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RULES VERSUS DISCRETION IN MONETARY POLICY

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ABSTRACT

This paper examines the case for rules rather than discretion in the conduct of monetary policy, from both historical and analytic perspectives. The paper starts with the rules of the game under the gold standard. These rules were ill-defined and not adhered to; active discretionary policy was pursued to defend the gold standard--but the gold standard came closer to a regime of rules than the current system. The arguments for rules in general developed by Milton Friedman are described and appraised; alternative rules including the constant money growth rate rule, interest rate rules, nominal GNP targeting, and price level rules are analyzed. Until 1977 the general argument for monetary rules suffered from the apparent dominance of discretion: if a particular monetary policy was desirable, it could always be adopted by discretion. The introduction of the notion of dynamic inconsistency made a stronger case for rules. The final sections analyze the case for rules rather than discretion in the light of recent game theoretic approaches to policy analysis.

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RULES VERSUS DISCRETION IN MONETARY POLICY.

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Discretionary monetary policy has long been an anomaly to liberal economists. Henry Simons addressed the issue[2] in his classic paper "Rules versus Authorities in Monetary Policy" (1948, original in 1936):

> The monetary problem stands out today as the great intellectual challenge to the liberal faith. ... The liberal creed demands the organization of our economic life largely through individual participation in a game with definite rules. ... [D]efinite, stable, legislative rules of the game as to money are of paramount importance to the survival of a system based on freedom of enterprise. (pp. 160-162, emphasis in original)

Simons posed the issue as one of rules versus authority or, rules versus discretion. That dichotomy should rather be seen as a continuum, in which the extent of discretion left to the monetary authority is determined by the specificity of the objectives it is given, and the immediacy of the link between its actions and the attainment of those objectives. At one extreme of discretion, a monetary authority could have the full powers of the Fed (to buy and sell securities, set the discount rate, reserve requirements, and other regulations) and be given the objective of promoting economic well-being.

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[1]World Bank and MIT, and Research Associate, NBER. This paper was prepared as a chapter for the forthcoming Handbook of Monetary Economics edited by Benjamin Friedman and Frank Hahn. I am grateful to Olivier Blanchard, Ben Friedman and Milton Friedman for helpful comments, and the National Science Foundation for research support.

[2]It had been discussed a century earlier, in the context of the dispute between the currency and banking schools (Viner, 1955, Chapter V). Fetter (1965, p.174) quotes the Chancellor of the Exchequer saying in 1839: "I deny the applicability of the general principle of the freedom of trade to the question of making money".

Both the objective, economic well-being, and the link between the monetary authority's actions and the attainment of the objective are vague. At the other extreme, the central bank could be directed to expand its holdings of government securities weekly, at an annual rate of 4% per year.

Intermediate arrangements exist in several countries, in which the central bank is given general objectives but required to report regularly and justify its plan of action for a reasonable period ahead. Its plans may be summarized by money and interest rate targets. It may also be required to report on the execution and outcome of past policies. The reports may be made to the legislature, to the Treasury, or to the public. In the last case, public criticism and the inherent threat that the legislature will intervene, constitute the limits on the powers of the institution.

Simons considered alternative monetary rules, including constancy of the quantity of money but, noting "the danger of sharp changes on the velocity side" (p.164), concluded that the optimal rule at least for an interim period was for the central bank to stabilize the price level. Mints (1950) likewise supported a price-level rule for the United States. Milton Friedman (1948) after echoing Simons' point of principle, developed a framework in which fiscal and monetary policy would operate automatically. It included 100% reserve money, essentially constant government spending and tax rates, and, through full monetary financing of deficits, countercyclical monetary growth.

Friedman (1948) raised the question of whether long and variable lags in the operation of policy might cause the active (though automatic) countercyclical policy of the framework to be destabilizing. In A Program for Monetary Stability (1960), he argued, on the basis of research later published in Friedman and Schwartz (1963), that the the Fed has frequently been a source

of economic instability. Given the record and the theoretical implications of long and variable lags, Friedman advocated the rule that the growth rate of money be held constant[3]. On the general issue of rules versus discretion, he suggested that discretion had permitted destabilizing shifts in monetary policy as the central bank had been swayed by public opinion and political pressures; and that, because the criteria for judging the performance of the monetary authority are so imprecise, the Fed's discretionary powers had enabled it to escape serious public scrutiny.

A new set of arguments in the rules versus discretion debate developed from the dynamic inconsistency literature brought to macroeconomics by Kydland and Prescott (1977). At the 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 discretionary policymakers could always behave that way--and retain the flexibility to change the rule as needed.[4] The dynamic inconsistency literature showed that precommitment by monetary authorities could improve the behavior of the economy.

In this chapter I first discuss the gold standard as a quasi-automatic monetary policy regime, then turn to the issues raised by the Chicago school. Alternative monetary rules are examined in Section III. The modern literature,

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[3]Friedman (1960) explains the switch from his earlier framework as resulting from the empirical evidence. Cogent criticisms of the 100% money proposal and the linking of monetary and fiscal policy by Clark Warburton (1966, Chapter 16, original in 1952) may also have played a role. Warburton (1966, Chapter 17, original in 1952) came close to advocating a constant money growth rule, suggesting an annual growth rate averaging 4-5%, with variations of not much more than 1-2% per annum to allow for changes in velocity. Selden (1962) reviews the development of support for the constant growth rate rule, giving substantial credit to Warburton.

[4]However Friedman did confront the issue of why a formal rule might be preferable to a discretionary policy, making an analogy to the Bill of Rights (1962, pp.239-241.

centered around the concept of dynamic inconsistency, and its relevance to the rules versus discretion debate is the focus of Sections IV through VI.

I. The Gold Standard.

A pure gold standard is a fully automatic monetary system. The specie-flow mechanism in which the money stock adjusts through the balance of payments reveals the equilibrating tendences inherent in the system. With all goods traded and their prices equalized worldwide, adjustment comes purely through wealth effects as the outflow of gold (specie) from a country with a current account deficit reduces the flow of spending in that country. With non-traded goods in each country, adjustments in the relative price of home goods that shift domestic spending between home and traded goods provide an additional stabilizing mechanism, as in Hume's analysis.[3]

Although far from fully automatic, the gold standard in its heyday was as close to a monetary system operated by rule as there has been. I therefore briefly review both the operation of the system and nineteenth century analyses of it, primarily in the United Kingdom where the theory and practice of central banking developed. The context was one in which commercial banking was developing rapidly and the question of the effects of changes in the quantity of bank deposits on the economy was being discussed.

The debate between the currency and banking schools preceding Peel's Bank Act in 1844 that determined the formal structure of the Bank of England explicitly addressed the rules versus discretion issue. The currency school argued that the quantity of currency should vary precisely as it would if all

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[3]Viner (1955, Chapter VI) presents a full analysis of gold standard mechanisms.

money were gold, meaning that the balance of payments should determine changes in the quantity of currency; they did not view bank deposits as money; and they favored the use of monetary rules rather than discretion. The banking school disagreed on these issues. Both schools believed that the currency should be kept convertible into gold[6].

