# THE CASE FOR RULES IN THE CONDUCT OF MONETARY POLICY: A CONCRETE EXAMPLE

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## Introduction

The purpose of this paper is to provide a nontechnical but reasonably up-to-date description of the case for rules, as opposed to discretion, in the conduct of monetary and fiscal policy. Special attention will be paid to the current state of macroeconomic theory and to the experiences of developed economies in the postwar (i.e., post-World War II) era. A feature of the paper is the proposal of a specific rule for monetary policy, one that is not open to objections typically made by opponents of rules. Some evidence regarding the potential effectiveness of this particular rule is reported.

## Basic Considerations

The first thing that needs to be emphasized is that the issue of rules vs. discretion is not the same as the issue of activist vs. nonactivist policy. That a policy rule can be activist—i.e., can be one that adjusts the value of a policy instrument in response to prevailing economic conditions—is a sufficiently elementary point that it has been clearly expressed in the widely used undergraduate macroeconomics textbook of Dornbusch and Fischer (1984) for almost a decade.[1] Yet it needs to be emphasized, as leading economists[2] and policymakers[3] continue to argue in a fashion that muddles together the two distinct issues, and sometimes even proceeds as if rules could be discredited in general by listing disadvantages of a particular type of rule that calls for a constant growth rate of the money stock.

What then *is* the nature of the rules vs. discretion distinction? It is I think widely agreed among macroeconomic researchers that the crucial distinction is the one illustrated in the seminal paper of Kydland and Prescott (1977)[4] and elaborated upon by Barro and Gordon (1983a). But precisely how to characterize this distinction is not so clear. Many economists use the term "precommitment" to describe policymaking by rules,[5] and often continue by discussing the difficulty or impossibility of achieving binding precommitment. Now in the context of monetary and fiscal policy, it would appear that literal and full precommitment is in fact virtually impossible. But it is not impossible for a monetary authority to select policy actions that conform to the "rule" sequence in the Kydland-Prescott example, so it must be concluded that precommitment cannot be the crucial characteristic. Instead, policymaking according to a rule exists when the policymaker chooses not to attempt optimizing choices on a period-by-period (or case-by-case) basis, but chooses rather to *implement* in each period (or case) a formula for setting his instrument that has been designed to apply to periods (cases) in general, not just the one currently at hand. Thus the policymaker's efforts toward optimization enter in the *design of the formula* to be utilized in a large number of periods, not in the actions selected in each period.[6]

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[1] The example provided by Dornbusch and Fischer (1984, pp. 342-43) is a policy rule that sets the money-stock growth rate equal to $4.0 + 2(u-5.0)$, where u is a recent unemployment rate. Both u and the (annualized) money-stock growth rate are here measured in percentage points.

[2] Tobin (1983) recognizes the analytical validity of the distinction, but refuses to accept it as a practical matter.

[3] See, for example, Volcker (1983).

[4] Which constitutes an application to macroeconomic policy of a point developed previously by Kydland (1975).

[5] Examples are Barro and Gordon (1983b) and Grossman and Van Huyck (1986).

[6] This characterization is consistent with Friedman's (1962, pp. 239-41) analogy to the constitutional protection of free speech.

To provide an example of this distinction, and also to begin our analysis of the *advantage* of rules over discretion in the context of monetary policy, let us briefly review the basic model laid out by Kydland and Prescott (1977). In this setup, the monetary authority's objectives are represented by a loss function in which the arguments are the squared deviations of unemployment and inflation from values determined by considerations of allocational efficiency.[7] It will simplify matters without distortion of the argument, however, to simply take the loss function to be decreasing in the current money-growth *surprise* (since unanticipated money growth reduces unemployment) and increasing in the square of money growth itself (since money growth induces inflation).[8] There are also discounted values of similar terms for all future periods, but for present purposes these can be ignored. If, with this objective function, the monetary authority were to adopt a policy *rule* by choosing among constant money growth rates, he would recognize that with moderately rational agents the surprise values will average to zero whatever his choice; thus the chosen money growth rate would be zero. For the same reason, moreover, an *average* growth rate of zero would be implied by the optimal choice of a (possibly activist) rule when a broader class of rules is considered.

