The Control of Monetary Aggregates

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I. Introduction: The Nature of the Issues

Our entry into the age of permanent and erratic inflation has sharpened the public's focus on monetary policy. Substantial controversies are hardly maintained by clever construals or sophisticated contrivances. They require serious issues of major dimension bearing on important aspects of the world. The history of our discipline offers some remarkable examples in this respect. We note the bullion controversy early last century followed later by the dispute between the banking and currency school. This interest subsided with the professional dominance of Keynesianism. The emergence of "monetarist" analysis stirred however a dormant interest in monetary policy. The profession's attention expanded in the last decade and even the media increasingly recognized the ongoing controversy.

It may be tempting to say that our current disputes essentially repeat with some variations the great controversies of the 19th century. Indeed some similarities occur. These pertain most particularly to some aspects of the motivating problems and even to some questions and issues raised in the discussion. But the motivating phenomena form only one strand of our intellectual activity. Lucas [1977, 1980] repeatedly emphasized in recent years the role of analytical techniques in the development of ideas. The subtle influence of the analytic evolution experienced over the past decades affected the nature of the discussions, conditioned the range of questions and the formulations developed. Some issues moved probably closer to a resolution, some at least by mutual (and possible tacit) recognition of their comparative irrelevance. Other issues may (one hopes) approach a closer understanding of their nature or a clearer appreciation of the differences in the underlying hypotheses which determine the obvious contrasts among the alternative approaches to monetary policy. It is frequently stated that prevailing differences among economists bearing on aspects of monetary and "stabilization" policy fundamentally reflect corresponding differences in "social values." Such values may indeed motivate some positions in this matter. But

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they cannot account for the central core of the differences which involve substantive and basic cognitive issues. Some of these issues actually reach well beyond the range addressed in earlier disputes and express fundamental aspects of our perception pertaining to man and society.

A central question guiding recent controversies addresses the desirability of formulating monetary policy in terms of a control over monetary growth. Several strands compose this problem and require examination. One strand refers to the choice between policymaking expressed in terms of interest rates or in terms of monetary growth. Another important and separate strand concerns the choice between an "activist" or "nonactivist" strategy of monetary policy formulated either in terms of interest rates or monetary growth. A relevant examination of the case for a "nonactivist" strategy addressed to the control over monetary growth needs thus to consider the alternative options. The case cannot be usefully judged in a vacuum without a comparison with the major classes of strategies seriously considered in our professional disputes.

My argument bearing on the alternative strategies rests on two basic social conditions. One condition characterizes the available level of information about the response structure of the economy. The other condition involves some crucial properties of the political process and most particularly of political institutions. It appears that the choice between an activist or a nonactivist strategy is essentially determined by substantively different assumptions about the available knowledge and the characteristics of political institutions. Our awareness of this connection between knowledge-level supplemented with conjectures of political economy and the rational choice among two major classes of strategies may focus our attention on the nature of the appraisals involved.

An argument advancing the case of monetary policy formulated in terms of monetary control requires attention beyond the nature of our knowledge and the workings of political institutions. A decision in favor of monetary control does not ensure per se any useful execution of such policy. The actual performance of officially announced policies of monetary control in the United Kingdom and the United States reveals the nature of the problem. We confront at this stage two subsidiary questions associated with any decision to follow a strategy of monetary control: *Can* we achieve a "sufficient" control over monetary growth and *how* will such control be assured? The two questions thus merge into the single issue about the fact and technique of controllability. Our attention is thereby directed to the role of institutional arrangements and the choice of implementation procedures. Poorly designed institutions and inappropriate or unreliable implementation procedures convert intentions directed at monetary control into the realization of a random game with shifting probabilities. The decision to pursue a monetary control policy thus involves an obligation to adjust the prevailing institutions and to modify implementation techniques in accordance with the declared purpose of monetary control. The choice of tactical procedures must be adjusted to the strategy selected.

II. Monetary Policy under Full Structural Information

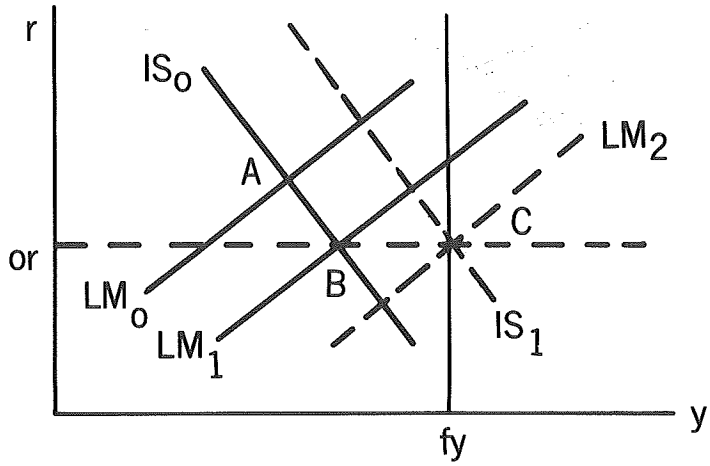
A. The Choice of Strategy under Full (Nonstochastic and Stochastic) and Asymmetric Information by the Policymaking Agency

1. The Argument for an Interest Targeting Approach Based on the Keynesian Dichotomy

Central banks of the developed industrial nations traditionally favor policies associated with interest rates. The Federal Reserve authorities in particular followed over many decades a conception emphasizing the guiding role of money market conditions [Brunner-Meltzer, 1964]. These conditions were originally summarized by the banks' indebtedness to the central bank, subsequently represented by free reserves, and ultimately characterized by some short-term interest rates. Neither the original conception of the Federal Reserve System nor its specific evolution over subsequent decades was much influenced by exposure to economic analysis. It emerged very much as a "home-baked" affair determined by the vision of a commercial bank's money desk. The central relations characterizing the basic structure of the vision were actually incompatible with economic analysis. The central bank's emphasis on interest targeting, i.e., its disposition to proceed with strategies implemented by setting some or controlling other interest rates, did thus not emerge as a result of any particular Keynesian infiltration. Keynesian formulations and ideas, conditioned by the IS/LM apparatus, appear to have influenced eventually the guiding conceptions of monetary policymaking essentially because they allowed justification of accustomed behavior with a wider resonance over the range of potential articulators in the public arena. The standard analytic frame expressed by the IS/LM diagram yields usefully exploitable arguments in support of an interest targeting approach.

