

Rules Versus Discretion: Making a Monetary Rule Operational

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Introduction

The rules-versus-discretion debate is the most enduring, if not the most central, issue in monetary policy. It concerns whether monetary policy should be conducted by rules known in advance to all or by policymaker discretion.

For many years, the case for a monetary rule was associated with a particular proposal by Milton Friedman (1959). Building on a tradition initiated by Henry Simons (1936), Friedman introduced the idea that the effects of monetary policy were uncertain, occurring with long and variable lags. In short, he argued that discretionary management of the money supply in the face of such uncertainty actually amplified economic fluctuations. Hence, Friedman argued for a constant-money-growth rule.

The case for rules has changed fundamentally since an important paper by Kydland and Prescott (1977). They show that precommitment to a rule could have beneficial effects that discretionary policies cannot. Unlike Friedman's argument, the Kydland-Prescott case was not specific to any one view of the world, but could be applied to a very general class of models. In principle, one cannot deny that a policy rule can have potentially stabilizing effects.

The example of Kydland and Prescott, however, trivialized an important concern of policymakers: how to account for uncertainty in the link between policy instruments and ultimate objectives. Once one allows for uncertainty, there is a potential role for flexibility to deal with variability in the links. To the extent that some variation is systematic and can be predicted, it is possible to incorporate feedback into a rule. However, some contingencies cannot be foreseen. When such events are potentially destabilizing, discretion may not be ruled out a priori.

This suggests that it is reasonable to consider the idea of rules with discretion. Fischer (1988) has concluded that the dichotomy between rules and discretion should be seen as a continuum, in which the extent of the monetary authority is determined by the immediacy of the link between its actions and the attainment of the objectives.

The actual practice of monetary policy can be viewed as a point on the continuum. Moreover, the rise of monetary targeting in the 1970s, which led to alternative operating procedures with differing degrees of commitment, illustrates that the degree of commitment to any rule can vary over time. Changes in the degree of commitment are best understood when one confronts the difficulties in making rules operational.

This paper reviews the historical development of the rules-versus-discretion debate and examines the problems associated with making rules operational. Section I traces the evolution of rule advocacy from the time of the Federal Reserve Act. Section II describes the actual operating procedures from the early 1970s to the present. The operational problems facing rule advocates are highlighted in Section III, and Section IV discusses how two recently proposed rules address the operational problems. Section V offers some concluding comments.

I. Rule Advocacy in the United States After the Federal Reserve

The original Senate bill to create the Federal Reserve System in 1913 contained a provision that the system should *promote a stable price level*. This provision was stricken by the House Committee on Banking and Currency and was not included in the original Federal Reserve Act, reflecting the dominant influence of the real bills doctrine at that time. By the late 1920s, however, several bills had been proposed to amend the Federal Reserve Act explicitly to include a provision for price stability.¹ Advocates of these bills essentially sought to legislate a rule establishing the primacy of the price-level objective.

These efforts culminated in the Strong Hearings, held by the House Banking Committee in 1926-1927.² The hearings initially considered a bill by Representative James G. Strong including a provision that "all the powers of the Federal Reserve System should be used for promoting a stable price level." Specifically, Congressman Strong did not want the Federal Reserve to have the discretion to vary the price level for the pursuit of another objective.

While the bill instructed that the Federal Reserve's discount-rate policy was to be determined with "the view of promoting price stability," no formula was specified. Thus, there was a certain vagueness about how the rule would be implemented.³ It left open the role for discretion in determining how much the discount rate should be altered when the price level deviated

from its objective. A subsequent version of the bill was even more ambiguous about the objective of price stability. Eventually, Congressional interest in establishing the primacy of the objective of price stability faded.

The Simons Tradition

In a widely celebrated article of 1936, Henry Simons initiated a case for rules that was to become known as the Chicago view. Specifically, Simons contrasted two sharply distinct ways to conduct monetary policy: one, to assign in advance specific responsibilities to a monetary authority to be carried out in accordance with well-defined operational rules; the other, to specify a general goal while allowing the monetary authority wide discretionary powers to achieve the goal. The essential distinction is that the first regime defines the authority's objective in terms of the means, while the second defines the objective in terms of the ends.

Simons argued for rules in terms of means. His case was predicated on liberal (19th-century sense) principles. "The liberal creed demands organization of our economic life largely through individual participation in a game *with definite rules*. It calls upon the state to provide a stable framework of rules within which enterprise and competition may effectively control and direct the production and distribution of goods." (Simons [1936], p. 1)

The essential notion is that government is necessary for establishing laws that would define the rules for a "game" in which competitive free enterprise could flourish, but that government should not be a player in the game. The idea that government would manage the currency to manipulate aggregate economic outcomes meant that government would be a player and thus violated the liberal creed.

