A Re-evaluation of Financial Targets[*]

Introduction

In recent years there has been much debate concerning necessary conditions for an optimal monetary policy. Earlier discussions on monetary rules have been supplanted by more sophisticated analyses of monetary policy targets and indicators; and this has lead to an application to monetary policy of the theory of decision making under uncertainty. The outcome has been a much greater understanding of the many theoretical and technical aspects of the formulation of monetary policy. And the monetary authorities themselves have been accepting some of these findings, as evidenced by their changed attitude towards the control of monetary aggregates.[1]

In his interesting "Evaluation of Financial Targets in Six Countries",[2] Argy presents an analytical framework, in which to evaluate diverse financial targets, based on the following assumptions: [3]

    i) the monetary authorities take some level of income as their ultimate target;

    ii) to achieve this goal, they choose an operating target among the financial variables they can control, and fix its value for the relevant planning period;

    iii) as the authorities do not have a complete knowledge of the structure of the economy, nor are able to forecast exactly all

[1] See BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM (1971).
[2] This *Review*, March 1974, pp. 28-50.
[3] *Ibid.*, pp. 33-34.

exogenous developments, there will occur unpredicted disturbances that destabilize income;

iv) the problem is then to find that operational target which — being maintained during the planning period in the face of these unexpected disturbances — will minimize the variance of income around its desired value.

Given these assumptions, and using a simplified macroeconomic model, Argy compares the effects on income of unexpected changes in private expenditure, the demand for money, the demand for currency, the demand for reserves by the banking system, private capital inflow and exports. The model is solved for income, given six different financial targets: short term interest rate, total base money, bank reserves, unborrowed bank reserves, free bank liquidity ratio, and domestic credit expansion (DCE). These targets are then compared in terms of the relative size of the impact multipliers of the above mentioned disturbances. The argument implies that if, for instance, the multiplier on income of a change in private expenditure is lower with DCE than with the other targets, DCE is judged the most stabilizing target the monetary authorities can adopt.

This analysis leads therefore to a ranking of the different targets in terms of the degree by which they are stabilizing income towards its desired value, and these conclusions can be used to judge the appropriateness of the financial targets employed in the various countries.[4]

Although interesting, these conclusions depend of course on the four basic assumptions listed above, which seem to us unrealistic and to some extent misleading. The purpose of the present paper is to investigate the characteristics of diverse targets under alternative, more reasonable, assumptions on the preferences of the monetary authorities. Some of the limitations of Argy's analysis are retained (e.g. a very simplified macroeconomic model which is only useful for comparative static analysis), but it will be shown that by relaxing some of its strictures, we can get more useful criteria for the formulation of monetary policy.

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4 As the choice of the best target depends on the instability of the various functions and on the forecasting capacity of the monetary authorities, the optimal operating target need not be the same in different countries. See ARGY, op. cit., p. 40.

1. Monetary Policy Goals and Targets

Recent discussions in the literature have centred on the question of the effectiveness of alternative monetary targets, the " optimal " target being that which minimizes the variance of income over time in a system subject to stochastic disturbances.[5] However, this criterion assumes symmetry of disutility attached to deviations about a desired level of income, an assumption that Wood[6] found " rather bizarre and needlessly unrealistic "! As Wood pointed out,[7] " the marginal utility of income is always positive and there exists no limit to the income desired; the public's and the policy-makers' desire for real income is insatiable ". While Argy simply assumes that the authorities have some unspecified level of income as their ultimate target, other analyses of optimal monetary policy have explicitly stated that the desired level of income is full employment income, and " it is assumed that incomes above " full employment income " are undesirable due to inflationary pressures ".[8] In other words, when realized income exceeds desired income, its marginal utility is negative because of the associated loss of utility due to inflation. However, even this formulation was criticized by Wood, who maintained that " if the price level affects social welfare and is influenced by governmental policy, then it should be included explicitly as an argument in the social welfare function "; and found that " the exclusion of non-controlled variables that influence social welfare, requiring the non-controlled variables that are included to play a hazy and undefined heterogeneous role, leads to losses in expected utility ".[9]

An evaluation of financial targets must then be made in terms of a general utility function which includes all relevant goals and constraints of monetary policy. Having specified the weights attached to deviations about the desired values of the terms of the utility function, the problem is then to find the operating target which, given unpredicted disturbances, will maximize utility. This implies finding the target which guarantees the best trade-offs between the various terms of the utility function.

