THE KNOWLEDGE PROBLEM UNDER ALTERNATIVE MONETARY REGIMES

William N. Butos

I. Introduction

During the past decade a significant change has occurred in the kinds of questions explored by monetary economists. Heretofore, one of the central issues concerned the "rules versus discretion" debate of a central bank empowered monopolistically to supply base money. However, with the publication of studies by Klein (1974), Thompson (1974), and Hayek (1976/1978), the range of alternatives expanded to include the possibility of regimes based on the private provision of inconvertible media of exchange. Subsequent research by White (1984b) rehabilitated the idea of free banking with fractional reserves and full convertibility of a commodity money. In addition, laissez-faire cashless payments systems have been studied by Black (1970), Fama (1980), and Greenfield and Yeager (1983).

In general, the literature on private provision of money has focused on the theoretical properties of such regimes, especially in connection with the constraints necessary to ensure stability of the banking structure and the value of money. An equally important body of research by White (1984a), King (1983), Rockoff (1974), and Rolnick and Weber (1983, 1984) has examined historical episodes of market alternatives to government provision of money.

Consideration of alternative monetary regimes might proceed in terms of the inherent problem of the effective acquisition, utilization, and production of knowledge in an economic system. The purpose of this paper is to explore the problem of constraints on knowledge as it applies to monetary regimes. To limit the range of the largely

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critical discussion, three cases will be considered: the current regime, i.e., the Federal Reserve System (Fed); the monetarist regime, which relies on a monetary growth rate rule; and a regime of competing, inconvertible currencies as proposed by Hayek and others.

Section II provides an overview of the "knowledge problem." Section III examines current and monetarist regimes, and section IV discusses a regime of competing currencies. Section V summarizes the major results and implications of the paper and suggests areas for further research.

II. The Knowledge Problem

One way societies have attempted to overcome constraints on knowledge is by developing media of exchange. Economists are in general agreement that money is an efficient device for coordinating individuals' plans. Yet, because money is ubiquitous and plays a crucial role in coordinating plans, a monetary system faces special difficulties if money itself or attendant institutions become sources and conduits of disruption. This prospect has a significant bearing in assessing monetary regimes. Regimes may differ in how well they utilize current information and adapt to new and novel information; if so, this would figure prominently in their evaluation.

In analyzing the knowledge problem as it pertains to monetary regimes, it is necessary to treat regimes as autonomous decision-making units. This means that, in addition to whatever characteristics differentiate them, they share a property relative to the system in which they function. Both the legally endowed Federal Reserve System and the undesigned market structures of Hayek's system of competing currencies constitute loci of knowledge activity. Although both function in frameworks of different constraints and rules, the presumption must be that the content of their knowledge does not coincide with that of the economic system's functioning units.

The claim is that knowledge is not redundant between any two decision-making units. This claim carries the implication that a monetary regime's effectiveness in coordinating the plans of individuals (or in offsetting the results of those plans) depends on its success in acquiring and anticipating knowledge as well as usefully organizing such knowledge to guide its actions. Since knowledge is not uniformly distributed across different minds, the "knowledge problem" is precisely that constraints exist on what can be known.

Given that differential knowledge distinguishes decision-making units of the monetary regime from those of the economic system, it is useful to structure the discussion around two main questions: What

is the kind of knowledge that individuals and the economic system produce, and can the decision-making units of the monetary regime acquire this knowledge?

The central element of complex orders, such as the market, is the absence of any locus of control. Knowledge is not centered in any one place; instead, it is dispersed. As Hayek (1948, p. 78) observes, the division of knowledge presents "the problem of the utilization of knowledge which is not given to anyone in its totality." Knowledge exists in the form of "objective" market data, such as prices and quantities, which express outcomes of transactions undertaken by individuals. Knowledge also exists in the form of unorganized "practical" knowledge of "particular circumstances of time and place" (Hayek 1948, p. 80). It is by acting on this *dispersed* knowledge that each individual contributes to changes in prices and the pattern of resource allocation. In effect, individuals' specialized and particulate knowledge is transformed into outcomes (and new knowledge) that are socially beneficial.

In viewing the market process as a mechanism by which bits of knowledge are transformed into market data, the tendency must be resisted to treat the knowledge problem as wholly a matter of somehow collecting dispersed knowledge, as if it were shells on a beach waiting to be picked up. Knowledge has no existence apart from the minds classifying it, and knowledge is a significant only because individuals attach usefulness to it. "Objective" market data are surface-level manifestations of knowledge subjectively held by individuals. The content of such knowledge not only includes perceptions about existing market data and "practical" knowledge, but also theories of causal relationships, anticipations of the future, and an unspecifiable body of inarticulated or tacit knowledge.[1]

From a subjectivist economics perspective, individuals utilize this knowledge to formulate plans. Such plans arise from complex mental processes that draw on knowledge available only to those individuals. Thus, the same set of "objective" data may be interpreted differently and formulated into plans based on the unique substrata of knowledge inhering in each individual. This means that an intrinsic aspect of the knowledge problem is the diversity of individual plans and the creation of novelty. Although individuals act purposively to attain their ends, the system itself generates outcomes that cannot be specified a priori. The system is end-independent.

Conceiving of the market order as open-ended and nondeterministic draws attention to its evolutionary character. Since knowledge

[1]See Polanyi (1966).

drives the system, the path of the system through time will involve the creation, utilization, and destruction of knowledge. What was relevant knowledge yesterday will be made useless tomorrow by newly created and discovered knowledge. The dynamic pattern of the spontaneous market order is characterized by Weimer (1983, p. 25) to involve "regulatory principles of change":

> [I]t seems to be informative to consider the evolution of spontaneous orders as an essential tension between three sets of principles that regulate change: creativity or productivity, rhythm, and opponent process regulation. The interaction of these principles creates an essential tension between the previous form or organization, the ongoing state, and changes that may occur. This tension between tradition and innovation, stability and change, is an inherent aspect of evolving cosmic structures.