An ideal rule according to Simons would be one that fixed the quantity of the money supply. He did not believe, however, that such a rule could be made operational without radical reform of the financial structure. Essentially, he believed that an unregulated financial sector was a source of great instability in money demand. This instability was reflected in the perverse behavior of velocity which, he argued, necessitated a role for discretionary actions. Simons

■ 1 For a thorough review of the debate, see Fisher (1934). It should be noted here that a provision for purchasing power was eventually incorporated in the Employment Act of 1946. However, the price-stability goal was not included as the primary objective as most advocates of price stability in the 1920s had sought.

2 For an excellent discussion of the background and events surrounding the Strong hearings, see Hetzel (1985)

3 Hetzel (1985) notes that Congressman Strong and his supporters wanted to institutionalize the policy of Governor Strong (no relation) of the New York Federal Reserve Bank, which they credited for the considerable price stability that existed after 1922.

therefore suggested a number of ideal reforms to reduce the variability of velocity to levels conducive to successful implementation of a fixed-money-supply rule. That is, government would need to redefine the rules of the game to avoid having to manage the money supply.

One proposed reform was the elimination of fractional-reserve banking. By requiring 100-percent reserves on all demand deposits, Simons sought to reduce greatly the threat of bank runs and the consequent effects on hoarding money (velocity changes). Such a reform would also give the monetary authority direct control over the total money supply by making it equivalent to the monetary base.

Simons recognized, however, that fixing the supply of deposits might merely serve to encourage the creation of effective money substitutes that would also affect velocity. Thus, another "ideal" (but even more radical) reform would be to prohibit fixed-money contracts. Restricting claims to residual equity or common-stock form would essentially drive a wedge between money and other assets and would tend to minimize the variability of velocity. In sum, Simons believed that a monetary rule in terms of means could be made operational only under a highly regulated financial system.

Simons was not naive about the kind of assent that could be gained for such radical reforms in modern democratic societies. He thought that adoption of an appropriate framework could be implemented only after decades of "gradual and systematic reordering of financial practices." Ironically, liberal principles also seem to support the notion that financial institutions should be largely unregulated and free to offer any instruments they choose. Indeed, institutional reform has moved in the opposite direction of Simons's ideal.

Recognizing the practical difficulties of sharp changes in velocity and that his ideal reforms might be unattainable, Simons argued for a rule for price stability in the interim. Because this is a rule of ends rather than means, the operational procedures were not well defined. His basis for this practical solution was that it was the "least illiberal" of the alternatives he considered. Thus, he recognized that for immediate purposes a certain amount of discretionary latitude was necessary. While Simons may have misjudged society's willingness to adopt his ideal reforms (new rules), his liberal view of economic agents participating in a game was prescient about the future state of the debate.

The Simons tradition was subsequently modified and popularized by Milton Friedman (1948, 1959, 1969). Initially, Friedman offered detailed proposals much in the spirit of Simons. They

included the 100-percent reserves reform applied to both time and savings deposits at banks.

Subsequently, however, Friedman changed tack, taking the position that the behavior of velocity, particularly the velocity of the M2 aggregate, was not so perverse in a relative sense, even under a fractional-reserve banking system. He argued that the discretionary actions of the Federal Reserve (albeit well-intentioned) were likely to be a more perverse source of economic instability. Thus, adherence to a constant-money-growth rule would lead to greater economic stability than would a rule with feedback, with or without discretion. In essence, Friedman maintained the idea that the monetary authority should not be a player in the game, but he eventually rejected the need for wholesale reform of the financial system.

Friedman's case for a constant-growth rule was based less on the liberal creed and more on pragmatism. His premise was that the economic impact of monetary policy occurs with a long and variable lag. Feedback, especially of the discretionary type, would have effects at the inappropriate time more often than not. Moreover, Friedman argued that political pressures and accountability problems under discretion are likely to exacerbate the problem.

While Friedman's case has intuitive appeal, it is difficult to justify in principle. Potentially stabilizing effects of policy feedback could be ruled out a priori only if money were the exclusive determinant of nominal GNP in the short run. If other identifiable factors also have significant explanatory power, then judicious use of feedback can, in principle, reduce the variability of nominal GNP, even if the coefficients on lagged money are stochastic. On the other hand, the stabilizing effects of policy feedback with parameter uncertainty are smaller than when parameters are nonstochastic (see Bminard [1967]).⁴

By eventually abandoning 100-percent reserves, Friedman also allowed a control problem: how to make a constant-growth rule operational for measures of inside money. Under 100-percent reserves there would be virtually no distinction between money and monetary base. Since Friedman also proposed closing the discount window, all money would essentially be outside money, and hence directly controlled by the Fed.

■ 4 When effects of monetary policy occur with a lag, there is a potential for instrument instability. The prospect of dynamic instability can be reduced with appropriate modifications to the objective function.

As advocates for constant money growth dropped the idea of 100-percent reserves, however, the issue of monetary control became relevant. When the measure of money is endogenous, the problem of making a constant-money-growth rule operational is far from trivial. Such was an important lesson of monetary targeting in the early 1980s. Perhaps recognizing this fact, advocates for money-growth rules now typically propose closing the discount window and adopting a constant-growth rule for the monetan base.