The temper of the times, soon to produce the Corn Laws, favored the use of markets and not discretionary authority. The Bank Act, reflecting currency school views[7], put a strict limit on the Bank's issue of fiduciary money and required all other Bank of England notes to be backed 100% by gold[8]. The Bank of England had claimed since 1832 to be determining the quantity of currency by following currency school principles[9], but the currency school was nonetheless severely critical of the Bank's misuse of its discretionary powers.[10]

Banking school opponents of the Bill argued both that it was a mistake to treat only currency as money, and that the gold standard rule for determining the stock of money was in any case unwise, since the appropriate behavior of the money stock depended on whether movements in the Bank of England's reserve were caused by domestic or foreign disturbances, and on

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[6]Good descriptions of the views of the two schools are contained in Mints (1945, Chapter VI), and Fetter (1965, Chapter VI).

[7]Included in this school were Lord Overstone, G.W. Norman (grandfather of Montagu Norman), and Robert Torrens. Peel himself recognized that in a crisis, discretionary authority might have to be exercised. (Kindleberger, 1978, p.173).

[8]Silver was permitted to constitute up to one-fifth of reserves, but the Bank did not deal in silver after 1850.

[9]This was the so-called Palmer rule, described in 1832 by J. Horsley Palmer, governor of the Bank of England, as guiding the Bank's operations (Fetter, 1965, pp132-133).

[10]Viner (1955, p.254) strongly supports their criticisms: "...during the period from about 1800 to about 1860 the Bank of England almost continuously displayed an inexcusable degree of incompetence or unwillingness to fulfill the requirements which could reasonably be demanded of a central bank."

whether the disturbances were permanent or temporary (Viner, 1955, p.261)[11]. Although the banking school's real bills doctrine appeared to suggest a rule for Bank of England operations, the school did not propose an alternative legislative rule. Viner's (1955, p.281) summary of their position describes the general view of proponents of discretion: "Reliance must be had on the good sense and the competence of those who had charge of the credit operations of the banking system".

Despite the 1844 Bank Act, British monetary policy during the period from the Bank Act until 1914 was actively managed. The need for management arose, as the banking school had anticipated, from the presence of fractional reserve banking. Claims on the Bank of England were throughout the period as good as gold. Virtually the entire gold reserve of the country was held by the Bank of England.[12] In several crises, the Bank in lending freely to meet largely internal drains of currency exceeded the legal limit on its uncovered liabilities. It was typically later indemnified by Act of Parliament.

The central role to be played by bank rate in the operation of the gold standard was not anticipated in 1844.[13] International capital flows responding to interest rate differentials moved gold far more rapidly than the classical specie-flow mechanism. During the heyday of the international gold standard, from 1880 to World War I, an informal set of "rules of the

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[11]Fetter (1965, Chapter VI) describes the views of the critics of the Bank Act, including Tooke, Fullarton, and John Stuart Mill.
[12]This was the situation decried by Bagehot (1906, original in 1873), who argued that it would have been better for the commercial banks to hold their own gold reserves. But he saw no way of moving from the current situation to the preferred alternative, instead vigorously developing the view that in a crisis the Bank should lend freely against "all good banking securities".
[13]On the operation of the gold standard, see Bordo and Schwartz (1984), particularly the introductory essay by Bordo, and Eichengreen (1985). The Eichengreen volume contains several classic sources; among others, W.M. Scammell's "The working of the gold standard" repays reading.

game"[14] is said to have developed to describe the discretionary actions that monetary authorities were to take in support of the system. A country suffering a current account deficit was supposed to tighten domestic credit, thereby protecting the gold reserve and gold convertibility by reducing both capital outflows and domestic demand.[15]

The rules of the game were not formally agreed to, not well defined, and may not have been implemented. The Macmillan Committee (1931, paragraphs 46-47), unable to define operating rules of the gold standard, set out principles to which central banks in a gold standard system would subscribe, including the stability of price levels and exchange rates as goals of policy, and the avoidance of non-cooperative behavior. Goodhart (1972) defined the main rule to be protection of the gold reserve through bank rate, and found that the Bank followed the rule. Bloomfield (1959), examining data for eleven countries over the period 1880-1914, showed that central banks predominantly violated the rule that domestic policy actions should reinforce the specie-flow mechanism.[16] This is suggestive of sterilization, which was

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[14]Moggridge (in Bordo and Schwartz, 1984, p.195) says that the phrase was coined and came into use only in 1930.

[15]The Cunliffe Commission's First Interim Report on the return of the U.K. to gold at the end of World War I contained a clear statement of the common understanding:

> Whenever before the war the Bank's reserves were being depleted, the rate of discount was raised. This ... by reacting upon the rates for money generally, acted as a check which operated in two ways. On the one hand, raised money rates tended directly to attract gold to this country or to keep here gold that might have left. On the other hand, by lessening the demands for loans for business purposes, they tended to check expenditure and so to lower prices in this country, with the result that imports were discouraged and exports encouraged and the exchanges thereby turned in our favour. Unless this two-fold check is kept in working order the whole currency system will be imperilled.

(Paragraph 18)

[16]Econometric results presented by Dutton (1984) confirm the view that the Bank was not obeying the rules of the game, though he broadens the rules to preclude the Bank reacting countercyclically to domestic contraction. See also papers on Germany, Sweden, and Italy, by, respectively, McGouldrick, Jonung, and Fratianni and Spinelli, in Bordo and Schwartz (1984), suggesting the rules were not followed.

certainly common in the gold-exchange standard after World War I[17], notably in the failure of the United States and France to expand their money supplies in response to gold inflows.

There is no question that the gold standard monetary system did not operate by rule. In the first instance, countries sometimes left and sometimes returned to the gold standard, by discretion. And even when they were on the gold standard, the central bank (in the United States, sometimes the Treasury) took an active, if not always successful, role in managing the system to maintain convertibility. The Bank of England manipulated bank rate actively, by discretion, mainly to protect the gold reserve.[18] The "rules of the game" were far from being well-defined.

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[17]Bloomfield's examination of the pre-World War I data follows the format of Nurkse s (1944) research on inter-War monetary policy.

[18]Sayers (1958, Chapter 2) provides a concise account of the period after 1873, noting that the Bank's concern to protect its own income interfered with the development of its central banking activities. Hawtrey (1962) covers a longer period and puts more emphasis on the mechanism by which bank rate affected real activity: he saw the link as being mainly through inventory demand, and for that reason emphasized that changes in the rate, which led to inventory accumulation or decumulation, were more significant than the level of the rate.

Nonetheless, the gold standard came closer to a regime of rules than the current system. The key difference is that monetary policy had a clearly defined objective that was for most of the period within the power of the monetary authority to achieve: to maintain convertibility of the currency into gold at a fixed price. Whether or not the rule enhanced economic stability relative to alternative feasible policies is another matter.

II. The Chicago School and Rules versus Discretion.

The Federal Reserve System was originally expected to operate within a gold-standard setting, although in specifying that the money stock was to be elastic, the Federal Reserve Act provided a contradictory guide to monetary policy. Because it started operating during World War I when many of the belligerents were effectively not on the gold standard, the System "began operations with no effective legislative criterion for determining the total stock of money. The discretionary judgment of a group of men was inevitably substituted for the quasi-automatic discipline of the gold standard" (Friedman and Schwartz, 1963, p.193).