The novelty created by spontaneous orders stems from the infinite applicability of general rules of conduct to particular circumstances.[2] Rules, as opposed to directives, are generative principles that limit the range of permitted action but do not specify a particular kind of action or result. Thus, while the rules that guide action are finite, the diversity they permit is not.

The discussion thus far has focused on the dispersed, subjective, and evolutionary character of knowledge. But is it possible to gain and utilize such knowledge, and what is the status of the knowledge that is acquired?

Although individuals clearly have access to certain kinds of particulate knowledge, they are precluded from detailed knowledge of the system's structure and the plans of others. The coordination of diverse plans, given the inevitability of ignorance, is, however, attributable to the economy of knowledge necessary for the market's operation. By decentralizing control, the market makes possible the effective use of dispersed knowledge and thus widens "the span of our utilization of resources beyond the span of the control of any one mind" (Hayek 1948, p. 88).

Constraints on what can be known also apply to the decision-making units of a monetary regime. Like those of the economic system, such units do not have direct access to dispersed knowledge or to detailed structural knowledge of the economy. The "objective" data generated by the market is available (at a positive cost), but it does not provide insight into the specific individual plans and novel outcomes that arise.

[2]See Hayek (1967).

The knowledge problem confronting regimes is regime-specific because they differ in their degree of centralization and in their objectives. For a centralized monetary regime, such as the Fed, the existence of data in the form generated by the market (individual prices and quantities) has little use. Rather, the collected data must be organized in a way that is compatible with the decision-making process and activity the regime undertakes. Specifically, data must be statistically aggregated or indexed. This follows because a centralized regime's concern (and presumed responsibility) is not associated with isolated market phenomena, but, instead, is directed to the broader contours of economic activity at the sectoral or macroeconomic level.

In contrast, a monetary regime composed of competing firms, such as Hayek's, has no identifiable or direct concern with macroeconomic outcomes. Rather, the firms' objectives are to produce products and services that generate profits. For example, their need to construct aggregate indices of economic activity, if present at all, is plainly secondary to the acquisition and utilization of knowledge proximate to their situation. The kind of knowledge that competitive money issuing firms require, therefore, is quantitatively and qualitatively different from that of a centralized regime. While constraints on knowledge apply to both, the nature of those constraints differs with respect to the regime's organization and charge.

III. The Current and Monetarist Monetary Regimes

In this section, I examine two monetary regimes based on government (or central bank) provision of base money. I assume the regimes differ only in the range of discretion allowed the central bank in issuing base money.[3] In the current regime this range is bounded in the sense that the Fed formulates and implements "sound monetary policy" consistent with broad policy objectives relating to inflation, unemployment, and balance of payments equilibrium.[4] In the monetarist regime the range is specified as a particular (monetary aggregate) growth rate rule.

[3]Obviously, other important features, such as regulatory functions, methods of reserve accounting, discount rate setting, and foreign exchange intervention might also differ across regimes.

[4]The centralization of Fed power and the identification of long-term monetary policy goals evolved over several decades. The original purpose of the Federal Reserve Act of 1913 was to provide an elastic currency and discount commercial paper, and to improve bank supervision. Following World War II, the Employment Act of 1946 and the Humphrey-Hawkins Act of 1978 established the legislative framework for monetary policy.

The Current Monetary Regime

As a consequence of the broad range of discretion Congress allows, the Fed is obliged to formulate and implement monetary policy. Notwithstanding the problem of assigning priorities to potentially competing long-term policy goals,[5] at both the formulation and execution stages the knowledge problem arises in important ways. Critics of the Fed, spanning the gamut of different schools, have argued that the Fed has not consistently or adequately fulfilled its charge to stabilize the economy, and may have actually destabilized the economy. I will argue that the knowledge problem is the root difficulty. The problem for policymakers is to formulate policy for a nonstatic, changing economy. The key point is that the kind of knowledge the Fed would need to formulate and implement optimal policy is not available. In the market, knowledge is dispersed and subjective; it exists as particulate data and as plans in the minds of individuals. Knowledge is neither centralized nor exogenously provided, but is produced anew by the continuous activity of interacting individuals.

In general, the Fed's policy process involves the use of such tools as open market operations and the discount rate to effect changes in various "operating targets" (a short-term interest rate, such as the federal funds rate, or a reserve aggregate, such as nonborrowed reserves). The operating targets, typically assumed to be capable of tight control by the Fed, are then linked to "intermediate targets" (such as M1 and M2), which, in turn, are thought to have a systematic relation to the long-run policy goals.

In this stylized overview of the Fed's approach to monetary policy, the knowledge problem intrudes at each turn. My focus here is twofold: on the collection, interpretation, and analysis of data to assess and forecast the past and future state of the economy, and, second, on the selection of an operating target and procedure to implement monetary policy.

Within this framework, the Fed's approach to the formulation of policy involves filtering a wide range of real and monetary variables to produce a forecast of the economy's performance up to one year in the future. Given the desired objectives of monetary policy, a

[5]The literature on Fed behavior often specifies a central bank utility function containing a vector of policy goals. The problem is to maximize the function (or, alternatively, to minimize deviations of desired and actual outcomes) subject to various constraints. See, for example, Lombra and Torto (1976). This approach, however, cannot specify the weights of the Fed's policy goals or claim the weights are constant over time. Public choice approaches to Fed behavior, moreover, have suggested that a more completely specified utility function should include arguments related to profits, prestige, and power. See, for example, Toma (1982) and Shughart and Tollison (1983).

growth rate of a monetary aggregate (M1 or M2) is selected that minimizes the deviation between the forecasted and desired values of the policy goals. The second stage of the Fed's approach involves the selection of the operating target and procedures to attain the desired growth rate of the monetary aggregate.

