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POLICIES FOR INTERNAL AND EXTERNAL BALANCE

MARINA VON NEUMANN WHITMAN

INTERNATIONAL FINANCE SECTION
DEPARTMENT OF ECONOMICS
PRINCETON UNIVERSITY · 1970

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FRITZ MACHLUP, *Director*
International Finance Section

ERRATA

Page 15, the last equation on the page should be changed to read as follows:

$$\Delta_{2(dB=0)} = T_r[L_y(E_i - K_i) + L_i(1 - E_y)] < 0.$$

Page 16, equations 9a to 9d should be changed to read as follows:

(9a) $$\left(\frac{\delta Y}{\delta G}\right)_{(dB=0)} = \frac{L_i T_r}{\Delta_2} > 0;$$

(9b) $$\left(\frac{\delta r}{\delta G}\right)_{(dB=0)} = \frac{K_i L_y - T_y L_i}{\Delta_2} \lessgtr 0;$$

(9c) $$\left(\frac{\delta Y}{\delta M}\right)_{(dB=0)} = \frac{T_r(E_i - K_i)}{\Delta_2} > 0;$$

(9d) $$\left(\frac{\delta r}{\delta M}\right)_{(dB=0)} = \frac{-K_i(1 - E_y - T_y) - T_y E_i}{\Delta_2} > 0.$$

Page 26, the equation number on line 7 should be changed to (7)

" the equation on line 9 should be changed to read $dG - tdY = mdY$

" the equation on line 11 should be changed to read $dY/dG = 1/(t + m)$

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PREFACE

This monograph is intended as an analytical survey of the literature on the problem of internal-external balance, a body of analysis which has been developed over the course of the past two decades. Any author of a survey faces a peculiar occupational hazard; that, in trying to include the latest contributions to his particular field of interest, he may become enmeshed in a process which resembles a dog chasing his own tail, and is just as futile. In order to avoid such a fate, I have set a firm cut-off date, taking no responsibility for the inclusion of anything published after the end of 1969. Those works in the list of references which bear a 1970 publication date are there only because I was fortunate enough to see them in a pre-publication version.

In writing this monograph, I have incurred a large number of intellectual debts, not the least of which are to the authors whose contributions I have here attempted to describe. These names appear, of course, in the list of references at the end of this study. But some of them appear also on a second list, of those whose comments and criticisms on earlier versions of this monograph shed light on many dark spots and led the author out of a number of blind alleys. Among those who were particularly helpful in this connection are Jay Levin, John Morton, Jack Ochs, Don Roper, David Starrett and, above all, Peter Kenen and Norman Miller, who have once again proved themselves friends and critics extraordinary. All of the aforementioned must, of course, be absolved of any association with the dark spots and blind alleys which remain.

M. v.N. W.

Washington, D.C.
September 1970

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Policies for Internal and External Balance

I. GENERAL CONCEPTS

A. Internal and External Balance: From Automatic Adjustment to Policy Goals

With the publication of his *General Theory* more than thirty years ago, John Maynard Keynes dealt a fatal blow to the classical notion that "internal balance," or full-employment equilibrium in the domestic economy, could be reached and maintained through the free play of market forces, with government intervention limited to the maintenance of a reasonable approximation to the conditions of perfect competition. But the notion that automatic adjustment mechanisms operate to assure "external balance," or equilibrium in the balance of payments, has persisted; even today, textbook treatment of the subject is devoted primarily to discussion of the "automatic" price and income effects which tend to restore balance-of-payments equilibrium after a disturbance.