But suppose that, instead, the authority executes policy in a period-by-period or discretionary manner, i.e., by selecting each period's money growth rate on the basis of a fresh optimization calculation. Then in each period the prevailing *expected* money growth rate is taken by the authority as a given piece of data—a new "initial condition." The current surprise then appears to the authority to be under his control, so the loss-minimizing choice of the current money growth rate is that value which just equates the marginal benefit of surprise money growth to the marginal cost of money growth *per se*. With the objective function as described, this seemingly optimal value will clearly be positive. But since moderately rational private agents will come to understand this process, their expectations regarding money growth will be correct on average. Thus the surprise magnitude will be zero on average, over any large number of periods, even though the magnitude within each period is under the control of the monetary authority. Consequently, there will on average be no benefit—no extra employment—materializing from surprises. On average, then, the discretionary regime will feature more money growth (i.e., inflation) but the same amount of surprise money growth (i.e., unemployment) as with a well-designed rule based on the same objectives. Thus the objectives will be more fully achieved with the adoption of a rule than with period-by-period attempts at optimization.

It should be noted that the foregoing line of argument does not require that the economy actually be one in which monetary surprises induce temporary output and employment gains. Nor is it necessary that private sector expectations are fully rational. What is required is that the monetary authority *believes* that unusually rapid monetary growth will induce output/employment gains and that expectations are rational enough to avoid any permanent bias. Also, the economy must be one that satisfies the weak version of the natural-rate hypothesis: output and employment must be independent over long spans of time of the economy's average inflation rate.[9]

To this point it has been argued that the conscientious attempt to avoid both inflation and unemployment will lead to an excessive amount of the former, with no reduction in the latter, when monetary policy is conducted in a discretionary manner. Is there any empirical evidence to suggest that this theoretical proposition is in fact descriptive of the workings of actual central banks and actual economies?

To my mind, the most impressive evidence in this regard comes from straightforward examination of the postwar inflationary experience of the industrialized nations of Europe and North America. Specifically, price levels are now in all these nations several times as high as they were in 1950. Even in Germany the

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[7] Our conclusions will depend upon the plausible assumption that deviations of inflation from the optimal rate are increasingly costly at the margin; use of the squared deviation reflects that requirement in a tractable manner. The unemployment term is of the form $(u_t - k\bar{u}_t)^2$, with $\bar{u}_t$ the natural-rate value of $u_t$ and with $k < 1$. The latter condition expresses the assumption that the monetary authority's target value for $u_t$ is below the natural rate. Barro and Gordon (1983a) interpret this as reflecting some externality and consequently claim that there is no discrepancy between the policymaker's objectives and private agents' preferences. The analysis would remain the same, however, if the $k < 1$ condition were interpreted as merely reflecting a desire by the policymaker for an excessively low rate of unemployment. Indeed, all that is necessary is that the policymaker values marginal reductions of unemployment in the vicinity of its natural-rate value.

[8] In the cited literature, "money growth" and "inflation" are often used interchangeably. In my opinion, it is preferable to think in terms of money growth as unemployment is in fact more closely related to money than price level surprises. In addition, inflation actually responds to money growth only slowly, so current money growth affects expectations of future inflation. Recognition of this point overturns the argument of Grossman and Van Huyck (1986) to the effect that the Kydland-Prescott setup is misspecified.

[9] For additional discussion of related issues, including reputational models, see McCallum (1987). Alternative surveys are provided by Barro (1986) and Cukierman (1986).

value of the currency is now less than a third of its 1950 level, while the comparable magnitude is less than one-tenth for France, Italy, and the United Kingdom. (A few figures are reported in Table I.) While there have been no episodes of extremely rapid inflation, price levels have risen steadily and substantially. The relevant question is, therefore, why has the experience been one of *positive* inflation in most years in all of these countries? The populations, governments, and central banks of these nations do not *enjoy* inflation—indeed, they regard it as something absolutely undesirable on its own. Also, there is little reason to believe that the policymakers in these nations are of the opinion that there is any *permanent* stimulative effect on employment or output of positive inflation rates. They know that employment and output growth were not enhanced by the inflation and rapid money growth of the 1970s. So why have price levels not moved downward about as often as upward, leaving current prices about the same as in 1950?