The discretionary operation of monetary policy created little controversy so long as it was successful during the 1920's. Proposals for monetary reform in the United States proliferated after the debacle of monetary policy in the Great Depression. Impressed by bank failures, a group of Chicago economists in 1933 advocated a system in which banks would hold 100% reserves against checkable deposits.[17] With 100% reserves, bank runs

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[17]Hart (1952, 1935 in original) provides an account and critique of the "Chicago Plan", which he says was independently developed by Lauchlin Currie at Harvard.

could not reduce the money stock, as they had in the Great Depression. Proponents included Irving Fisher (1945, original in 1935)[20], whose simplest plan required the money stock to be held constant after a currency commission had bought sufficient government securities to bring reserves up to 100%. Among the alternatives proposed by Fisher were constancy of the per capita nominal money stock and a price stabilization rule. Fisher also implied that interest might be paid on reserves.

Although the Chicago arguments for rules were originally developed in the context of the 100% reserve plan, they are not inherently related. Simons and Fisher could easily have advocated stabilizing the price level in a fractional reserve system. Friedman could later advocate the constant growth rate rule without requiring the economy first to move to 100% money.

A change to 100% reserves would have removed one potential weakness in an automatic system--the danger that a loss of confidence would lead to runs on banks. But it should have been anticipated then, and is clear now from the fate of regulation in the seventies, that it would have been impossible to maintain the restriction against the use of all other financial intermediary liabilities as means of payment.[21] The system would have required frequent legislative or discretionary rule changes to keep up with private sector attempts to circumvent the artificial barrier, and increased monetary uncertainty. Rather than prevent sharp changes in velocity the 100%

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[20]In the preface, Fisher thanks members of the Chicago group and acknowledges their memorandum on the 100% plan as the original source of many of the ideas in the book.

[21]Simons (1948, p.172) was aware of the difficulties. He thought that a way of handling them could be found "when we conceive the problem broadly as that of achieving a financial structure in which the volume of short-term borrowing would be minimized, and in which only the government would be able to create (and destroy) either effective circulating media or obligations generally acceptable as hoards media."

reserve proposal by mandating the use of inefficient methods of banking, would have ensured continuing shifts in velocity[22]. Monetary rules are discussed in the remainder of this chapter without reference to 100% reserves.

It is useful to distinguish two levels of argument in the rules versus discretion debate. The first is general, examining the case in principle for rules rather than discretion, without necessarily specifying the rule or details of the discretionary system. The second is specific, discussing whether the money supply should vary one way or the other, or whether nominal interest rates should be fixed, and may be relevant to both discretionary and rules systems.

Friedman's general arguments for rules rather than discretion are that a rule enables the monetary authority to withstand political pressures, provides criteria for judging its performance, and ensures certainty about economic policy for private agents. His specific argument for a constant growth rate rule was entirely pragmatic, that this would reduce economic instability. I briefly discuss Friedman's general case for rules and then in the next section examine alternative operating rules.

Insulating the central bank from political pressures is, I believe, a worthy purpose, though it accords ill with a general preference for democratic decision making.[23] The other two arguments are unpersuasive.

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[22]The payment of interest on reserves would reduce the incentive to invent non-bank depository institutions, though it is unlikely even so that attempts to differentiate sharply between banks and other intermediaries in order to control the quantity of "money" would be successful.

[23]Friedman (1962) remarks on the inherently undemocratic nature of central banking, referring to the implicit view of Emile Moreau, a governor of the Bank of France between the Wars, that he, Norman, Schacht and Strong could run the economies of the world if only they were left alone to do so. The more recent view is that central banks follow the prevailing political winds. Society of course makes arrangements to shield other types of decision making--for instance legal--from immediate political pressures.

What good is it to evaluate the performance of the central bank if it is engaged in an exercise that is irrelevant to the behavior of the macroeconomic variables that matter? Far better to require the central bank each year, or quarter, to explain its actions, and to subject the explanation to the uncertain evaluations of an imprecise science--as we do at present. Certainty about economic policy is not a compelling argument for rules either. Economic agents want certainty about prices and about output; banks aside, they have no inherent interest in the behavior of the stock of money. If a discretionary policy that produced an unpredictable path for money ensured price stability and full employment, the uncertainty about monetary policy would be of no account.

Leaving aside the dynamic inconsistency argument that will be discussed later, it is difficult to evaluate the argument of principle made by Simons and most proponents of rules. A successful discretionary monetary policy that maintains reasonable price stability and employment will likely do more to maintain the general use of free markets and personal freedoms than an unsuccessful rule that causes discontent over the basic organization of the economy. I will therefore analyze alternative policies with differing degrees of discretion in terms of the likely economic outcomes, leaving the reader to factor in his or her preference for rules as a matter of principle.

III. Alternative Rules.

In this section I consider alternative monetary policies: the Friedman constant money growth rule; the possibility of feedback monetary rules, including the frequent modern proposals for a nominal GNP rule; the

Fisher-Simons rule of a price level target; and the Fisher "compensated dollar" proposal. I do not consider exchange rate based rules.

The Constant Growth Rate Rule: Friedman's argument for the constant growth rate rule[24] rather than an active feedback rule is that there are long and variable lags in the effects of monetary policy. Thus any active policy that responds to current events may have its effects only at an inappropriate time. Let Y_t be the level of a target variable, say nominal GNP, and m_t be the level of the money stock. The aim of policy is to minimize the variance of Y_t, conditional on information available up to period (t-1). Suppose that

$$(1) \qquad Y_t = \Sigma_1^n \alpha_{1,t} Y_{t-1} + \Sigma_0^k \beta_{j,t} m_{t-j} + \varepsilon_t$$

where $\alpha_{i,t}$ and $\beta_{j,t}$ are stochastic coefficients, and ε_t is a disturbance term, which can be taken to be white noise.

Consider now the role of lags. First, in the absence of lags, active policy may be unnecessary: if the α_i in (1) were identically zero, and given that ε is white noise, active monetary policy could not reduce the variance of nominal GNP. Long lags in the system, reflected in the α_i, make policy potentially more useful. The mechanisms that produce such lags are likely also to cause monetary policy to work with long lags. Long lags in the effects of policy by themselves are not necessarily an impediment to the successful use of active countercyclical policy. (Fischer and Cooper, 1973). If the coefficients in (1) were not stochastic, then optimal monetary policy could exactly offset the lagged effects of earlier disturbances and monetary policy by setting

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[24]After some discussion, Friedman (1960) proposes there be no seasonal variation in the growth rate of money. This would restore the seasonal to interest rates.

(2) $m_t = -[\beta_0]^{-1}[\Sigma_{i=0}^{n} \alpha_i Y_{t-i} + \Sigma_{j=1}^{k} \beta_j m_{t-j}]$

One difficulty with the policy in (2) is that it could produce instrument instability, requiring ever larger changes in the money stock to offset its lagged effects (Holbrook, 1972). It would be more likely to do so the more slowly the effects of money on output build up; if β_0 were small, the rule (2) would call for large fluctuations in the money stock. In that sense long lags of policy could make the active policy in (2) undesirable, but allowing for costs of instrument instability in the objective function, optimal policy would still in this model be active.