This view is also shifting drastically, however, under the combined pressure of modern economic theory and observation of the chronic international financial difficulties that plague the real world under fixed exchange rates. We have come to recognize that the automatic "classical" price-adjustment process may be inoperative in a Keynesian world of unemployment and downward rigidity of wages and prices. Moreover, we know that there are real economic costs involved in automatic adjustment via income changes.[1] Therefore, central banks

[1] The standard Keynesian foreign-trade-multiplier analysis implies that the automatic balance-of-payments adjustment process will be incomplete for a "stable" economy, that is, one which has a positive marginal propensity to save. Mundell [24], however, argues that the adjustment process will be complete even in such cases because of the effect of induced changes in the money supply on expenditures and imports. The effects of monetary changes on real variables are not incorporated into standard multiplier theory.

today neutralize the impact of reserve changes on the money supply and thus prevent the movement of reserves resulting from a payments imbalance from having an equilibrating effect on either income or prices. Acknowledging these facts, economists have come to regard "external balance"—that is, balance-of-payments equilibrium—as one of the specific economic objectives of deliberate governmental action, rather than as something that will take care of itself.

Two of the major innovators in developing a formal body of analysis incorporating these views are Meade [21] and Tinbergen [39]. In books with almost identical titles on the theory of economic policy and both published in the early 1950's, they independently developed similar approaches to the problem of simultaneously achieving external and internal (full employment and price stability) balance via *quantitative* economic policy, that is, changing the values of existing policy parameters.[2] Their approach is to *invert* the traditional method of problem solving.[3] In the traditional "positive" or "forecasting" model, policy instruments are among the "exogenous changes" whose magnitudes are given, whereas the economic targets are the unknowns for which the system must be solved. This is the approach of multiplier analysis and, more broadly, of analysis concerned with the effects on income, employment, and the balance of payments of changes in any exogenously determined parameter, including changes which take the form of some politically desirable government action, such as a change in the tax rate or the interest rate. The Meade-Tinbergen policy model "inverts" this approach by taking some desired level of real income (that is, employment) and the balance of payments as given and then solving the system for the corresponding values of the policy variables (for example, the appropriate tax rate).

B. The Linear Targets-Instruments Model: Requirements for Solution

The targets-instruments framework developed by Meade and Tinbergen requires that we set out a system of equations that represents

[2] Tinbergen notes [39, p. 2] that this model ". . . is not suited to the analysis of qualitative policy . . . involving the changing of certain *qualitative* aspects of economic structure."

[3] Meade's book actually incorporates both the traditional and the inverted approach. It begins with a conventional analysis of the income and price effects of various exogenous disturbances to the balance of payments in a Keynesian-type economy where the government pursues a "neutral" or passive economic policy. It moves quickly, however, to a detailed consideration of these same processes of adjustment when governments actively pursue policies to maintain or restore both internal and external balance, pointing out that the achievement of both goals may be impossible under a system of fixed exchange rates.

the structural relationships between target variables and policy variables in a particular economy. Because their analysis rests on the simplifying assumption that the influences of both policy and exogenous variables on the target variables are linear in the neighborhood of the relevant values, the reduced form of a system of this type can be represented in matrix form as $y = Aw + Bx$. The y's represent the target variables, the x's the policy-instrument variables, and the w's the exogenous or disturbance variables which are outside the direct control of the government authorities. The matrix A consists of a_{ij} coefficients representing the quantitative effects of the various disturbances on the target variables, and the B matrix is composed of b_{ij} coefficients representing the effects of the policy variables, for a particular economy. Except under special conditions,[4] such a system will be interdependent; each instrument will affect all the targets simultaneously.

Perhaps the most obvious requirement for the achievement of the desired values of target variables in a system such as we are describing is that the policy instruments utilized be effective in their impact on the target variables. An attempt to achieve internal and external balance is doomed to failure if one of the instruments employed is a tariff on peanut butter, however high it may be set.

Some difficulties arise, however, when we try to express precisely what is meant by the "effectiveness" of a particular policy instrument with respect to a particular target variable. Generally speaking, a policy instrument is more effective the larger the change in the target variable achieved by a given change in the policy variable, or the smaller the change in the policy variable required to bring about a given change in the target variable. This sounds very much as if we are simply stating the same criterion two different ways. But an examination of the underlying logical structure reveals that they may not come to the same thing at all.