My suggestion, of course, is that the Barro-Gordon theory[10] provides an answer to these questions, namely, that discretionary policymaking has been exercised in the postwar era by central bankers who wish to avoid inflation but who also have employment or output concerns. The plausibility of this suggestion is enhanced, I believe, by a comparison of the postwar experience with that of an earlier era in which monetary policy was circumscribed by formal rules. Here the reference is, of course, to the period before World War I when the countries under discussion maintained commodity-money standards. As all readers probably know, price levels at the start of World War I were roughly the same as they had been in the middle 1800s—or in the late 1700s, before the start of the Napoleonic Wars. For easy reference, a few relevant figures are reproduced in Table II.

## A Specific Rule for Monetary Policy

Instead of continuing the discussion of rules vs. discretion in the abstract, let us now turn to the consideration of a specific rule for the conduct of monetary policy. Examination of a concrete proposal should help to reveal weaknesses in the rule-based approach, if they exist, or to attract support for the rule, if its desirable properties are convincingly impressive.

Table I

**CONSUMER PRICE INDICES, POST-WORLD WAR II**

| Nation | CPI, 1950 | CPI, 1985 | Ratio |
|---|---|---|---|
| Belgium | 30.1 | 140.5 | 0.214 |
| France | 15.6 | 157.9 | 0.099 |
| Germany | 39.2 | 121.0 | 0.324 |
| Italy | 13.9 | 190.3 | 0.073 |
| Netherlands | 23.9 | 122.7 | 0.195 |
| United Kingdom | 13.4 | 141.5 | 0.095 |
| United States | 29.2 | 130.5 | 0.224 |

Source: IMF, *International Financial Statistics.*

In previous writings, I have emphasized four principles that should be respected in the design of a monetary rule (McCallum, 1984, 1985), which are as follows. First, the rule should dictate the behavior of a variable that the monetary authority can control directly and/or accurately. To specify behavior of some magnitude that is not itself controllable—such as the M1 measure of the money stock, for instance—would be to leave the task of rule design seriously incomplete. Second, the rule should not rely in any essential way upon the presumed absence of regulatory change and technical progress in the financial industry. While these processes may not produce as much turmoil in the future as they have in the recent past, it would be unsafe to presume that they will not be present again to a significant extent. Third, neither money stock nor (nominal) interest rate paths

Table II

**WHOLESALE PRICE INDICES, PRE-WORLD WAR I**

| Year | Belgium | Britain | France | Germany | United States |
|---|---|---|---|---|---|
| 1776 | na | 101 | na | na | 84 |
| 1793 | na | 120 | na | 98 | 100 |
| 1800 | na | 186 | 155 | 135 | 127 |
| 1825 | na | 139 | 126 | 76 | 101 |
| 1850 | 83 | 91 | 96 | 71 | 82 |
| 1875 | 100 | 121 | 111 | 100 | 80 |
| 1900 | 87 | 86 | 85 | 90 | 80 |
| 1913 | 100 | 100 | 100 | 100 | 100 |

Sources: B.R. Mitchell, *European Historical Statistics*; Bureau of the Census, *Historical Statistics of the United States.*

[10] While the model outlined above was developed by Kydland and Prescott (1977), its use as a *positive* theory of policy behavior was pioneered by Barro and Gordon (1983a).

are important for their own sake; these variables are relevant only to the extent that they are useful in facilitating good performance in terms of inflation and output or employment magnitudes. Fourth, a well-designed rule should recognize the limits of macroeconomic knowledge. In particular, it should recognize that neither theory nor evidence points convincingly to any of the numerous competing models of the interaction of nominal and real variables. The economics profession does not have a reliable quantitative or even qualitative model of aggregate supply (or "Phillips curve") behavior. In other words, the profession does not have accurate knowledge of the way in which changes in nominal GNP will be divided, on a quarter-to-quarter basis, between real output growth and inflation.[11] Thus any rule whose design depends upon some particular model of that division warrants very little confidence.