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5 See POOLE (1970), (1971), and MOORE (1972).

6 See WOOD (1965, p. 311).

7 Ibid., p. 312.

8 See POOLE (1971, p. 139).

9 See WOOD (1965, p. 314). Wood stresses the need to distinguish between the income level that is desired (which is unbounded), and that which the policy-makers expect can be attained consistent with other objectives.

Again, this is something more than just finding which operating target is best for one goal and which is best for another goal. An exercise along these lines has been done by Polak-Argy in a well-known article,[10] which employs an analytical framework very similar to the one used by Argy in his recent paper. Polak-Argy compared a money supply target with a " domestic credit expansion " target, in terms of two objectives, income and the balance of payments, whose variances had to be minimized given unpredicted disturbances in autonomous expenditure, the demand for money, exports, and capital inflows. Their conclusion was [11] that a DCE target was unquestionably better for the balance of payments objective, while for income a DCE target was best in the case of domestic disturbances, but a money supply target was most suitable for stabilizing income in the case of external disturbances.

Clearly this conclusion implies (apart from the obvious case in which there are two independent instruments for the two objectives) [12] that the monetary authorities either know which of the kinds of disturbances is the more likely to occur, or in fact they act as if they had only one target at the time. In the latter case, they will stick to a DCE target whenever there is a crisis in the balance of payments, and move to a money supply target if the internal objective has overriding priority.[13]

However, this somewhat schizophrenic approach raises more questions than it answers. While it is obvious that with a balance-of-payments crisis its cure must have priority, the best target being the one that guarantees that there would be no unexpected decline in foreign reserves (and viceversa if there is declining income and employment), the very occurrence of alternating internal and external crises is what the policy-makers ought to avoid. But a monetary strategy which considers either income or the balance of payments to be the goal variables, depending on which of the two is in " worse " conditions, is in itself a factor of instability; we will come out of one crisis only to get into another.[14] The more reasonable alternatives

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10 See POLAK-ARGY (1971).

11 *Ibid.*, p. 18.

12 This point was raised in a footnote by POLAK-ARGY, " The appropriate credit ceiling that would reach the balance of payments target is not necessarily one that would generate a satisfactory level of income. Resort to a second instrument (e.g. fiscal policy) might be necessary under these conditions ". *Ibid.*, p. 16, n. 31.

13 In fact, this has been the British experience since 1969. See GOODHART (1972).

14 Of course, the situation will be made even worse by the wrong pairing; for

involve either the use of two independent instruments [15] or the adoption of a monetary strategy which optimizes the trade-off between the internal and the external objectives.[16]

In the latter case, since we are assuming that monetary policy is the only available instrument, we can formulate the problem as follows: the authorities have one objective, the level of income, whose value is unbounded, and have one constraint, the volume of foreign reserves; [17] then, given unpredicted disturbances, they are required to select the financial target which gives the best trade-off income/reserves.

Having so reformulated Argy's original assumptions,[18] to better approximate the behaviour of monetary authorities of industrial countries in the postwar period, we can analyse the criteria for selecting a financial target. We use a stylized macroeconomic model which shares both the simplifications [19] and the characteristics of the various models developed by the IMF (as given in many articles by Polak and Argy) to indicate the relationship between credit expansion in one country and its balance of payments and income objectives.

The model is as follows:

$$[1] \quad Y = C + I + G + (X - U)$$
$$[2] \quad C = A + cY + dM$$
$$[3] \quad U = B + mY$$

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instance with a devaluation accompanied by a monetary expansion: this was the case in Britain in 1968, see JOHNSON (1974, p. 11) and again in Italy in 1973, see VACIAGO (1975).

15 In this case, monetary policy will be assigned to the balance of payments objective, see JOHNSON (1972). Thus Argy's evaluation in terms of an objective for income can be misleading.