Arguments for a monetat). rule in the Simons tradition remain highly controversial in principle. One cannot rule out the possibility that an intelligent policymaker could effectively take account of incomplete information when deciding optimal monetary policy. As Barro (1985) notes, "if the policymaker were also well-meaning, then there was no obvious defense for using a rule in order to bind his hands in advance." Moreover, Fischer argues, "At a formal level Friedman's analysis suffered from the logical weakness that discretion seemed to dominate rules: if a particular rule would stabilize the economy, then discretionan policymakers could always behave that way—and retain the flexibility to change the rule as needed."

Kydland and Prescott

The idea that discretion could always replicate a preferred policy rule seemed to provide a highly influential argument in which intelligent, well-meaning policymakers should not be bound by rules. However, in a widely recognized paper, Kydland and Prescott (1977) demonstrate a fallacy in this argument. It is now well understood that if economic outcomes depend on expectations about future policies, then credible pre-commitment to a rule could have favorable effects on the economic outcomes that discretionary policies cannot have.

Applications of the Kydland and Prescott result to monetary policy are often developed in familiar (and highly abstract) models of output and inflation.⁵ These models assume that wage-setters and the monetary authority are engaged in a noncooperative game. In this game, wage-setters must specify the nominal wage rate in a

contract (their play) *before* prices are determined (the policymaker's play). Firms' decisions to hire are made after prices are determined, so that the real wage is known. Since firms are assumed to be profit maximizers, the real wage determines the level of output for the economy.

An essential feature of the game is that by determining the price level, the policymaker's play determines the real wage and level of real output. Moreover, expectational errors of wage-setters determine the deviation of output from its full employment levels. Thus, the game yields the familiar output supply function

$$(1) \quad y = y^* + b(\pi - \pi^e),$$

where y and π are output and inflation, y^* is full employment output, and π^e is the expected inflation rate.

The policymaker is assumed to have a loss function quadratic in the deviations of inflation and output from target levels. Here, desired inflation is assumed to be zero.

$$(2) \quad L = an^2 + (y - ky^*)^2$$

The target rate of output is assumed to be above the natural rate, that is, $k > 1$. One motivation for this assumption is that tax distortions and unemployment policy cause the natural rate to be too low from a social point of view. Alternatively, one might argue that the labor market is dominated by large unions (see Canzoneri [1985]). He assumes that the labor supply curve includes only union members and that wage-setters' behavior systematically excludes other workers. By contrast, the loss function includes all workers. Others have argued that equation (2) is not really a measure of social utility, but reflects the bias of policymakers to underestimate the natural rate of unemployment.

To illustrate the advantage of a rule, consider the case in which the policymaker has discretion in a one-period game. Because the policymaker chooses policy *after the wage-setters specify the wage rate*, the wage-setters know that the policymaker has the incentive to take the *expected inflation rate as given* and to induce higher employment with additional inflation, if possible. Given the *known* loss function, there is only one strategically rational expectation (that is, Nash solution) for inflation:

$$(3) \quad \pi^e = a^{-1}b(k - 1)y^*.$$

■ 5 The particular example presented here is the compact static model in Fischer (1988). The use of a static model to illustrate dynamic inconsistency has been criticized as inadequate. The basic concept, however, has been developed in the context of a dynamic model (see Roberts [1986]). Since it is the concept we want to convey here, the static model suffices.

Under this solution, the policymaker has no incentive to choose an inflation rate higher than expected. The gains from the additional output would be more than offset by the loss of the additional inflation. Note also that if the policymaker had an objective for the inflation rate less than the expected inflation rate *before* wage-setters acted, it would be inconsistent *afterward*. That a zero-inflation objective is not credible with discretion is an example of the problem of *time inconsistency*.

The value of the loss function evaluated at the solution is denoted as L_d and is given by

$$(4) \quad L_d = (k - 1)^2 y^{*2} [1 + a^{-1} b^2]$$

If the policymaker could credibly precommit to a policy of zero inflation, that is, a dynamically consistent inflation objective, the loss function would be

$$(5) \quad L_p = (k - 1)^2 y^{*2}.$$

Since $L_p < L_d$, precommitment to a zero-inflation objective affects expectations in a way that leads to a more favorable outcome than pure discretion would allow. Essentially, discretion buys nothing in terms of output, which is the same under both policies, but leads to an inflationary bias.

To be sure, the basic result of Kydland and Prescott demonstrates in a very precise way a benefit to precommitment to a policy rule. Although developed in a highly abstract model, the result has been widely influential in academic research. A major shortcoming of the analysis, however, is that it trivializes the control problem. Specifically, it presumes that the policymaker has a deterministic operating procedure that enables precise control of inflation. Once disturbances are introduced into the model, the precommitment solution does not necessarily dominate the discretion solution.