In one of these earlier papers (McCallum, 1984), I proposed in qualitative terms a rule that respects all four of these principles. My proposal began with the specification of a target path for nominal GNP that grows evenly at a prespecified rate that equals the economy's prevailing long-term average rate of real output growth. For the United States the appropriate figure is about 3 percent per year. Since this magnitude will be virtually independent of monetary policy over any extended period (say, 20 years or more), keeping nominal GNP growth at the appropriate value—henceforth assumed to be 3 percent per year[12]—should yield approximately zero inflation over any such period. Furthermore, the prevention of fluctuations in nominal GNP growth should help to prevent swings of real output from its trend path.[13] While some output fluctuations would continue to occur even with a perfectly smooth growth path for nominal demand, they would probably be as small as can feasibly be obtained, given the absence of a reliable Phillips curve model.

To complete the rule, an operational mechanism must be specified for keeping (nominal) GNP growth close to the prespecified 3 percent growth path.[14] My 1984 suggestion was to adopt as an instrument the monetary base, a variable that can be accurately set on a day-by-day basis by the central bank of any political entity with a floating exchange rate. Specifically, the rule "would adjust the base growth rate each month or quarter, increasing the rate if nominal GNP is below its target path, and vice versa" (McCallum, 1984, p. 390).

The algebraic form implicit in this description is as follows, where $b_t$ = log of monetary base (for period t), $x_t$ = log of nominal GNP, and $x_t^*$ = target-path value for $x_t$:

$$(1)\quad \Delta b_t = \Delta b_{t-1} + \lambda_1(x_{t-1}^* - x_{t-1}), \qquad \lambda_1 > 0.$$

In this formula, the magnitude of $\lambda_1$ would have to be chosen so as to (a) provide adequate responsiveness of base growth to departures of $x_t$ from its target path but (b) without inducing dynamic instability of the type that can prevail when feedback effects are too strong. Presuming this value is satisfactorily chosen, one attractive feature of the scheme summarized in (1) is that it would automatically adjust the $b_t$ growth rate, in a fashion that would yield zero inflation on average, in response to alterations in base "velocity" stemming from technical or regulatory changes. Even in the face of drastic changes of this type it would remain true that an increase in $\Delta b_t$ would be expansionary, and a decrease contractionary, in terms of aggregate demand—and more knowledge than that is not required for the appropriate type of adjustment.

I have recently become persuaded,[15] however, that a somewhat different specification would have better properties. Instead of (1), then, I would now

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[11] On this topic again see McCallum (1987).

[12] Designation of the trend value of real output growth is, of course, part of the rule's specification. It should be based on the economy's actual real growth record over the past several decades and should be changed very infrequently —say, once every ten years. Any error in setting this rate will obviously lead to an error of equal percentage magnitude (but of opposite sign) in the inflation rate induced by the rule. Fortunately, the conceivable magnitude of such errors is quite small—probably less than 1 percent per year—for developed economies.

[13] The workings of the rule are independent of the currently prominent issue concerning the nature of output trends. Thus the target path for nominal GNP should be set to grow at the value $\gamma$ whether real output growth occurs according to $y_t = \alpha + \gamma t + \epsilon_t$ or to $y_t - y_{t-1} = \gamma + \epsilon_t$. (Here $\epsilon_t$ denotes white noise.)

[14] By virtue of its emphasis on this operational mechanism, the current proposal is quite different from other schemes involving "nominal GNP targeting" such as those of Gordon (1985), Hall (1983), and Taylor (1985). This difference is clearly exemplified by Gordon's (1985, p. 77) reference to "controlling growth in nominal GNP . . . *rather than* controlling the monetary base" (emphasis added). Much of Gordon's discussion, incidentally, is concerned with a difficulty not elsewhere discussed in the present paper, namely, that of *starting up* a rule like (2) from initial conditions with nominal GNP growth substantially different from 3 percent. In this regard my own inclination would be to begin with a path that adjusted gradually toward the 3 percent figure, attaining the latter after (say) three years. Another objective of Gordon's is to argue the desirability of *final sales* over GNP as a nominal demand variable; I have no desire to quarrel with that argument.