The essential aspect of one particular argument is represented with the aid of diagram I. The IS and LM lines are drawn in the usual mode in a plane defined by a vertical r-axis and a horizontal y-axis. Full employment income is indicated by the vertical fy. The initial position is at point A determined by the intersection of LM_0. and IS_0. At this stage the "Keynesian dichotomy" enters our argument. A frequent construal has fiscal policy determine the position of the IS line with no effect on the position of the LM line. Similarly, monetary policy determines the position of the LM line without any direct effect on the IS line. This dichotomy naturally conditions an assignment distinguishing between the strategic roles appropriate for fiscal and for monetary policy [Horwich, 1969]. The strategic division of labor assigns fiscal policy the task to manipulate the IS line and monetary policy is responsible for the LM line. The purpose of this assignment is further developed in terms of an optimal rate of interest "or" indicated by the horizontal in the diagram. The choice of this interest rate is governed by considerations of the desired division of total output between consumption and investment available for absorption by the private sector. The choice reflects thus considerations of optimal capital accumulation. Any changes in the conditions

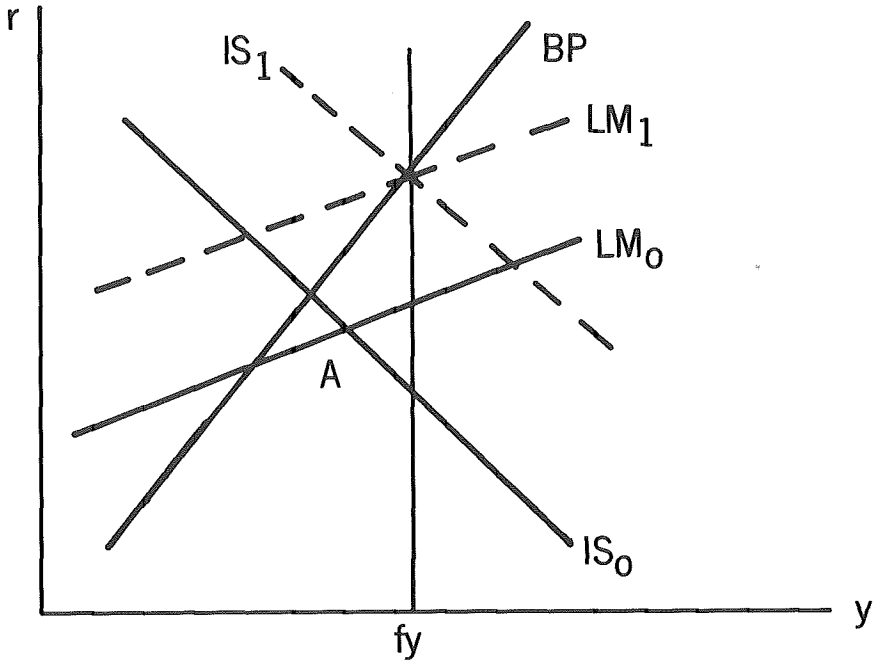
Figure 1



affecting the desired rate of accumulation modify under the circumstances the optimal rate of interest. The central banks are thus instructed to maintain the actual rate of interest at the optimal level "or." With the actual state initially at point A central banks are obliged to expand the money stock until LM is pushed to intersect IS_0 at point B on the or line. Enter now the fiscal authorities. They are instructed to adjust the fiscal magnitudes in order to maintain full employment. For a state resting at B this instruction is translated into an expansion of the government sector's net spending sufficient to move the expenditure line from IS_0 to IS_1. The magnitude of the shift is determined by the requirement that the IS line ultimately intersect the full employment line at the point determined by the choice of an optimal interest rate. The central bank accommodates under its assignment the fiscal expansion and maintains the targeted interest rate. This accommodation is expressed by the shift of the LM-line from LM_1 to LM_2.

This assignment problem can be extended in order to include the case of an open economy. The IS/LM diagram needs to be augmented in this case with a balance of payments line BP as in diagram II. This line summarizes all combinations of r and y satisfying a condition of "international equilibrium." Under a fixed exchange rate system the choice of interest rate is determined by the desired position of the balance of payments expressed for our purposes by the intersection of the BP and the full employment line. The optimal interest rate need not be consistent however with full employment combined with a persistent balance-of-payments equilibrium. Considerations of domestic capital accumulation may induce a choice of interest rate on the full employment line below the balance-of-payments line. Whatever the motivations involved may be, they will be expressed within this general approach by

Figure 2



the choice of an interest rate level. The central bank is moreover instructed to maintain this interest rate by means of suitable monetary accommodations. The fiscal authorities remain responsible for the maintenance of full employment. This means that in diagram II, with an initial position at A, the monetary authorities need to shift LM from LM_0 to LM_1 by means of a monetary contraction. The fiscal authorities increase on the other hand the fiscal impulse sufficiently in order to manipulate IS from IS_0 to IS_1. An explicit inclusion of exchange rate policy widens the opportunity for a selection of an optimal rate of interest more attuned to considerations of domestic capital accumulation. But the essential characteristic of the argument supporting an interest targeting approach is not affected by such extensions.

A related but still somewhat different argument emerged among "Keynesian circles" in the early 1960s. This argument permeated mostly the public discussion with little spillover into the canonical literature of the profession. An important strand of Keynesian thinking, at least in the United States, centered the crucial linkages of the monetary transmission mechanism in the housing sector. A dominant version of the Keynesian framework concentrates the transmission of monetary impulses on the play of interest rates associated with financial assets. It seemed to follow therefore

that monetary impulses were transmitted in accordance with the relative borrowing costs prevailing over the spectrum of activities represented by expenditure categories in national income accounts. It appeared that housing operates within this spectrum with the largest relative borrowing costs. Major expenditure categories showed little, if any, serious exposure to the impact of borrowing costs according to this view. Countercyclic variations of the money stock imposed under the circumstances a heavy burden on a sector of the economy satisfying "social or political priorities." This social evaluation combined with a Keynesian view of the transmission mechanism implied that fiscal policy was assigned the task of offsetting the exogeneously initiated cyclic fluctuations. The monetary authorities on the other hand were assigned an "accommodative" role expressed by targeting an interest rate attuned to the "social priorities of the country."