To analyze the control problem, Canzoneri considers a stochastic disturbance to money demand such that velocity follows a random walk. In his game, wage-setters cannot see the disturbance at the time they specify their wage, but the Federal Reserve has some forecast of money demand before it chooses its policy for money growth. If the Fed is left with some flexibility, it can accommodate the predictable component of the change in velocity. As Canzoneri notes, this practice benefits both wage-setters and society as a whole. Thus, the policy problem becomes one of trading off flexibility needed for stabilization with the constraint needed for eliminating the inflation bias.⁶

The discussion thus far has been in the context of a one-period framework. In reality, however, the central bank has a horizon that extends beyond one period. Indeed, this may explain why central banks are typically isolated from political pressures by design. It is now widely understood that in a multiperiod context, the Fed may be able to establish a reputation that serves the same purpose as a monetary rule. This possibility has been investigated by Barro and Gordon (1983a, 1983b). They find that under certain conditions, reputation-building can lead to a result that is superior to pure discretion, although not as good as precommitment to a rule.

Barro and Gordon assume, however, that wage-setters eventually have access to the same information as the Fed. Canzoneri shows that when the Fed has its own private forecast of money demand, it has an incentive to misrepresent its intentions? He further demonstrates that no stable resolution of the credibility problem can rely on the Fed's own announcement of its forecast. When the Barro and Gordon model is modified to account for asymmetric information, the Fed cannot build sufficient credibility by simply running a noninflationary policy for a few periods.

Rogoff (1985) has shown that other solutions may mitigate the problem of dynamic inconsistency. One such solution is that society can benefit by choosing a "conservative" central banker—one that places a high cost on inflation. In the context of the simple model above, this means that the central bank places a high value on parameter a in its loss function. Equation (4) reveals that as a gets large, the value of the loss function diminishes, ultimately approaching the value of the precommitment solution given in equation (5).

Like Barro and Gordon, Rogoff assumed symmetric information. When the Fed has private information! it has the incentive to appear more conservative than it actually is; the wage-setters have no way of telling. The implication is that there could be periodic inflationary breakdowns followed by sustained periods where credibility builds and wage-setters learn the true intentions of their central bank. Unfortunately, Canzoneri shows that it is no simple matter to legislate incentive-compatible rules that would remedy the problem posed by private information.

6 Fischer (1988) demonstrates in a formal model that when control error exists, the ordering of the loss functions under precommitment and discretion is ambiguous.

8 7 If the money demand forecast were predicated on a stable model over time, it would be preferable for the Fed to commit to a contingent rule based on that model forecast. Thus, while the rule would allow flexibility, it would not admit discretion. Given the absence of evidence of stability in money demand, such a rule seems infeasible.

Rogoff also demonstrates that under certain conditions, intermediate targeting may also provide a reasonable solution to the problem of dynamic inconsistency. By providing the central bank with incentives to hit an intermediate target, it is possible to induce fewer inflationary wage bargains in the context of his model. While the Rogoff result demonstrates some a priori basis for intermediate targeting, his analysis abstracts from many problems the policymaker faces in practice. Nevertheless, the literature since 1977 suggests there is a reasonable basis for some precommitment—if not to a rule for all time—to some monetary policy on a continuum between a pure rule and pure discretion.

II. The Operating Strategy of the Federal Reserve

The operating strategy of the Federal Reserve can be viewed as a commitment to a policy on the continuum between a pure rule and pure discretion. The rule-like elements are embedded in the Fed's monetary targeting procedure. Monetary targets are not ends in themselves, but are intermediate variables between the instrument variables that the Fed directly controls, such as the federal funds rate or nonborrowed reserves, and ultimate goals, such as price stability and stable output growth. Thus, intermediate target variables must be closely linked to both ultimate objectives and instruments.

The use of intermediate targets has been criticized as redundant and inefficient from a control-theoretic perspective (see B. Friedman [1975]). These objections, however, are based on the assumption that policymakers have precise, reliable knowledge about the relationships between instruments and final objectives. In practice, policymakers see great uncertainty in these links and doubt that such relationships could be captured by econometric models accurately enough to be operationally useful (see Black [1987]). In contrast, intermediate target variables are seen as relatively more controllable than ultimate variables.

Moreover, policy decisions are made by majority rule. It is therefore difficult, if not impossible (Mow's theorem) to obtain a consensus for adopting a particular social objective function, which is necessary under direct targeting of final objectives. Under an intermediate targeting strategy, the Fed does not need to specify numerical objectives for goal variables.

Intermediate targeting strategies can vary substantially in degree of flexibility or commitment. In principle, intermediate targets may or may not be designed to allow feedback. For example, a target could be specified for a five-year horizon without allowing for revisions, or for a three-month horizon to accommodate frequent adjustments based on new information. Also, the operating procedure used to control the target variable may or may not allow for a high degree of discretion. Thus, operating rules could be highly automatic with infrequent discretionary input or be judgmentally modified day-to-day, based on the latest information.