16 In this case, the pairing suggested by Polak-Argy, which was in terms of one objective-one target, is less relevant.

17 The price level as such has not been an effective constraint. Its *internal* effects have been disregarded, and only the recent acceleration of inflation has prompted solutions to avoid them. See FRIEDMAN (1974). Its *external* effects (with prices rising in one country faster than elsewhere) have been taken into consideration, but because they were associated with a loss in reserves, the latter being the ultimate constraint.

18 Also his other assumptions could be questioned. For instance, if the target will not be changed when the objective variable diverges from its desired value, it is ruled out any feedback mechanism which could in effect give more successful outcomes. See TOBIN (1974, p. 73).

19 The model makes no explicit allowance for reaction lags, and there is no equation for the price level, thus we ignore the division between real output and prices. See POLAK-ARGY (1971).

[4] $MC = D - b\Delta M$

[5] $R = (X - U) + MC$

[6] $\Delta M = R + DCE$

where: $Y = $ Income

$C = $ Consumption

$I + G = $ Autonomous Expenditure

$X = $ Exports

$U = $ Imports

$MC = $ Capital Inflows

$R = $ Change in the Net Foreign Assets of Consolidated Banking System

$DCE = $ Domestic Credit Expansion

$M = $ Money Supply

$c, d, m, b > 0$

Equations [2], [3], and [4] are the three behavioural equations in the model, explaining consumption, imports, and capital inflows. A, B, and D are the autonomous component of these three functions, while b and d measure the direct and indirect (through the interest rate, whose determination is omitted for simplicity) effects of the money supply on endogenous expenditure and capital inflows. Equations [1], [5], and [6] define income, the balance of payments and the money supply. The increase in the money supply is divided into its two components, domestic (DCE) and external (R). Given the parameters m, c, b, d, A, B, D and the exogenous variables I, G, X, M_{t-1}, DCE, the model determines the values of the six unknowns Y, C, U, MC, R, M. Thus we can analyse the effects on both the goal variable (Y) and the constraint (R) of alternative strategies based on money supply or domestic credit targets.

2. Certainty and Uncertainty in Selecting Financial Targets

With complete knowledge of the structure of the economy (i.e. with non-stochastic estimates of the parameters c,m,b,d), with accurate forecasts of autonomous expenditure (I,G,X), and without unexpected developments (i.e. unpredictable shifts in the behavioural functions, measured by A,B,D), it would make no difference whether

the authorities adopted a target for the money supply or for DCE. In both cases the relationship between the two targets is stable and known, thus the authorities will either fix DCE (leaving M endogenous) or fix M (leaving DCE endogenous) to achieve either a desired value for income *or* for the balance of payments.[20]

Solving the model, we find that with a desired level of income (Y*), the optimal values for the targets, DCE or M respectively, are given by equations (I) and (II):

(I) $DCE = d^{-1}\{(1+b) [A+I+G+dM_{t-1}] + (1+b+d) [X-B] + dD + [(1+m-c)(1+b)+md] Y^*\}$

(II) $M = d^{-1}\{B - A - I - G - X + (1+m-c) Y^*\}$

While equations (III) and (IV) give the values of the two targets for a desired balance of payments (R*):

(III) $DCE = [b(1+m-c)+md]^{-1}\{-m[A+I+G+dM_{t-1}] + (1-c) [X-B] + (1+m-c) D - [(1+m-c)(1+b)+md] R^*\}$

(IV) $M = [b(1+m-c)+md]^{-1}\{-m[A+I+G] + [b(1+m-c)] M_{t-1} + (1-c) [X-B] + (1+m-c) D - (1+m-c) R^*\}$

It can be seen that an increase in Y* implies an increase in both DCE and M, while an increase in R* implies a decrease in DCE and M. It is also evident that an increase in either DCE or M to raise Y will lower R; it is not possible to guarantee both Y* and R*. And finally, we note that the decline in reserves for a given increase in income is the same[21] for both a DCE and an M increase, the trade-off being equal to:

(V) $\dfrac{R}{\Delta Y} = - \dfrac{b(1+m-c)+md}{d}$

where $d > 0$ and $[b(1+m-c)+md] > 0$.

Now, let us assume that either I,X,G change or the functions [2],

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20 However, the two strategies will differ in terms of the actual monetary instruments used. This point is further developed in my " Credito totale interno e offerta di moneta ", *forthcoming*.

