole world economy.

A country will acquire world money (through a balance-of-payments surplus) faster or slower than the rate of world monetary expansion according as the product of its income elasticity of demand

for real balances and its growth rate of output exceeds or falls short of either this average product for the rest of the world or this average product for the whole world including itself. In the latter event it may lose international reserves even though total world reserves are growing.

If for further simplification it is assumed that the growth rate of world reserves is zero, the condition just stated determines whether the country has a surplus or a deficit. If for further simplification the income elasticity of demand for real balances is assumed to be everywhere unity, the expression reduced to

$$g_{M_j} = (1 - w_j)(g_{y_j} - \overline{g_{y_i}}) = g_{y_j} - \overline{g_y}$$

the bars successively denoting the average growth rate in the rest of the world and the average growth rate of the world as a whole, and the country gains or loses reserves according as its real growth rate is greater or less than the world average.

The preceding model aggregated national monetary systems into a demand for international money derived from real output. I now turn to a model in which the world economy possesses an international reserve money, but in which the residents of the various countries demand national monies which are based partly on international money reserves and partly on domestic credit. In the model, the total money supply for the world economy is

$$\begin{aligned} M &= R + \sum_i D_i \\ &= \sum_i w_i r_i M + \sum_i w_i (1 - r_i) M \end{aligned}$$

where R is total international reserve money; D_i is domestic credit in country i; w_i is country i's share in the total world stock of money; and r_i is country i's ratio of international reserve money to its domestic money supply.

As before, the rate of growth of world demand for money is

$$g_{M_d} = \sum_i w_i \eta_{y_i} g_{y_i} + g_p.$$

The rate of growth of the world money supply is

$$g_{M_s} = \sum_i w_i r_i g_R + \sum_i w_i (1 - r_i) g_{D_i}.$$

These two equations determine the rate of change of world prices, through the requirement that $g_{M_d} = g_{M_s}$:

$$g_p = \sum_i w_i r_i g_R + \sum_i w_i (1 - r_i) g_{D_i} - \sum_i w_i \eta_{y_i} g_{y_i}.$$

From previous results, the growth rate of an individual country's reserves is

$$\begin{aligned} g_{r_j} &= \frac{1}{r_j}(g_p + \eta_{y_j} g_{y_j}) - \frac{1 - r_j}{r_j} g_{D_j} \\ &= \frac{1}{r_j}\sum_i w_i r_i g_R + \frac{1}{r_j}\sum_i w_i (1 - r_i) g_{D_i} + \frac{1}{r_j}\eta_{y_j} g_{y_j} \\ &\qquad - \frac{1}{r_j}\sum_i w_i \eta_{y_i} g_{y_i} - \frac{1 - r_j}{r_j} g_{D_j} \\ &= \frac{1}{r_j}\{\sum_i w_i r_i g_R + (\eta_{y_i} g_{y_j} - \overline{\eta_y g_y}) - [(1 - r_j) r_{D_j} - \overline{(1 - r) g_D}]\} \end{aligned}$$

where the bars again indicate the average product of the barred terms for the world economy.

This expression indicates that a country's reserves will grow faster the lower its initial reserve ratio, the faster the growth of total world reserves, the higher its income elasticity of demand for money and its real growth rate relative to other countries, and the lower its international reserve ratio and rate of domestic credit expansion relative to other countries.

Simplifying by assuming that income elasticities of demand for money are everywhere unity, and that international reserve ratios are also the same everywhere, we obtain

$$g_{R_j} = g_R + \frac{1}{r}(g_{y_j} - \overline{g_y}) - \frac{1 - r}{r}(g_{D_j} - \overline{g_D})$$

which shows that the growth rate of a country's reserves will on these assumptions tend to be faster than the world average if its real growth rate is greater than the world average, and slower than the

world average if its rate of credit expansion is greater than the world average, and vice versa.

An alternative approach in this model is to formulate the money supply for the world in terms of the ratio of international reserves to total money stock r, initial shares in international reserves s_i, and initial ratios of domestic credit to reserves d_i. (Note that $r = 1/(1 + d)$, where d is the ratio of credit to reserves.) Then

$$M = \sum_i s_i R + \sum_i d_i s_i R$$

$$g_{M_d} = \sum_i s_i (1 + d_i) \eta_{y_i} g_{y_i} + g_p$$

$$g_{M_s} = r(g_R + \sum_i d_i s_i g_{D_i})$$

$$g_p = r(g_R + \sum_i d_i s_i g_{D_i}) - \sum_i s_i (1 + d_i) \eta_{y_i} g_y$$

$$\begin{aligned} g_{R_j} &= (1 + d_j)(g_p + \eta_{y_j} g_{y_j}) - d_j g_{D_j} \\ &= (1 + d_j) r g_R + [(1 + d_j) \eta_{y_j} g_{y_j} - \sum_i s_i (1 + d_i) \eta_{y_i} g_{y_i}] \\ &\qquad - [d_j g_{D_j} - (1 + d_j) r \sum_i d_i s_i g_{D_i}] \\ &= (1 + d_j) r g_R + [(1 + d_j) \eta_{y_j} g_{y_j} - \sum_i s_i (1 + d_i) \eta_{y_i} g_{y_i}] \\ &\qquad - \left[d_j g_{Dj} - \frac{1 + d_j}{1 + d} \sum_i d_i s_i g_{D_i} \right]. \end{aligned}$$

This alternative formulation, which will not be explored further here, naturally produces the same qualitative results as the one presented above.

