

On the Selection of a Program of Economic Policy with an Application to the Current Situation in the United States

I

The separate listing of targets (objects of policy), and instruments (vehicles of policy) has proved to be of considerable help in testing the consistency of systems of economic policy. To achieve a given target there must be an effective instrument and to achieve various independent targets there must be, at least an equal number of effective instruments. If a program includes more targets than instruments at least one target cannot be fully attained; whereas if it contains more instruments than targets, there will be more than one way of achieving the combination of targets. Just as a mathematical system will be "overdetermined" or "undetermined" if the number of variables differs from the number of equations, so a policy system will not generally have a unique attainable solution if the number of targets differs from the number of instruments. This reflects the rule made famous by Timbergen (1) and it is of fundamental importance in the selection of a consistent policy system.

Matching the number of instruments and targets is not of course, a sufficient guide for policy. In the first place, instruments must be *effective* in the sense that they are capable of influencing to the necessary degree the target variable. An increase in a tariff that is already prohibitive, for example, cannot affect imports at all, while a tax on peanuts, although it may affect peanut production, would exert no important influence on the general level of effective demand. "Effectiveness", moreover, is partly a matter of

degree: an increase in the discount rate may be effective in reducing the volume of credit up to the point where banks no longer borrow but it would not be effective beyond it unless the banks were forced into the Central Bank by other instruments (e.g., open market operations).

Consistency also requires that targets and instruments be mutually *independent*. For example, full employment and maximum output could not be considered independent targets if there is a unique functional relationship between the level of employment and of output, just as an adjustment of the exchange rate and certain applications of tariffs and export subsidies could produce equivalent effects on output and on the balance of payments.

The distinction between targets and instruments, moreover, is neither entirely unambiguous nor obvious. In Dr. Polak's apt phrase, targets refer to variables for which we care, instruments to those for which we do not care (2). But it is not easy to decide which variables we in fact care about. Nowadays, most people do not "care" about a change in the interest rate *per se* except insofar as it affects output or prices or the balance of payments, though this was not true in many countries immediately after the war; in the United States, for example, before the "Accord" of 1951 between the Treasury and the Federal Reserve (which permitted interest rates to rise), a prime object of Treasury policy was to defend the price of bonds. The same can be said for the exchange rate; thus, in 1925, some people in Britain "cared" about the traditional value of the pound sterling, while others (like Keynes) did not. Most people today do not "care" about the particular gold or foreign exchange value of a currency *per se*, although they do care, and strongly, that the gold value — whatever it happens to be — remain unchanged. "Defense of the dollar" is a much (or more) a part of U.S. policy today as "defense of the bond price" was in the early post-war period.

The difficulties of classification arise partly because targets and instruments are "hierarchical" in structure. Like the imputation view of production in which inputs produce outputs that turn out to be only inputs at a higher stage in the hierarchy, the structure

(1) See, for example, *On the Theory of Economic Policy* (Amsterdam, 1952), Chapter V.

(2) J. J. POLAK, "International Coordination of Economic Policy", *IMF Staff Papers*, IX, 2 (July 1962), p. 151.

of a policy system includes instruments for the attainment of targets that are themselves only instruments on another level. Certainly the achievement of balance of payments equilibrium, or of a particular level of foreign reserves, and even maximum output and employment are only instruments for attaining higher welfare targets. There is also a sense in which the interest rate, the money supply and the price level are simultaneously instruments and targets.

It really depends on the vantage point from which one views economic (or social) reality. A telephone call from the governor of a central bank may be the « instrument » while « the target » is an open market operation of the central bank; this, in turn, is the instrument for the achievement of a certain target level of bank reserves. Subsequently the latter is the instrument for attaining a certain level of interest rates or credit, a given degree of ease or tightness in the market and, on a still higher stage, a prescribed level of effective demand. The latter is in turn the « instrument » used to stimulate given output and employment targets.

What is a target for one set of persons is an instrument for another; a certain degree of monetary expansion may be the target of a particular central bank technician, but it would be regarded by his superior as an instrument for attaining full employment. The hierarchial structure of economic policy processes is thus flanked by a parallel bureaucratic structure controlling the links within the process.

But an overall view is necessary. Fiscal experts in the Treasury have to evaluate the general effects of tax changes while monetary experts of the Central Bank should understand the relationships between money, velocity of circulation, interest rates and employment; all must have some knowledge of the influences of their policies on the balance of payments. But at a certain stage, when a dilemma of importance arises, there is the problem of selecting a program after examining the full gamut of policy alternatives. This usually requires some generalized knowledge of the degrees of effectiveness of different policy prescriptions.

It will be found in most cases that each instrument influences all target variables, though the *relative* impact of a given set of instruments on a certain pattern of targets, if they are independent, will nevertheless be different. A useful guide which can be used in this connection, is what I have called elsewhere the *Principle of*

Effective Market Classification (3), according to which an instrument should be matched with the target on which it exerts the greatest relative influence. The application of this rule, which takes into account the fact that « comparative advantages » of instruments are different with respect to different targets, reduces the unfavourable side effects of policies and hence minimizes the magnitude of the adjustments that must be made when an instrument is « attached » to a target which is not appreciably out of equilibrium.

In the final stages of policy-making, however, qualitative information alone is generally not sufficient. In order to decide which sets of policy responses are likely to be appropriate, some judgement about the likely magnitude of the required adjustment is necessary. It would be unusual, for example, if a country considering devaluation of its currency were to be entirely indifferent to the magnitude of the devaluation required; this judgement requires at least a crude estimate of the elasticities involved and of the income effects. Similarly, an expansive fiscal policy might be under consideration, but it may be known in advance that limitations exist as to the permissible size of budget deficits. The degree of effectiveness of fiscal policy will play an important role in the decision to use fiscal policy at all.