21 As expected, since the two are not independent instruments. The trade-off can be altered by changes in G (government expenditure), which is just another way of saying that with two independent instruments both objectives can be satisfied.

[3], [4] shift (i.e. A,B,D change).[22] What are the results for Y and R under alternative strategies of a money supply or a DCE target?

If we consider the level of income first, the model can be reduced to two equations relating the money supply to the level of income:

(VI) $Y = [1 + m - c]^{-1} \{A + I + G + X - B + dM\}$

(VII) $M = [1 + b]^{-1} \{X - B + D - mY + \overline{DCE}\} + M_{t-1}$

Equation (VI) indicates that an increase in M, *ceteris paribus*, raises Y; while equation (VII) shows that an increase in Y, DCE given, reduces the money supply (through an increase in imports which is only partly offset by capital inflows)*. Equation (VII) is thus used to represent a DCE target, and can be substituted by an alternative function which shows that M does not depend on Y, when a money supply target is employed (in this case, DCE becomes endogenous and varies according to Y). Equations (VI), (VII) and the alternative equation for a money supply target are represented in Figure I.

Any change in autonomous internal expenditure (A + G + I), will shift equation (VI), to the right if expenditure increases and to the left if expenditure declines. In the first case, the maximum increase in income (Y_4) will be obtained with a money supply target; in the second case, the minimum decline (Y_2) will be obtained with a DCE target.[23] This is because, with a DCE target, changes in income (eq. VI) are partly reduced by the offsetting changes in M (eq. VII), a mechanism which does not operate with a money supply target (equation VII being substituted by the horizontal line).

Any change in the exogenous component of the current account of the balance of payments (X — B), will shift both equations (VI) and (VII) — as indicated in Figure II for the case of an increase — with a DCE target; while it will shift only equation (VI) with a money supply target. In this case, we find that the maximum increase in income (Y_2) is obtained with a DCE target; while the minimum decline is given by a money supply target.

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22 An alternative interesting case would be to consider the parameters as stochastic estimates. See FRIEDMAN (1973).

23 In Figure I it is also evident that with certainty any Y can be achieved either by fixing DCE or M.

* This result depending on both the import propensity and the capital inflow elasticity, there could be cases when M will rise with an increase in income. In that case, the following analysis should be accordingly changed.
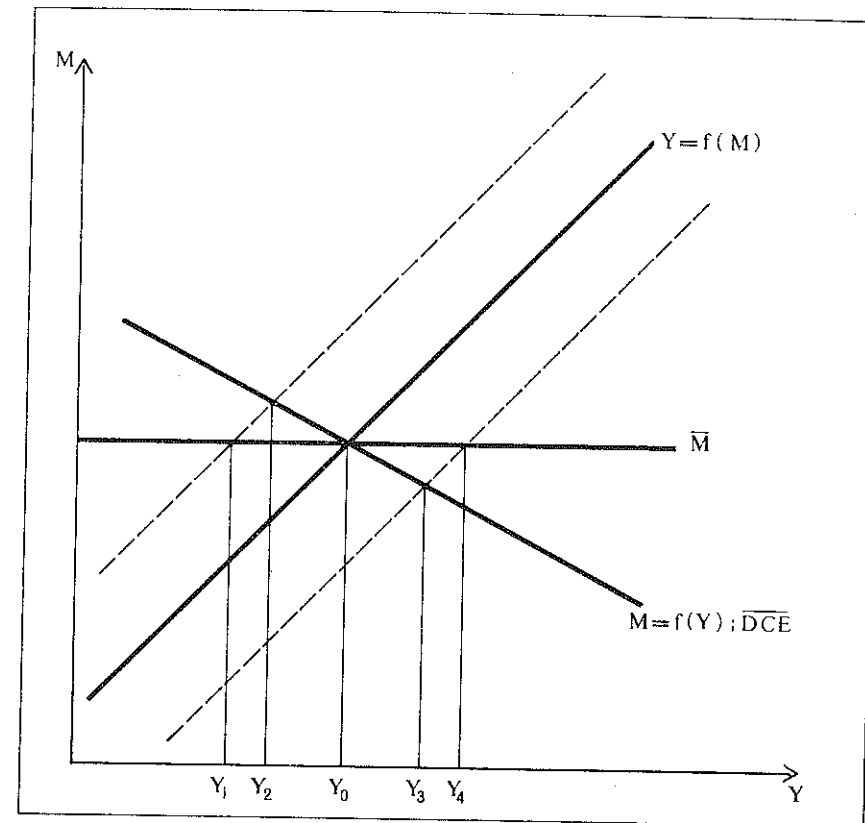