The story seems plausible enough and the case for an interest targeting approach almost obvious. As a matter of fact, the case is so obvious that one is bound to wonder what went wrong. According to the story optimal stabilization should (any time) be just around the corner. But our experience overwhelmingly suggests that we hardly turned the corner. There is of course always an opportunity to adduce some conspiracy. More relevant would be the irrelevance of the "goodwill" or "public interest theory" of government implicit in this assignment. This aspect will be suspended, however, for the moment and reserved for consideration in a later section of the paper. At this stage we concentrate on the nonoperationality of the argument and some highly questionable aspects of the underlying view bearing on the economy's structure. The nonoperationality follows from the information level implicitly slipped into the argument. The policymaking agencies know fully and with certainty the structure of the economy and of all the relevant underlying conditions. They *know* in particular the structural conditions shaping the form and dynamics of the IS and LM lines. They also *know* the evolving conditions modifying the positions of the IS and LM lines or the conditions relevant for the selections of an optimal interest rate. In the context of such perfect knowledge available to the policymaking agencies reenforced with a "public interest" theory of government, the argument operates with a plausible strength. An activist stance naturally emerges under the circumstances in reference to intermittent variations in underlying conditions modifying the optimal level of the interest rate. Perfect knowledge of these variations is immediately translated into corresponding revisions of the targeted interest rate to be maintained by the central bank. The apparent strength of the argument dissolves however once we seriously recognize the irrelevance of the information level presumed to be (monopolistically and asymmetrically) possessed by the policymakers.

The questionable aspects of the underlying view are closely associated with a specific "Keynesian" tradition. The substitution of money is either narrowly confined within a range of financial assets or the analysis remains confined to episodes with variations in the price level dominating changes in relative yields of financial and real assets [Brunner, 1971]. Under the first

interpretation policy analysis proceeds with an empirically untenable conjecture about the transmission of nominal impulses, and relies under the second interpretation on a "special case" hardly characteristic for the mass of cyclic patterns defining the stabilization problem confronting policymakers. The disregard of aggregate supply and the usual omission of price behavior worsen the questionable nature of the transmission mechanism underlying the "Keynesian dichotomy." These neglects closely mirror, as will be emphasized subsequently, the implicit assumption that perfect knowledge enjoyed by the public sector is balanced by ignorance suffered in the private sector.

2. The Choice between Strategic Control Variables in the Context of Full Stochastic Information for Policymaking Agencies

The contribution developed by William Poole [1970] essentially modified the nature of the discussion pertaining to the choice between monetary strategies. His analysis moved beyond the range of perfect deterministic knowledge available to the policymaking agencies. The analysis admitted a measure of incomplete information. The authorities are still supposed to possess perfect information about the deterministic and the stochastic structure of the process. They also know all the past realizations of the stochastic process but are unable to foresee the particular values of the realizations. The relaxation of full information pertaining to ongoing realizations still proceeds within a format determined by the IS/LM apparatus with the standard interpretation. The crucial elements of the argument can be presented as follows: Let equations (1) and (2)

$$(1) \qquad y = -ar + u_1$$

$$(2) \qquad m = -br + cy + u_2$$

represent the IS and LM relation with y indicating income, r the nominal rate of interest and m the money stock. The stochastic shocks u_1 and u_2 are governed by specific processes. They include in particular the operation of all omitted variables and thus operate with a nonvanishing expectation. Suppose furthermore that the money stock is determined by a process characterized by (3) with β a deterministic policy variable

$$(3) \qquad m = \beta + sr$$

and s a policy parameter. The policy problem is defined by the optimal choice of β and s with a view to minimize the fluctuations of income around a desired target y^*. The choice is specifically determined by the usual goal function

$$(4) \qquad G = E(y-y^*)^2$$

The optimal value of β is obtained for every time period by setting $y = y^*$, i.e.

$$(5) \qquad \beta^*_t = \frac{b+s+ac}{a} y^*_t + Eu_{2t} - \frac{b+s}{a} Eu_{1t}$$

The setting of β thus shifts with the target and the expectations of the stochastic elements driving the economy. The second component of the strategy is fixed by the first order condition for a minimum of the goal G. This goal function is equivalent to the following expression after replacing β with β^*

$$(6) \qquad \left(\frac{a}{b+s+ac}\right)^2 V(u_2) + \left(\frac{b+s}{b+s+ac}\right)^2 V(u_1)$$

$$- 2\frac{a(b+s)}{(b+s+ac)^2} Cov(u_1,u_2)$$

where V denotes the respective variances and Cov the covariance. The first order conditions yields expression (7). The covariance term was deleted in order to avoid some complications which actually reenforce however the subsequent argument bearing on the relevant execution of "accommodating" policies.

$$(7) \qquad s^* = \frac{a}{c}\frac{V(u_2)}{V(u_1)} - b$$

We may interpret the parameter s as the degree of monetary accommodation. This degree increases with the variance of the money market disturbance. With a dominant pattern of money market shocks an optimal strategy requires a high degree of monetary accommodation expressed by a large value of s. The money stock responds under the circumstances quite sensitively to variations in interest rate. The analysis thus establishes that the optimal strategy appears "in general" in the form of a mixed case. It involves setting simultaneously a pure monetary component β^* and a degree of monetary accommodation to interest rates. A pure monetary control policy emerges when the money market disturbance vanishes, whereas a vanishing output market disturbance determines a pure interest rate policy.

The framework used provides an alternative interpretation of the "coordination" between fiscal and monetary policy frequently discussed in the policy literature. This coordination was assured in the previous context by the assignment of different tasks. "Coordination" occurs in the present context on the other hand with a somewhat different meaning. Fiscal policy is implicitly impounded into the stochastic term u_1. This would express the fact that monetary policymaking proceeds under substantial uncertainty with respect to the evolution of fiscal policy over the relevant period governing the choice of strategy. We note in particular that a pronounced unreliability of fiscal policy would *lower* the degree of accommodation built into an optimal stra-

tegy. "Coordination" could thus mean that fiscal policy be arranged with greater assurance and smaller variability. A small adjustment in equation (1) reveals the nature of the issue. We enlarge the IS relation with fiscal policy terms summarized for simplicity by government expenditure g. We replace thus (1) with (1′)

$$(1') \quad y = -ar + \alpha g + \bar{u}_1$$

where $\bar{u}_1$ is now the adjusted shock satisfying $E(\bar{u}_1) = E(u_1) - \alpha$ Eg. "Coordination" requires under the circumstances that Treasury and central banks jointly set the optimal values for g* and β^* in response to the selected target y* so as to satisfy the reduced form

$$(8) \quad y^* = \mu_1\beta^* + \mu_2 g^* + \mu_3 E(\bar{u}_1) + \mu_4 E(u_2)$$

The essential purpose of such coordination is however the attempt to produce a more predictable fiscal policy and lower the variance of $\bar{u}_1$ below the variance of u_1. The execution of effective coordination would thus raise the degree of monetary accommodation built into the optimal strategy.

The strategy procedure also determines the required degree of activism. The setting of β^* needs adjustment whenever g* or the expectations of $\bar{u}_1$ and u_2 change. In the context of the institutions typically governing fiscal policy-making we can hardly expect g* to be rapidly adjustable over shorter horizons in response to evolving expectations about the underlying stochastic process. Financial coordination can at best lower the uncertainty with little adjustability in the shorter run. Evolutions in the stochastic processes are reflected under these conditions by the monetary setting β^*. The extent and magnitude of "activist adjustment" is completely determined by the frequency and magnitude of shifts in underlying processes.