At each Federal Open Market Committee (FOMC) meeting staff economists review the economy's recent performance. Drawing on aggregated and sectoral data for real and financial variables, an overall picture of the economy is constructed. This picture, however, is substantially built on data that are known only with a considerable lag. While some indicators of economic activity, especially those related to financial markets, are available quickly, those that pertain to real activity are generally available only with a one quarter or greater lag. As a result, the picture of the economy that can be constructed refers to the economy as it existed in the past.

Suppose, for example, that the Fed chooses a monetary aggregate target (M*). In a simple income-expenditure model, this selection gives an LM (money market equilibrium) schedule in interest rate and income space, given money demand. Now, assume "the" interest rate is observed to rise. The question that will confront policymakers is: What has happened? If money demand has increased (given M*), the rise in the interest rate will be associated with a fall in income. Alternatively, if autonomous spending, say investment expenditures, has increased, the rise in the interest rate will be associated with an increase in income. The appropriate (discretionary) policy response in the former case might be to increase the nominal stock of base money. The problem, however, is that the information necessary to make that inference will not become available without a substantial lag. If the source of change is not correctly identified, the policy response itself will be inappropriate.

The staff economists of the Fed also prepare for the FOMC forecasts of the economy derived from a large macroeconometric model. Such models sometimes perform reasonably well over the near term, but their predictive accuracy, especially for real variables, starts to fall off sharply beyond two quarters or when their structural parameters—referring ultimately to individuals' behavior—change or become unstable. The knowledge problem enters here because detailed structural knowledge of the economy is beyond the capability of models. Although the Fed's econometric model might provide reasonably accurate forecasts for an economy in which the future did not diverge greatly from the past, this is not the relevant context to assess discretionary policy.[6]

[6]A detailed study of staff projections contained in the Greenbook (nonfinancial) and

The kinds of difficulties encountered in preparing macroeconometric forecasts also arise in the procedures used to reach the desired intermediate target.[7] Since the mid-1970s, the Fed has devoted increased attention to achieving a specified growth-rate range of a monetary aggregate. To implement this policy objective, the Fed employs certain operating procedures. Let us assume, therefore, that the FOMC has decided on a growth rate of M1 equal to M*. According to the "demand approach," the Fed estimates a money demand function using the targeted growth rate of the money stock and a forecasted value for income (Y^e). The resulting equation is then solved for the equilibrium rate of interest (i*) consistent with M* and Y^e. Over the relevant policy horizon, the Fed adds (or subtracts) reserves necessary to hit i*.

Alternatively, the "supply approach" uses the money multiplier model to determine the change in reserves consistent with achieving M*. Here, the estimated value of the money multiplier is used to solve for desired reserves, given M*.[8]

Both procedures are designed to achieve tighter control over a monetary aggregate target and have figured prominently in Fed policy during the past decade.[9] Yet, each procedure suffers drawbacks that can confound the intentions of policymakers. For the "demand approach," the estimated demand function for money may be subject

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Bluebook (financial) during the period 1970–73 is found in Lombra and Moran (1980). Among the many useful insights into the policymaking process uncovered by Lombra and Moran is the systematic underestimation of inflation by the staff. Nevertheless, they concluded that the Fed staff did about as well as other forecasters.

[7]I ignore the controversy of which intermediate target is "optimal." Within the framework of a stochastic IS-LM model Poole (1970) has shown that the choice depends on the relative instabilities of the IS and LM schedules.

[8]The "supply approach" discussed here is a convenient way to describe the formulation of monetary policy. It should be noted, however, that the (nonborrowed) reserves approach that the Fed adopted in October 1979 differs with the "supply approach" at the empirical and operational level. Specifically, in money multiplier models the Fed exercises control by altering the quantity of reserves. As Lombra (1980, p. 283) notes, however, in the Fed's view the "system is equilibrated through the movement of interest rates which, through their effect on bank revenues and costs, determine banks' desired asset and liability positions." For *analytical* purposes, nevertheless, these two mechanisms can be treated as compatible.

[9]Ostensibly, the "supply approach" replaced the "demand approach" in 1979. Whether this constituted a "new regime," as much of the literature suggests, is doubtful. Above all, I would argue that Fed behavior is fundamentally "flexible." Narrow characterizations are likely to be misleading or relevant only over fairly short policy horizons. The operating procedures adopted in 1979 actually widened the acceptable range of volatility in the federal funds rate. In 1982 the Fed narrowed this range and also placed more emphasis on M2.

to various shocks, specification error, and parameter instability.[10] If so, the Fed's response of supplying reserves to achieve a certain level of the desired interest rate will systematically over- or undersupply reserves during the policy period and, hence, generate undesired deviations in money growth. Since weekly and monthly fluctuations in money stock measures may arise irrespective of monetary policy, the Fed is unable to ascertain in the near term if those money stock figures stem from technical problems in its procedures or "white noise." As a result, symptoms of a problem in the procedures appear with a time-lag.[11] In the meantime, money growth is tied to the targeted interest rate.

The "supply approach," on the other hand, requires reasonably accurate forecasts of the money multiplier over the relevant policy horizon. If the multiplier is predictable, controlling the money stock simply requires the Fed to control reserves. Empirical studies by Johannes and Rasche (1979) and Balbach (1981) find that variations in the multiplier tend to even out on a quarterly or annual basis. The reduced-form models that underpin multiplier estimates, however, abstract from the short-run dynamics of bank and public behavior, thus obfuscating the role of interest rates. Since the Fed views the impact on the money stock of changes in reserves as occurring through the movement of interest rates, the multiplier approach is uninformative with respect to the linkages involved in short-run monetary control.