The next stage in making the 'monetary' model of balance-of-payments behaviour more realistic is to introduce a reserve-currency country whose currency is held as a substitute for the basic international money. The interesting problem in this case is the behaviour of the reserves of the reserve-currency country. The total world

money supply is as before the sum of reserves and domestic credit created by the individual countries; but the reserve-currency role enables the reserve-currency country to induce other countries to hold its domestic money, backed by its own domestic credit, instead of or in addition to providing their own money by domestic credit creation.

As before we have

$$g_{M_i} = \sum_i w_i r_i g_R + \sum_i w_i (1 - r_i) g_{D_i}$$

$$g_p = \sum_i w_i r_i g_R + \sum_i w_i (1 - r_i) g_{D_i} - \sum_i w_i \eta_{y_i} g_{y_i}.$$

But now the behaviour of the reserve currency country's reserves is determined by the relation between the growth of both foreign and domestic demand for its money, and its domestic credit expansion. Assuming homogeneity in money demand still,

$$g_{R_j} = \frac{1}{r_j} [g_p + h\eta_{y_j} g_{y_j} + (1 - h) g_f] - \frac{1 - r_j}{r_j} g_{D_j}$$

where h is the proportion of the reserve currency country's currency held by residents and g_f is the rate of growth of foreign demand for its money as a reserve currency, in real terms.

$$g_{R_j} = \frac{1}{r_j} [(1 - h) g_f + \sum_i w_i r_i g_R + (h\eta_{y_j} g_{y_j} - \overline{\eta_y g_y})] -$$

$$- [(1 - r_j) g_{D_j} - \overline{(1 - r) g_D}].$$

If the real foreign demand for the reserve country's currency is assumed to be a constant proportion of the foreign money supply, the expression simplifies to

$$g_{R_j} = \frac{1}{r_j} [\sum_i w_i r_i g_R + h(\eta_{y_j} g_{y_j} - \overline{\eta_y g_y})] - [(1 - r_j) g_{D_j} - \overline{(1 - r) g_D}].$$

Assuming unitary income elasticities of demand for real balances

everywhere and the same initial ratios of international reserves to domestic money, it simplifies further to

$$g_{R_j} = g_R + \frac{h}{r}(g_{y_j} - \overline{g_y}) - \frac{1-r}{r}(g_{D_j} - \overline{g_D}).$$

That is, the reserve currency country will gain reserves faster than the rate of growth of total reserves if its real growth rate exceeds the world average or its rate of domestic credit expansion is below the world average, and vice versa.

An alternative formulation of the problem, using the same two assumptions for simplicity, is to ask what rate of growth of foreign holdings of the reserve currency is necessary to enable the reserve currency country's reserves to grow at the world rate. The answer is

$$g_f = \frac{1}{1-h}[(1-r)(g_{D_j} - \overline{g_D}) - (hg_{y_j} - \overline{g_y})].$$

That is, foreign demand for the reserve currency must grow faster, the faster the reserve currency country's rate of domestic credit expansion relative to the rate of credit expansion abroad and the slower its real rate of growth relative to the real world growth rate.

Finally, I apply the general class of monetary models of the balance of payments developed above to the problem of the effects of a devaluation of a currency. The application is not entirely theoretically satisfactory, since the mathematics employed relate to continuous change whereas a devaluation is a once-over affair. Still, the results are suggestive.

For this problem, retain the assumption that domestic prices must keep in line with foreign prices, but introduce an exchange rate that can be changed, representing devaluation by an instantaneous rate of change of the exchange rate. The demand for money now becomes

$$M_d = \rho\, p_f f(y, i)$$

where p_f is the foreign price level and ρ is the price of foreign currency in terms of domestic. The rate of growth of reserves then becomes

$$g_R = \frac{1}{r}(g_p + g_{p_f} + \eta_y g_y + \eta_i g_i) - \frac{1-r}{r} g_D.$$

(Note that this formula reintroduces the interest rate as a determinant of the demand for money; for analysis, g_i may be interpreted as an expected rate of change of the money interest rate.)

There are several points to notice about the formula, with specific reference to the British devaluation of the pound in 1967 and the initial failure of that devaluation to improve the balance of payments.