Uncertainty about the lag coefficients, the $\beta_{j,t}$, means that active use of monetary policy adds variability to income. Active policy can still be used, cautiously, to reduce the variance of output, but the gain may be small.[25] The presence of variable lags, then, makes optimal policy less active, and in that sense is an argument in favor of the constant growth rate rule. Totally inactive policy could be optimal if the mere use of active policy adds uncertainty to the system independent of the particular active policy followed.[26]

Friedman's evidence for long and variable lags in the effects of money is based on a comparison of turning points in the growth rate of money and cyclical peaks in activity in NBER reference cycles.[27] Reduced form evidence, for example of the St Louis Fed model (Andersen and Jordan, 1970),

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[25]This is the effect of multiplier uncertainty, discussed by Brainard (1967).

[26]This could be the case if economic agents viewed the Fed as either being totally inactive, or else potentially a source of instability--as implicit in Friedman's development of the case for a constant growth rate rule.

[27]Friedman (1969, original in 1961) discusses his evidence and criticisms of it.

or Barro (1978), or Mishkin (1983) typically finds a reasonably close connection between money growth and the subsequent behavior of nominal GNP.[28] In the St. Louis model active monetary policy can be stabilizing even when lags are treated as stochastic. (Cooper and Fischer, 1974).

In the above example, a zero (logarithm of the) money stock minimizes the noise added to the system by active monetary policy. The question arises of what is the corresponding monetary policy in practice (Diamond, 1985). Friedman regards a policy of maintaining a constant growth rate of money as inactive, though even in this case the monetary rule has to specify whether past misses in attaining the given growth rate are to be ignored or corrected. Also to be considered are the questions of which monetary variable to target, and whether an alternative policy such as attempting to fix the nominal interest rate might produce a lower variance of the target variable.[29]

Except if the argument for a rule is based on the principle of minimizing the Fed's discretion, these questions cannot be answered without using an analytic and ultimately an empirical model. The Fed's discretion is minimized by giving it a task that it can accomplish exactly, the simplest of which is to require it to increase its portfolio each week at a given annual rate, say 4% or 0%.[30] Statistical inference would place the minimum

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[28]The variability of lags found by Friedman could result from the omission of other factors that move the cycle, such as fiscal policy.

[29]So long as a base level of a nominal variable such as the money stock is specified, an interest rate pegging rule need not produce indeterminacy of the money stock. See Blanchard and Fischer (1988, Chapter 10) and McCallum (1981).

[30]It is because he believes the Fed's authority should be minimized that Friedman has recently moved from his former proposal that the money growth rule target M1 or M2 to the view that the monetary base should be held constant.

uncertainty about the outcome of policy at the historical average level of the monetary variable in the regression relating the behavior of the target variable (real output, or nominal GNP) to the instrument variable.

The strongest argument against a constant growth rate rule for money is that the velocity of all money stocks has varied substantially and with some short-run predictability. It can be argued that these variations are themselves induced by unstable monetary policy, but it is hard to believe that shocks to the demand for money that cause interest rate movements, and technical progress in the payments system will not cause continuing future changes in velocity. Because the behavior of the stock of money per se is not the ultimate goal of policy, there is no reason other than the fear that any active policy will degenerate for not taking such changes into account in setting monetary targets.

Interest Rate versus Money Targets: In a famous article, Poole (1970) analyzed in the context of a fixed price IS-LM model the question of whether output would be more stable if monetary policy held the interest rate or the quantity of money fixed in the face of shocks to the IS curve (shocks from investment, consumption, or government demand for goods) and the LM curve (money demand shocks). The well-known answer is that interest rate pegging stabilizes output if shocks are primarily from money demand, and that money stock fixing is preferable if shocks are primarily from the IS curve.

If the price level is allowed to vary, and with rational expectations, monetary policy cannot affect the behavior of output unless the monetary authority has an informational advantage, or equivalently, if some prices are fixed before monetary policy decisions are made[31]. Assume as

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[31] I abstract here from Mundell-Tobin and other effects through which changes in the growth rate of money affect real variables even when all markets clear.

seems realistic that the monetary authority can react after wages are set. In a model with IS and LM curves, plus an aggregate supply curve in which output is an increasing function of the price level relative to the expected price level, results similar to Poole's are obtained with respect to IS and LM shocks. The relative impact of a supply shock under money and interest rate rules depends on the parameters in the model: when the level of output is relatively little affected by price level movements, money stock targeting stabilizes output relative to interest rate targeting.[32]

Nominal GNP Targeting: Among monetary rules that allow for changing velocity, a nominal GNP rule has received considerable attention.[33] The rule would specify a target path for nominal GNP, for instance one that grows at x%. If the target path for nominal GNP is pre-specified for all time, policy accepts a linear and one-for-one tradeoff between changes in the price level and output. This implies for instance acceptance of the need for a recession of 5% of real GNP in the face of a supply shock that raises the price level 5%. It is unlikely that such a tradeoff would be accepted if the choice were put explicitly.

Nonetheless, suppose that a target path for nominal GNP has been specified. Monetary policy would then be chosen each period to bring GNP as close as possible to the specified path. Given lags in the operation of money, and if current money growth has small effects on current nominal GNP, such a policy is likely to produce instrument instability, ever increasing fluctuations in the money stock.[34] The nominal GNP rule would then have to

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[32]These results are developed in detail in Blanchard and Fischer (1988, Chapter 10).

[33]For instance, Bean (1983), Taylor (1985).

[34]Instrument instability would not be a problem if we had full confidence in our models, but we can be sure that the models will not continue to describe reality if the money supply fluctuates more than it ever has historically.

be calculated imposing some costs on variations in money growth. Taylor (1985) examines economic performance with nominal GNP targeting, emphasizing the difficulties caused by the lagged responses of output and prices to previous policy.

Once the impacts of past shocks, including the lagged effects of monetary policy, are recognized, an alternative mode of GNP targeting may be employed in which the monetary authority announces policies that are expected to bring the economy back to a target path gradually. Or the aim might be to produce a given growth rate of GNP each year, with past deviations from target forgiven. The simplest method of calculating the required growth rate of money is to use a forecasting equation for velocity to derive the growth rate of money implied by the intermediate target levels of GNP. This was the policy followed by the Bundesbank from 1974 to 1980, with target money growth set annually (Fischer, 1988).

A related interpretation is that under nominal GNP targeting, the monetary authority announces each period a nominal GNP target rather than a target growth rate of money. With the nominal GNP target justified in public, this is a policy that gives the monetary authority the discretion to adjust money growth in response to changes in velocity within the period. From the control theory viewpoint this change makes it possible in principle to come closer to achieving targets. Whether that would actually happen would depend on the monetary authority's success at predicting velocity and the extent to which the greater discretion would enable it to pursue other objectives.