The previous discussion implicitly attributed all shocks operating in the money market to money demand behavior. Equation (3) proceeds as if the setting of β combined with the prevailing interest rate produces a deterministic money stock. This seems hardly compatible with our knowledge of the facts. Suppose therefore that $\bar{u}_2 = u_2 - u_3$ where u_3 represents the stochastic component of the process governing the money stock. Consider also that the variance of u_3 contributes substantially to the variance of $\bar{u}_2$ with little covariance between u_2 and u_3. Such a state suggests an extension of strategic consideration to the institutional arrangements governing the money stock process. Our accumulated experience indicates that the role of the stochastic component u_3 may substantially change with rearrangements of the prevailing institutions. An appropriate choice of arrangements bearing particularly on reserves and liabilities of the banking system could be expected to lower both $V(u_3)$ and $V(\bar{u}_2)$. An application of strategic considerations to the choice of institutions may lower simultaneously the variance of output and the required degree of optimal monetary accommodation.

The basic framework traditionally used for the analysis represented by

equations (1) and (2) impounds some major issues and complexities into the stochastic process. Two aspects implicitly included into the stochastic terms deserve our attention. Once we accept substitutability of money over the whole spectrum of assets the use of a single money market equation to represent portfolio allocations restricts the application of our argument to episodes with high rates of inflation. A more extensive representation of financial markets implies moreover that both (1) and (2) appear as semi-reduced forms with all other asset yields, except a single interest rate r, solved out of the system with the aid of the partial solution made over the remaining equations describing portfolio allocations. It follows that the stochastic terms u_1 and u_2 occur in general as linear combinations of random terms including an array of "financial disturbances." The resulting positive contribution to the covariance $Cov(u_1, u_2)$ complicates the analysis in terms of the specific information required. Contrary to some Radcliffian ideas it does not necessarily raise the degree of optimal accommodation.

Various games could be pursued at this stage involving block diagonality, recursiveness and similar properties of the system's matrix of asset-yield coefficients in order to derive from wide ranging financial markets either a dominant $V(u_1)$ or a dominant $V(u_2)$ with corresponding consequences for the required degree of monetary accommodation. The combination of a Fed type money demand (depending on a single short rate) with the occurrence of a broad array of asset yields operating on aggregate demand for output would raise $V(u_1)$ relative to $V(u_2)$. The focus on a broader range of interacting financial markets enlarges moreover the range of the strategy problem. It involves also the optimal selection of the asset yield guiding the degree of monetary accommodation. A Tobin q may emerge (possibly) under one particular pattern of circumstances represented by the deterministic and the stochastic structure as the best choice governing the required degree of monetary accommodation to the prevailing shock structure.

The omission of explicit price behavior and supply patterns has been another feature of the traditional analyses. But such behavior may be impounded into the stochastic expressions similar to the operation of wider ranging financial markets. A simple extension of (1) and (2) with a supply equation

$$p = \gamma y + \epsilon$$

and a random term with possibly nonvanishing expectation magnifies the optimal degree of monetary accommodation. Money demand includes under the circumstances a price term p. It follows that the variance of the money market reflects the stochastic properties of money demand, money supply and price behavior (ϵ). Large real shocks expressed by a large variance $V(\epsilon)$ thus induce a large measure of monetary accommodation. Moreover, frequent shifts in the stochastic process controlling ϵ would produce frequent and substantial changes in β^* and thus produce the typical pattern of activist policy. But the extension of the argument to impound price behavior into the

semi-reduced system (1) and (2) can proceed as a game with diverse exercises producing very different accommodation patterns. The reader's (or writer's) imagination determines the limitations of an inherently unlimited game.

The literature developing this analysis emphasized occasionally the controllability of "interest rates" in contrast to the money stock. It is generally acknowledged that the money stock emerges not deterministically in response to the values of policy instruments imposed on the process. This has been contrasted [Ben Friedman, 1977] with the central banker's ability to set "interest rates" at the desired strategic level by means of suitable accommodations. This assertion neglects both an important institutional fact and some facts of the ongoing discussion. Standard Keynesian analysis assigns different interest rates to the IS and the LM relation. A short-term nominal rate operates according to this view on money demand, whereas a long-term real rate affects aggregate demand for output. The output market and the money market equation need to be connected therefore with a term structure equation $lr = sr + x$, where lr is the long-term rate, sr the short-term rate, and x the random connection between the two rates. When replacing lr in equation (1) with this term structure equation the uncertainty surrounding x is impounded into the variance of the stochastic term operating on the output market. This would seem to lower the required degree of monetary accommodation. But the short rate sr is probably not the relevant interest rate directly addressed by the authorities as a control variable. Suppose we follow the custom observed in the United States and recognize the federal funds rate as the control variable. Another relation is thus required connecting the federal funds rate ffr with the short rate sr, let us say $sr = ffr + z$. The substitution of sr by $(ffr + z)$ in equation (2) in order to produce an explicit occurrence of the relevant policy variable focuses all the uncertainty surrounding the connection between sr and ffr into the money market variance. The occurrence of the stochastic terms x and z modifies the disturbances operating in output and money market. Substitution of lr in equation (1) and sr in equation (2) yields the expression

$$y = affr + \bar{u}_1 \text{ and } \beta = -bffr + cy + \bar{u}_2$$

where $\bar{u}_1 = u_1 - a(x + z)$ and $\bar{u}_2 = u_2 - (b + s)z$. We obtain thus the modified variances

$$V(\bar{u}_1) = V(u_1) + a^2[V(x) + V(z)] > V(u_1)$$

$$V(\bar{u}_2) = V(u_2 + (b + s)^2 V(z) > V(u_2)$$

Once again we disregard the covariances. We also proceed at this stage with a straight comparison between a pure monetary and a pure interest policy. A monetary policy sets the monetary base β and an interest policy the federal funds rate ffr. The parameter s represents in this case a structural response characteristic of the monetary system. The conditional variance of output y

under a monetary and an interest rate policy is given by the following expressions

$$V(y|\beta) = \left(\frac{a}{b+s+ac}\right)^2 V(u_2) + \left(\frac{b+s}{b+s+ac}\right)^2 V(u_1) + \left(\frac{a(b+s)}{b+s+ac}\right)^2 V(x)$$

$$V(y|\,\text{ffr}) = V(u_1) + a^2V(x) + a^2V(z)$$

We note that the variance V(2) exerts no effect on $V(y|\beta)$ on the output variance under monetary policy. The following inequality satisfies the condition for a choice of monetary policy over interest rate policy

$$V(y|\beta) < V(y|\,\text{ffr})$$

This condition is equivalent to the inequality

$$V(u_1) + a^2V(x) + \frac{a}{c}\frac{(b+s+ac)^2}{2(b+s)+ac}V(z) > \frac{a}{c}\frac{1}{2(b+s)+ac}V(u_2)$$

This expression implies that larger uncertainties built into the term structure of interest rates and expressed by V(x) and V(z) strengthen the case for a monetary against an interest policy centered on the federal funds rate.