If one takes what Tinbergen calls the "traditional" approach, regarding the targets as unknown functions of the given policy parameters, the effectiveness of instrument x_j with respect to target y_i is $\delta y_i/\delta x_j$, which appears to correspond to the first definition given

[4] The special conditions prevail when the coefficient matrices are either diagonal or triangular or block-diagonal or block-triangular, implying that the system can either be partitioned into self-contained subsystems or arranged into systems of one-way causal relationships. For a discussion of such systems and their implications for the decentralization of policy-making, see Fox, Sengupta, and Thorbecke [8, pp. 24-25].

above. If the problem is inverted, the values of the instrument variables become the unknowns, dependent upon the predetermined desired values of the target variables. Now the logical measure of the same effectiveness is $\frac{1}{\delta x_j/\delta y_i}$, analogous to the second part of the verbal definition.[5] These two expressions will be the same only under very special circumstances; in the general case, when all targets and all variables are interdependent, they are sure to differ.

Tinbergen [39] offers an example to illustrate this point, using a simple macroeconomic model and data for the Netherlands in 1949. Using the first concept of effectiveness, $\delta y_i/\delta x_j$, he calculates an income multiplier for changes in public expenditure of 1.74. Using exactly the same structural equations and data, he derives a coefficient based on the alternate definition, $\frac{1}{\delta x_j/\delta y_i}$, of 6.7. The paradox is resolved by considering the economic meaning of the two definitions of "effectiveness" in this case. The multiplier $\delta y_i/\delta x_j$ is the change in target i (income in this example) associated with a given change in instrument j, here defined as public expenditures, *when all other instruments are held constant* (a reduced-form coefficient). The expression $\frac{1}{\delta x_j/\delta y_i}$, on the other hand, represents the reciprocal of the change in instrument j that is needed to sustain a given change in target i, *when all other targets are held constant* (the reciprocal of a structural coefficient).

In the Tinbergen example, $\delta y_i/\delta x_j$ is the multiplier for an open economy, since the other target (specifically, the trade balance) is free to vary. Hence, part of the additional expenditure induced by the budget deficit leaks away in the form of increased imports, reducing the impact on domestic output. On the other hand, $\frac{1}{\delta x_j/\delta y_i}$ means that the "other target," the balance of trade, remains unchanged, so that such leakage via an increased deficit or reduced surplus is prohibited by assumption. In a small country like the Netherlands, where the marginal propensity to import is undoubtedly high, it is not at all surprising that the two coefficients should be so different. Which

[5] Using the matrix notation of page 3, and ignoring the exogenous disturbance terms for simplicity, $\frac{\delta y_i}{\delta x_j} = b_{ij}$, while $\frac{1}{\delta x_j/\delta y_i} = \frac{|B|}{|B_{ij}|}$, where $|B_{ij}|$ is the cofactor of the "ij-th" element of B and $|B|$ is the determinant of B.

measure is the appropriate one depends, of course, on the context of the problem at hand, but considerable confusion can arise from failure to distinguish between the two.

In addition to the requirement that instruments be effective, a unique solution to the problem of achieving the desired values of the target variables will exist only if the requirements of "Tinbergen's Rule" are fulfilled: *that the number of independent targets must equal the number of independent instruments.*[6]

If there are fewer targets than policy variables, then there are fewer equations than unknowns and the system is underdetermined, that is, there is no unique policy solution, but an infinite number of them. If a country is concerned with, say, achieving only internal balance and can use both monetary and fiscal policy to achieve this goal, there is in principle an infinite number of monetary-fiscal combinations which can be used to reach the desired level of real income.

If on the other hand, there are more targets than policy variables, the system has more equations than unknowns. It will not then, in general, be possible to find a set of values for the policy tools that will satisfy all the equations, that is, that will permit all targets to be achieved. In everyday terminology, this is a situation in which there are not enough tools to do the job.