What this means is that there are either institutional barriers to the free adjustment of particular instruments or that, after a point the instrument itself becomes a target or at least impinges on other targets that have not been explicitly taken into account. Variations in interest rates, for example, may be entirely permissible within some ranges but not in others, just as in the present system of international payments, free adjustment of exchange rates is permissible within the one per cent margin on either side of parity but not outside this margin — except in unusual cases.

Accordingly, before a policy program is formulated in its final stages there must be preparatory quantitative work examining the effectiveness of various instruments in order to establish if the extent of the adjustment needed is within the realm of political possibility. Otherwise, alternative methods must be sought.

(3) "The Monetary Dynamics of International Adjustment Under Fixed and Flexible Exchange Rates", *Quarterly Journal of Economics*, LXXIV (May 1960), p. 250.

II

An attempt is made below to illustrate some of the above precepts and to elucidate some of the problems likely to be encountered in pursuing two "targets" that have become recognised as extremely important in the post-war years: "full employment without inflation" and "balance of payments equilibrium".

It will be apparent at the outset that the mere specification of these goals as "targets" involves a great deal of ambiguity and implicit assumptions about the economic system. In the first place, the expression "full employment without inflation" seems to involve *two* targets, rather than one, since the attainment of full employment is certainly different from the attainment of price stability. Post-war literature has, however, frequently assumed that an increase in effective demand leads to an expansion of employment and of output up to the point of full employment; further increases will cause inflation. The underlying implicit assumption is that the aggregate supply curve, reflecting the marginal costs of firms (if competition is allowed), is perfectly elastic up to the point of full employment, and completely inelastic after that point. This assumption is not generally satisfied in reality, firstly because of diminishing returns at constant wage rates, and secondly because wage rates, determined through the collective bargaining process, are influenced by the level of activity because "bargaining power" shifts back and forth between management and labor as economic activity contracts or expands. But in extreme cases — high unemployment or rapid price increases — it is usually not difficult to determine whether inflation or unemployment is the major problem, and therefore in which direction the authorities should try to push aggregate demand. For this reason there is some justification for lumping full employment and stable prices together as a single target, provided that it is recognised as an approximate description of a set of very complicated economic facts.

A more serious problem with the target of "full employment without inflation" relates to its closed-economy connotation. If one is dealing with a closed economy (such as the world as a whole or — to a lesser extent — the Soviet or non-Soviet bloc) a stable price level is not an unreasonable practical goal. As the closed economy expands the increase in real income can be distributed through wage

increases more or less in line with productivity growth (maintaining reasonable price stability) or through falling prices also in line with productivity growth (maintaining constant money wages, but growing real wages). Economic theory has never demonstrated adequately which of these two methods is better in a world of flexible wages and prices. But since a fact of life at the present time is the existence of some degree of wage and price rigidity, economists all over the world typically prefer a system of expanding wages and constant prices.

For a single economy facing the rest of the world, however, it is far from clear that price stability should be treated as a goal. If it means stability of a price index of home-produced goods it means, literally interpreted in a world of fixed exchange rates, no possibility of *relative* price changes in the world as a whole. If the prices of German goods, Italian goods, Indian goods and American goods are all stabilized, then the international price mechanism cannot function at all under fixed exchange rates. It is clear, therefore, that the goal of price stability must be very cautiously interpreted in an international context. If an implicit goal is a system of fixed rates of exchange, what is required is differential rates of inflation between countries; surplus countries should let prices go up while deficit countries should either prevent them from going up or let them fall, depending on how the "burden of adjustment" is agreed to be divided.

There appear to be even greater ambiguities connected with the target of "balance of payments equilibrium". The balance of payments reflects the budget of the community as a whole; after netting out home-produced and -consumed goods, and home-issued and -bought securities, the "balance" is the difference between the values of the goods and securities sold and bought abroad. The balance must be settled in money acceptable to foreign central banks — gold or liquid assets. Strictly speaking, a balance of payments deficit does not *per se* cause any discomfort. The man-in-the-street does not care about a balance of payments deficit. Discomfort arises from the actions that a dwindling level of foreign reserves will necessitate. The man-in-the-street will care about these actions insofar as they must affect him directly or indirectly.

To an extent, therefore, it is stocks rather than flows that people do worry about, and should worry about. The balance of payments is a flow over time which, when added up from a certain

date, changes the *stock* of foreign reserves. In turn, significant changes in the stock of reserves will induce discomfort. If reserves begin to accumulate rapidly the country will realize that it is investing too large a portion of its savings in an asset which yields no return (e.g., gold or creditor position at the IMF) or only a small return (e.g., foreign exchange balances). And if reserves get too low the country will be placed at the mercy of foreign private speculators or central banks or else be forced into precipitous action at inopportune times. Reaction to excessively low reserves is, of course, usually more rapid than reaction to unnecessarily high reserves.

There is an analogy in this to the budget of the government. Economists have become accustomed to regard the budget deficit — as it altered through changes in taxes or government spending — as an instrument of policy. The man-in-the-street has no objections to budget deficits, but he has, in many countries, strong objections to increases in the public debt, arguing rationally or otherwise by analogy with his own budgetary problems as an individual. Of course the rub is that the budget deficit always leads to an increase in the public debt. But again the discomfort is produced by the stock of outstanding debt rather than by the flow of the deficit over time. In the same way individuals, as public citizens, would be worried about an excessive accumulation of external debt rather than about the position of the balance of payments over time.