The uncertainties associated with the term structure of interest rates, reenforced moreover by the occurrence of a *real* long-term rate in (1) and a *nominal* short-term rate in (2), already pose some difficult questions. But the information or knowledge problem fundamentally affects the whole policy analysis. Two separate strands need be considered: the choice of the accommodation parameter s and the monetary component β. The determination of s requires perfect information about both the deterministic and stochastic structure of the system. The variations in the game alluded to in previous paragraphs produce an unbounded range of optimal settings for the accommodation parameter. Optimal strategy is thus highly sensitive with respect to reliable possession of detailed structural information. The possession of such knowledge certainly yields a definite resolution of the strategy problem expressed by a definite selection of the accommodation parameter. The choice of β^* depends moreover beyond the possession of reliable structural knowledge on the target level of output y^*. This target level remains in the absence of an adequate analysis of supply behavior, precluding propositions assigning permanent real significance to monetary impulses, a purely arbitrary and extraneous magnitude. There is no way to anchor it in the structure of the economic process described by the analysis. Even inclusion of a Phillips

curve provides no anchor to the free-floating target level without inclusion of a natural rate hypothesis. A definition of y* in terms of the traditional Keynesian measures of "full employment output" fails to resolve our problem in the absence of an adequate supply analysis. The stochastic processes intermittently produce under the circumstances positive deviations from full employment output. There is moreover nothing in the analysis to prevent perpetuation of such deviations from *any* stipulated level of "full" output. So why not use a *fuller* output as the relevant target level? The analysis offers thus no good reason for the choice of any monetary component β^* and the strategy problem remains partially unresolved and incompletely defined.

3. Optimal Control and Exploitation of Intermediate Information as Paradigm of Activist Policymaking

The procedure examined in the previous section is a special case of a more general technique defined by the theory of optimal controls. This theory initially developed in the context of engineering systems gradually attracted the attention of economists. An excellent paper by Fischer-Cooper [1973] surveyed the development of this analysis over the postwar period. Economists became initiated to these ideas with the work published by Phillips during the 1950s on proportional, derivative, and integral controls. This work was enlarged by Gregory Chow with reference to econometric models and in terms of computational procedures. It apparently promised an operational explication of the strategy problem confronting monetary policymaking. It also defines the meaning of "activist policymaking" and determines the nature and amount of such activist involvement. We require for our purposes here no detailed discussion of optimal controls. The presentation concentrates on common aspects permeating the variations on the theme.

Optimal control procedures are based on two analytic strands. One specifies the goal of policymaking usually in form of a quadratic loss function.

$$(9) \qquad L = E_t \sum_{i=0}^{N} (y_{t+1}-y^*_{t+i})' P_{t+i}(y_{t+i}-y^*_{t+i})$$

where y_s refers to the vector of endogenous variables determined by the system, y^*_s indicates the proscribed target levels for these magnitudes and P_s is a matrix expressing the "social preferences" in terms of relative weights assigned to the possible deviations from target level. The other strand involves a description of the economic process which controls the evolution of y in response to exogenous inputs and policies selected. We specify thus

$$(10) \qquad Ay_t = By_{t-1} + C \begin{pmatrix} m_t \\ x_t \end{pmatrix} + u_t$$

where A, B, and C are matrices characterizing the deterministic structure, m refers to a vector of monetary policy instruments, x summarizes fiscal policy variables and exogenous inputs into the process. Lastly, the vector u_t contains the system's stochastic terms.

The strategy problem for monetary policymaking can now be defined as the minimization of the social loss L by selecting the best path over time for the policy instruments m_t. This problem can be solved implicitly for a wide class of linear or nonlinear systems. A standard case [Chow, 1975; Kalchbrenner-Tinsley, 1975] offers an explicit solution in terms of a deterministic formula linking the optimal setting of m_t to the past observations of the state and the concurrent values of the remaining fiscal and other inputs x_t, i.e.,

$$(11) \quad m_t = G_t y_{t-1} + K_t x_t + g_t$$

The coefficients of this feedback rule are fully determined by the economic structure (A, B, C) and the social preference matrix P_t. This rule specifies that monetary policy instruments should be set in response to information presented by the system's past state and the current values of inputs x_t. According to this rule the variability in the setting of policy instruments m_t depends on the variability produced by the exogenous processes, the vagaries of fiscal policy, and the magnitude of the shocks represented by the stochastic structure governing u_t, impounded into the evolution of the endogenous vector y_t. This analysis has been extended to classes of processes involving less stringent information levels. The structural patterns may be governed by stochastic processes. With stochastic uncertainty permeating the whole system beyond the additive shocks an opportunity still remains for optimal control procedures [Fischer-Cooper, 1973]. It was also shown in the literature [Kalchbrenner-Tinsley, 1975] that the optimal setting under pervasive stochasticity can be exhibited as a proportion of the setting computed with a deterministic structure. The proportionality factor is a rational function of expectations and covariances of all stochastic coefficients in the structure.

Control theory can be used in this manner beyond the determination of optimal settings for a given array of policy instruments. The structure of the system combined with the admissible monetary arrangements defines a range of alternative options of policy instruments. Each one of the alternative options modifies correspondingly the endogenous vector y and the matrices as representations of the relevant structure. An optimal feedback rule (or simply an optimal solution) can be obtained for each option in the range of feasible combinations of policy instruments. The combination yielding the lowest value for the loss function naturally determines the optimal selection of control variables.

The discussion proceeded so far with the assumption of a very specific information accrual concerning the observable variables y and x. It was implicitly assumed for any unit period t that the values of y_{t-1} and x_t are fully

known to the authorities in addition to the structural information required. The monetary authorities experience however a very different information accrual. Some components of the endogenous vector y are known much more rapidly than the component (or components) representing national output. Let us define a unit period as the time period required to obtain measures of output. But for n components of the N-dimensional endogenous vector y information accrues for each of the S subperiods dividing the unit period. The previous description can still be applied to such a state of affairs. The strategy horizon must however be extended to the largest time period required to obtain sufficiently reliable measurements of past output and most particularly for x_t. But the structured information accrual described above offers opportunities to formulate strategies which exploit the available information emerging *within* the unit period without any direct measures about the development of the crucial output variables. A strategy based on optimal control procedures thus involves under the circumstances specified a rational extraction of intermediate information in order to achieve a better adjustment in the setting of policy instruments reflecting immediately ongoing evolutions in the economy's shock structure.

