MONETARY POLICY-MAKING IN THE SHORT RUN

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Any useful discussion of economic planning and macroeconomic policy must deal with a wide range of theoretical and institutional problems. Some of the most interesting and important of these problems arise when theoretical constructs are applied to specific policy decisions. I shall discuss some of the difficulties encountered in designing and executing monetary policy as an example of this type of problem.

Specifically, I shall briefly treat problems arising from (a) conflicts of goals; (b) incomplete models; and (c) uncertainty. In addition, I shall consider some of the methods which the Federal Reserve uses in an attempt to meet some of these difficulties.

Some Problem Areas for Decision-Making

Conflicts of Goals

A coherent monetary policy must be oriented toward achieving both long-run and short-run goals. Long-run goals usually include an optimum growth rate for real output together with minimum levels of unemployment and a relatively stable price level. In attempting to achieve these goals, policy-makers must also consider sectoral problems such as the balance of payments, impacts on major industries and geographical areas, and the distribution of income. As is well recognized, choices of trade-offs among these goals and constraints depend heavily on value judgments in the decision-making process.

In addition to these long-run policy aims, however, there may be goals which appear to be short run, but which have longer run implications for the efficiency and output levels of the economy. In the field

of monetary policy some of these short-run goals are concerned with the maintenance of orderly markets and with movements of assets and liabilities among financial institutions. Avoidance of extremely sharp shifts in rates and flows, both domestic and international, may mean lower long-run costs as well as more optimum allocations of savings and capital. Some of the possibilities which must be considered in the selection and operation of monetary policies are rapid shifts of deposits from intermediaries to money market instruments, failure of financial institutions and brokers or dealers, sudden changes in demands for liquidity, and the inability of creditworthy borrowers to obtain loans because of a general decrease in confidence in the credit system. Because these and similar eventualities may be extremely costly to the over-all economy, monetary policy must be concerned with its impacts in these areas as well as on the level of spending.

Generally, short-run goals have been ignored by theorists in monetary economics. The problem is that most models deal almost exclusively with policy instruments, and cannot comprehend such forces as the impact of a sudden change in the demand for liquidity, or the difficulties raised by short-run movements in financial flows and rates of return even though these result in subsequent feedback effects on the public and eventual impacts on gross national product. Despite their absence from almost all models, economists recognize that such forces can create extreme pressures on particular types of financial institutions, and that if they become cumulative they can seriously damage or destroy the

underlying financial structure of the economy, as they have in past
financial panics. Relating the goal of avoiding the disequilibrating
effects of such developments to other goals remains a highly judgmental
and qualitative process. Thus, to a certain extent, the short-term goal
of avoiding the disruptive impacts of sudden liquidity shifts can be
pursued as an end in itself, and may at times take precedence over all
other goals.[1]

Given the varying degrees of interrelatedness among potential
goals, the monetary authority is always faced with the dilemma of having
to establish priorities among them, and with accepting less than optimal
values of conditions in one area in order to achieve a desired setting
elsewhere.

Choosing a Model for Policy

All policy-makers use a model or models (implicit or explicit)
to enable them to estimate the expected impact of changes in the policy
variables which they control on movements in the economy and, therefore,
on the achievement of the desired goals. Unfortunately, however, there
is far from complete agreement on what are proper or correct models for
this purpose.

There are at least three major types of strategic monetary vari-
ables which theory offers the policy-maker as significant in influencing
the final goals:

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[1] For a theory of how a financial system can generate such short-run
movements, see Minsky [6]. Unfortunately, there has been no success-
ful attempt to translate the theoretical content of Minsky's work
into an operational model which will assist policy-makers.

(1) Monetary or credit aggregates such as: the money supply narrowly or broadly defined; deposits of financial institutions; member bank liabilities or credit; broader concepts of credit flows, liquid assets, wealth, and lending.

(2) Relative and absolute real or nominal interest rates.

(3) The general atmosphere of the credit markets and banking as reflected in expectations; demand for credit; and the amount of credit being supplied.

The movements in these strategic monetary variables in turn result from interactions of the specific instrumental policy variables controlled by the monetary authority together with decisions made by private financial institutions, the Treasury, corporations, and individuals.

There are an extremely large number of models and views which attempt to explain how and to what extent these variables influence prices and economic activity as well as how these intermediate variables are influenced by the policy variables controlled by the policy-maker.[2]

It should be recognized that much of the debate over the correct choice of a policy model is really not a debate over macroeconomic theory. We could probably build a theoretical model which all could agree on. We could do this by letting one group set down its equations, and then allowing other groups to suggest the addition of other variables and equations. Most theories could be encompassed in a single model, with a large number of variables and equations.