On this interpretation, in the context of a simple three-equation macroeconomic model--consisting of IS and LM curves plus the Lucas supply function--a policy that fixes nominal GNP within a period completely offsets the effects of demand shocks (shocks entering the IS and LM curves) on output and prices. Thus if the ultimate goals of policy are to keep output and the price level at some target level, monetary policy that successfully targets nominal GNP is appropriate when the economy is affected by demand shocks. However, obviously, an adverse supply shock would raise the price level above its target level and reduce output below its target level. (Blanchard and Fischer, 1988, Chapter 10).

Price Level Rules: As in the case of nominal GNP targeting, a price level rule can be viewed either as the specification of the objective of monetary policy or the basis for an operating rule. The Fisher-Simons price level rule is in Simons merely the specification of a target for monetary policy. Fisher (1945, p.25) makes the specific proposal that the Fed expand the money stock when the price level falls below target and contract when the price level rises above target. The dynamic properties of such a policy cannot be evaluated without an explicit model; lags in the operation of monetary policy raise the possibility the policy would actually be destabilizing, particularly because monetary policy seems to operate more slowly on prices than on real GNP. This suggests that a Fisher-Simons rule could cause significant fluctuations in real GNP in trying to stabilize the price level.

Fisher's "compensated dollar" proposal (1920), recently revived by Hall (1984), proposes that the dollar be exchangeable into gold, but that the value of gold that is exchanged for a dollar be fixed in real terms, defined say by the CPI. The notion is that the gold standard check on excess issue

of currency would still be available, the simple gold standard criterion of maintaining convertibility would still be there, but the secular effects of changes in the relative price of gold on the aggregate price level would disappear.[35]

The proposal gives the Fed a simple rule to follow--maintain convertibility--and appears to promise price level stability. The difficulty with the scheme is that its dynamics are not understood, particularly whether there would be destabilizing speculation against the standard. For instance, if the price of gold were adjusted monthly in accordance with the change in the CPI, anticipated changes in the CPI would allow individuals to speculate by buying or selling gold in advance of the change in parity. Probably the imposition of sufficiently large transactions costs would reduce the extent of such speculation, but the desirability and consequences of such costs have not been explored. Further, it is entirely unclear how the scheme induces the wage flexibility that must be needed if the aggregate price level is to be stable.

The Methodological Problem: None of these alternative policy proposals commands wide assent within the profession. Since Lucas's policy evaluation critique (1976), there has been no accepted way of evaluating detailed policy proposals.[36] There has been a tendency to evaluate proposals either in very simple econometric models, which are set up as much for tractability as for realism, or in very simple theoretical models, also marked mainly by

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[35]In the introduction to the U.S. edition of Webb (1934), James H. Rand Jr. claims this is precisely the policy followed in Britain after its 1931 departure from the gold standard.

[36]This includes the constant growth rate rule, which represents a significant change from previous practice and therefore may induce changes in economic structure in unexpected ways.

tractability. One such model that provides considerable insight is the three-equation macro model consisting of IS and LM curves plus an aggregate supply curve. However few appear to be convinced by such exercises--and they are right, for how a policy would operate in practice depends to a considerable extent on the lags with which policy affects the relevant target variables.

Yet policy evaluation and Fed policy making continue. Economists with experience confidently pronounce on the errors of the Fed's ways. The Fed continues to make discretionary policy, recently with considerable success in terms of its objectives. Each is using implicit and sometimes explicit models, of considerable sophistication.

The natural vehicles for studying alternative policy rules are the large-scale econometric models, some of which have met the market test of commercial success. Given an econometric model, an objective function, and computing ability, optimal feedback rules for monetary policy can be calculated. However, given the variety and inadequacies of existing models, it would be difficult to justify enshrining any of these rules in legislation. Until and if ever a new generation of models that meets the demanding standards of the profession is developed, there will be no generally accepted professional basis for discussing alternative policy rules.

What monetary policies should be adopted in the meantime? At a minimum, it is clear that monetary policy should adjust for predictable changes in velocity. It might be possible to find simple feedback rules that perform well in a variety of models,[37] and to recommend them as a basis for

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[37]Cooper and Fischer (1972) found feedback rules that reacted to the behavior of inflation and unemployment which stabilized output in both the St. Louis and MPS models.

monetary policy. They could serve in the first instance as an indicator of what monetary policy should be. Prudence would suggest years of public and professional discussion before an attempt was made to put such rules into legislation.[28] It also suggests that the rule include procedures for its own amendment.

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[28]Friedman in 1948 offered his monetary and fiscal framework very much as a tentative proposal for professional discussion.

IV. Dynamic Inconsistency: the Basic Example.

Until 1977, it appeared that discretion dominated rules, since any good rule could be adopted by discretion.[39] The concept of dynamic inconsistency, brought to macroeconomics in the rules versus discretion context (Kydland and Prescott, 1977) completely changed the debate.[40]

Dynamic inconsistency occurs when a future policy decision that forms part of an optimal plan formulated at an initial date is no longer optimal from the viewpoint of a later date, even though no new information has appeared in the meantime. An example of dynamic inconsistency due to Prescott (1977), developed in Fischer (1980), is that of optimal taxation in a system with capital. Under rational expectations the solution gives tax rates that are optimal conditional on their being expected by private agents. But once capital is in place, its supply is inelastic and a government acting to maximize the welfare of the representative individual would tax capital more heavily. The problem is that if the public expected the government to violate its announcement, economic welfare would be lower than if the government could commit itself to following through on its promised tax rate.[41]

The application to the rules versus discretion debate comes from the claim that policy will be dynamically consistent if determined by rules. By

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[39]Friedman (1972) had argued that a policy adopted by rule would stabilize private sector expectations relative to the same policy carried out by discretion, but the basis for that argument was not clear.

[40]In this section I draw freely on my 1986 survey article; see also Cukierman (1985).

[41]Precisely the same problem occurs with the optimal inflation tax and money holding (Calvo, 1978); the monetary authority can always impose a lump-sum tax by discretely increasing the money supply and, once the private sector has formed expectations, is tempted to do so.

contrast, a government or central bank with discretion may under rational expectations be expected to make the short-run optimal decision every time it can, therefore gains nothing from its opportunism, and on average produces a worse outcome than would a government able to tie its hands.

In this section I present a simple Phillips-curve example of dynamic inconsistency, and discuss the relevance to the rules versus discretion debate of the example. In the next section I present extensions that take reputation into account.[42]

Basic Example: Suppose that the policy maker has a single period loss function quadratic in the rate of inflation (π) and in the deviation of real output (y) from a target level:

$$(3) \qquad L(\ ) = a\pi^2 + (y - ky^*)^2; \quad a > 0,\ k > 1.$$

Here y^* can be interpreted as full employment output. The target level of output exceeds the natural rate.

The assumption $k > 1$ is crucial. The most plausible justification is that tax distortions cause the natural rate of employment to be too low. That justification allows the loss function $L(\ )$ to be consistent with the single period utility function of private agents. An alternative view is that the government has different tastes than the private sector.[43] In any event, dynamic inconsistency may occur whether or not the private sector and the government have the same tastes.

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[42]This structure was introduced by Kydland and Prescott (1977) and developed by Barro and Gordon (1983, 1983a), Backus and Driffill (1985, 1985a), Canzoneri (1985), Rogoff (1985) and others.