My summary follows closely the original piece presented with admirable skill by Kareken, Muench, and Wallace [1973]. A somewhat simplified version proceeding within the context of an IS-LM framework was recently examined by Ben Friedman [1977]. Let us assume that the final equation for output derived from a system can be exhibited in the form

$$(12) \quad y_t = \pi_0 + \pi_1' x_t + \pi_2 p_t + \pi_3' u_t$$

with y occurring now as a scalar expressing output; x_t is a column vector of exogenous inputs, u_t a column vector of random shocks, p_t is a policy instrument, π_1 and π_3 are column vectors and π_0 and π_2 are scalars. We assume for x_t the same information accrual pattern as for y_t. Exogenous inputs operating during a unit period are only known at the beginning of the next unit period. No direct information about the current values of y_t and x_t are available within the current unit period. With y_{T-1}, x_{T-1} and p_{T-1} known for the past unit period (T–1) policymakers know u_{T-1}. This value and knowledge of x_{T-1} provide an anchor for the information extraction process developed for the "within the unit period" adjustments in the setting of the policy instrument. In order to proceed with the analysis it is further assumed that the (ultimately) observable or computable shocks x and u are governed by first order Markoff processes.

$$(13) \quad \begin{aligned} &(a) \quad u_t = \rho_u u_{t-1} + \epsilon_{ut} \\ &(b) \quad x_t = \rho_x x_{t-1} + \epsilon_{xt} \end{aligned}$$

with both ϵ vectors behaving as pure white noises. Some generality is sacrificed at this point by assuming that all components of the vector u (or x) are governed by a Markoff process with identical ρ. This magnitude appears thus as a scalar. The information accrual problem is moreover described with the aid of the following relations

$$(14)\quad \begin{aligned} &(a)\quad u_{t-1} = E_t u_{t-1} + e_{ut} \\ &(b)\quad x_{t-1} = E_t x_{t-1} + e_{xt} \end{aligned}$$

These relations express the fact that neither u nor x are known in subperiod t on the basis of the incomplete information available in t within the unit period. The error vectors e_t are naturally orthogonal to the information impounded into the expectation formation and emerge thus as white noise. With these specifications the expression for output may be rearranged as follows

$$(15)\quad y_t = \pi_o + \pi_1'\rho_x E_t x_{t-1} + \pi_2 p_t + \pi_3'\rho_u E_t u_{t-1} + \pi_1'[\rho_x e_{xt} + \epsilon_{xt} + \pi_3'\rho_u e_{ut} + \epsilon_{ut}]$$

With the conditional expectations available the policy instrument p can be set at a level assuring equality of the sum of nonrandom terms in (15) with the target level y* of y. The variance of y can be stated under the circumstances by the formula

$$(16)\quad V(y_t) = \pi_1'[\rho_x^2 E_t(e_{xt}\cdot e_{xt}') + E(\epsilon_{xt}\cdot\epsilon_{xt}')]\pi_1 + \pi_3'[\rho_u E_t(e_{ut}\cdot e_{ut}') + E(\epsilon_{ut}\cdot\epsilon_{ut}')]\pi_3$$

We note that the coefficient vectors π_1 and π_3 depend on the choice of policy instruments p_t selected by the authorities. The covariance matrices of e and ϵ on the other hand are independent of this choice. This follows from the Markoff process specification in the case of the ϵ's and from the orthogonality of the e's with respect to all information available in t, which includes knowledge of current and past selections of policy instruments. The optimal choice of policy instrument for each subperiod from a range of feasible options is determined in accordance with the minimization of the variance. The optimal *value* of the optimally selected *kind* of policy instrument is then

set according to the target equation derived from the deterministic portion of (18), i.e.,

$$y^*_t = \pi_o + \pi'_1\rho_x E_t x_{t-1} + \pi_2 p_t + \pi'_3\rho_u E_t u_{t-1}$$

These choices predicate however that $E_t u_{t-1}$, $E_t x_{t-1}$ and the covariance matrix of the e's are known to the authorities. The derivation of these magnitudes still requires our attention. Let z^i_t be a generic description for any component in the column vectors x_t and u_t. The information for the expectation $E_t z^i_{t-1}$ includes in subperiod t the observations made on the endogenous variables $y^j_{t-1}(j=1 \ldots n<N)$ which became known *within* the unit period. The structure of the interacting system yields in particular the following final equations for the n endogenous variables observed over subperiods within this unit period:

$$(17) \quad y^j_t = \pi^j_o + \pi'_{1j}x_t + \pi_{2j}p_t + \pi'_{3j}u_t; \qquad j = 1 \ldots n$$

The coefficient vectors depend in general also on the choice of policy p. Rational formation of the expectation $E_t z^i_{t-1}$ with respect to the information y^j_{t-1} and knowledge expressed by (17) is under the circumstances determined by equation (18)

$$(18) \quad E_t z^i_{t-1} = E_{t-1} z^i_{t-1} + \sum_{j=1}^{n} \beta^{ij}_t v^j_{t-1}$$

where

$$(18a) \quad v^j_{t-1} = y^j_{t-1} - E_{t-1} y^j_{t-1} = \pi'_{1j}[\rho_x e_{xt-1} + \epsilon_{xt-1}] + \pi'_{3j}[\rho_u e_{ut-1} + \epsilon_{ut-1}]$$

We note that the information available in t allows the authorities to compute the v^j_{t-1}. The knowledge of the system's structure determines moreover the stochastic structure of the v^j's. This stochastic structure yields the regression coefficients β^{ij}_t as the standard functions of the covariances associated with e and ϵ. These regression coefficients depend thus on the full deterministic *and* stochastic structure of the system. The expectation specified in expression (18) for any subperiod t depends of course on $E_{t-1} z^i_{t-1}$. The latter is however equal to $\rho_z E_{t-1} z_{t-2}$. The expectation $E_t z_{t-1}$, for subperiod t, is thus reduced to the expectation $E_{t-1} z^i_{t-2}$ in (t-1) which corresponds to expression (18) shifted backwards by one subperiod. Repeated backwards shifting anchors ultimately the regression of the current subperiod expressed by equation (18) in the first subperiod of the current unit period with the relation $E_t z^i_0 = z^i_{T-1}$, i.e., the full information about y and x from the past unit period

anchors the sequence of expectations developed over the subperiods within the ongoing unit period.