Actual practice of monetary targeting indicates that the degree of flexibility and discretion incorporated into the strategy is influenced by two key factors. The first is evidence concerning the stability of the relationship on which the strategy is based. If there is a broad consensus about the reliability of the relationship between the intermediate target and ultimate goals, then it is more likely that a central bank would be willing to commit to closer targeting of the variable with less feedback from other sources, whether discretionary or not. The other key factor is the central bank's credibility or reputation in containing inflationary expectations. If the central bank establishes its credibility by avoiding inflationary policies, then the public and Congress are generally more willing to accept a greater degree of discretion in strategy and tactics.

The interplay of these factors may well account for the increased reliance on monetary aggregates as intermediate targets during the early 1970s. Before the mid-1960s, there was scant evidence that discretion exercised by the Federal Reserve provided a substantive basis for inflationary expectations. Nominal interest rates were, on average, too low to indicate expectations of rising inflation. The public apparently believed that the Fed would "take the punch-bowl away just as the party got going," a perception consistent with Rogoff's notion of a conservative central bank. Although the Federal Reserve had intermediate targets for interest rates—a strategy that is now widely viewed as potentially defective for avoiding inflation—the Fed seemed to use its discretion judiciously in avoiding inflation and hence in assuaging public doubt about the efficacy of its operating strategy.

By the early 1970s, however, a basis for doubt was beginning to emerge, as inflation had accelerated to new and persistently high levels. Over that decade the Fed gradually strengthened its reliance on monetary aggregates as a source of information about its ultimate objectives.

While the process was initially internal only, the Fed began to announce publicly its desired annual growth mnges for selected monetan aggregates in response to a Congressional resolution in 1975. Evidence in the early 1970s convinced many that the relationship between money and nominal GNP—as summarized by velocity—was sufficiently reliable to choose monetary targets over annual, or even longer, horizons. Also, the parallel rise in the price level offered simple but persuasive evidence that inflation could be slowed by slowing growth of the monetary aggregates. In 1979, the Fed adopted a strategy for disinflation by gradually reducing the rate of money growth from year to year.

The strategy was coupled with an automatic feedback rule to enhance monetary control and demonstrate a commitment to the strategy. Over most of the 1970s, the Fed used the federal funds rate—the interest rate banks charge one another on overnight loans of reserves—as its operating target for controlling money growth. Specifically, it sought to influence the quantity of money the public demanded by altering the opportunity cost of money. For example, if money growth was too rapid, it attempted to raise the federal funds rate, and thereby raise other short-term rates.

The higher rates were expected to slow money growth by inducing the public to shift from monetary assets to other financial assets. Over longer horizons, higher interest rates might also be expected to slow spending growth and hence the transactions demand for money. In practice, however, there is always substantial pressure for the Fed to minimize interest-rate movements, particularly interest-rate increases. For this reason and others, the Federal Reserve did not respond sufficiently promptly or intensively to keep monetan growth from accelerating in the 1770s.

By late 1979, the inflation rate had accelerated to double-digit levels. Financial markets, especially foreign markets, began reacting strongly to the inflationan developments. The dollar was falling rapidly as foreign investors appeared to doubt the Fed's resolve to contain inflation. In response to the evident inflationan pressures, the Federal Reserve adopted a new set of tactics "as a sign of its commitment to longer-run restraint on money growth" (Lindsey [1984], p. 12). These tactics in effect eliminated a substantial degree of discretion that the Fed had used to smooth short-term interest-rate movements.

The new procedures sought to control money growth by maintaining a short-run target path for nonborrowed reserves. As Lindsey describes, "holding to a nonborrowed reserves path essen-

tially introduces in the short run an upward sloping money supply curve on interest rate and money space" (p. 12). In effect, the nonborrowed reserves target created an automatic self-correcting mechanism that would partially resist all deviations of money from target. If money growth in a given week moved above target, the prespecified level of nonborrowed reserves virtually assured that the federal funds rate would move upward. In sum, the Federal Reserve gave up its discretion to minimize federal funds rate movements to assure financial markets of its commitment to the disinflation strategy.

While the new procedure involved substantial commitment at the tactics level, it permitted significant discretionary feedback at the strategy level. Under the strategy, the FOMC was free to change its short-term monetary target to take account of new information—a practice that led to significant deviations of money from announced annual targets. Such discretionary feedback was deemed necessan as evidence mounted that the velocity of money was not as reliable as expected.

It was well understood at the time that deregulation in financial markets, changes in transactions technology, and disinflation were having a substantial impact on individual portfolios and hence on the velocity of money. While such factors could account for the target misses in a qualitative sense, policymakers lacked means to predict the impact on money growth in order to specify reliable target values. By August 1783 the evidence was compelling that the behavior of velocity had been altered in some permanent way. Because time was needed to identify the new patterns of velocity behavior, attempts to control monetan aggregates closely appeared futile.