Related to the importance of stocks of reserves is a problem concerning the consistency of domestic decisions in relation to the rest of the world. Under one definition of the over all balance of payments position — a perfectly symmetrical definition — the sum total of the balances of payments of all countries in any one period of time is zero, so that there is no inconsistency if every country aims for a precise balance at all points in time. But as a practical matter an asymmetrical definition of the balance of payments position is generally used. If gold were the only type of international reserve, the sum of the external positions of all countries would add up to the amount of new gold finding its way into the monetary reserves of the central banks. This is because South Africa and other gold-producing countries treat the export of gold just like any other commodity export, while the import of gold into the coffers of central banks is excluded from ordinary imports. For this reason

it is possible for each and every country to have a balance of payments surplus when monetary gold holdings of the world are increasing, which is the case whenever gold production exceeds the current use of gold for the arts and for private hoarding.

This does not imply consistency in the targets of each country; since the external surpluses planned by all countries — as they attempt to let reserves grow with trade — may add up to more than the net accretions of gold into monetary reserves. (This, of course, is the crux of the liquidity problem of the present decade: most countries desire a balance of payments surplus to finance a level of desired reserves growing at a faster rate than actual reserves; the demands of all countries cannot in this way be satisfied thus threatening progressive contractionary policies). Every country cannot have a surplus of an arbitrary size since the sum of the surpluses is limited to the growth of gold reserves.

There are additional reasons, based on accounting practices, why the balances of payments of all countries do not sum to zero. Countries do not all follow the same practice in recording various transactions in the balance of payments. Thus, a deposit by German commercial banks in New York would be counted in the U.S. as an item *financing* a U.S. deficit, but there would be no offsetting surplus in German accounts, since the transaction would be treated in Germany as a capital outflow. These are technical questions of definition, but they have real significance insofar as policy becomes conditioned to particular accounting practices (4).

The ambiguities do not end with problems of asymmetries in the definition of the balance of payment position. Discomfort is provided by a bad *composition of the balance*. Thus, there was a sense in which Canada had a continuing external equilibrium during the period 1950-62 when the exchange rate was, in varying degrees, flexible. But the composition of the balance, achieved through an import surplus financed by capital inflows from the United States, was a source of considerable worry. What is involved here is an additional goal implicit in the system: the level of the net external indebtedness. Increasing indebtedness causes discomfort because it introduces present feelings of future insecurity. Just as the composi-

(4) For a review of the major asymmetries see POUL HØST-MADSEN, "Asymmetries Between Balance of Payments Surpluses and Deficits", *IMF Staff Papers*, July 1962, pp. 182-201.

tion of output is important (the division of output between investment and consumption affects additional growth targets) so an appropriate composition of the balance of payments is a matter of proper concern for policy.

III

Despite the ambiguities attendant upon specification of the targets of full-employment-without-inflation and balance-of-payments equilibrium, they remain useful concepts. To show how they can be attained through various conventional policy measures, simple graphical devices can be useful. One device is to use the axes of a diagram to represent the targets (Figure 1).

The discrepancy between actual income (Y) and full employment income (Y_0) is plotted in Figure 1 below on the vertical axis; the difference between the actual (F) and the desired balance of payments position (F_0) is plotted on the horizontal axis. At all points along the vertical line the balance of payments is in equilibrium and at points along the horizontal line there is internal stability. At the intersection of the two axes there is both full employment and external equilibrium; it is toward this point that the object of policy is to strive.

Any point away from the origin indicates failure to achieve the targets. In Quadrant I there is over-employment and external surplus; in Quadrant II there is over-employment and external deficit; in Quadrant III there is under-employment and external deficit; and in Quadrant IV there is under-employment and external surplus. Quadrant IV reflects the situation of the United States during the 1930's; Quadrant I that of the Common Market countries, with the exception of Italy (Quadrant IV), in recent years; Quadrant II describes the situation prevailing in the U.K. and Japan until recently; and Quadrant III that of the United States since 1953 and, especially, since 1958 (5).

Figure 1 also describes the effects of three instruments on the targets. Beginning from the origin, consider the effects of a change

(5) See my "The International Disequilibrium System", *Kyklos*, No. 2, 1961; and also J. VANEK, *International Trade: Theory and Economic Policy* (Homewood, 1962), Chapter 17, for analogous treatment.

in the exchange rate. If the exchange rate is devalued there will be a tendency for the balance of trade and payments to improve and for income to increase, the extent of the changes depending