The expectational components in equation (15) required to determine the optimal *value* of any p in each subperiod are thus fully specified in terms of available observations and the system's fully known structure. The choice of the optimal *kind* of p still requires the derivation of the covariance matrix $E[e_{zt}, e'_{zt}]$ of assessment errors. The specifications laid down yield after some substitutions and rearrangements equation (19).

$$(19) \quad e^i_{zt} = \rho_z e^i_{zt-1} + \epsilon^i_{zt-1}\beta'_t V_{t-1} \qquad \text{for any i, z}$$

where β is a column vector with components β^{ij}_t and V_t is a column vector with components v^j_{t-1}. This expression implies that the covariance Cov (e^i_{zt}, e^j_{zt}) must be a function of $\text{Cov}(e^i_{zt-1}, e^j_{zt-1})$ derived from the right-side expression, and the covariances of the V-components. The elements of the covariance matrix summarizing the stochastic structure governing the assessment error e in subperiod t concerning the shock variables x and u are thus computable from a recursion formula involving the system's stochastic and deterministic structure. The covariance matrix Cov_t of the e's is thus reduced to Cov_{t-1} of the covariance in $(t-1)$ and eventually connected by finite steps to Cov_1. This initial covariance matrix is necessarily a zero matrix according to the specification $E_1 z^i_0 = z^i_0$. This implies that e^i_1 is equal to zero. We may summarize at this stage the procedure characterizing the rational exploitation of intermediate information with the following constitutive steps: (i) the computation of a covariance matrix governing the assessment error from the underlying system's structure, (ii) with this covariance matrix for subperiod t available the authorities can determine the optimal kind of policy instrument for this subperiod, (iii) the conditional expectation $E_t x_{t-1}$ and $E_t u_{t-1}$ are computed for the subperiod t, and (iv) the selected policy instrument is set at an optimal level in view of the conditional expectations and the target level y*.

The general problem of filtering intermediate information for purposes of macroeconomic forecasting has attracted some attention in recent years. This filtering analysis provides variations on the general theme we hardly need consider for our purposes here. The basic issue remains unaffected by these variations. Our discussion proceeds therefore to some general remarks concerning the intermediate information filtering for purposes of optimal selection and setting of policy instruments. Once the reader worked his way through the sophisticated analytic evolution he may recognize that no definite result really emerges. It offers us a *program of procedures* concerning the choice of instruments (money stock, interest rate, etc.), and bearing on the frequency and magnitude of changes in selection and level of instruments determined by specific properties of the system characterizing the economic process. Once we *know* the system we can establish with the aid of these procedures the (possibly) shifting pattern of optimal control variables and the extent of the optimal short- (or shortest) run activism. It demonstrates conclusively that full information about the system's structure provides a suffi-

cient condition for the rational determination and execution of activist policymaking. It demonstrates moreover that policymaking defined in this manner involving the proper exploitation of intermediate information, is efficient relative to the possession of full knowledge at vanishing social costs. It is in particular more efficient [Ben Friedman, 1977] than any intermediate targeting procedure directed, for instance, at a selection of target paths for monetary aggregates. The full information assumption made about the structure ensures indeed all these demonstrations of efficiency. Intermediate targeting associated with a two-stage procedure would definitely be inefficient and offers under the circumstances no rational basis for policymaking.

Some further aspects require our attention. We refer the reader to equation (13) describing the first order Markoff process governing the exogenous shocks. The processes are presumed to govern the evolution over the subperiods within the unit period. The same applies to equation (14) formulating the best assessment in each subperiod of the recent values assumed by the exogenous shocks. But the process of information filtering is anchored with a known *average* value for the *whole* past unit period, i.e., it is anchored with the vectors u_{T-1} and X_{T-1} and not with the values produced in the last subperiod of the past unit period. The choice of anchor value is thus not consistent with the specification of the stochastic processes (13) and (14). The correct initial values setting the process in motion for the determination of the expectations $E_t x_{t-1}$ and $E_t u_{t-1}$ are thus not observed. It would be more appropriate probably to formulate this issue somewhat differently. The structure of information accrual makes it impossible to obtain the correct choice of initiating values produced by the last subperiod in the past unit period. It is thus approximated with information actually available which contains consequently a measurement error. But the analysis does not acknowledge this measurement error nor errors associated with the actual measurement situation expressed by the fact that repeated revisions of the past unit period data are distributed over the subperiods of the following unit period. This revision of available information should rationally modify the nature of the finely tuned adjustments in selection and settings of policy instruments.

The first type of measurement problem may be resolved (possibly) by restructuring the analysis to infer the stochastic patterns of the measurement error from the stochastic properties of the underlying short- (or shortest) run process. But this raises another issue inherent in this approach. How much sense does it make to speak about national output for one day (not per day), for one week or for one month? We do certainly observe daily, weekly or monthly receipts, but such receipts are poorly related in the very short run with any economically relevant measure of economic activity. The analysis proceeds moreover on the assumption that the same structural (most particularly stochastic) properties hold simultaneously for arbitrary subperiods and unit periods. No doubt, other versions of the information filtering procedure compose in some manner the unit period structure from subperiod structures. But the question raised about the meaningfulness of shortest run (involving daily, weekly or even monthly) variables pertaining to economic

activity remains. The sophisticated filtering of dubious information hardly offers rational grounds for finely tuned shortest run adjustment.

B. The Strategy Problem under Full and Symmetric Information for Policymakers and Actors on the Market Place

The traditional strand of policy analyses evolving with increasing technical sophistication over the past decades contained a major asymmetry in its information assumption. The policymaker, his staff, or academic advisor possesses full knowledge. Economic agents on the market place possess either no information about these matters or do not exploit the opportunities offered by the available information. Such asymmetry is hardly justifiable in any relevant terms. The segmentation of information postulated by the analysis surveyed under section II.A. may approximate under one interpretation the state of a totalitarian society but hardly fits the circumstances of western democracies. Another interpretation may assign to economic agents the behavior of a "dumb critter" ("homo boobus"). But this version conflicts with the accumulated facts of human history [Brunner-Meckling, 1977]. The assumption of asymmetric or segmented information rigidly differentiating between the status of the public and private sector fails to conform with important aspects of our reality in more or less open societies.