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[2] For a discussion of this problem, cf. Maisel [5].

The present debate is really about the number of variables and the size of the coefficients on those variables which are included in the models offered to the policy-maker for his use. Few would completely rule out the possibility that variables or equations contained in the theories of others, but omitted from their own, might at some point in time add to the explanatory capacity of their preferred model. Debates occur because some assume that certain elasticities are large, others that they are small. Some drop equations because they assume that co-efficients are zero in the relevant range of variables. Thus, the policy debates center about such questions as how much should a particular mone-tary variable be altered at a given time if we want to achieve a specific goal? Given a particular setting for a monetary variable, what will be the effect on other goals? Because of all the well-known disabilities of econometrics and statistics, we have no certain method of choosing among the models which are offered.

Another major problem with today's models is that most theory concerned with economic policy-making remains one of comparative statics. Even dynamic econometric models rely on comparative statics for their underlying theoretical base. But policy in the short run deals with a system which is in constant disequilibrium and which is being subjected to a continuous series of shocks. We never reach, nor even approach, the equilibrium position which most theories and models are concerned with. This is not to say that comparative statics is useless in helping to analyze policy choices, but only to point out it is not a fully satis-factory procedure. For the present, it's about all we have.

Uncertainties

There are at least three major sources of uncertainty in planning. Each of these must be taken into account in the decision-making process.

The problem of selecting a model leads immediately to a first type of uncertainty. When we start to make policy, we are uncertain as to the functional relationships among variables and the values of the coefficients given by the hypothesized relationships. Knowing that our view of the world is not 100 per cent accurate, we encounter two subclasses of uncertainty of this type:

(1) First, there is uncertainty about the relationships primarily within the monetary sphere. When the monetary authority decides to alter the setting of its policy instrument variables, it cannot predict accurately the impact of these changes on the intermediate monetary variables. We have only rough estimates of the relevant monetary demand and supply functions. The relationships of open market operations, or any other monetary instrument, to the money supply or interest rates, particularly in the short run, are neither simple, direct, nor fully understood. Beyond this, most equations in the monetary sphere contain variables outside the control of the monetary authorities. The movements in these variables may or may not be affected by policy changes, but the fact that they are beyond the control of the policy-maker adds uncertainty to any decision.

(2) Another subclass of functional uncertainty is that which surrounds the relationship between the strategic monetary variables and policy goals. For example, even if we accepted a theory which assigned the dominant role in influencing spending to the money supply, there would still be uncertainty as to the value of the coefficients relating current and past changes in the money supply to the GNP, as well as in those relating changes in spending to movements in real and nominal output and employment. In addition, existing theories tell us little about the short-run impact of changes in the money supply on interest rates, liquidity, expectations, or availability of credit, all impacts which may be of considerable relevance to other policy goals of the monetary authority.

A second type of uncertainty arises from the fact that at any time the data which we must use are far from exact. This is a problem which affects our selection of both policy and strategic goals. For example, the United States data on the gross national product are available on a quarterly basis, with a lag of roughly one month for the first "preliminary" estimates and then another month for "provisional" estimates. Finally, once a year, estimates for the previous three years are re-evaluated. The differences between the first and last estimates can be considerable, enough in fact to have led some observers to conclude that economic policy would have been different at certain periods in the past if policy-makers had been working with the "final" estimates instead of earlier ones.

Similar problems of "noise" exist in the monetary variables. At the time a policy decision must be taken, estimates of the monetary variables have a wide variance or a large degree of unreliability. It is difficult to decide whether to change a policy tool if the existing reading of the monetary variable is well within the normal range of error from a desired position.3/

Some theories assign most of the responsibility for variations in spending and output to movements in the rate of change in the narrowly defined money supply. As an example, one well-known model estimates that each increase in the narrowly defined money supply (M_1) of $170 million

3/ Cf. Davis [2].

will eventually increase GNP by $1 billion. But consider the implications of the fact that revisions between the money supply as first reported and as currently estimated average $152 million per week for 1967-69. Revisions had a range of $-1.4 billion to $+1.0 billion. Their mean deviation was over $490 million. In 1969, revisions of the estimated growth rate of the money supply in the first six months amounted to over 100 per cent. The difference between the model's estimate during the decision-making period and that which the model predicted from the revised data of the total monetary policy impact on the GNP was nearly $10 billion, or a magnitude that in many cases would encompass the difference between an inflationary and deflationary policy.