FIGURE I

Finally, any change in autonomous capital inflows (D), will shift equation (VII) with a DCE target, leading to corresponding changes in M and Y; a DCE target is thus best with an increase in D for it leads to a rise in income. With a money supply target, a change in D will be offset by a change in DCE leaving income unaffected: a money supply target is best to avoid a decline in income.

In a similar way we can analyse the effects on the constraint variable R. The model can be reduced to the following equations:

(VIII) $R = [1 + m - c]^{-1} \{(1 - c) [X - B] + (1 + m - c) D + [b(1 + m - c)] M_{t-1} - m (A + I + G) - [b(1 + m - c) + md] M\}$
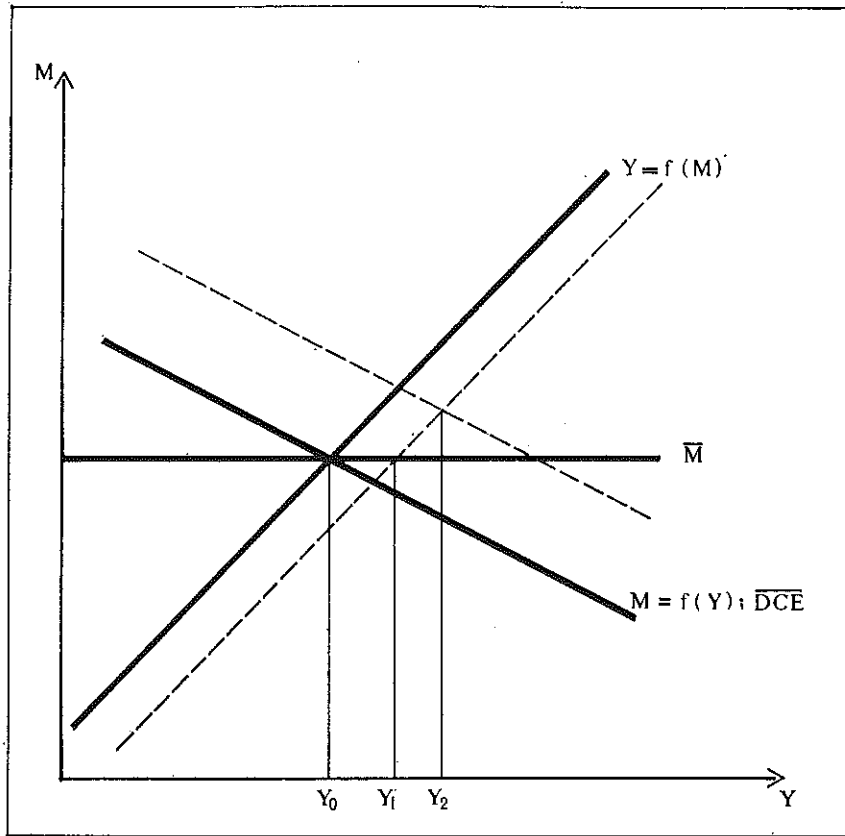
(IX) $M = R + \overline{DCE} + M_{t-1}$

FIGURE II

FIGURE III

as represented in Figure III. Again, equation (IX) can be substituted with an equation for $\overline{M}$, where the money supply does not vary with the reserves, as their changes are offset by changes in DCE.

It is evident that all changes in the various exogenous variables will only shift equation (VIII). And that the maximum increase in reserves (R_4) will be obtained with a money supply target, while the minimum decline (R_2) will be given by a DCE target. As before, with a DCE target we have offsetting changes in the money supply which reduce the change in reserves.