[15] In part by discussions with Allan Meltzer.

like to propose the following rule for quarterly adjustments:

$$(2)\quad \Delta b_t = 0.00739 - (1/16)\,[x_{t-1} - x_{t-17} - b_{t-1} + b_{t-17}] + \lambda_2(x^*_{t-1} - x_{t-1}), \quad \lambda_2 > 0.$$

Here the constant term 0.00739 is simply a 3 percent annual growth rate expressed in quarterly logarithmic units, while the second term subtracts from this the growth rate of base velocity, calculated as an average over the previous four years.[16] Finally, the third term adds an adjustment in response to departures of GNP from its target path. Again the only parameter value to be determined is that for the response coefficient, in this case denoted $\lambda_2$. Again it is possible to induce dynamic instability by setting the value of $\lambda_2$ too high. But as the response is now applicable to $\Delta b_t$ rather than its change, $\Delta b_t - \Delta b_{t-1}$, the danger of instability is lessened. My proposed value for $\lambda_2$ is 0.25, which implies an extra 1 percent base growth per *year* for each 1 percent deviation of nominal GNP from its target path.

## Properties of the Proposed Rule

To determine how this rule would work, one needs to experiment with it. Since experiments with actual economies can be very expensive to the societies involved, such experimentation needs to be done with a model. The problem, of course, is that there is no agreement as to the appropriate model. My conjecture, however, is that rule (2) with $\lambda_2 = 0.25$ will perform well for a wide variety of quantitative models of developed market economies such as the United States, United Kingdom, Germany, Italy, France, or the Netherlands. Let me immediately be clear, however, about what is here meant by the term "perform well." Specifically, the criterion involves only the time path of nominal GNP; as we do not know how changes in GNP will be divided among inflation and output growth, the rule should not be judged on the basis of any particular model's predictions in that regard. Subject to that stipulation, it is my conjecture that application of the rule (2) in place of actual historical policy would yield simulated nominal GNP paths that are smoother than those actually experienced,[17] as well as implying growth at noninflationary rates. This type of result will obtain, I believe, whether the models utilized are constructed along Keynesian or classical lines provided that they are not strongly inconsistent with the natural-rate hypothesis.

Such simulations with a wide variety of models have yet to be conducted. But I can report results based on two extremely simple models that are merely atheoretic regressions of nominal GNP on past values of itself and values of the monetary base.[18] The first such model, pertaining to the U.S. economy for 1954.1-1985.4, consists of the following estimated regression equation:

$$(3)\quad \Delta x_t = \underset{(0.0021)}{0.00749} + \underset{(0.079)}{0.257}\,\Delta x_{t-1} + \underset{(0.121)}{0.487}\,\Delta b_t + e_t$$

$$R^2 = 0.23 \quad \hat{\sigma} = 0.010 \quad DW = 2.11$$

Here $e_t$ denotes the residual, i.e., the estimated disturbance, for period t. Simulated values for $b_t$ and $x_t$ have been calculated for 128 periods by means of equations (2) and (3), with initial conditions corresponding to 1954.1 and with $e_t$ residual values fed in each period as shock estimates. This procedure is analogous to one stochastic simulation of (2) and (3) with shocks drawn from a population with mean 0 and standard deviation 0.010.

Results of this simulation exercise are shown in Chart 1, where TAR denotes the target path $x^*_t$. Clearly the rule induces $x_t$ to follow the target path quite closely. To put this behavior into perspective, the result of this simulation is compared with simulations using alternative policy rules in Table III. There the first numerical column reports root-mean-squared-error (RMSE) values—i.e., square roots of the mean over 128 simulated quarters of the squared deviations of $x_t$ from $x^*_t$. The RMSE value of 0.0197 in line 1 indicates that the root-mean-squared deviation of nominal GNP from its target path is roughly 2.0 percent under rule (2), since log deviations are approximately equal to percentage deviations divided by 100. That figure can be compared with a RMSE value of about 22 percent when the policy rule is one that sets the monetary base growth rate at zero throughout the period (line 3). This surprisingly high