Critics of the multiplier approach point to the "large" annualized monthly variations in the multiplier that, given tight control of reserves, increase the amplitude of interest rate fluctuations.[12] The destabilizing effects of such swings on financial markets cannot be discounted any more than the reaction of the Fed to modify those swings. In the context of a discretionary monetary regime the long-run multiplier predictability is unhelpful without a supporting theory of Fed behav-

[10]The literature on these issues is vast. Goldfeld's (1976) finding that conventional money demand functions seriously underpredicted money demand after 1974 led to a search for the "missing money." The apparent instability of money demand has been attributed to various sources, including regulatory change, financial innovation, and money supply endogeneity. A useful survey is found in Judd and Scadding (1982).

[11]Even if targeted money growth is outside the desired quarterly range, the Fed's corrective steps may be to take the past growth rate as given and attempt to hit the targeted range over the next quarter. This racheting phenomenon or "base drift" seems to have existed during the 1970s, as noted by Lombra and Torto (1976).

[12]Lombra and Kaufman (1985) point out that during the period 1979–82 the Fed's "supply approach" may have reflected a damage-control mechanism in that shocks affected both quantities and rates. Under the "demand approach" only quantity would be affected.

ior, especially as it relates to short-run monetary control. Lindsey (1983), for example, provides evidence for 1979–81 in which variations in nonborrowed reserves are strongly and negatively correlated with monthly variations in the multiplier.

Since the data available to policymakers are necessarily *ex post* and aggregated, they refer to outcomes of the market process that may not be relevant for current and future plans. The data do not reveal decisions or plans individuals will embark on. If the study of unintended consequences of purposeful activity is the central problem of economic inquiry, recourse to historical data provides an ambiguous, if not misleading, basis for inferring novelty in economic activity. Moreover, the rendering of collected data into broad aggregates represents formalist constructions that are disembodied from the plans and actions of individuals. The market generates prices and quantities, but not, for example, a price level or a homogenous output. The treatment of such aggregates as independent entities neglects the underlying and implicit market processes that they allege to explain and results in the loss of detailed market-generated information.

The purview of the Fed should always be future-oriented. In particular, it must form judgments of the likely path of the economy without policy, and then devise a program to steer the system toward a set of desired outcomes. Here, finally, the knowledge problem intrudes because the future path of the economy can be only conjectured. As we have seen, forecasts of key economic variables must be generated to set the stage for policy implementation. But the problems here can be severe. To forecast accurately the future path of the economy (and hence justify any particular policy), policymakers require detailed knowledge of the economy's structure. The dispersion of knowledge, its inherent subjectivity, and the prospect of novelty suggest, however, a set of constraints that will prevent policymakers from consistently meeting this requirement.

A Monetarist Monetary Regime

Some years ago, Milton Friedman (1960) suggested constraining the Fed to adhere to a fixed monetary growth rule. In his "Statement on the Conduct of Monetary Policy," Friedman (1976, p. 559) argued:

> The ultimate target should be a rate of growth in M2 of roughly 3 to 5 percent a year. That would roughly match the rate of growth in our productive potential. Given the highly stable velocity of M2 over more than a decade, it would be consistent with roughly stable prices.

The objective of the monetarist fixed, stable growth rule is to remove discretion from policymaking and, hence, policy activism as an independent source of instability. In addition to historical evidence (see, for example, Friedman and Schwartz 1963) monetarists make a series of theoretical arguments supporting this point of view.[13] *Inter alia,* these arguments include the dynamic stability of the economic system, the long-run neutrality of changes in money, and the stability of money demand. In terms of policy, monetarism emphasizes the uncertain environment in which activist monetary policymakers are forced to operate and the timing problems associated with possibly long and variable lags in the economic system.

The monetarist point of view recognizes implicitly the informational constraints confronting policymakers. Hence "optimal" policy—stabilizing the path of the economy and offsetting cyclical fluctuations—is a chimera because it would require knowledge that policymakers do not and cannot have. As Brunner (1983, p. 25) observes:

> Nevertheless, many Keynesians implicitly, and sometimes quite explicitly, assert that they possess knowledge about the position and movements of these [IS and LM] curves. Indeed, they proclaim to possess specific knowledge about the mix of fiscal and monetary policies that at any moment would guide the curves to the "full employment" equilibrium.

Sensitivity to knowledge constraints also appears to underpin the monetarist preference for "reduced-form" econometric models as opposed to large, structural Keynesian models. According to monetarism, the economy is too complex to be captured adequately, even in detailed econometric models. Moreover, if the transmission mechanism of monetary impulses involves relative price and portfolio effects across a broad spectrum of assets, as monetarists contend, then modeling only a small number of channels would bias large structural models against picking up the ubiquitous effects of monetary changes.

The monetarist growth rule, therefore, might be a plausible approach to monetary policy in a world of uncertainty. If the system in the long-run attains its natural rate of unemployment, the only outstanding policy question from the monetarist perspective is: at what rate of inflation? The monetarist answer to this question involves a monetary quantity rule for a price level (or rate) objective. The automaticity of the rule is, according to monetarism, the proximate requirement to achieve overall monetary and systemic stability. But would

[13]Mayer (1975) provides a useful overview of monetarism.

the adoption of a quantity rule solve monetary problems? Would it dispense with policy decision making?[14] And would it, in short, be capable of dealing effectively with the knowledge problem?

To examine this question, let us suppose that the Fed is forced to adopt a growth rate rule.[15] Further, assume that the Fed's self-imposed impediments to monetary control, such as lagged reserve accounting, nonuniform reserve requirements, and a nonmarket-related discount rate, are removed.[16] In this setting, a once-for-all and publicly announced FOMC directive would specify that the trading desk purchase some fixed amount of securities at regular intervals.[17]

The apparent automaticity of a monetarist regime, however, does not mean that decision making by the Fed is unnecessary. First, a determination must be made as to which monetary aggregate should serve as the operating target. Presumably, it would be one which the Fed could control tightly and which bore a systematic relation to the relevant intermediate target. The preferred monetarist aggregate is the monetary base, controlled by asset-side manipulation of the Fed's balance sheet. Once selected, the operating target's growth rate would

[14]This is the same question Will Mason (1984, p. 1) raises in the context of a gold standard: "The gold standard failed because it became mistaken for an automatic mechanism that would solve our monetary problems for us."