A third type of uncertainty confronting the policy-maker concerns the values of the exogenous variables beyond his immediate control. Government itself is frequently a major source of such disturbances, with major changes in predicted spending plans and revenues. Business investment is another example. Clearly, the larger the number of exogenous variables that must be included in any model, the greater the uncertainty from this source. Making more variables endogenous does not, however, solve this problem. They tend to increase--not decrease--the standard error of forecast.

These and similar sources of uncertainty are what make the choice of proper indicators of monetary policy so difficult. Any single indicator can at any time be giving a completely incorrect reading of the actual impact of monetary policy. Coefficients in policy-makers' models

may be wrong, the assumed values of the data may be incorrect, the strength or weakness of exogenous variables may be improperly estimated. As a result, because of distortions introduced in the decision-making process by the vagaries of the real world, a given indicator or model at the moment of the policy decision may yield an estimate of the impact of monetary policy decisions which differs significantly, even to the point of an opposite sign, from those actual requirements which would be shown by a correct and true model.

Planning in the Short Run

Having discussed how difficult it is to design monetary policy in a world of conflicting goals and uncertainty, I shall now suggest a somewhat idealized and over-simplified procedure which enables policy-makers at the Federal Reserve to come face-to-face with reality, if not to unanimous agreement. It is, of course, a truism that policy must be made no matter how great the uncertainty. Failure to alter monetary policy variables is as much a policy decision as altering them. The problem is to obtain the best possible decision given all the difficulties of the underlying situation.

The system utilized contains at least five distinct attributes. It attempts, obviously, to achieve the best possible current performance. In addition, in designing and operating it, attention has been given to the importance of maintaining a structure which can improve future per-formance. Such improvements are only possible if errors and mistakes are recognized and corrected. This means that existing theories and models

must be constantly tested in order to develop better theories, data, and judgment for the future.

(1) There is a constant struggle and a large expenditure of effort to maintain and improve the flow of information. The knowledge sought includes both qualitative and quantative data of the past and current situations as well as forecasts of the future.

(2) Many different models are used. Each is under continuous study with elements being constantly revised so as to enable each to encompass the latest developments in both theory and actuality. The models are used to simulate varying policy options and possible changes in the non-policy spheres so that the sensitivity of the economy to different exogenous and policy changes may be estimated.

(3) Policy is not usually altered in response to week-to-week or short-run movements in the data. Rather longer run spans are used in order to avoid the pitfall of over-interpretation of short-run developments. Insofar as possible, attempts are made to give proper weight to the past reliability of the data.

(4) Policy is not based on a literal acceptance of any specific fixed model. Rather it develops with the use of discussion and debate which allow for the introduction of judgment as to the economy and the model and value judgments over goals. All of these tend to be excluded (or deeply buried) in the more formal models.

(5) A variety of policy tools and several monetary variables are encompassed in the analysis and decision-making process. It is recognized that each tool may have a differing impact on each monetary variable depending on circumstances. In addition, in particular periods, both tools and monetary variables may reach limits beyond which any movement may endanger some of the desired goals. Flexibility is maintained in both plans and operations to allow switching among policy variables as indicators move outside their normal range. In practice switching appears to improve current performance. In addition, it appears proper and logical on theoretical grounds.

The Models

Two earlier references, Maisel [5] and Davis [2], outline the
basic type of very general models used by the Federal Reserve. In effect,
the Fed has some specific policy instrument variables: open market opera-
tions, the discount rate, ceilings on interest rates paid by banks,
required reserve ratios, and some policy with respect to the frequency
and amount of discounts. Changes in these variables interact with demands
and actions of other financial institutions--in particular, commercial
banks and the Treasury--and the general public. The result of these
interactions are changes in the monetary aggregates, in interest rates,
and in the willingness to lend. Movements in these strategic monetary
variables in turn influence total spending (the GNP) as well as particu-
lar markets and sectors of the economy.

The decision-making problem is to determine when and to what
degree to alter the policy variables so as to move the economy closer to
desired goals given current assumptions about the economy, exogenous vari-
ables, and the reactions to any changes in Fed policy.