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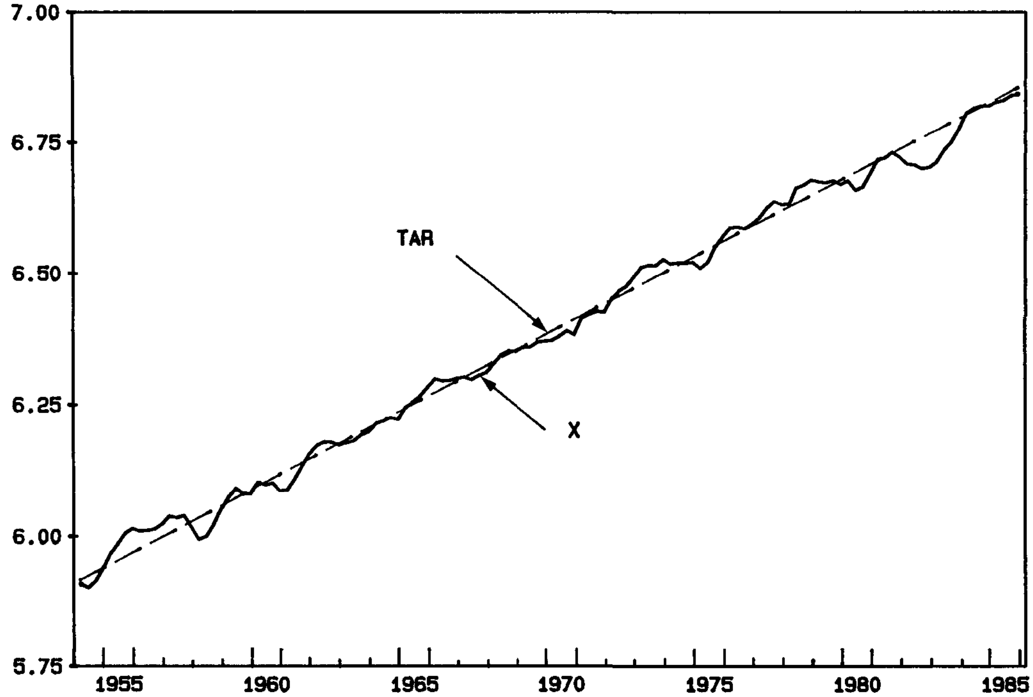
[16] Note that $x_{t-1} - x_{t-17} - b_{t-1} + b_{t-17} = \sum_{j=1}^{17} (\Delta x_{t-j} - \Delta b_{t-j})$.

[17] Here I am assuming simulations that feed in random errors of the same magnitude as seem to occur in actuality; see the discussion below.

[18] Since drafting this paper I have also obtained results for a model that consists of a 4-variable vector autoregression (VAR) system, the variables being four lags each of the 90-day Treasury bill rate and the logs of real GNP, the GNP deflator, and the monetary base. The RMSE value with $\lambda_2 = 0.25$ in rule (2) is 0.0219, almost the same as for model (4).

Chart 1

SIMULATION RESULTS FOR 1954 - 1985
WITH POLICY RULE (2) AND MODEL (3)




Note: The target path TAR increases by 0.00739 each quarter, starting from the actual value of 5.909 for 1953.4. Here 5.909 = log 368.3, while 368.3 is nominal GNP measured in billions of dollars (annual rate, seasonally adjusted).

magnitude obtains because base velocity has grown enough during the period 1954-85 that no growth in the base would have permitted a significant amount of inflation![19] The base growth rate needed to yield zero inflation—literally to yield 3 percent nominal GNP growth—with model (3) is $\Delta b_t$ = -0.0041 (i.e., about -1.6 percent per year). With that rate held constant for 128 periods, the RMSE is about 3.6 percent (see line 4), which is only about twice as large as with policy rule (2). But it is important to recognize that the correct constant value of $\Delta b_t$ embodied in the "rule" of line 4 could not have been known ex ante, before the experience of 1954-85 had been accumulated, for it is calculated on the basis of model (3).[20] By contrast, our preferred rule (2) is not based on any parameter estimated in the model.