[15]According to Friedman (1982), a more realistic alternative is to place the Fed under the control of the Treasury Department or Congress. It is not clear why shifting control to another agency would ensure adherence to a growth rate rule in the absence of a constitutional constraint.

[16]Greater uniformity of reserve requirements was specified in the Monetary Control Act of 1980, and a form of contemporaneous reserve accounting was reintroduced in 1984.

[17]Currently, the FOMC's directive becomes publicly available only after a lag of several weeks. This practice was unsuccessfully challenged in a civil action in 1975. The Fed's position is that immediate release of the directive would cause financial markets to overreact, leading to increased volatility of interest rates and speculative profits for astute "Fed watchers" (see Burns 1978, especially pp. 392–93). Volcker (1984, p. 3) also argues that "one danger in immediate release of the directive is that certain assumptions might be made that we are committed to certain operations that are, in fact, dependent on future events, and these interpretations and expectations would tend to diminish our needed operational flexibility." On the surface, the Fed's position is inconsistent with the efficient-markets hypothesis and reduces to the claim that less publicly available information is preferable to more. Michael Dotsey (1984) has developed a model which suggests that the variance of the federal funds rate is smaller when the FOMC delays release of the directive. As he points out, however, this may augment the Fed's utility if smoothing interest rates is an objective but increase financial institutions' costs, given that they have a strong incentive to uncover the direction of monetary policy. Also see O'Brien (1981). Under a monetarist regime, the issue of the directive's delayed release does not arise since the directive would not change and the Fed would not act to smooth interest rates.

be hooked into a money multiplier to give the growth path of a money stock intermediate target (see Friedman 1982).

I suggested earlier that the money multiplier approach may involve certain difficulties.[18] While these mainly serve to highlight potentially important issues in *implementing* a monetarist growth rule, the introduction of dynamism into the economy, however, sets the stage for a more fundamental problem, namely, which money stock should the Fed target? My claim is that the Fed does not determine what money is, but discovers *ex post* what individuals use for money.[19] In the context of a monetary growth rule, the presumed (policy) exogeneity of money exists only to the extent that the market permits. Because the particular kinds of financial assets that may become money result from entrepreneurial activity on the market, no one, including the Fed, can know beforehand what they might be. While the government may legalize different kinds of media of exchange and the Fed may incorporate their quantity into a measure of the money stock, only through a market process is money legitimated. Even if the Fed is able to control a particular collection of assets called money, say M1, there is no guarantee that the measure is the appropriate one for controlling nominal GNP.

These considerations suggest an interesting dilemma for monetarists. It is widely agreed that month-to-month variations in the measured money stock contain a substantial amount of randomness. Tight control of the money stock target is, therefore, not possible in the short run. Monetarists, however, do claim that on a quarterly or annual basis, these random deviations even out and permit a monetary rule to achieve its targeted range. As a result, it is argued that in the long run the Fed is in a position to control the money stock and researchers can treat the money stock as an exogenous (policy determined) variable.

This latter claim might be correct if the collection of assets used to mediate exchanges were unchanged. To the extent, however, that

[18]In figures reported by Rasche (1982) forecasts of the base multiplier show sizable monthly errors but considerably smaller yearly ones, suggesting that the errors tend to "average out" over time. Such results would appear to provide a strong basis for a growth rate rule. However, the large monthly forecast errors will tend to generate more volatile interest rates (see Lombra and Struble 1979; Auerbach 1982). Second, Rasche uses a time series model to generate money multiplier forecasts. The significant feature of such models is that they require no explicit behavioral assumptions; they are purely *ex post*, historical, nontheoretic.

[19]See Menger (1892). Monetarists identify the appropriate money stock to target on the basis of its ability to track nominal GNP. See, for example, Rasche (1982) and Cagan (1982). The empirical definition of money, however, confuses the concept of money with its measurement. On this, see Mason (1976).

financial market innovations arise, that presumption is cast into doubt and suggests that the long-run money stock exogeneity and controllability assumption is contingent upon the dynamics of the market process. The fact that the measurement of the aggregates has undergone periodic revision during the past several years highlights the difficulties facing policymakers in a rapidly changing environment.[20]

The desire of financial institutions to circumvent regulations by issuing new kinds of liabilities surely has played a significant role in this process,[21] as has the recent trend toward deregulation. The prospect exists that financial innovation will gradually wind down, although recent experience suggests that the opposite may be more nearly the case. Indeed, a case can probably be made that the major task confronting Congress, the Fed, FDIC, and the comptroller of the currency is whether the legislature and regulators will *ratify* changes in the financial sector. In any event, the evolution of financial institutions is likely to continue to surprise policymakers and theorists alike.

Recent innovation in the financial sector illustrates the novelty inherent in a complex system like the market. When individuals perceive new institutional arrangements they are motivated to exploit opportunities and to do things differently. In so doing, not only do they take advantage of their proximity to particulate knowledge, but they also generate new information and hence unintentionally contribute to the formation of new social institutions and structures. In those activities that are closely related to money and monetary institutions, special difficulties are generated for policymakers. Although I suggested earlier that such problems may be particularly pressing for discretionary policymakers, they also arise when rules are imposed to constrain the range of discretion.