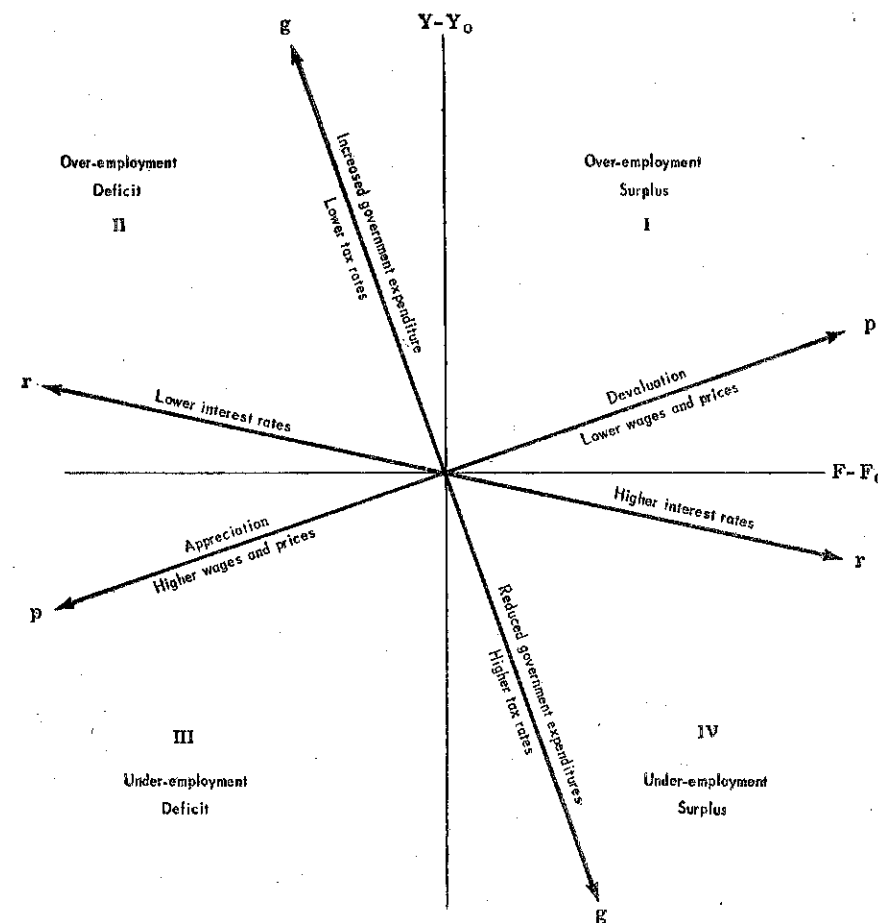


Figure 1

upon the elasticity of the trade balance and on the multipliers at home (and abroad if repercussion effects are taken into account). From the origin, therefore, devaluation of the exchange rate will move the situation in a north-easterly direction (and therefore into Quadrant I), the extent of the movement being more or less pro-

portionate to the size of the depreciation (6). Similarly, an appreciation of the exchange rate should worsen the balance of trade and payments, and lower income, moving the situation from the origin into Quadrant III.

Wage-price changes will have effects similar to that of exchange rate adjustment (7). A fall in money wages and prices will improve the balance of trade and therefore increase output while a rise in money wages and prices will worsen the balance of trade and lower output. Wage-price increases act like currency appreciation and wage-price decreases have effects similar to currency depreciation.

Budgetary policy will tend to move income and the balance of payments along a line like *gg*. Beginning from the origin, an increase in general tax rates or a decrease in government expenditure will lower the level of internal demand for both home goods and foreign goods, simultaneously reducing income and improving the balance of payments. In a similar way an increase in government expenditures or a reduction in taxes will increase income and worsen the balance of payments (8).

Interest rate policy — like budgetary policy — will move income and the balance of payments in opposite directions, but in a different ratio, as the *rr* line indicates. An increase in interest rates (effected by a reduction in the money supply) will lower expenditure and thus reduce income and improve the balance on goods and services, much as do increases in taxes or decreases in government spending, but it will also attract capital from abroad and thus have an additional effect on the balance of payments. This means that

(6) Strictly speaking the lines must break at the origin with different slopes in the over-employment segment as compared with the underemployment part, partly because price changes have different effects than output changes on effective demand and partly because employment changes are reversible while price changes are often possible in one direction only.

(7) The effects will not, however, be identical because those of devaluation on income distribution and in the monetary sphere are likely to differ from those of wage reduction.

(8) The slopes of the lines reflecting changes in taxes or government expenditures will, of course, be influenced by the division of the effects between home goods and foreign goods. When general policy measures are under consideration it is usually convenient to assume that the tax or expenditure changes are "neutral" in the sense that they affect imports and home goods in the same proportion as any change in income. But if the authorities are willing to direct their changes in spending in arbitrary ways away from or on to foreign goods (*e.g.*, changes in military expenditures abroad relative to those at home) or to modify any tax rates regardless of their impact on other implicit targets, virtually the whole of the northwest and southeast quadrants can be mapped out with lines corresponding to the implied policy vector.

the slope of the *rr* line, expressing interest rate policy, will be less steep than the slope of *gg* line. Interest rate policy can thus be thought of as possessing a "comparative advantage" relative to budgetary policy (9) in affecting the balance of payments.

A variety of other instruments could be explicitly taken into consideration. Tariffs or export subsidies (on price-elastic exports) tend to move income and the balance of payments in the same direction; the import restriction or export promotion line has, like devaluation, a positive slope. But the three general policies considered are sufficient to illustrate the main principles.

Figure 2 (which duplicates the essential of Figure 1) can be used to demonstrate alternative means of reaching, or approaching, equilibrium. First, it can be shown that a single instrument is normally insufficient to attain two targets. Consider any point in the diagram that is not on one of the three policy lines, let us say the point *Z* in the overemployment-surplus quadrant. The country wants to reduce overemployment and to eliminate its balance of payments surplus. It will at once reject devaluation as a policy because that increases disequilibrium in both targets. Budget deficits would reduce the surplus but aggravate overemployment, while budget surpluses would reduce overemployment but aggravate the external surplus. The same is true (though in different ratios) for lower or higher interest rates. The obvious policy seems to be currency appreciation or an increase in the price level since this would lead to a reduction of both overemployment and of the external surplus near *Z*. But even this policy will not normally be sufficient to restore complete equilibrium. A relatively small exchange rate appreciation (in the diagram) will restore external stability, but it would require a larger appreciation to eliminate the inflationary pressure, as may easily be seen by extending the "appreciation line" from *Z* (a point like *B* on the *y* axis would result). No single policy can restore both internal and external stability. The only exception is when the point of disequilibrium falls precisely on one of the major policy lines.