In response to the last claim, it could be said that—while not precisely based on model (3)—the parameter value $\lambda_2$ = 0.25 in rule (2) is to some extent based on ex post knowledge. Consequently, it is of interest to know how rule (2) would perform with different values used for $\lambda_2$—in particular, with $\lambda_2$ = 0. Results for that case, which corresponds in spirit but not in detail to the rule proposed by Meltzer (1984, 1987), are reported in line 5. There we see that performance is less good than in line 1, but still rather impressive. Shifting $\lambda_2$ in the other direction, to a value of 0.5, yields results (not tabulated) that are even better than in line 1. Also reported in Table III is one result pertaining to the policy rule (1), which I had previously proposed. Specifically, line 6 shows that with $\lambda_1$ = 0.02 the RMSE would be about

[19] That this is the case can be seen from the model reported in equation (3). Setting both $\Delta b_t$ and $e_t$ at zero for all t yields $\Delta x_t = .00749 + .257\ \Delta x_{t-1}$, which has a steady-state value of .00749/(1-.257) = .0100. Thus with zero base growth, nominal GNP would grow at about 1 percent per quarter or 4 percent per year. With 3 percent per year real GNP growth, we would then have about 1 percent per year inflation.

[20] Specifically, by solving $\Delta x = .00749 + .257\ \Delta x + .487\ \Delta b$ for $\Delta b$ with $\Delta x$ set equal to .00739.

4.2 percent, which is not too bad. But using instead $\lambda_1 = 0.05$ would result in explosive fluctuations.

Finally, the foregoing RMSE figures can be compared to those that actually obtained during 1954-85, i.e., with actual Federal Reserve policy. Because of the substantial amount of inflation that occurred, the RMSE value is enormous in comparison—the value is .7711, over 30 times as great as in line 1. Perhaps more interesting, however, is the extent of actual nominal GNP *variability* about its (inflationary) trend path. Consequently, the RMSE value for $x_t$ relative to a fitted linear trend is also reported in line 2. That value is 6.2 percent per period, somewhat higher than in lines 5 and 6, and just over three times as great as in line 1. Thus the first-column indications of Table III are that our proposed rule would not only prevent inflation but also yield less variability in nominal GNP growth than actual Fed policy.

The foregoing estimates are all predicated, however, on the "model" of GNP behavior given in equation (3). The extreme simplicity of this specification arguably tends neither to favor nor harm the simulated performance of our rule (2). But there is one aspect of specification (3) that is questionable and that works in our favor—namely, the inclusion of the current-period value of $\Delta b_t$ as an explanatory variable. To some extent the estimated effects, a critic might claim, could be due to the sample-period response of $\Delta b_t$ to $\Delta x_t$, rather than the causal direction presumed in (3). Consequently, results are reported in column two of Table III for simulations like those of column one except that the "model" is as follows:

$$\text{(4)}\quad \Delta x_t = \underset{(0.0020)}{0.00506} + \underset{(0.083)}{0.199}\,\Delta x_{t-1} + \underset{(0.127)}{0.529}\,\Delta b_{t-1} + e_t$$

$$R^2 = 0.23 \quad \hat{\sigma} = 0.010 \quad DW = 2.05$$

Here, *none* of the current-period connection between $\Delta b_t$ and $\Delta x_t$ is attributed to the direction going from policy to GNP. This specification should be expected to sharply deteriorate the rule's performance, as it introduces a full two-quarter lag between target departures $x^*_{t-1} - x_{t-1}$ and corrective effects.

Indeed, as inspection of Table III will readily indicate, the performance of rules (2) and (1) both deteriorate. The former remains superior, nevertheless, to any of the other possibilities considered, and continues to yield substantially less GNP variability than observed in actual U.S. experience. Since there is probably some within-quarter response of $\Delta x_t$ to $\Delta b_t$ in actuality, this brief investigation suggests results intermediate to those of columns one and two. For rule (2), they are clearly excellent.