Firstly, aside from the scale factor $(1 - r)$, devaluation is equivalent to domestic credit contraction; its function is to deflate domestic real balances and thereby to cause domestic residents to attempt to restore their real balances through the international commodity and security markets.

Secondly, since devaluation is a one-shot affair, it can be only a transitory factor for improvement in the balance of payments. Lasting improvement can only be achieved via a decrease in the rate of domestic credit expansion.

Thirdly, the beneficial transitory effects of devaluation on reserves and the balance of payments can be offset or neutralised by any one or more of the following developments: (i) an increase in the rate of domestic credit expansion, which the authorities may allow either unwittingly or as a consequence of efforts to hold down interest rates on government debt; (ii) a fall in the growth rate (though this requires modifying the model to allow unemployment, which may be induced by deflationary official policies or by lags in the adjustment of production to demand); (iii) a rise in interest rates inducing a fall in the demand for real balances relative to income: here interest rates have to be interpreted to include the expected money rate of return on holdings of goods, which may be expected to rise temporarily as a consequence of devaluation and the inflationary expectations generated by it.

It may be noted in passing that the equation for devaluation can be converted into an equation for the motion of a freely floating exchange rate as a function of policy variables, as follows:

$$g_p = rg_R + (1 - r)g_D - g_{Pf} - \eta_y g_y - \eta_i g_i.$$

The monetary models of the balance of payments surveyed in this chapter are long-run models, inasmuch as they assume full employment of resources and the necessity for domestic price levels to keep

in line with the world price level. The Keynesian model with which they have been contrasted applies to a shorter run in which these assumptions do not necessarily, or commonly, hold. The Keynesian model has become the basis for policy-thinking and policy formulation. The monetary models suggest that it may be very misleading to rely on the Keynesian model as a guide to policy-making over a succession of short periods within each of which the Keynesian model may appear to be a reasonable approximation to reality.

ADDENDUM

The formulas presented in the text can be applied to a number of other problems than those mentioned, simply by rearranging terms. Thus, if a small country in an open international economy wishes to maintain a certain balance-of-payments surplus (growth rate of reserves), it must control the growth rate of domestic credit according to the formula

$$g_D = \frac{1}{1-r}(g_p + \eta_y g_y + \eta_i g_i - r g_R^*)$$

where g_R^* is the desired growth rate of reserves.

Similarly, in a world economy without a reserve-currency country, if there is an international monetary authority that has control over the growth of world reserves, and it seeks to maintain world price stability, the formula it must follow (assuming stability of interest rates) is

$$g_{MS}^* = \sum_i w_i \eta_{y_i} g_{y_i}.$$

Note that this formula will not imply a constant growth rate of world reserves over time, if income elasticities of demand for money, or growth rates of real output, vary among countries.

The formula is still more complex if the fractional-reserve character of domestic money supplies is allowed for, being

$$g_R^* = \frac{\sum_i w_i \eta_{y_i} g_{y_i} - \sum_i w_i (1 - r_i) g_{D_i}}{\sum_i w_i y_i}.$$

Note that the presence of a reserve-currency country does not affect this formula; however, it affects the empirical value of it indirectly through the effects of reserve-currency status on the willingness of the reserve-currency country to expand domestic credit, and the possible desires of other countries to expand domestic credit in order to avoid accumulating excess stocks of the reserve currency.

Finally, for a country on a floating exchange rate, the movement of the exchange rate over time is related to domestic credit expansion and exchange-market intervention intended to (or having the effect of) altering the country's international reserves by the formula

$$g_\rho = rg_R^* + (1 - r)g_D^* - g_{Pf} - \eta_y g_y - \eta_i g_i.$$

(The last term should probably be dropped, as a transitional factor.)

Note. Arturo Brillembourg has pointed out to me an implicit assumption in the analysis of the effects of devaluation presented above, namely that the capital gains on the domestic value of international reserves are sterilized and have no effect on the money supply. For the longer run it would be more reasonable to assume that these gains are lent or transferred to the government and spent. In that case, $M_S = R + D$, $r = \frac{\rho R}{\rho R + D}$, and $g_R = \frac{1 - r}{r}(g_\rho - g_D) + \frac{1}{r}(\eta_y g_y + \eta_j g_j + g_p)$. This formulation brings out more clearly than mine the symmetry between devaluation and domestic credit contraction, since there is no 'scale factor' as in my analysis. In this case

$$g_\rho = \frac{1}{1 - r}(\eta_y g_y + \eta_j g_j + g_p) - \frac{r}{1 - r} g_R - g_D,$$

in which equation the movement of the exchange rate can be thought of as determined by the authorities' desired rate of growth of reserves g_R. In a truly floating rate case, r goes to zero and $g_\rho = \eta_y g_y + \eta_j g_j + g_p - g_D$.