When two instruments are used, equilibrium can always be attained in principle, though it may require very powerful applications of the instruments. Consider, for example, the situation (under-

(9) This point is treated more fully in my "The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability", *IMF Staff Papers*, March 1962.

employment and deficit) at the point *A*. Devaluation (or a fall in the domestic price level) sufficient to move from *A* to *Q₂* (which is a situation of underemployment and of external surplus) would

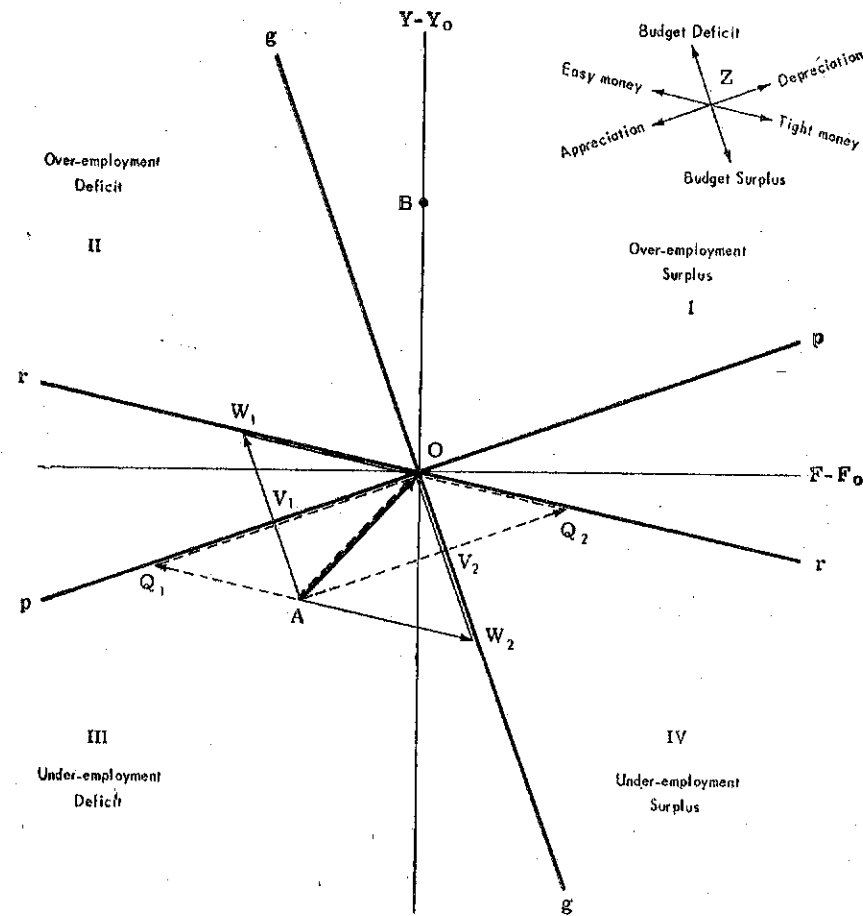


Figure 2

then permit lower interest rates indicated by the movement from *Q₂* to the origin. The *resultant* of the parallelogram *OQ₁AQ₂* is the direct line *AO*. Alternatively, a budget deficit sufficient to move from *A* to *V₁* would then permit devaluation or relative price reduction indicated by the movement *V₁O*.

The monetary and fiscal instruments in combination are, in a sense, less efficient than depreciation or relative price reduction because they have, from Quadrant III, unfavourable side effects. But they can still be used for achieving balance since the slopes of the policy lines are different. To use this method requires a movement resulting from one policy until the other policy line is reached. Starting from *A*, a budget deficit sufficient to reach *W₁* (where *AW₁* is parallel to *gg*) will then permit equilibrium to be restored through the higher interest rates required to move from *W₁* to *O*. Or, monetary tightness sufficient to reach *W₂* (where *AW₂* is parallel to *rr*) would then sufficiently improve the balance of payments and thus permit the budget reduction necessary to travel along *W₂O*. In practice both policies can be pursued simultaneously, leading to the resultant *AO*.

A combination of the three policies can be envisaged. If devaluation is ruled out there might still be hope of achieving similar results by price restraint at home compared with price changes abroad. In that case the disequilibrium point can travel part of the way along *AQ₂*, thus moderating the required budget deficit and tightened monetary conditions.

It should be noted that the use of monetary and fiscal policy in a contrasting sense, i.e. easier money and more restrictive budgetary policy, will yield a "resultant" moving in the opposite direction from *AO*. This is because that mixture of policy violates the principle of "Effective Market Classification". But even the correct mixture of monetary and fiscal policy (monetary policy for the external balance and budgetary policy for the internal balance) might necessitate larger changes in interest rates and budget deficits than are politically feasible. The extent of the variations required will depend on the *degree* to which the slopes of the policy lines are different.

In practical situations some idea of numerical magnitudes is necessary before deciding what approach to policy is most feasible. We need to know the slopes of the policy lines in the previous diagrams and also the dimensions of the necessary adjustments. To find these slopes and dimensions it is usually necessary to make numerical assumption about a wide variety of parameters. Such assumptions can be based on econometric studies, casual empirical examination or simply intuition, the usual results being a combina-

tion of all three methods. The important fact is the necessity of making the parameters explicit. Because only then can the assumptions be challenged, revised and, accordingly, improved as further information comes to light.