The conclusions we have thus reached are not entirely novel.[24] Had we defined the policy criterion in terms of minimizing the

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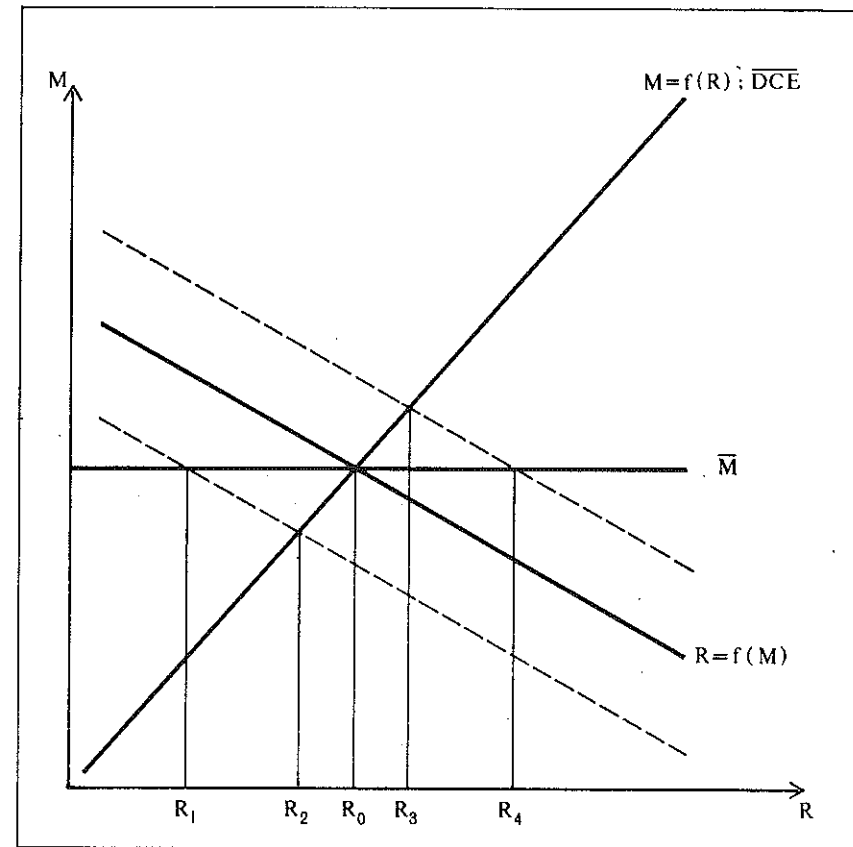24 The analytical framework itself is adapted from POOLE (1970), (1971).

variance around a desired level of income or reserves, we would have found that a DCE target is always better for stabilizing the external objective (see Figure III: $R_2 - R_3$ is smaller than $R_1 - R_4$). While for the income objective, a DCE target is better in the case of a change in internal autonomous expenditure (see Figure I: $Y_2 - Y_3$ is smaller than $Y_1 - Y_4$), but a money supply target is best when there are shifts in the balance of payments. As we have seen earlier on, these were in fact the conclusions reached by Polak-Argy.[25]

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25 In fact, our diagrammatic analysis corresponds to Polak-Argy's analysis which is cast in terms of relative size of the multipliers: the finding that a shift in equations (VI), (VII), (VIII) has a smaller effect on one objective, given one target, corresponds to the case of a smaller multiplier of that disturbance.

What we have shown, however, is that the selection of an optimal target depends not only on which unpredicted disturbance occurs, but also on the utility function of the monetary authorities. If their only objective variable is income, without any constraint, and we simply assume that utility is proportional to income, the choice between a DCE or a money supply target is just a question of risk-aversion. With an increase in autonomous expenditure, a money supply target gives the maximum increase in income, but with a decline in autonomous expenditure, a DCE target gives the minimum decline in income. Unless the authorities can forecast the *direction* of unpredictable disturbances, there is no obvious criterion for selecting the optimal target: in each case there is going to be a loss of utility with one of the two disturbances.

This state of indeterminacy is the consequence of comparing two alternative targets in terms of just one objective variable which is by definition unbounded. But we can show more reasonable results if we simultaneously consider both the internal objective and the external constraint.