In a monetarist regime, the need to deal with the dynamic properties of the financial system may require periodic changes in the

[20]In 1982 the FOMC narrowed the targeted range of fluctuation in the federal funds rate and placed greater emphasis on M2 (rather than M1). According to the Fed this was necessitated by the uncertainty surrounding the introduction of new financial assets. Volcker (1983, p. 38) observes: "Deposit flows in response to the advent of the money market deposit and super NOW accounts have been massive. As expected, these inflows have had a major impact on the growth of some of the aggregates—particularly M2. . . . The range of uncertainty on these points is substantial. . . ." Also, Lyle Gramley (1982, p. 395) notes: "Financial innovation in the United States has had important and far-reaching ramifications. It has raised questions about the appropriate definition [measurement?] of money, the precision of the Federal Reserve's control over the money stock, the meaning of changes in money balances, and the mechanism by which monetary policy affects economic activity."

[21]See Kane (1977).

monetary rule. Even if the Fed were able to control tightly a particular money stock measure, there is no a priori assurance that the aggregate would contemporaneously reflect the appropriate collection of financial assets used as money in a dynamic economy. The uncertainty surrounding the nature, significance, and transience of financial sector innovation would measurably complicate adherence to an established monetary rule. Because financial sector innovation is an ongoing, open-ended process, the knowledge policymakers would need does not exist. Thus, in a dynamic financial environment the knowledge problem effectively drives a wedge between the *intentions* of policymakers and the undesigned process of the market.

IV. A Regime of Competing Currencies

The monetary regimes discussed in section III are based on government (or Fed) provision of base money. In this section, I consider a denationalized regime in which private firms issue non-convertible fiduciary money, as proposed by Hayek (1978).

As envisioned by Hayek, the denationalized monetary regime's essential characteristics would include the following: (1) private bank issuance of liabilities (non-interest bearing notes and demand deposits) denominated in a unit with a registered trademark and redeemable at a contractually fixed rate with another currency, which Hayek (1978, p. 42) suggests could be Swiss francs, dollars, or D-marks; (2) each bank would announce its intention to keep the purchasing power of its currency constant by adjusting the stock of its currency; (3) the purchasing power of each bank's currency would be defined in terms of a standard composed of a basket of commodities.

Hayek suggests that since individuals' dominant preference is for currencies of stable value, a competitive selection process will result in the survival of those currencies that maintain their value in terms of the commodity basket. According to Hayek, the mechanism that ensures this outcome is the operation of an organized currency exchange market. In this market, movements in exchange rates between currencies would provide signals to the issuing banks to contract (or expand) the stock of their currencies. Thus, if bank A overissued its currency, the value of currency A in terms of other currencies would fall. To prevent further depreciation and to ensure the preservation of the public's desire to hold its currency, bank A would have to take steps to contract the stock of its currency. If the bank views its brand-name currency as a capital asset, the incentive, as Klein (1974) suggests, is for the bank not to overissue. Generalizing

this result implies that the supplies of currencies by private firms will be bounded.[22]

In terms of the knowledge problem, Hayek's proposed regime appears to offer several attractive features not evident in those considered in section III of this paper. Perhaps the most obvious is the absence of the need for a policymaking role by the Fed. As discussed earlier, the Fed's obligation to supply base money carries the corresponding charge of formulating and implementing monetary policy. The various manifestations of the knowledge problem inherent in that charge do not arise under Hayek's proposal because government money would be just another currency subject to the same competitive constraints as all other currencies. Fed "monetary policy" (in the usual sense of that term) would be irrelevant.[23]

Currency issuing firms in a Hayekian regime pursue "monetary policy" only in the sense that they contract (or expand) their balance sheets to maintain a stable value of their currencies in terms of the commodity basket. Unlike a centralized monetary authority, such firms have no need to construct models of the economy to determine appropriate policy. Their purview, moreover, is unrelated to the path and levels of aggregates in the economy. As a result, they are neither burdened with the task nor have the incentive to collect particulate information on a scale approaching that of a centralized monetary authority. Instead, each bank in Hayek's scheme has ready access to the information relevant for its decision making by consulting the currency exchange market. The signals that the currency exchange generate summarize the market's assessment of banks' past (or recent) behavior and presumably provide information useful in guiding their future behavior. This suggests that even though changes in a bank's balance sheet will alter commodity basket prices in terms of its currency, the bank has no special incentive to expend resources to acquire that information. Rather, the bank is able to economize on what it needs to know by referring to the currency exchange market. As Hayek (1978, p. 56) puts it:

> The bank would therefore have to look to the effects of changes in its circulation, not so much directly on the prices of other *commod-*

[22]Girton and Roper (1979, 1981) argue that a competitive system of substitutable (fiduciary) monies will generate the optimum quantity of money. They show that for a costlessly produced money, the real cost of holding it, not its price, will be driven to zero. In their model the equilibrium real rate of return on alternative assets requires banks to offer the same real rate for money balances by paying a positive nominal interest rate or by contracting money to generate an equivalent rate of deflation.

[23]Girton and Roper (1981, p. 27) argue that "a money supplied at a fixed rate of growth would be driven from circulation if the public is offered substitutable convertible currencies."

> *ities*, but on the rates of exchange with the *currencies* against which they are chiefly traded.

In a regime of competing currencies, the problem of inherent constraints on knowledge is not "solved" in the same sense as raising the thermostat solves the problem of being cold. The sensation of feeling cold disappears, but the problem of knowledge does not. The relevant issue, rather, is the extent to which dispersed knowledge is used effectively. In Hayek's monetary regime, an economy of knowledge is achieved because decision making and control are decentralized. The informational efficiencies associated with individuals' access to practical knowledge of "particular circumstances of time and place" (Hayek 1948, p. 80) provide the negative-feedback regulative mechanism essential for the coordination of plans. In the *Denationalisation of Money* Hayek (1978, p. 98) writes:

> Indeed, if . . . the main advantage of the market order is that prices will convey to the acting individuals the relevant information, only the constant observation of the course of current prices of particular commodities can provide information on the direction in which more or less money ought to be spent. [Money] should be part of the self-steering mechanism by which individuals are constantly induced to adjust their activities to circumstances on which they have information only through the abstract signals of prices. It should be a serviceable link in the process that communicates the effects of events never wholly known to anybody and that is required to maintain an order in which the plans of participating persons match.