Unfortunately, a large number of parameters is usually necessary to build up a coherent model assessing the slopes and magnitudes needed. Some of these can be used with a great deal of confidence because past studies have shown they predict quite accurately; others may involve a considerable amount of guesswork and be subject to very large error. Even in this case it is better not to hide ignorance by building a model excluding the unknown parameters, since the needed information may not be forthcoming unless its crucial importance is known.

IV

We can illustrate these points with reference to problems faced by the United States. The balance of payments problem and the unemployment problem in the United States are well known. What combination of fiscal, monetary, exchange rate or wage policies can bring about equilibrium?

To find very crude answers to this question I constructed a very simple model of the U.S. economy (10) and made the following assumptions:

- 1) Foreign interest rates and prices are exogenous.
- 2) An increase in the U.S. long-term interest rate would lead to an increase in the short-term interest rate three times as large.
- 3) The U.S. multiplier (allowing for a marginal propensity to invest and a leakage through imports) is 3.
- 4) The foreign multiplier is $3 \frac{1}{3}$.
- 5) The U.S. marginal propensity to import is 5 per cent.
- 6) The marginal propensity to import in foreign countries is 10 per cent.

(10) For a derivation of the model see the Appendix.

7) An increase in the short-term interest rate of 1 per cent would lead to a decrease in the capital outflow of \$250 million per quarter (this takes no account of the important complication of stocks).

8) An increase in the U.S. long-term interest rate of 1 per cent would cause a decrease in annual U.S. domestic expenditure of \$2.5 billion before taking account of resulting multiplier effects.

9) The elasticity of the balance on goods and services is 2. U.S. exports are taken to be \$20 billion.

It will be recognised that these assumptions are far from accurate; and even the structure of the underlying model suffers from many limitations due to the great simplifications made. But as a first step they afford a basis for more serious "guesswork".

Let Y denote the change in U.S. income, F the change in the balance of payments, r the change in the long-term interest rate, p the percentage reduction in the exchange rate or wage rate, and g the change in government spending expressed in billions of dollars. Then the numerical system expressing changes in the target variables, as functions of changes in the instrumental variables, is as follows:

$$Y = -\frac{150}{19} r + \frac{16}{19} p + \frac{60}{19} g$$

$$F = \frac{62}{19} r + \frac{68}{285} p - \frac{2}{19} g$$

These two equations provide all the information necessary to construct the gg , rr and pp lines in the diagrams and to assign numerical values for movements along them. The slope of gg is found by setting $r=0$ and $p=0$ and dividing the first equation by the second equation, getting -30 . This means that the increase in government spending necessary to increase income by (say) \$30 billion would *worsen* the balance of payments by \$1 billion, interest rates and prices being assumed as constant. Similarly, the slope of rr is $-150/62$, which means that the interest rate increase (11) neces-

(11) The changes in the money supply necessary to effect various changes in the interest rate can be estimated by making use of the approximately linear relation between income

sary to improve the balance of payments by (say) \$620 million would lower income by \$1.5 billion, government spending and prices being assumed as constant. Finally, the slope of pp is $240/68$, which means that the devaluation or wage reduction necessary to improve the balance of payments by (say) \$680 million would cause an increase in output of \$2.4 billion, assuming interest rates and government spending as constant. The three slopes are plotted in Figure 3.

The slopes of the policy lines alone, of course, are not sufficient to establish the basis for a policy prescription. To complete the background the dimensions of rr , gg and pp must be established. How far along each of the schedules will a one-half percentage point change in the rate of interest take us? A two per cent devaluation or wage (and price) reduction? A \$1 billion increase in government spending?

This information also is contained in the equation system. Setting $p=g=0$ and $r=1/2$ in the first equation gives the information that a one-half percentage point increase in the rate of interest will lower income by $\frac{150}{19} \times \frac{1}{2} = \3.95 billion. Moving down in the diagram from the origin along rr we find the ordinate -3.95 . This is the point corresponding to a one-half percentage point increase in the (long-term) rate of interest. Corresponding to this point is the abscissa $31/19$ which shows the effect of the interest rate change on the balance of payments (this result could be derived directly from the second equation). The same procedure applies for each of the three policy lines and these are indexed appropriately. The rr line is indexed in units of percentage points, the gg line in units of billions of dollars, and the pp line in per cent changes. For example, a 4 per cent devaluation will, under the assumptions of the model, improve the balance of payments by slightly less than \$1 billion and increase income by more than \$3 billion.

The required changes in income (Y) and in the balance of payments (F) remain to be specified. Let us suppose that we want to increase income by \$15 billion and improve the balance of pay-

velocity and the long-term bond rate since 1950 in the United States (using data compiled by D. Edwards of the Department of Commerce).

Specifically $V=1/2 r$ where V =change in GNP velocity.

Given present GNP and money supply levels, this means that the relation between r ,

Y and M (=change in money supply) is crudely $r = \frac{1}{75} Y - \frac{M}{20}$.

ments by \$1 billion: then we can mark off the point A in the underemployment-deficit quadrant with coordinates -1 for the balance of payment and -15 for income.