[43]More sophisticated theories that recognize heterogeneity in private sector tastes and that seek to ground the government's objective function in the electoral process could produce a utility function for some governments that would seek to raise output above the natural rate. Cukierman (1985) contains an extended discussion of this point.

The intertemporal loss function, a discounted sum of the form

(4) $M_t(\ ) = \sum_{\tau=0}^{\infty} (1+\delta)^{-\tau} L_{t+\tau}(\ )$

may more plausibly differ between the private sector and the government in a system with periodic elections that can end the life of the government. In this case the government may have a shorter horizon than the private sector.

An expectational Phillips curve describes the relationship between output and inflation each period.

(5) $y = y^* + b(\pi-\pi^e)$

where π^e is the expected rate of inflation.

Consider first a one-period game. The policy-maker sets the inflation rate. Under discretion the expected inflation rate is taken as given, implying:

(6) $\pi = (a+b^2)^{-1}b[(k-1)y^* + b\pi^e]$

If expectations are correct, the inflation rate will be positive, at the level

(7) $\pi_d = a^{-1}b(k-1)y^*$

where subscript d represents "discretion". Note that the inflation rate is higher the larger is b, and thus the greater the output gain from unanticipated inflation, the larger is the distortion $(k-1)y^*$, and the smaller is a (the less costly is inflation).

The implied value of the loss function under discretion is

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

This equilibrium is evidently worse for the government (and if it has the same utility function, the private sector) than a zero inflation equilibrium. The zero inflation equilibrium, the precommitment solution, gives a value of the loss function equal to

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

Why in this game does the policy-maker not choose an inflation rate of zero, thereby attaining L_p rather than L_d? Under the rules of the game, in which the private sector commits itself first to a given π^e, $\pi = \pi^e = 0$ is not a Nash equilibrium. Once the private sector has committed itself to $\pi^e = 0$, the policy-maker will choose the positive rate of inflation implied by (6). The inflation rate π_d in (7) is a Nash equilibrium that if expected by the private sector will be implemented by the government.[44] If the policy-maker could somehow commit herself to choosing $\pi = 0$, she could obtain the distorted second-best outcome L_p.

For discussing reputational equilibrium we want also to calculate the inflation rate and value of the utility function in the fooling solution in which individuals expect the policy maker to create zero inflation but he instead acts opportunistically. With $\pi^e = 0$, the optimal discretionary rate of inflation is from (6):

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[44]It is also the only Nash equilibrium. It is tempting when talking of the private sector "moving first" to to think of it setting its expectation strategically. If π^e was a private sector strategic variable, it could be set at the value that would from (6) induce $\pi = 0$. According to the algebra that would result in $y = ky^*$ and produce a first best solution. But that would not be an equilibrium because π and π^e would be different. In other words, it is inconsistent to argue that the public "sets" π^e at a negative number in order to achieve $\pi = 0$.

(10) $\pi_r = (a+b^2)^{-1}[b(k-1)y^*]$

The corresponding value of the loss function is

(11) $L_r = (1+a^{-1}b^2)^{-1}(k-1)^2y^{*2}$

Thus:

(12) $L_r = (1+a^{-1}b^2)^{-1}L_p \equiv (1+\theta)^{-1}L_p$

$L_d = (1+a^{-1}b^2)L_p = (1+\theta)L_p$

Note that $\theta = b^2/a$ is, loosely, a measure of the utility gain from unexpected inflation: b gives the increase in output and a the utility loss from higher inflation.

We thus have the fundamental set of inequalities that demonstrates the benefits of precommitment:

(13) $L_r < L_p < L_d$

The discretionary solution produces the largest loss, resulting as it does in a positive rate of inflation with no output gain. Therefore, one suspects, the policy-maker would want to choose a zero inflation rate, to attain L_p. But because the loss function is lower when the government succeeds in fooling the private sector than when it acts consistently ($L_r < L_p$), the government is tempted to violate expectations if the private sector should be lulled into expecting zero inflation. In striving to obtain output gains by fooling the public, the government succeeds only in raising the inflation rate and producing the worst of the three outcomes in (13).

Therefore, Kydland and Prescott argued, policy-makers should be constrained by rule. That would enable them to attain the precommitted solution, admittedly not the best possible, but better than the discretionary alternative.

Preliminary Discussion: How persuasive is this? Should we expect discretionary policy-makers always to choose the short-run optimal solution, or might they take into account the consequences for future expectations of any current decisions to pursue short-run gains? Before presenting models with reputation, we briefly discuss the general problem of dynamic inconsistency.

Societies deal routinely and continuously with situations in which dynamic inconsistency could occur. So do individuals.[45] Wealth in general and the national debt in particular are standing invitations to surprise taxation, which is rarely explicitly imposed. Implicit social security obligations are honored and protected. Property rights are protected by law and understood to be essential to economic efficiency in a market environment. Central banks with discretionary powers successfully run low-inflation policies in several countries, including Germany, Japan, and Switzerland.[46]

The law, constitutional or less fundamental, is obviously one solution to the dynamic inconsistency problem. But not all potential dynamic inconsistency situations are dealt with by the law. This raises the questions of which issues are and should be handled through the law and which by discretionary policy-making. The ability to describe future contingencies fully must be an important element in this choice.

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[45]Elster (1979) and Schelling (1984) are stimulating references, dealing in part with individual inconsistencies and problems of self-control.

[46]The dynamic inconsistency literature in macroeconomics has been almost exclusively concerned with the alleged inflationary bias of macroeconomic policy. Switzerland and Germany aside, it is clear from history that inflationary bias is only a sometime thing. At the ends of the Napoleonic and Civil Wars, and World War I, Britain and the United States deflated to get back to fixed gold parities. These episodes too deserve attention in the dynamic inconsistency literature. A challenge for the theory of dynamic inconsistency is to explain why countries were able to institute mechanisms to suppress their inflationary bias until the end of World War II, and to explain why the bias is worse in some countries than others.

A potentially fruitful way of thinking about the constitutional law-law-rule-discretion continuum is to view policies as involving a tradeoff between the benefits of flexibility and the costs of dynamic inconsistency[47]. Depending on the policy, the legal system makes an ex ante choice of the costs that should be attached to attempts to change it. Discretionary policies, such as monetary policy, can be changed at low cost; rules fixed by law such as much of fiscal policy are changeable at greater cost; rules fixed by constitutional law such as the rights of private property or interstate commerce are in principle also changeable but at yet greater cost.

Non-Rules Solutions: One way of reducing the inflationary bias of the basic example, developed by Rogoff (1985), is to appoint conservative policymakers. Suppose society's loss function is (3). Let a_b (b for banker) be the policymaker's weight on inflation in his personal loss function. Giving such an individual full discretion results in a loss for society of

(14) $L_b = [1 + b^2/a_b]L_p$

The more conservative the policymaker, the closer the society comes to achieving the precommitted equilibrium.

The notion of appointing conservative central bankers is certainly suggestive. Further reasons to appoint them relate to the benefits of reputation, to be examined below.