Although Hayek's proposed regime may seem to deal effectively with aspects of the "knowledge problem," I am not suggesting that it is without potential drawbacks. There is a sense in which Hayek's monetary regime assumes away the possible existence of certain informational problems. If we suppose that several media of exchange circulate within a given locale, individuals would incur increased information and transaction costs.[24] Among the efficiencies associated with the use of money is the decrease in the number of relative prices compared to barter. For a barter system with n commodities, (n/2)(n-1) relative prices exist, while only (n-1) relative prices exist if one commodity serves as money and is traded on every market. As the number of circulating currencies increases, the number of relative prices existing on the market also rises, thus generating increased costs of information.

This difficulty would be diminished, and eventually eliminated, as the number of competing currencies in a locale approached one

[24]See Mundell (1961), Klein (1974).

and as the circulation area of that currency grew larger. But the reduction in information and transactions costs this implies would expose the system to other difficulties. As the number of competing currencies dwindled, the competitive constraints facing the remaining ones become associated increasingly with potential entrants and decreasingly with actual competitors. If potential entrants face nontrivial start up costs to induce individuals to use their currency, established issuers are situated to exploit their position and reap extra-normal profits by overissuing their currencies. There is a limit pricing problem here that reduces the incentives for issuers to fulfill their announced intention to maintain the value of their currencies within a narrow range.[25]

On the other hand, the existence of entry costs does not give existing issuers *carte blanche* or imply that conditions will favor the establishment of a "super-currency." The notion that the need for currency competition will bring forth currency competition is relevant here as a binding, though unspecifiable, constraint upon established issuers.

A second difficulty may also arise with overlapping currency areas concerning variations in currency exchange rates. If exchange rates fluctuate, people are exposed to capital value losses. The loss may be temporary if the depreciated currency's bank moves to restore its exchange value. However, the possibility exists that to avoid those risks people will shift to other currencies, further destabilizing the value of the depreciated currency. This may be particularly relevant if payments systems use electronic funds transfers, in which deposits can be withdrawn almost instantaneously. Although banks might develop interbank lines of credit to insure their liquidity, those lines may tend to dry up (or become more costly) when they are needed most.[26] In the face of these considerations individuals may reduce their overall risk of capital value loss by diversifying their money holdings. While this reintroduces the problem of currency areas mentioned above, it may also have the desirable effect of maintaining

[25]Vaubel (1977) argues that currency competition will necessarily evolve into currency unification (i.e., nationalized monies) because the production of money is subject to economics of scale and hence involves a natural monopoly. Vaubel's claim assumes that the *quality* of money increases as its domain expands (p. 458). This is true in the sense that information costs fall as the currency area increases. But it may not be true if "quality" is associated with stable purchasing power.

[26]The problem here is that a potential interbank lender may not have adequate information on the status of the balance sheet of the troubled bank. An adverse exchange rate movement in a bank's currency may indicate a serious problem or might be entirely temporary. If the lender assumes the former, credit may be difficult to obtain.

an underlying demand for several currencies. In this case, a competitive market in money is furthered.[27]

In terms of variations in currency exchange rates, an underlying issue is that the currency exchange market is driven in part by expectations of future exchange rate movements. While no special advantage is gained by postulating "animal spirits," it is well to remember that expectations are ultimately psychological and subjective. Consequently, the meshing of expectations and the dovetailing of plans will not always be smooth or complete. It is plausible to assume that individuals will revise false expectations, but the learning process this involves and the character of reformulated expectations may be difficult to specify. In the absence of a more detailed treatment of expectations, the operation of the currency exchange market is something of a loose joint in Hayek's proposal.

V. Conclusion

The failure of the current monetary regime to achieve consistently stable prices probably explains the increased interest in exploring alternative monetary regimes. Criticisms of the Fed, whether they focus on the details of Fed behavior or attribute monetary problems to the stewards of monetary policy, concern the knowledge problem it faces as an institution. As a result, the agenda established for the Fed may be excessively optimistic and, in the end, unobtainable. Lucas (1980, p. 209) notes, "as an advice-giving profession we are in way over our heads."

The yet untried monetarist proposal may be a plausible regime in that it would alleviate monetary policymakers of some of the difficulties suggested by the knowledge problem. Nevertheless, serious doubts about it arise in a dynamic context. A monetary rule would likely eliminate the possibility of severe inflation, but the problem of financial asset and quasi-money stock endogeneity cannot be dismissed, especially if financial regulations and the monetary growth rule constraints become binding.

A regime of competing currencies along the lines suggested by Hayek offers an interesting alternative to government provision of base money. Implicitly, Hayek's proposal is a critique of having monetary policy at all. For Hayek, Fed monetary policy, by discretion or a growth rule, is macroeconomic "central planning" that fails to achieve the economy of knowledge attributed to market mechanisms. Hayek's proposal is not without difficulties, but their severity is open

[27]Girton and Roper (1981) show that exchange rate instability is reduced as currency substitution increases between competitive, endogenously supplied monies.

to further question. Since our knowledge of a regime of competing (inconvertible) currencies is largely theoretical, its actual operation remains something of a mystery. In any event, additional theoretical and historical work would be useful. Among the issues that here seem pertinent, the question of Hayek's suggestion for a commodity basket as the standard of value would merit further study, given that convertible (gold) commodity standards have historically emerged as the preferred ones. In this sense, White's (1984a) proposal may be more consistent with what we know about monetary regimes.