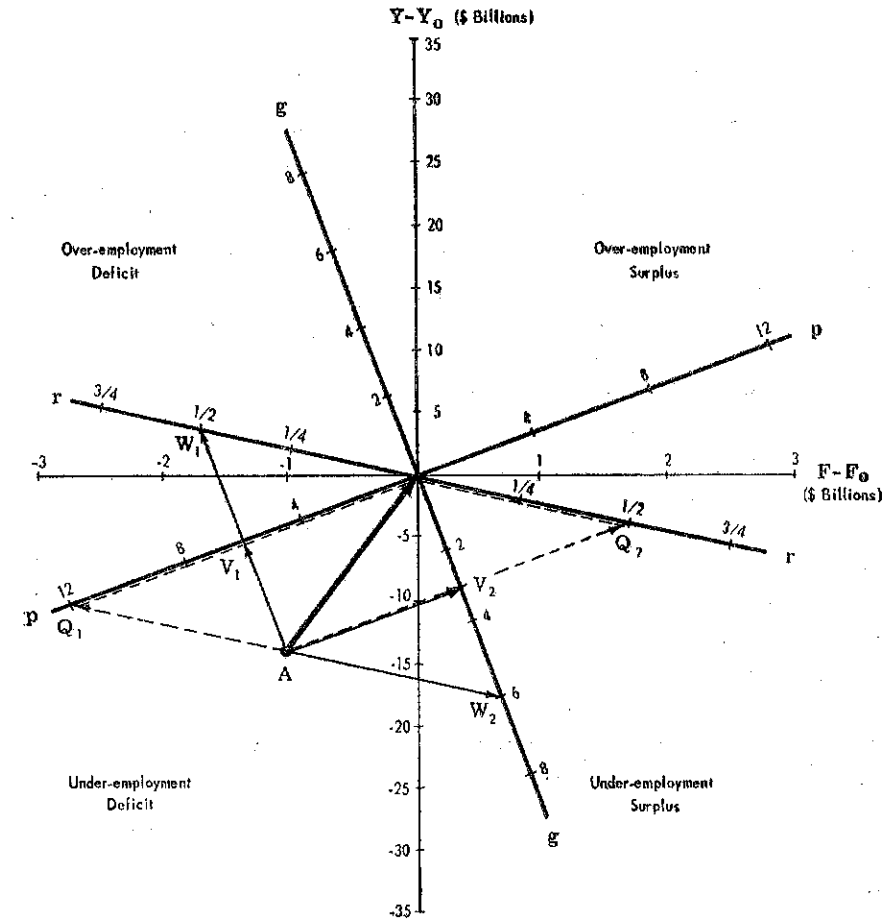


Figure 3

To move from A to the origin we simply apply the methods used in Figure 2. If the interest rate and changes in government spending alone are used we simply move up the line AW_1 (parallel to the gg line) until we reach the line rr , and down the line AW_2 , parallel to rr , until we reach gg . The resultant of these forces is the vector AO , which effects the required changes.

The numerical values of the changes can be read off from the rr and gg lines. Since the AW_2 movement is the same as the W_1O , the implied increase in interest rates is one-half of a percentage point; since the AW_1 movement is the same as the W_2O , the implied increase in government spending is \$6 billion.

A second policy system involves changes in relative prices combined with monetary policy. It is apparent that a simple change in relative prices alone will not result in equilibrium in both targets; the change in relative prices, necessary to improve the balance of payments position, is less than that necessary to increase income to the required extent. But if relative prices change in such a way that the movement AQ_2 is effected, then the reduction in the rate of interest implied in the movement AQ_1 (or Q_2O) will achieve the desired result. Thus devaluation or wage-price reduction of 12 per cent, combined with a reduction in the interest rate of about one-half of one percentage point, will improve the balance of payments by \$1 billion and income by \$15 billion.

The third combination of two policies involves a movement along gg and pp . This is in a sense more efficient, for it can be seen that by moving from A the distance AV_2 , by price changes, and the distance AV_1 , by fiscal policy, smaller relative price changes will be required, i.e., an increase in government spending of somewhat more than \$3 billion combined with a reduction in relative prices of about 6 per cent.

To summarize when the target values are double those just described, (i.e., an improvement in the balance of payments of \$2 billion and an increase in income of \$30 billion) the following possibilities are found:

(1) To raise the (long-term) interest rate by 1 percentage point and to increase government spending by \$12 billion. This would lead to a budget deficit of \$6 billion assuming a marginal tax rate of 20 per cent. A somewhat higher tax reduction would produce similar results.

(2) To reduce money wages and prices or to devalue by 24 per cent, and to lower the interest rate by about 1 percentage point.

(3) To devalue or reduce wages and prices by 12 per cent and to increase government expenditures by about \$6 billion. This would not lead to any increase in the budget deficit since the increase in income will produce tax revenues by an equal amount.

(4) To employ all three instruments. Since devaluation is not considered a component of official policy in the United States, and since absolute wage *reduction* is impossible, the relative price changes have to come from price stability (at best) at home compared with some price increase abroad. The changes that can be expected in this regard can be estimated by noting past trends at home and abroad and inspecting current wage demands. Suppose, for example, that an improvement in relative export prices of 6 per cent in favor of the United States can be expected. Then we substitute $Y=30$ and $F=2$ for the targets and $p=6$ for the estimated change in relative prices in the equation system. We obtain:

$$30 = \frac{150}{9}r + \frac{16}{9} \cdot 6 + \frac{60}{9}g$$

$$2 = \frac{62}{19}r + \frac{68}{285} \cdot 6 - \frac{2}{19}g$$

After solving for dr and dg we find that $r=.26$ and $g=2.76$. Thus equilibrium will be restored by the combination of (a) an improvement in relative prices of 6 per cent, (b) a rise in the rate of interest by about $\frac{1}{4}$ percentage point, and (c) an increase in government spending of less than \$3 billion. A reduction in the budget deficit of something of the order of \$3 billion will be associated with these changes. Further alternatives can be determined in a similar manner.