Consequently, the Fed abandoned its operating procedure and hence its commitment to a fixed path of nonborrowed reserves in the short run. It de-emphasized the role of M1 and adopted a more flexible operating strategy. Since the fall of 1983, the Fed's operating target has been the aggregate level of seasonal plus adjustment borrowings at the discount window. Under this procedure, the FOMC specifies a short-term objective for this variable at each of its regularly scheduled meetings (at approximately five- to six-week intervals).

Unlike with the nonborrowed reserves operating target, the current procedure does not produce automatic self-correcting federal funds rate responses to resist divergences of money from its long-run path. Substantial changes in the federal funds rate are largely a consequence of judgmental adjustments to the borrowings target. Thus, the Fed has regained much of the

leeway to smooth short-term interest rate changes that it had prior to 1979.

It is important to note that by the end of 1982 the disinflation process had become credible to most of the public. Financial markets, particularly those for fixed-income securities, reacted favorably to the procedural change. Long-term interest rates continued to decline substantially after the Fed announced abandonment of the nonborrowed-reserves procedure. Moreover, over the long term, wage demands moderated to pre-1970s levels and have been persistently moderate to this day.⁸ Such would seem strong evidence that wage-setters haven't suspected the Fed of "cheating" on its goal of reducing and maintaining lower inflation.

The evolutionary cycle of the Federal Reserve's operating procedure provides a useful illustration of how the degree of discretion has varied in response both to evidence concerning the reliability of the money-income relationship and to the reputation of the Fed. As the Fed's credibility on inflation appeared to wane in the 1970s, it adopted procedures that increased reliance on monetary aggregates as intermediate targets and limited its discretion to smooth interest rates. As evidence suggested a breakdown in the behavior of velocity, the degree of commitment to monetary control diminished to allow the necessary operational flexibility. By that time the Fed's commitment to maintaining lower rates of inflation had become credible. While the actual strategy can be characterized as a monetary rule with varying degrees of discretion, it never incorporated the degree of commitment that most monetarists had hoped for—one that would have not altered monetary targets at all.

III. Problems with Making Rules Operational

The review of the Federal Reserve's actual operating strategy also serves to highlight a number of potential problems with making rules operational. Poole (1988), a longtime monetary rule advocate, recently concludes that "there is a serious and probably insurmountable problem to designing a predetermined money growth path to reduce inflation." Essentially, he argues that it is not possible to reliably quantify the effects of disinflation on money demand and, hence, on velocity.⁹ Thus, managed money is

unavoidable during the transition to lower inflation. While Poole accepts the eventual efficacy of a constant-growth rule, he believes there is no formula to determine when the discretionary mode should terminate. Presumably, it would only be after inflation has been eliminated.

Even if the transition to lower inflation were no longer operationally relevant, the experience of the early 1980s makes it clear that money demand and velocity have also been independently affected by regulatory change and by developments in transactions technology. McCallum (1987) has recently argued that a rule should not rely on the presumed absence of the effects of such changes. This principle of rule design precludes simple, fixed rules like the constant growth rate of money (or monetary base). Operational feasibility demands that a monetary rule should at least be flexible enough to accommodate the effects of such changes on velocity.

Recognizing a need for some form of flexibility, some pure-rule advocates now propose nondiscretionary feedback rules. Nondiscretionary feedback requires specification of a formula linking goal (or target) variables to policy instruments. The formula presumes the existence of some reasonably stable and hence reliable model, that is, one that characterizes sufficiently well the relationship between instruments and objectives.

The absence of a consensus in macroeconomics about an appropriate model poses a serious obstacle for gaining assent for any particular feedback rule in practice. While most economists adopt a perspective, few seem willing to accept the notion that a particular (especially simple) characterization of the economy would be sufficiently reliable for long periods. Even among rule advocates sharing a common perspective, there are likely to be subtle differences about the formula specification that may splinter support for a given rule.

This problem of model uncertainty is compounded by the important demonstration by Lucas (1976) that "structural" models are in general not invariant to the way in which policy is implemented. Since this critique, there has been no widely accepted means of evaluating operationally concrete policy proposals.¹⁰ While many large-scale econometric models have met the market test, few economists seem convinced by policy evaluations based on particular econometric models.

■ 8 For evidence concerning moderation in compensation demands, see Goshen (1988)

● 9 The point is an example of a more general result of Lucas (1976), which is discussed below.

10 Advocates of rules sometimes argue that if a nondiscretionary rule were to be implemented, relationships would stabilize, leading to more favorable outcomes than suggested by simulations based on historical relationships. While this purely a priori theoretical argument is consistent, it does not appear to be convincing to most economists.