In the Federal Reserve System we take as the relevant planning
period the next twelve months, broken down into four quarters. The staff
of the policy-making Federal Open Market Committee (FOMC) constructs a
four-quarter forecast of gross national product, broken down into compo-
nents. The GNP is projected based on expected movements in non-monetary
forces and on specific assumptions about future monetary and fiscal poli-
cies including their impact on the monetary variables. The projections
include movements in all monetary aggregates such as bank reserves, the

money stock, bank credit, all financial institution assets, total credit flows and short- and long-term interest rates. These are based on the expected interaction between the movements in the GNP and the assumed monetary and fiscal policy.

Within this general type of framework, we rely on both judgmental and econometric models to assist us in evaluating alternative courses of monetary policy. Figure I lists the contents of a typical forecast of this type. The over-all structures are based on the GNP and the flow of funds accounts. A judgmental model of spending, output, employment, and prices consists of roughly 100 variables including monetary and credit variables. Forecasts are made partly from past trends, partly from individual equations, and partly from computer models of past relationships. These projections are then checked against the logic of the large-scale econometric model and simulations made with it.

Not surprisingly, we continue to rely rather heavily on the judgmental forecasts. In fact, when it comes to short-run policy, even the most dedicated econometricians will concede that mathematical models of the economy have a serious disadvantage. An econometrician can explain errors as stochastic disturbances, or a deviation of actual from predicted gross national product as falling within the standard error of his model. The policy-maker, however, particularly in a democracy, cannot use this language to comfort critics if he wishes to remain an effective policy-maker.

FIGURE I

DESCRIPTION OF A RECENT FEDERAL RESERVE BOARD
JUDGMENTAL FORECAST

A total of 106 variables were projected forward one year with estimates of the level and rate of change for each variable in each quarter of the year ahead. These variables can be classified into six groups:

GNP and National Income (22 series). Includes estimates of personal consumption expenditures, broken down into durable goods, nondurables, and services; private domestic investment, broken down into residential construction, business fixed investment, and the change in business inventories; government purchases of goods and services, divided into defense-related items, other, and state and local purchases; corporate profits; and personal income.

Employment and Labor Force (5 series). Employment in manufacturing, armed forces, nonfarm payroll employment; total labor force; and the unemployment rate.

Physical Volume of Production (4 series). Industrial production index; capacity utilization; housing starts; and sales of new domestic automobiles.

Balance of Payments (19 series). Includes imports, exports; military expenditures; receipts and payments of investment income; corporate claims on foreigners; purchases of U.S. corporate stocks; and increase in liabilities to commercial banks abroad.

Flow of Funds (46 series). Total borrowing by type of credit instrument by sector borrowing, and sector supplying; net purchases of government securities by sector; and commercial bank asset and liability acquisitions.

Key Monetary Variables (10 series). Reserves; money supplies; bank credit; and interest rates.

From these 106 variables, a total of 187 series were constructed as the variables were expressed singly or in combination as levels, changes, ratios, and rates of change.

Alternatives

In the actual decision-making process, to the basic projection one or two alternate courses for monetary policy are added. Staff analysis works through the interrelated movements in the monetary aggregates, interest rates, output, employment, and prices which would be expected to result from different settings of the policy instruments.

Ideally, these projection exercises can be (and to some extent are) repeated for different views on how monetary policy affects the economy. The differing results highlight the critical variables and their impact on agreed-upon policy goals. Staff resources impose practical limits on the number of exercises. Even with extremely dedicated and competent staff members, we are able to investigate only a small number of alternatives at each FOMC meeting.

It is difficult to over-emphasize the importance of considering alternative monetary policies. Without adequate presentation of the implications of alternative policies, decision-making by policy-makers becomes a largely hit-or-miss affair. If policy-makers do not consider alternatives, they are, in effect, abnegating their responsibility to make decisions. This point of view quite clearly runs counter to that which holds monetary policy-making should be largely confined to following fixed "rules" concerning monetary aggregates.

In my view, the central bank must develop policies based on its recognition of lack of knowledge of both the complete economic situation and the actual workings of the economy. Contrary to the views of some

that uncertainties should lead to less flexible policies, I believe, on both practical and theoretical grounds, uncertainties require the use of more judgment and flexibility. A critical problem in using a simple rule would be what to do when the levels of the indicators are in areas with potentially large policy implications, but still well within the range expected because of the "noise" in the system. Particularly when we admit the existence of short-term goals, such as avoiding sharp fluctuations in exchange rates and the adverse impacts of sudden shifts in desired financial asset holdings, it is doubtful that any monetary authority could properly function with only a set of unchanging rules to guide them.