Table III

**SIMULATION RESULTS FOR ALTERNATIVE RULES**

| | Policy | RMSE Model (3) | RMSE Model (4) |
|---|---|---|---|
| 1. | Eq.(2), $\lambda_2 = .25$ | .0197 | .0217 |
| 2. | Actual historical | .7711 | .7711 |
| | | (.0616)* | (.0616)* |
| 3. | $\Delta b_t = 0$ | .2258 | .2302 |
| 4. | $\Delta b_t = -.0041$ | .0358 | .0391 |
| 5. | Eq.(2), $\lambda_2 = 0$ | .0499 | .0502 |
| 6. | Eq.(1), $\lambda_1 = .02$ | .0424 | .0671 |

*This is RMSE relative to fitted trend rather than target path.

## Criticisms

At this point it will be useful to consider some possible objections that might be raised by critics. Three that will be discussed in turn pertain to (i) the Lucas critique, (ii) the natural-rate hypothesis, and (iii) our neglect of open-economy considerations.

With respect to (i) the point is, of course, that the parameters of our models (3) and (4) might change with an alteration in policy from that actually experienced to that of the hypothesized rules. Since these "models" are not structural, this objection is in principle correct. I would suggest, however, that the Lucas critique is much more important quantitatively for equations relating real to nominal variables—e.g., Phillips curves—than for ones relating nominal demand to nominal policy variables. If this conjecture is correct, then equations (3) and (4) should be virtually immune to the critique, as it has been found to be rather hard to detect empirically even in Phillips-curve relations. [See, e.g., Gordon and King (1982).]

Next, there is the issue of the natural-rate hypothesis, which has recently come under attack as a result of extremely high and persistent European unemployment rates.[21] But in the context of the present discussion, the issue is not whether unemployment promptly reverts following a shock to some "natural" level, but whether the trend growth rate of real output is essentially independent of monetary

[21] See, for example, Fitoussi and Phelps (1986) and Blanchard and Summers (1986).

policy. If the recent experience is thought to provide evidence against this relevant proposition, it is unclear how the posited relationship would go. Proponents of the notion that nominal demand behavior affects the trend output rate usually hypothesize a positive relationship, i.e., that real output growth is stimulated by more rapid growth of nominal demand. But in fact nominal GNP growth has been *more* rapid in Europe during the 1970s and 1980s than it was during the 1950s and 1960s,[22] yet it is the more recent period that has featured high unemployment and reduced real growth.

Finally, let us briefly address the issue of how our proposed rule should be modified to take account of open-economy considerations, i.e., large import and export sectors. In this regard the relevant principle to keep in mind is that the most constructive thing that monetary policy can accomplish is to induce nominal aggregate demand to grow smoothly and at a noninflationary rate. Thus the only modification required to our rule is the possible replacement of nominal GNP with some other measure of nominal aggregate demand. My first inclination would be to use real GNP multiplied by the consumer price index. But the main point is that steady growth in some such aggregate constitutes a more reasonable objective for the monetary authority than either maintaining a fixed exchange rate or following a target path for any measure of the money stock. These are variables that are neither instruments nor ultimate targets. While the same is true of nominal aggregate demand, it is a magnitude that is more closely related to output and inflation variables—which are ultimate targets.

[22] For Europe as a whole, nominal GDP grew at an average rate of 14 percent over the period 1955-69 and 24.6 percent over 1969-83 (IMF, *International Financial Statistics*).

## Conclusion

Let us now conclude with a brief summary of the foregoing argument. The paper begins by reiterating that a policy rule can be activist; the distinction between rules and discretion depends upon the stage at which optimization calculations enter the policy process—in the design of a formula (rule) to be implemented each period or in each period's (discretionary) selection of a policy action. Next, the Kydland-Prescott (1977) example is used to illustrate the tendency for discretionary monetary policy to produce more inflation than would result from a rule, with no additional employment obtained in compensation. Then a specific monetary rule is proposed, one that sets the monetary base—a controllable instrument—each period in a manner designed to keep nominal aggregate demand growing smoothly at a noninflationary rate. Some simple simulations are conducted which suggest that this rule would have worked well in the United States, over the period 1954-85, if it had been in effect. The basic idea is that, since economists do not understand how nominal demand changes are divided between inflation and output growth, the most useful thing that monetary policy can accomplish is to keep nominal demand growing smoothly at a noninflationary rate. This can apparently be well achieved by means of a rule such as the one proposed.

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