To illustrate the problems that arise when the number of targets does not equal the number of instruments, or when either some of the instruments or some of the targets are not independent, let us consider a simple two-by-two case in which monetary and fiscal policy, x_1 and x_2, are used to achieve a desired level of income, y_1^*, and a desired balance-of-payments position, y_2^*. A geometrical illustration of the independence requirements can then be given with the aid of Figure 1, below, which is an adaptation of the geometry used by Mundell [22] in one of his best-known articles on the internal-external-balance problem. In Figure 1, *II* and *EE* stand for combinations of "monetary policy," represented by the rate of interest, and "fiscal policy," represented by government deficit expenditures, that will yield, respectively, internal and external balance. That is, at every point on *II*, $dy_1^* = 0$, and at every point on *EE*, $dy_2^* = 0$. The internal-

[6] If this condition is not met, the B matrix will be singular, that is, its determinant will equal zero and the inverse matrix, B^{-1}, required for a solution to the policy problem, will not exist. This criterion applies when the causal relationships are linear and uncertainty is absent. The modifications required by the relaxation of these assumptions will be discussed in a later section.

balance locus (II) has a positive slope because a higher interest rate would reduce income (y_1) if it were not accompanied by a larger government deficit. Similarly, the external-balance locus (EE) has a positive slope, because a higher interest rate would improve the balance of payments (y_2) via both capital inflows and an improved trade balance as income and therefore spending are reduced, unless it were accompanied by an increase in deficit spending by the government.

Figure 1 also depicts four zones of disequilibrium. To the left of EE, the interest rate (x_1) is too low and/or the budget deficit (x_2) is too large, so that the balance of payments is in deficit, whereas the opposite combination causes a surplus to the right of EE. Above II,

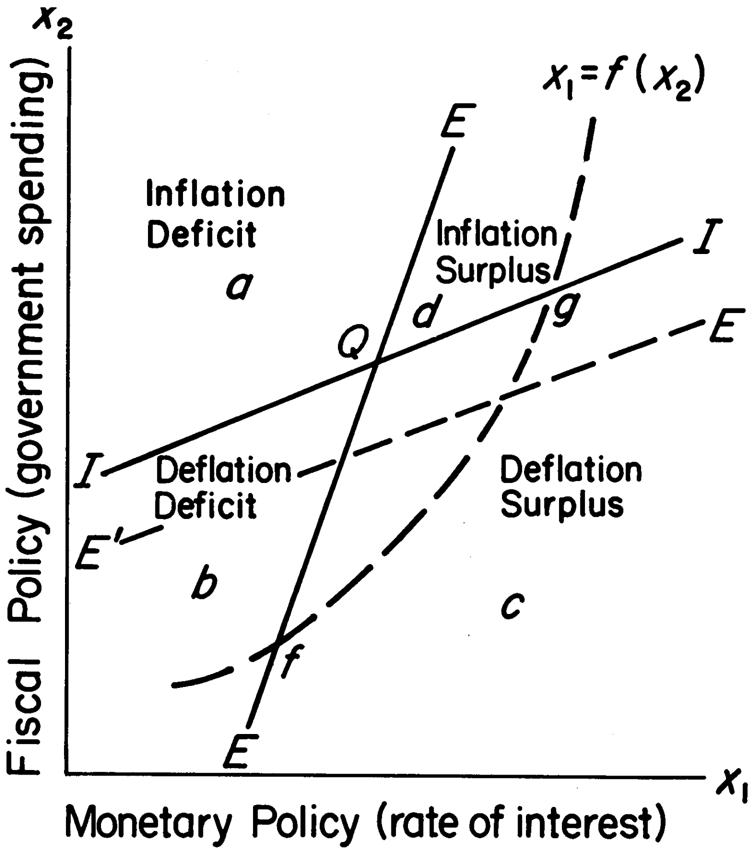

FIGURE 1. The Independence Requirements for Internal and External Balance

the combination of policies is too expansionary and inflationary pressure occurs. The reverse is true below II. The letter within each zone indicates the particular type of disequilibrium that characterizes that zone.[7]

With this framework, we are in a position to examine the cases in which the independence required by "Tinbergen's Rule" does not hold, with the result that there does not exist any unique combination of monetary and fiscal policy, such as that represented by point Q in Figure 1, which yields simultaneously both internal and external balance.