Second, Hayek's regime does not specify a role for a lender (or lenders) of last resort. Presumably, such institutions are not inconsistent with Hayek's regime, and there is evidence to suggest that they would emerge in a free banking environment (see White 1984a). Additional study of this function is essential for proposals recommending abolition of government monopolization of money. A useful starting point might be to consider the international interbank loan market.

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THE PROBLEM OF MONETARY CONTROL: ANOTHER VIEWPOINT

Edward J. Green

My comment will focus on the part of Professor Butos' (1986) paper that deals explicitly with the Federal Reserve System. This portion of the paper can be read simply as an analysis of a specific monetary policy regime that the Federal Reserve imposed during the period 1979–82. However, it is clear that Butos views that particular regime as being broadly representative of the policies that the Federal Reserve and other central banks have followed over the course of a substantially longer historical period. Thus, his paper can also be read as a comparison of the institution of central banking with other political and economic institutions that have been recommended for the provision of money. The present comment will focus on this latter, more general, aspect of the paper.

In his paper, Butos proposes answers to three questions that he has implicitly posed. The first of these questions is, what is the appropriate role of a monetary institution? Following Professor F. A. Hayek, Butos suggests that a monetary institution should foster an environment in which nominal prices can effectively aggregate and disseminate the incomplete and dispersed information possessed by individual market agents. The second question is, how do monetary institutions actually operate? Butos' discussion of the Federal Reserve System is consistent with the assumption that there is a good-faith effort to achieve the appropriate goal of informational efficiency that has just been mentioned. The third question is, how does the actual performance of the monetary institution compare with its intended performance? Butos argues that, although it acts in good faith, the Federal Reserve System achieves only limited success in enhancing the informational efficiency of prices.

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The author is Professor of Economics at the University of Pittsburgh.

One might expect an economist writing in the tradition of Hayek to approach his subject from a substantially different perspective from that of many other economists. The preceding account of Butos' paper should make it clear, though, that his perspective actually is not very different from others'. Virtually all economists would agree that his three questions are the appropriate ones to pose. Virtually all would define the appropriate goal of the monetary institution in terms of optimizing some narrowly economic objective function, although quantities such as the levels of output and employment would be competing candidates to be optimized. (Perhaps it is a tribute to Hayek that the informational efficiency of the price system is now considered to be a narrowly economic objective on a par with these others.) With the notable exception of the public choice school, most economists would probably subscribe to the view that central banks (although not necessarily all public-sector institutions) typically act in good faith to do what they are supposed to do. There would be less agreement with Butos concerning the extent that central banks succeed in their good-faith endeavor, but this is a question about which the economics profession in general is not unanimous.

In this comment, I would like to suggest that another aspect of Hayek's thinking would be relevant to thinking about the questions stated above. In particular, I refer to his work on constitutional theory. In that work, he has emphasized that government should not be viewed as a single optimizing agent, or indeed as an agent that ought to optimize something. Rather, government is a set of evolving institutions that ought to provide a stable environment in which private-sector agents would be able to make intelligent decisions. In the economic sphere, "price stability" is a way of describing such a stable, reliable environment. However, this notion is quite different from the idea that the monetary authority ought to minimize the variance of a time series of price levels. Thus the conception of the monetary authority that I have in mind here is contrary to that embodied in much of contemporary macroeconomic theory where solving such a minimization problem is taken to be the objective of the central bank. (Incidentally, the inappropriateness of this objective is the theme of much of economists' work on indexation.)

Rather, an important component of "price stability" ought to be that the monetary system is reasonably insulated from political interference. Aside from the criticisms that Butos raises regarding a constant money supply growth rule, it is hard to see how such a rule would be an effective insulating device. If Congress were to mandate such a rule, it could just as easily and quickly reverse the mandate when such a reversal would be politically expedient. It may be that,

in order meaningfully to insulate the price system from political interference, it is necessary to have a bureaucracy to act as a buffer. Its role as such a buffer is one of the important things to understand about the Federal Reserve System.

Of course, there are costs as well as benefits to having buffers, and bureaucracies can be either well or badly designed. Let me mention three observations regarding these issues. First, in order to insulate the monetary system from politically powerful interests and institutions, the monetary authority itself presumably needs to have considerable political power. This suggests that power in the monetary authority may need to be more highly centralized than would be the case if it were really an apolitical, technocratic agency. In particular, it seems naive not to expect the Chairman of the Federal Reserve Board firmly to control the FOMC. Second, it seems inevitable that a monetary authority will allow very strong political pressures to be transmitted in attenuated form to the monetary system. When Congress directs the authority to do something to ameliorate what constituents perceive to be a terrible situation, the Chairman cannot simply argue that his job is to foster long-term price stability and that that is what he is doing. When we look for a politically viable way to insulate the monetary system, then we are looking for a less-than-ideal way to insulate it. Third, the monetary authority will be staffed by human beings who have interests and incentives. Thus, all problems of public-sector bureaucracies that are pointed out by the public choice school will be experienced to some extent by the monetary authority. In 1986, the recognition that political agents are not Plato's guardians should not shock anyone. Rather, it should prompt people to think about the problem of designing monetary institutions in a way that will minimize these problems, subject to the constraint that the authority must retain the substantial political power that is required for its work. In the case of the Federal Reserve System, the division of the monetary authority into regional banks, and the employment of a large staff of academic economists (who owe some allegiance to a set of professional values, as well as to their immediate employer) arguably address these concerns.

The preceding paragraph should be read as an expression of what I do not find completely satisfactory about the way that most macroeconomists of various schools think about the problem of monetary control. Insofar as he deals with the Federal Reserve System, I read Butos' paper as being closer to this mainstream conception than he may realize himself to be. The observations that I have made above are not intended as statements of established fact, but rather as sensible conjectures deserving of further exploration. I hope that both

macroeconomists and students of political economy will find this program to be attractive.

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