Another non-rules solution is to put in place incentives for successor governments to behave consistently. This is the approach that has been followed in a model involving government debt but not capital by Lucas and Stokey (1983) and in a model including in addition monetary policy by Persson,

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[47]Rogoff (1985) suggests this tradeoff, which is examined further in Section VI below. Cukierman and Meltzer (1986) include similar considerations in their analysis of a government's choice between discretion and rules.

Persson, and Svensson (1985). The general principle, explained by Persson and Svensson (1984), is to place the successor decision-makers in a situation where the penalty for deviating from the precommitted consistent plan balances at the margin the benefit of doing so. In principle such arrangments can be made in any situations where the full set of states of nature can be specified ex ante.

The Lucas-Stokey and Persson-Svensson solution raises delicate issues. Dynamic inconsistency does not disappear. Rather the solution assumes that the government will not violate certain explicit obligations, such as repaying the debt, even though there is an incentive to do so. Without a theory of reputation such solutions have to be regarded as incomplete. We turn now to models with reputation.

V. Dynamic Inconsistency and Reputational Equilibrium.

The basic Phillips-curve example invites the question of whether the decision-maker cannot, by behaving consistently, reach a better result than the one-period discretionary outcome. Perhaps by showing forbearance, investing in reputation, a central bank can induce the private sector to believe that it will not produce unexpected inflation.

There indeed exist reputational equilibria in which the monetary authority is expected and induced to behave consistently so long as it does so. The key to analyzing such equilibria is the specification of private sector expectations.

Suppose that the horizon is infinite and that policy-makers have the loss function $M_t(\ )$ in (4). Denote the inflation rate (7) associated with

discretionary policy in the one period problem by π_d. The inflation rate associated with the precommitted monetary policy is $\pi_p = 0$.

We start with expectations based on the private sector's viewing the policy-maker as either reliable or opportunistic. If the inflation rate has ever been anything other than the precommitted rate of zero, the expected inflation rate from then on will be π_d from (7). If the government has hitherto produced the precommitted inflation rate, $\pi_p = 0$, it is expected to continue doing so.

Why these particular expectations? They will turn out to be justified, or rational. But as in many cases, they are not the only rational expectations, or in game theory terminology, perfect, equilibria. The problem of multiple rational expectations solutions to intertemporal games is well known. Below we give another example of a consistent set of expectations.

Given these expectations, consider a government that has always behaved consistently, now considering whether to continue producing zero inflation or whether rather to fool the public. If it cheats, it gains in that period

(15) Temptation = $L_p - L_r = \theta L_p/(1+\theta)$

It then has to pay for its cheating by being expected to produce the discretionary solution forever. If that is what is expected, that is the best thing for the government to do. The loss from discretionary policy in one period relative to the precommitted equilibrium is:

(16) Loss = $L_d - L_p = \theta L_p$

Note that both the temptation and the loss are increasing in θ.

The gain from acting opportunistically is then equal to the temptation minus the present discounted value of the loss that starts a period later:

$$\text{Gain from opportunism} = \text{Temptation} - \text{Loss}/\delta \tag{17}$$
$$= \theta L_p[\delta-(1+\theta)][\delta(1+\theta)]^{-1}$$

The government will act opportunistically if it has a very high discount rate, and it will then be expected to and will behave that way in every succeeding period. It will keep the inflation rate at zero if the discount rate is low or if θ is high. The role of θ in determining whether the government keeps inflation at zero appears paradoxical in that when θ is high, the short-run gain from unanticipated inflation is high. But since both the gain and the loss are increasing in θ, the net effect is a priori indeterminate, and depends on the curvature of the loss function.

Note that in this certainty setting, a reputational equilibrium is possible only if the horizon is infinite. Otherwise the government would be sure in the last period to produce the discretionary outcome whatever the private sector's expectation, and working backwards would be expected to do the same in the first period.

The Barro-Gordon Example: Barro and Gordon (1983a) produce another example of a reputational equilibrium in this type of model. Their expectations assumption is that if the government fails to produce the expected inflation rate this period, the private sector expects the discretionary inflation rate next period; if they produce the expected inflation rate this period, they are expected to do so again next period.

The first question is whether a zero inflation rate can be sustained as an equilibrium. The loss from opportunism lasts only one period, before the government regains credibility and is faced with the same decision it has in the initial period. Thus the gain from opportunism in this case is, using (15) and (16):

$$\text{Gain} = \text{Temptation} - \text{Loss}/(1+\delta) \tag{18}$$
$$= \theta L_0[(\delta-\theta)/(1+\delta)(1+\theta)]$$

With a high discount rate the government will produce higher than expected inflation in period one. In period two it produces the discretionary rate π_d. It regains trust by doing what was expected, but then promptly violates it in period three. Thus the initial set of expectations were not rational.

With a low discount rate and high θ the government will produce zero inflation.[49] If by accident it were to violate that rule, the public would expect π_d to be followed by zero inflation, and the government would indeed act that way. Thus with low δ the assumed expectations are rational.

For the high δ case, Barro and Gordon are able to show that there is an equilibrium if $\delta\theta < 1$, that is only if the government is not too impatient. If $\delta\theta > 1$, it will go to the discretionary solution. If it is not too impatient, the equilibrium inflation rate in this reputational equilibrium lies between the zero inflation that would be attainable under precommitment and π_d that occurs if the government is entirely short-sighted.

The nature of the rules equilibrium is that the government will carry out the rule because there is no advantage to not doing so. If it should by

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[49]In the Barro-Gordon model zero inflation is not an equilibrium, because of differing assumptions on the utility function.

miscalculation deviate, then it will next period implement π_a given that it is expected to do so. It regains credibility and thereafter is happy to implement the rule again. The equilibrium is perfect--though it is far from unique, as Barro-Gordon recognize and discuss.

Multiple Equilibria: Perhaps there are many possible equilibria in the real world, and it is pure accident that a particular situation exists. Nonetheless, it would be preferable if theory could narrow down the range of possibilities.

The description of the private sector's response to the government's deviation as a punishment raises the hope that the design of an optimal punishment strategy will reduce the multiplicity of equilibria. But unless the private sector is thought of as a single union, it is difficult to conceive how it can select an optimal punishment as opposed to optimally calculating expectations.

The more promising route probably lies in enriching the description of the environment in which the policymakers and the private sector operate.

A Randomizing Government: Tabellini (1983, 1985), Backus and Driffill (1985, 1985a) and Barro (1985) apply the Kreps-Wilson (1982) reputation model to the inflation problem. Tabellini, and Backus and Driffill consider a monopoly union setting wages in a game with a monetary authority. The alternative assumption, made by Barro, is that private agents are homogeneous and not engaged in strategic considerations vis-a-vis the policy-maker. The union versus central bank game may be appropriate for Europe, but in the United States context the notion that private agents cannot combine against the monetary authority is more attractive than the alternative.

The horizon is finite. The public believes there are two possible types of policy maker, the strong and the weak. The strong never inflates. The weak has the same utility function as the public, is always tempted to produce unanticipated inflation, but by pretending to be strong can build up a reputation for strength. The weak policy-maker potentially engages in a mixed (randomizing) strategy, picking a probability of acting tough (or alternately, producing inflation) in each period, and letting the dice decide the policy choice. If in any period the dice make him act weak, the public understands he is weak, and in each subsequent period he obtains only the discretionary outcome.