3. Trade-offs Between Internal and External Objectives

An alternative, more realistic, utility function for the monetary authorities (which certainly gives a better approximation of their behaviour in the postwar period), can be stated as follows:

i) any unexpected disturbance which leads to both an increase in income *and* reserves unquestionably increases utility. In this case, the optimal financial target is the one that leads to the maximum increase in income, per unit of increase in reserves;

ii) with a disturbance that leads to a decline in income, the best target is the one that gives the minimum decline in income;

iii) with an unexpected disturbance that leads to an increase in income and a decline in reserves, the optimal target is the one that gives the minimum decline in reserves per unit of increase in income.

We can solve the model [1]-[6] for the two targets and compare the effects of unexpected disturbances on both income and re-

serves (the ratio of the various multipliers will give the relevant trade-offs [26]).

The first case — both income and reserves rise — is found with an increase in the autonomous components of the balance of payments. With an increase in exports, a DCE target will lead to the maximum increase in income per unit of increase of reserves. This is confirmed by the fact that the ratio $\Delta Y/R$ for $\overline{DCE}$ is greater than the ratio $\Delta Y/R$ for $\overline{M}$:

$$(X) \qquad \frac{\Delta Y}{R}_{\overline{DCE}} = \frac{1+b+d}{1-c} > \frac{\Delta Y}{R}_{\overline{M}} = \frac{1}{1-c}$$

where $b+d>0$ and $1-c>0$.

The same is true with an increase in autonomous capital inflows:

$$(XI) \qquad \frac{\Delta Y}{R}_{\overline{DCE}} = \frac{d}{1+m-c} > \frac{\Delta Y}{R}_{\overline{M}} = \frac{0}{1}$$

The second case — income declines — is found in the case of a decline in all the various functions. Here we must distinguish two cases. With a decline in internal autonomous expenditure, a DCE target gives the minimum decrease in income. With a decline in exports or in capital inflows, a money supply target gives the minimum decline in income (at the expense of a greater decline in reserves).

The third case — income increases and reserves decline — is found with an increase in autonomous internal expenditure. Here, again, a DCE target is better, for it leads to the minimum decline in reserves per unit of increase in income, as is confirmed by the

fact that the ratio $R/\Delta Y$ for $\overline{DCE}$ is smaller than the ratio $R/\Delta Y$ for $\overline{M}$:

$$(\text{XII}) \qquad \frac{R}{\Delta Y}_{\overline{DCE}} = -\frac{m}{1+b} < \frac{R}{\Delta Y}_{\overline{M}} = -m$$

Thus, not surprisingly — given the previous results — this analysis leads to the conclusion that, in general, a DCE target is better than a money supply target. It is better for both income and the balance of payments, except in the case of an unexpected decline in exports and capital inflows. A money supply target is best in the latter case, but then it is less satisfactory in many more other cases.

Conclusions

In this paper we have maintained, first, that an evaluation of alternative targets of monetary policy in terms of minimum variance of income is not a very relevant analysis. There is no reason why the authorities should prevent an increase in income, except, of course, if a constraint is violated. Nor is it very useful to find which target is best for what objective. By shifting from one target to another, according to which objective has overriding priority, monetary policy may actually increase the instability of the system.

If we assume a utility function in which we have both income as an objective variable and the foreign reserves as a constraint, and we have just monetary policy as the available instrument (otherwise, with two instruments, monetary policy should be paired to the external objective), then in order to maximize expected utility the monetary authorities have to select the target which gives the best trade-off between the internal goal and the external constraint.

Our results indicate that a DCE target is the optimal operating target, except in the case of an unexpected worsening of the balance of payments. A possible way out of this dilemma requires the relaxation of two other stringent assumptions which are commonly found in the literature and were adopted in the present paper. That is to say, the authorities have to take into account, in their forecasts of the exogenous components of the balance of payments, the necessity

to rule out any decline in exports and capital inflows. Their target for DCE [27] will be, in the first instance, the one which accepts the most " pessimistic " forecasts of the balance of payments. Then the target itself could be adapted upwards, once the balance of payments turns out better than forecasted. In other words, by this simplified rule-of-thumb, the authorities can dispose of uncertainty with regard to the balance of payments, but need to correct this more restrictive approach by introducing a feedback mechanism on their target. Less uncertainty and greater flexibility are, after all, the monetary authority's preferred conditions.

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[27] This procedure is much simpler for a DCE than for a money supply target.

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