Without a consensus about how monetary policy affects aggregate economic outcomes, it is not compelling to argue that expectations of economic agents (for example, wage-setters) are based on any one model of the economy. Any given rule could possibly be perceived as unsustainable by a sufficient number of agents such that the rule would not be credible in an aggregate sense. If agents believed the rule was unsustainable, the game between agents and policymakers would become extremely complicated, with no apparent solution. Thus, it would not be clear that commitment to a rule would be beneficial. It would seem useful that a rule advocate demonstrate that favorable consequences of a proposed rule would be robust to alternative models of the economy.

IV. Two Recently Proposed Rules

Two recently proposed rules by McCallum (1987, 1988) and Hall (1984) illustrate how the debate over rules versus discretion has evolved to a more operationally concrete level. Both authors appeal to the result of Kydland and Prescott as a justification for implementing their rules. Both also recognize a need for flexibility and address operational problems. In sharp contrast, however, is the way they incorporate flexibility.

McCallum proposes a nondiscretionary feedback rule for nominal income using the monetan base as the instrument. The target path of nominal income is fixed and grows at a pre-specified rate of 3 percent per year. The feedback formula is

$$(6) \quad \Delta b_t = 0.00739 - (1.16)[v_{t-1} - v_{t-4}] + \lambda(x_t^* - x_{t-1}),$$

where b_t = log of monetan base (for period t), v_t = log of base velocity, x_t = log of nominal GNP, and x_t^* = target path for nominal income.

The constant term 0.00739 is simply a 3 percent annual growth rate translated into quarterly logarithmic units. The second term subtracts the average growth rate of velocity, approximated by the average difference in the logarithm of velocity over the previous four years. This term can be thought of as a simple time-series estimate of trend velocity growth. The third term specifies how policy is to respond to deviations of nominal income from its target path.

The moving average of velocity growth is a simple statistical filter designed to detect permanent changes in velocity growth. As such, it provides a mechanism to maintain a long-term

correspondence between the current base growth path and the long-term nominal objective to account for changes in transactions technology. Given the length of the moving-average period (four years) and the absence of any systematic feedback from interest rates, however, the rule provides virtually no adjustment in response to the current state of the business cycle or to financial conditions.¹¹

The third term provides feedback to assure that nominal income ultimately returns to its trend path. The choice of parameter λ incorporates some degree of flexibility to deal with the potential problem of instrument instability. This problem arises when effects of policy occur over time as they do in actual economies, particularly those with sticky prices. Large responses to maintain a target path in the near term could lead to longer-term effects in the opposite direction, requiring even greater offsetting policy responses in later periods. This sequence would be unstable if responses and effects were to become ever increasing. The value of λ (presumably less than zero) should be chosen to minimize the potential for this dynamic instability, under the constraint that it be sufficiently large to provide adequate responsiveness of base growth to target misses. McCallum suggests that a value of 0.25 appears to be somewhat robust for this objective over alternative models of the economy.

If velocity growth were constant, and if nominal GNP were on its target path for a sustained period, the policy prescribed by McCallum's rule would be the same as a 3 percent growth rule for the monetan base. Thus, McCallum's rule is essentially a generalization of the constant-money-growth rule. Because it is more general, it allows for flexibility to deal with some of the problems of making monetarist rules operational.

Moreover, McCallum claims that because the monetan base is "controllable," the rule can be accomplished with no operational discretion.¹²

8 11 Recent evidence suggests that velocity has become increasingly interest-sensitive in the 1980s. To the extent that systematic effects of interest rates could be reliably estimated, additional flexibility could be introduced into the rule as feedback to compensate for short-run variability in velocity. McCallum expresses doubt, however, that economists know enough to base policy on any one short-run empirical model. In this sense he defends, if only indirectly, the monetarist dictum of Friedman in which monetary policy affects the economy with long and variable lags.

8 12 Under current institutional arrangements, the total monetary base can be controlled only indirectly, working through effects of changes in interest rates on the demand for base components. Advocates of base targeting often call for institutional reforms—such as exactly contemporaneous reserve accounting and closure of the discount window—to enable direct control of the base. Alternatively, McCallum's rule can be applied to the nonborrowed base, which is directly controllable under existing institutions.

In this sense McCallum's proposal is a flexible version of a rule for means. The flexibility is extremely limited. However, involving only feedback from simple statistical models to maintain long-run relationships. No role is given to structural models that might allow feedback for short-term economic stabilization. Such a rule shows little faith in macroeconomic models or in discretionary decisions of the Fed.

Some rule advocates, on the other hand, propose a much greater role for economic models and judgment of the Fed. An example is an ends oriented rule advanced by Hall (1984). Under Hall's strategy, the Federal Reserve is instructed to stabilize the price level around a constant long-run average value. To make this strategy elastic in the short run, Hall proposes giving the Fed some prespecified leeway in achieving the target depending on the amount of unemployment. The permissible deviation of the actual price level, p , from its target, p^* , is defined by the simple numerical rule linking it to the deviation of the unemployment rate, u , from its normal rate, presumed to be 6 percent:

$$(\tau) \quad 100(p - p^*)/p^* = A(u - 6).$$

The coefficient A is to be specified by the Federal Reserve. Based on simulations, Hall tentatively recommends that it equal eight.