The general form of the solution is as follows.[47] For a long-horizon problem the policy-maker will start out not randomizing at all and not producing inflation (this will keep his reputation unchanged). Because private agents are uncertain of the policy-maker's type, inflation is below its expected level all this time, causing a small recession. Eventually the end beckons, and the policy-maker begins to randomize. During this period his reputation is improving and the probability of playing strong is falling. Then towards the end, maybe only in the last period, he inflates for sure.

One result that emerges from this framework is that as the horizon goes to infinity, and provided the discount rate is reasonable, the reputational equilibrium with zero inflation is attained. The reasoning is similar to that above: the penalty for revealing your weakness is a very long period of inferior performance.

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[47]A two-period example is worked out in full detail in Fischer (1986).

Neither the elegance nor the suggestiveness of the Kreps-Wilson construct can be denied. But the analysis, by focusing entirely on the weak policy-maker who has made it through without inflating, draws attention away from the implausibility of the underlying view of the policy-maker s actions. It is difficult to believe a model of reputation in which a central bank creates inflation because the dice fell one way rather than another.[50]

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[50]While Fed policy that conditions on the stock market or the exchange rate is in outcome stochastic, the Fed is not in those cases purely randomizing.

VI. Flexibility and Rules.

The models of the preceding two sections appear to prove the clear dominance of rules over discretion; reputational models show that policymakers under discretion may, but will not necessarily, produce the optimal outcome that rules ensure.

However, the issue is not closed. A basic argument for activist policy is that the policy-makers can handle certain disturbances more flexibly and more cheaply than can myriad private agents. For instance, there is no good reason why a shift in the demand for money should be transmitted to prices, causing all economic agents to adjust prices and wages when the money-creating authorities can respond instead. One of the most important arguments for discretionary policy is that it leaves the policy-maker the flexibility to respond rapidly to contingencies not foreseen or not describable in the potential rule.

Suppose that a disturbance ε is observed by the policymaker each period, after private sector expectations have been determined, and that the nature of the disturbance cannot be described in the monetary rule.[51] We generalize the supply function (5) to:

$$(19) \qquad y = y^* + b(\pi - \pi^e) + \varepsilon$$

Here ε is a disturbance with expectation zero, that is not serially correlated, and that is not known to private agents when they make their wage decisions. (We do not show time subscripts). Denote the variance of ε by σ^2. The social loss function is now the expectation of $L(\ )$ in equation (3).

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[51]This example is closely related to the analysis by Rogoff (1985).

The monetary authority is in a position to respond to realizations of ε, but π^e, representing wage-setting, is determined before ε is known. There is no pre-commitment, and no consideration of reputation, so that the discretionary solution is chosen each period. The inflation rate is

(20) $\quad \pi = (a+b^2)^{-1}\, b[(k-1)y^* + b\pi^e - \varepsilon]$

implying π^e is the same as under certainty, namely

$$\pi^e = (b/a)(k-1)y^*$$

and

(20) $\quad \pi = (b/a)(k-1)y^* - (a+b^2)^{-1}b\varepsilon$

In this solution the monetary authority responds to supply shocks, allowing them to affect both output and inflation: an adverse supply shock both raises the inflation rate and reduces output below the natural rate.[52]

The expected value of the loss function under these conditions is calculated as

(21) $\quad E(L) = (1+\theta)(k-1)^2y^{*2} + (1+\theta)^{-1}\sigma^2; \qquad \theta \equiv b^2/a$

Suppose alternatively that the monetary authority had no discretion and that the money supply was held rigidly constant. Assume also that the quantity theory holds, with

(22) $\quad m = y^* = p + y$

where p is the (logarithm of the) price level, and the money stock is set at the level which is expected to produce $p = 0$. Suppose that last period the (logarithm of the) price level was zero. The expected price level and inflation rate this period are also zero.

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[52] I am assuming that the target level of output does not change with the supply shock. That assumption does not affect the basic point being made here.

The expected value of the loss function under a constant money rule can then be shown to be:

(23) $E(L_m) = (k-1)^2 y^{*2} + (1+a)(1+b)^{-2}\sigma^2$

The first term is larger under discretion, reflecting the basic dynamic inconsistency result. The second term is larger under the constant money rule, reflecting the benefits to society of flexible monetary policy.

There is thus a basic tradeoff between the gains from dynamic consistency and the loss of flexibility in imposing a monetary rule. To the extent that the central bank has a longer horizon than one period--and this may be one reason that the law attempts to isolate central bank management from political pressures--it may be able to establish a reputation that serves the same purpose as a monetary rule.

VII. Concluding Comments.

The rules versus discretion debate in monetary policy is at least 150 years old. There has in that time been no monetary system which operated without the exercise of substantial discretionary authority--to be sure more so at some times, such as after the collapse of the gold standard, and in some countries, than others.

The pre-1977 arguments of principle for rules lacked any convincing demonstration that rules might systematically be better than discretion. That demonstration came with the dynamic inconsistency literature. However, given the possible benefits of the flexibility of monetary policy under discretion, and the role of reputation, the dynamic inconsistency literature does not establish the superiority of rules.

In thinking about monetary policy and rules, it is useful to discuss who the monetary policy makers will be[53]. For concreteness, consider the example of the United States. At one extreme the decision on monetary policy could be made on the basis of current knowledge and enshrined in the constitution. That is unlikely to happen, given the difficulties of amending the constitution. Nor, given the uncertainties over monetary policy, should serious economists argue for such an amendment. It surely ill behooves a profession that completely failed to anticipate the variability of real exchange rates under a floating exchange rate system to believe that it is capable of specifying a monetary policy that should be changed only through the tortuous process of constitutional amendment. The choice in the United States is thus not between a monetary policy determined by rule for all time, and discretion, but between a monetary policy specified by the Congress and one chosen by the Fed. Current U.S. fiscal policy does not suggest that the Congress would do a better job of choosing monetary policy than the Fed, though that is not to say that the Fed cannot do better.

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[53]In commenting on an earlier draft of this chapter, Milton Friedman stated:

> "The major comment is the omission of what I have increasingly come to regard as Hamlet on this issue [rules versus discretion], namely the public choice perspective. To illustrate, ... you talk about a loss function for 'the policymaker' that includes solely inflation and the deviation of real ouput from a target level. If we bring this down to earth, these are likely to be only very indirectly related to the real objectives of the actual policymakers. From revealed preference, I suspect that by far and away the two most important variables in their loss function are avoiding accountability on the one hand and achieving public prestige on the other. A loss function that contains those two elements as its main argument will I believe come far closer to rationalizing the behavior of the Federal Reserve over the past 73 years than one such as you have used."

The Chicago school's emphasis on rules versus discretion was misleading, as was its emphasis on the desirability of rules as such. There is a continuum of monetary policies, some giving more discretion to the central bank than others. It is difficult to attach much virtue to a rule, merely because it is a rule, if it produces poor economic performance. Accordingly, more valuable than the rules versus discretion debate is the substantive discussion of alternative monetary policies that accompanied it. That discussion has sputtered since being derailed by the econometric evaluation critique, but is too important to be suppressed much longer.

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