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APPENDIX

The model on which the numerical results were based is a crude Keynesian open-economy system:

$$(1) \quad Y = E(Y, r) + B(Y, Y', p) + g$$

This equation defines the equilibrium income (Y) in the U.S. as the sum of private expenditure (E), government expenditure (g) and the external balance on goods and services (B). E is a function of income (Y) and

of the long-term interest rate (r), and B is a function of income (Y) of foreign income (Y') and of relative prices of U.S. and foreign goods (p).

$$(2) \quad Y' = E'(Y') - B(Y, Y', p)$$

This equation defines the equilibrium foreign income (Y') as the sum of total foreign expenditure (E'), assumed to be a function of Y' , and the balance on goods and services of foreign countries (which is equivalent to the U.S. balance, with opposite sign).

$$(3) \quad F = T(r) + B(Y, Y', p)$$

This equation defines the U.S. balance of payments (F) as the sum of capital imports (T) and of the U.S. export surplus (B). T is assumed to be a function of the long-term interest rate both because of its direct effects on long-term capital flows and also because a rise in the long-term rate is assumed to be associated with an even greater rise in the short-term rate.

The three equations can be differentiated totally; foreign income (Y') can be eliminated from all equations, which would reduce the system to a two-equation model, in Y and F , in addition to the policy variables r , p and g (the latter is interpreted as government spending on *home goods*). The result is as follows:

$$(4) \quad dY = \frac{k E_r}{1 - mm' k k'} dr + \frac{k B_p (1 - m' k')}{1 - mm' k k'} dp + \frac{k}{1 - mm' k k'} dg$$

$$(5) \quad dF = \left[T_r + \frac{mm' k k' - mk}{1 - mm' k k'} E_r \right] dr + \frac{B_p (1 - m' k') (1 - mk)}{1 - mm' k k'} dp + \frac{mm' k k' - mk}{1 - mm' k k'} dg$$

where $E_r \equiv \frac{\partial E}{\partial r}$ = responsiveness of expenditure to the long-term rate of interest.

$B_p \equiv \frac{\partial B}{\partial p}$ = elasticity of balance of trade multiplied by level of exports.

$m \equiv -\frac{\partial B}{\partial y}$ = U.S. marginal propensity to import.

$m' \equiv \frac{\partial B}{\partial y'}$ = foreign marginal propensity to import.

$$k = \frac{1}{1 - \frac{\partial E}{\partial y} + m} = \text{U.S. "open economy" multiplier.}$$

$$k' = \frac{1}{1 - \frac{\partial E'}{\partial y'} + m'} = \text{foreign "open economy" multiplier.}$$

$$T_r \equiv \frac{\partial T}{\partial r} = \text{change in capital imports due to a change in the long-term rate of interest.}$$

The recurring term $\frac{k}{1 - mm' k k'}$ is simply the domestic multiplier with a repercussion effect added. The term $\frac{\partial T}{\partial r}$ can be subdivided into T_r' , measuring the direct effect of the long-term rate on capital flows, and $T_r'' = \frac{\partial T}{\partial i} \cdot \frac{\partial i}{\partial r}$ (where i is the short-term interest rate) measuring the indirect effect of a change in the long-rate insofar as this is associated with a larger change in the short-term rate.

The following values of the parameters were assumed in the text:

$$k = 3$$

$$k' = 3 \frac{1}{3}$$

$$m = 1/20$$

$$m' = 1/10$$

$$E_r = -\$2.5 \text{ billion}$$

$$T_r = \$3 \text{ billion}$$

$$B_p = \$4 \text{ billion}$$

The assumption about the value of T_r is based on the \$250 million per quarter figure suggested in the text (\$250 million per quarter = \$1 billion of short-term capital per year induced by a 1 per cent short-term interest differential in turn resulting from a one-third percentage point change in the long-term differential); no account is taken of the responsiveness of long-term capital. The value for B_p is found by multiplying the coefficient of elasticity of the trade balance (assumed to be 2) by exports (assumed to be \$20 billion) and dividing by 100 in order to be able to convert p into percentages.

Substituting these values into (4) and (5) gives the numerical equations of the text.

In developing the numerical values of one or more of the parameters I have benefited from (without necessarily accepting their results literally) published or unpublished work of T.C. Liu, D. Meiselman, W. White, F. de Leeuw, R. Rhomberg, von Hohenbalken and Tintner, D. Edwards, A. Okun, J. Vanek, P. Kenan and P. Bell, in addition to more well-known econometric models. However, it is as well to emphasize again the tentative and exploratory nature of these estimates and my hope is that they will serve to stimulate further research on the subject.

In addition to noting the weaknesses of the parameter estimates it is also necessary to point out possible refinements to the model itself — though the high price of increasing complexity must certainly be paid. It is sufficient to enumerate some of the more important limitations:

- (1) Foreign interest rates may react to a change in U.S. interest rates.
- (2) The relation between changes in long- and short-term interest rates is unlikely to be linear as assumed in the text.
- (3) Forward exchange rates may partly adjust to changes in interest differentials.
- (4) The initial effects on capital flows will be greater than the final effects.
- (5) Relative prices may affect saving and hence expenditure.
- (6) Changes in interest rates often affect the division of expenditure as between home and foreign goods.
- (7) The size of B_p depends on which other exchange rates or prices change with U.S. prices.
- (8) If the rest of the world is pinched for liquidity, foreign governments may react to prevent any worsening of their balance of payments surpluses.
- (9) The effect of income changes on speculation and capital flows has not been allowed for.
- (10) The repercussion effects may be greater or less, depending on the state of employment in the rest of the world and upon its distribution.

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