Specifically, this relationship is to be imposed as a constraint on policy instrument settings. In formal terms: "Monetary policy is on track when the deviation of the price level from its constant target is eight times the deviation of unemployment times its normal level [*presumed to be 6 percent*]. Policy is too tight if the price deviation is less than eight times the employment deviation: it is too expansionary when the price deviation is more than eight times the employment deviation. The elasticity of 8 in this statement is a matter for policymakers to choose." (Hall [1984], p. 140)

Policy formulation under this approach would be prospective. Thus, the Fed would need to employ a model that links instrument variables to the price level and to the unemployment rate over the criterion period.¹³ It would be free to use whatever model and instruments it chooses. Instrument settings would be determined by an iterative process. To begin, an initial forecast for the unemployment rate and price level would be compared against the rule formula to be judged for appropriateness — foreexample, too tight, too

easy, or on track. This process would thereby determine the direction in which instrument settings should be changed, if necessary. A second round of forecasts would then be obtained and compared. The process would continue until the instrument settings yielded price-level and unemployment forecasts consistent with the rule.

To impose discipline, Hall would require the Fed to be explicit about its forecasts, defending them publicly at the semiannual Congressional review and in comparison with private forecasts. Hall argues that forecasting errors of good private forecasters would provide a sufficiently reliable standard to maintain unbiased outcomes. If the Fed's forecasts were consistently different from reputable private forecasts, and if the outside forecasts were more often correct, then the Fed would be under public pressure to modify its way of setting policy instruments. For Hall, the problem with discretion lies not with the use of faulty econometric models but with the absence of a commitment to an explicit rule for the price level.

Both Hall and McCallum employ small empirical models to generate simulations under their rules. McCallum uses a variety of models based on competing views to examine the robustness of his rule's performance. His simulations suggest that his rule would have produced a root mean square error (RMSE) of nominal income of around 2 percent from 1954 to 1985. This is approximately one-third the RMSE of actual GNP around its trend over the same period. He concludes that his rule would have worked relatively well in the United States.

To address the criticism that his simulations are subject to the Lucas critique, McCallum notes that his rule relates nominal demand to nominal policy instruments. He argues that the sensitivity of parameters to policy regime changes is likely to be quantitatively less important for such rules than for rules that relate real to nominal variables, for example, based on Phillips curve models. Hall's simulations, on the other hand, are based on the presumption that there is a reliable (policy invariant) relationship between the *variability* of the inflation rate and the *variability* of the price level.¹⁴ His simulation results suggest that *both* price level variability and unemployment variability would have been less than actually experienced from 1952 to 1983 under the elastic-price rule.

■ 13 Based on the assumption that monetary policy affects the unemployment rate reliably only after a yearlong lag. Hall argues that the criterion period should be the forecast horizon for the year beginning six months ahead

■ 14 The analysis of policy in terms of the *variability* of unemployment and price level was developed by Taylor (1980, 1981). It is important to note that there is no implied trade-off in this model between the inflation rate and trend output growth.

While the results presented under both rules appear favorable, few analysts seem convinced by small-model simulations. Experience with large-scale econometric models, for example, suggests that interest rates would vary sharply under McCallum's rule. His models, which do not allow for interest-rate interactions, cannot account for the economic consequences of such interest-rate variation. Fischer (1988) argues that the natural vehicles for studying policy rules are the large-scale econometric models, many of which have met the market test. Nevertheless, he notes that it would be difficult to justify legislating any nondiscretionary rule given the variety and inadequacies of existing models. On the other hand, existing models may be no more reliable for discretionary decisions, particularly when policymakers may use them selectively to support their own prior beliefs.

V. Some Concluding Comments

The success of the U.S. disinflation strategy early in this decade helped reestablish the Federal Reserve's credibility as an inflation fighter. Much of the reputational capital surely persists today. Recently, however, some analysts have questioned whether the current strategy is adequate to extend and maintain the progress against inflation (see Black [1987]).

A key concern is that the strategy may lack sufficient institutional discipline to assure that short-term objectives—such as interest-rate smoothing—do not interfere with the achievement of longer-term price stability. This fear has led to a renewed interest in alternative strategies that are closer to a pure rule on the continuum between a pure rule and pure discretion.

Ideally, a policy strategy should perform adequately well under alternative views about aggregate economic relationships so that sufficient numbers of agents believe that the rule could be credibly implemented. Rule advocates might well follow the example of McCallum and examine the robustness of their rule's performance, simulating with alternative models of the economy. The choice of criteria for "adequate performance" is of course a difficult and controversial matter. We conclude here, as does Fischer (1988), that the discussion of alternative policies is too important to be suppressed by the econometric evaluation critique.

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