Group Decision-Making

The alternative models as presented by the staff are subject to analysis and debate by the policy-makers--which in the case of the Federal Reserve System consists of either the Board of Governors with seven members or the broader Federal Open Market Committee which includes the Board plus five regional Federal Reserve Bank presidents.

This debate brings out differing theoretical interpretations and views with respect to the basic presentation. Each policy-maker adds his judgment plus any arguments he may wish to advance for theoretical concepts or coefficients different from that of the staff. These differences may be concerned with the staff's estimate of the current situation, views as to the probable future movements of exogenous variables, or as to the impact of possible policy changes on both the monetary and banking variables and on spending, output, employment, and prices.

The policy-makers may also, of course, and frequently do differ as to their views of the weight to be given to conflicting goals. Such differences encompass both the importance of specific short- versus long-run goals but also the trade-offs among prices, employment, balance of payments, residential construction, etc.

The debate among the policy-makers ends up with a decision as to the desired movements of the monetary variables over a future period. If necessary, action is taken to reset the policy variables in line with these desired movements. Policy is under constant re-examination with a semi-formal review at least weekly and a more formal and detailed examination at monthly intervals.

Similarly, revisions of the projections occur at far shorter intervals than the actual horizons used in the analysis and/or that adopted for policies. Ongoing and prospective movements in the policy variables are estimated on the basis of incoming daily data. As the data accumulate, changes in their expected future relationships are indicated and every week regular re-estimates of the policy and monetary variables are made for the next 90 days. However, the detailed projections of the GNP and all financial variables may be completely reworked as few as three times a year.

Uncertainty

How do the FOMC's decisions take account of the presence of uncertainty? There are four channels through which allowances for un-certainty are made: multiple objectives, the use of ranges, the use of

Proviso clauses, and the ability to adjust settings on any of a variety of policy tools.

In the formal directive and associated memoranda which result from policy meetings of the FOMC, multiple strategic goals for the inter-mediate monetary variables as well as over-all policy goals are laid out. The directive contains desired movements in the monetary aggregates plus ranges of bank reserves and borrowings and sensitive money market interest rates believed to be internally consistent both with respect to the mone-tary variables but also to the desired movement of the economy. While numbers are given for the expected movements in each variable, it is recognized that variations around each of these numbers are to be ex-pected. As a result, it is not a matter for immediate concern if the expected relationships between policy goals, strategic goals, and the day-to-day banking and money market indicators do not work out in exact detail. The specific parameters which govern these relationships are unknown; they may vary tremendously in the short run because of the erratic behavior of the data, and because the nature and extent of all future exogenous disturbances cannot be predicted. In between meetings of the FOMC, it is the job of the Manager of the Open Market Account to carry out operations according to the directive and its associated memoranda. Given the multiple objectives and ranges, the Manager's task of dealing with uncertainty is rendered more feasible than if he were given a single objective and single-valued indicators.

Because the variances in both the data and the relationships are recognized, the Manager need only make certain that the general direction and, within a rather broad range, the rate of movement of the monetary variables are maintained. He has as guideposts the development of relationships in the recent past as well as historically. He must react when the estimates of the key monetary variables move too far from the desired path or when they remain above or below the targets for several weeks. But, given the Manager's close and continuing contact with the financial markets, he is allowed to use his own judgment as to how best to move to the desired path with a minimum of under- and over-shooting. He is given the best technical and statistical aid available, but the success of the operation to meet the targets will depend greatly on individual skill and judgment.

The existence of proviso clauses gives the Manager new instruc-tions in case the postulated relationships deviate beyond acceptable ranges. In effect, he is told to switch his primary target if it can only be maintained at the expense of an overly large movement in one of the secondary targets. As an example, assume the Manager has had as a prime target the blending of a 3 per cent growth rate in the narrowly defined money supply with an 8 per cent growth rate in a more broadly defined money supply (such as bank credit). The blend is used partly because of knowledge that the errors in measuring the two separate concepts are likely to be less than the errors in either one and partly to encompass conflicting theories of how monetary variables influence spending. Such

a monetary movement might, in the assumed case, be estimated as consistent with a 7 per cent call money (Federal funds) rate. Then depending on the directive the proviso might come into effect even if the growth rate for money was on target when the call money rate rose over 8 per cent. The proviso would require that he switch his target and instead of aiming at the growth rate in the monetary aggregates he would attempt to lower the call money rate below 8 per cent by his operations.