First, assume that the two policy instruments are dependent, so that a given level of one implies a particular level of the other; that, for example, any given change in public expenditures implies a particular change in the money supply.[8] If fiscal policy is used, say, to maintain internal balance, then monetary policy is not free to function as required to achieve external balance. For operational purposes, the two instruments have collapsed into one, and the system is one instrument short, a situation depicted in Figure 1 by the line $x_1 = f(x_2)$.[9] This line would intersect EE and II at point Q only fortuitously.

[7] Strictly speaking, the regions labelled "inflation" in the diagram must be interpreted as situations of inflationary pressure, with excess demand at full employment prevented from raising prices by some form of rationing device. A situation of dynamic inflation, with continuously changing price levels and expectations, cannot be handled with such a model. In fact, Quirk and Zarley [31] argue that, because it does not take into account the fundamental changes in the working of the economy above the full-employment level, the Mundell-type model is, strictly speaking, applicable only to disequilibrium positions below full employment. They suggest, further, that Mundell's conclusions concerning the stability of a system ensured by the application of his Principle of Effective Market Classification (see Section C, below) are quite sensitive to the assumptions made about the determination of the level of output in disequilibrium states, assumptions which are not spelled out by either Mundell or his followers.

[8] More precisely, a once-over increase in government expenditures to a sustained deficit level implies a continuously increasing money supply. The money supply will increase in each period by an amount equal to the level of (not the increase in) deficit spending by the government. A stable relationship between the level of deficit spending and the interest rate is possible only in an economy which is growing at a rate such that the increasing demand for money exactly matches the increasing supply at an unchanged interest rate. This aspect of the stock-flow problem is evaded by most of the short-run Keynesian models dealing with monetary and fiscal policy.

[9] Actually, we cannot know anything about the nature of the functional relationship between x_1 and x_2, not even whether it is positive or negative, without more information, specifically about the behavioral functions which determine the relationship between changes in the money supply and in the rate of interest. Once these relationships are defined, however, as they are in the model described on pp. 14-15, the functional relationship $x_1 = f(x_2)$ is determined.

In general, both equations could not be satisfied; the economy could reach either external balance at point f in Figure 1 or internal balance at point g, but both targets could not, except by chance, be simultaneously reached.

The two targets in the system will be linearly dependent when the EE locus has the same slope as the II locus, as is the case with $E'E'$ in Figure 1. In economic terms, this means that the relative effectiveness of the two types of policy with respect to changes in the level of domestic income is exactly the same as their relative effectiveness with respect to changes in the balance of payments.

This situation will occur only if monetary policy has no impact on capital flows. For in this case both monetary and fiscal policy will affect the balance of payments in exactly the same way: via a change in the trade balance which is equal in each case to the induced change in income multiplied by the marginal propensity to import (on the usual Keynesian assumption that exports are exogenously determined). If, on the other hand, international capital flows have any interest elasticity at all, the relative effectiveness of the two instruments in terms of internal balance will remain unchanged, but monetary policy will now have an additional effect on the balance of payments through the international flow of capital which results from a change in the rate of interest, here taken as the monetary-policy variable. This additional effect increases the relative effectivenses of monetary as compared with fiscal policy in achieving external balance, making EE steeper than II.[10]

[10] This can be shown algebraically by writing out the equations for the internal and external balance lines, respectively (holding the exogenous w terms constant), as:

(1a) $$dy_1^* = b_{11}\, dx_1 + b_{12}\, dx_2 = 0 = \frac{\delta y_1^*}{\delta x_1}\, dx_1 + \frac{\delta y_1^*}{\delta x_2}\, dx_2;$$

(1b) $$dy_2^* = b_{21}\, dx_1 + b_{22}\, dx_2 = 0 = \frac{\delta y_2^*}{\delta x_1}\, dx_1 + \frac{\delta y_2^*}{\delta x_2}\, dx_2.$$

Solving these expressions for the slope of II, $(dx_2/dx_1)_{II}$, and the slope of EE, $(dx_2/dx_1)_{EE}$, we have:

(1c) $$(dx_2/dx_1)_{II} = -\frac{\delta y_1/\delta x_1}{\delta y_1/\delta x_2};$$ (1d) $$(dx_2/dx_1)_{EE} = -\frac{\delta y_2/\delta x_1}{\delta y_2/\delta x_2}.$$

The denominators of these expressions are related via the equation

$$\frac{\delta y_2}{\delta x_2} = -m(\delta y_1/\delta x_2),$$

where m is the marginal propensity to import; the numerators are related via:

There can be no point of intersection, like Q, representing a position of both internal and external balance, when the slopes of EE and II are equal. In general, the internal- and external-balance schedules will be parallel and nonintersecting, like II and $E'E'$, indicating that the two targets are inconsistent, since there is no possible combination of monetary and fiscal policies which can yield both internal and external balance.[11] If, on the other hand, we have the special case in which the exogenously determined w variables happen to take on values which shift II so as to coincide with $E'E'$, then there is an infinite number of solutions to the system; the targets are for operational purposes one and the same. Implicit in this example is an important point: targets are dependent or independent only with respect to a particular set of instruments; in the example just given, the substitution of a new instrument for one of the original ones could change the slope of one or both of the balance lines and thus create independence among targets which did not exist before.

In summary, Tinbergen's Rule says that, within the framework of the linear fixed-targets model, a unique combination of policy tools consistent with the achievement of both internal and external balance cannot exist unless the number of independent policy instruments available is the same as the number of independent economic objectives (targets) toward which these policies are directed. If the number of instruments does not equal the number of targets, the system will be either over- or under-determined; there will be either no solution or an infinite number of them. If the number of targets equals the

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$\frac{\delta y_2}{\delta x_1} = -m(\delta y_1/\delta x_1) + (\delta K/\delta x_1)$, where K is the net inflow of capital. If we substitute these last two expressions into (1d), we obtain the following relationship between the slopes of EE and II:

$$\text{(1e)}\quad (dx_2/dx_1)_{EE} = \frac{-m(\delta y_1/\delta x_1) + (\delta K/\delta x_1)}{m(\delta y_1/\delta x_2)} = -\frac{\delta y_1/\delta x_1}{\delta y_1/\delta x_2} + \frac{\delta K/\delta x_1}{m(\delta y_1/\delta x_2)} = \left(\frac{dx_2}{dx_1}\right)_{II} + \frac{\delta K/dx_1}{m\ (\delta y_1/\delta x_2)}.$$

These slopes will be equal if $\delta K/\delta x_1 = 0$; in this case, where $\frac{\delta y_1/\delta x_1}{\delta y_1/\delta x_2} = \frac{\delta y_2/\delta x_1}{\delta y_2/\delta x_2}$, the Jacobian of the system is singular and its inverse nonexistent, so that no unique solution exists.

[11] The introduction of a third policy instrument, such as commercial policy, could bring about a *shift* in one of the lines, in this case probably the external-balance line, until it coincided with the internal-balance line. This would imply a move from the inconsistent case, where no joint-balance point exists, to the trivial case, where there is an infinite number of such points, since any policy combination leading to internal balance will lead to external balance as well.