The logic of the proviso, or "switching rule," arises from the lack of certainty. The break in past relationships may reflect errors in the measurement of the growth in money or it might reflect a shift in the liquidity schedule, and therefore a larger demand for money. In either of these or similar cases the reported growth rate of money should be larger than initially projected. This increased growth would be in accordance with and not harmful to the ultimate policy goals. In each of these cases, the policy-maker has determined in advance that a change in targets would be proper. Model simulations indicate that such switches give better results than maintaining the original target.[4/] Furthermore, any movement in the call rate above 8 per cent might threaten a short-run goal because of its impacts on confidence and financial institutions.

Such a re-ordering of targets, however, is a delicate matter. The Manager, and ultimately the FOMC, is faced with the possibility that the numbers are really accurate and the relationships have not changed so that the higher than expected short-term interest rates arise from a

[4/] Cf. Pierce [8].

larger than desirable rise in spending. In such a case, since the subordi-
nation of long-term to short-term goals is costly, there may be a conse-
quent need to undertake drastic action to "get back on the path" towards
the long-run targets. A shift to allow higher than previously expected
current interest rates may be necessary even if the switch to using a
maximum rate rather than a monetary aggregate guide was not wrong. For
example, if a sudden shift in liquidity preferences calls for a large
increase in the amount of reserves supplied to the banking system via
open market operations, the Manager and the FOMC have to consider the
implications if liquidity preferences shift rapidly in an opposite direction
within a short period. Clearly, long-run objectives must have an influence
when decisions are being reached on how to deal with short-run phenomena.

The logic of the way in which policy is formed and the use of
multiple objectives should be understood. No matter what the basis for
operations--either monetary aggregates, money market conditions, or interest
rates more broadly--the FOMC can hardly avoid making judgments at each
meeting as to the appropriateness of the targets it sets. Moreover, when
data do not move according to expectations and past relationships, it must
make judgments as to the degree by which it may be willing to sacrifice
its long-run goal in the short run, or may be willing to alter its long-
run goal given the existence of uncertainties. With emphasis on the path
of monetary aggregates over the longer run, monetary policy can permit
unexpected shifts in the demands for goods and services to be offset by
countervailing movements in interest rates and credit conditions. At the

same time, because of concern with the condition of money markets over the short run, it is desirable that monetary policy be conducted in such a way that purely short-run shifts in demands for credit and money are not permitted to lead to cumulative and undesired changes in market conditions and the public's spending propensities.

The existence of policy tools other than open market operations also enables monetary policy-makers to deal more effectively with the problems caused by uncertainty and multiple goals. Reserve requirements, lending policy toward commercial banks, and interest rate regulation can be used to assist in achieving strategic and policy goals. While none of these tools is as sensitive and capable of day-to-day adjustments as open market operations, they nonetheless do enable policy-makers to influence different sectors of the monetary system and in such a way as to help in the achievement of differing goals.5/

Conclusion

Let me conclude by re-emphasizing what I consider to be the important results of this examination.

Coherent monetary policy can be best achieved by forcing policy-makers to (1) specify their goals clearly, (2) think quantitatively,

5/ The tendency for real world policy-makers to use all available tools (or "instruments"), no matter what the number of goals, suggests that the conclusion reached by some writers, such as Tinbergen [10] and Mundell [7] ('we need no more instruments than there are goals'), is not applicable to a world of uncertainty. And recently Brainard [1] and Poole [9] have formally demonstrated how the presence of uncertainty can lead to operational policies quite different from those which would be followed in a world of certainty.

(3) explicitly allow for the presence of uncertainty, (4) consider in some detail alternative policy paths and their implications, and (5) enable non-quantative and judgmental considerations to be expressed in the quantative form necessary for operations. With guidelines based on these factors we can get a better idea of the trade-offs, risks, and lack of knowledge associated with different policies and differing theoretical constructs of the world.

If our objective is to minimize the difference between the target and realized values of a policy goal, it makes both theoretical and practical sense to use overlapping models and as many policy instruments as possible rather than to attempt to guess at the right theory or to put one's entire trust in one or a minimum number of variables. Such a procedure will tend to minimize undesirable results.

Progress is being made at constructing workable rules of thumb to guide policy-makers. Even though we may not be able to get optimal solutions given the current state of knowledge, examining past policy successes and failures in light of theoretical advances should help us to avoid the worst mistakes of the past.

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