The acceptance of an approximately symmetric state of information involves however some further reconsideration. Such reconsideration becomes particularly relevant in the context of an analysis generalizing the full information assumption to agents operating in the private sector. Economic analysis proceeds with the assumption that men behave as resourcefully evaluating optimizers in the context of the conditions confronting them. This implies that men, on the average, will exploit available opportunities for their benefit in accordance with their perceptions. But opportunities depend on information and agents tend thus to exploit all obtainable information. Human behavior will be conditioned in specific ways under the circumstances by the available information. This basic theme motivated the emergence of the "theory of rational expectations" initiated by Jack Muth and developed in the last decade by Robert Lucas and others. Inclusion of such information absorption by agents encouraged reconsideration of the inadequate (or occasionally nonexistent) attention to the supply side of output markets. The formulation of supply behavior in the context of aggregative analysis remains at this stage an unsettled issue. But we can hardly avoid coping with this problem in one fashion or another. The assumption of exogenously fixed or moving prices seems hardly consistent with the basic tenets of economic analysis.

Rational expectations supplemented with an explicit aggregate supply in the context of a system with classical homogeneity properties reconciles the "long-run" neutrality of money with its "short-run" nonneutrality. The neutrality property at issue should be properly confined to deviations from the normal output. There are sound considerations to suspect that systematic

monetary patterns may affect the path of normal output [Fischer, 1980]. But this particular kind of nonneutrality remains basically uncertain in direction and magnitude and does not really bear on our central problem under consideration. The reconciliation mentioned above is associated with the "irrelevance thesis" pertaining to systematic monetary policy. Fully perceived nominal impulses are impounded by the competitive pressure of resourcefully coping agents into current price-setting. Systematic monetary policy patterns exhibit thus the classical neutrality property and exert no real effects on the economy. The selection among alternative strategies becomes irrelevant and without significance for the pattern of real fluctuations. Only unanticipated monetary impulses modifying the strategy affect the state of real variables.

The basic features of this irrelevance analysis can be summarized for our purposes with a broad outline of the discussion contributed by Sargent-Wallace [1975]. The system used in our context is a conventional IS-LM structure supplemented with a supply function and a real balance effect

$$(20)\quad (a)\quad s(p_t, E_{t-1}p_t, u_{1t}) = d\,[r_t - (E_{t-1}p_{t+1} - E_{t-1}p_t), m_t, p_t, u_{2t}]$$

$$(b)\quad m_t = \lambda[r_t, p_t, y_t, u_{3t}]$$

Equation (20a) describes the output market equilibrium with s denoting the supply function and d the demand function. Equation (20b) represents the money market equilibrium. All behavior functions satisfy the standard homogeneity conditions with respect to all nominal values. The economy's shock structure consists of four shocks (u_1, u_2, u_3, m) governed by some stochastic processes. The u-processes reflect nature and social events whereas the process governing m expresses the explicit or tacit strategic choice exercised by the authorities. No particular specifications are needed for our purpose at this stage. A linear representation of (20) yields immediately the following pseudo solution for the price level

$$(21)\quad p_t = \alpha_o + \alpha_1 E_{t-1}p_t + \alpha_2 E_{t-1}p_{t+1} + \alpha_3 m_t + u_t$$

where u_t is a linear combination of the u_{it} ($i = 1, 2, 3$) and the α-coefficients are rational functions of the structural coefficients. The homogeneity property of the system implies that $\alpha_1 + \alpha_2 + \alpha_3 = 1$. The same property implies that p_t and $E_{t-1}p_t$ occur in the supply function combined as a difference $(p_t - E_{t-1}p_t)$. Inspection of (21) yields immediately

$$(22)\quad p_t - E_{t-1}p_t = \alpha_3\,[m_t - E_{t-1}m_t] + u_t - E_{t-1}u_t$$

The difference between actual and expected price level which determines output according to (20a) depends completely on unanticipated components of nominal and real shocks. Systematic monetary policies are necessarily

impounded in the expectational component $E_{t-1}m_t$. Only the stochastic components of the monetary impulses can affect output. The choice of strategy thus becomes irrelevant under the circumstances.

The homogeneity properties of the system also bear on the choice between an interest rate or a monetary targeting policy. Equation (21) can be converted into (23)

$$(23) \quad p_t = \beta_0 + \beta_1 E_{t-1}p_{t+1} + \beta_2 m_t + \beta_3 E_{t-1}m_t + \beta_4 E_{t-1}u_t + u_t$$

We note again that $\beta_1 + \beta_2 + \beta_3 = 1$. These coefficients occur as rational functions of the α-parameters in equation (21). In the context of the interest targeting procedure the pseudo solution appears as

$$(24) \quad p_t = \gamma_0 + \gamma_1 r_t + \gamma_2 E_{t-1}p_t + \gamma_3 E_{t-1}p_{t+1} + w_t, \qquad \gamma_2 + \gamma_3 = 1$$

where w_t is again a linear combination of the underlying u's and the γ's are rational functions of structural coefficients. Removal of $E_{t-1}p_t$ yields directly

$$(25) \quad p_t = d_0 + d_1 r_t + E_{t-1}p_{t+1} + d_2 E_{t-1}w_t + w_t$$

with the d's occurring as rational functions of the coefficients in (24). Proceeding with the usual forward projection for the derivation of solutions familiar in rational expectations analysis yields after n steps in the case of (23) an expression containing a term with the "terminal" price level, i.e., $\beta_1^n E_{t-1}p_{t+n}$. The same projection applied to (25) yields the term $E_{t-1}p_{t+n}$. Application of the transversality condition to the first case constrains the admissible paths of price movements but violates economic sense in the latter case. We are left with one equation in two endogenous variables, the current price level and the expected (n-period ahead) "terminal" price level. Sargent-Wallace concluded thus that the price level is essentially indeterminate under an interest targeting procedure.

The Sargent-Wallace analysis was not anchored with an explicit information structure characterizing the nature of incomplete information suffered by the agents. This attention to the requirement of incomplete information in order to reconcile the "long-run" neutrality with the "short-run" nonneutrality of money forms however an important contribution of rational expectations analyses. Two distinct information structures have been developed. Lucas applied to his work an idea initiated by Phelps. This idea centered on the differential accrual of local and global information. Agents were confronted under the circumstances with an inference problem bearing on the separation between allocative and aggregative impulses jointly contained in the price signals received. The inference was crucially determined by

the relative variances of allocative and aggregative shocks in the system. Comparatively larger aggregative shocks lower in this context the real effect of monetary impulses. But this variance occurs, at least according to some formulations, beyond the systematic pattern defining a strategy. The strategic component would thus become impounded into the prevailing prices. A rather different analysis is required when we proceed in the context of incomplete information bearing on the *composition* of the shocks under uniform contemporaneous information about local and global data [Brunner-Cukierman-Meltzer, 1980, 1981]. The inference problem confronting agents bears in this case on the distinction between "permanent" and "transitory" states among evolving shocks. Agents observe the values of all shock variables, but their composition in terms of "permanent" and "transitory" conditions remains unknown. The resulting inference problem provides a basis for the analysis of comparatively inflexible prices with price setting adjusted to perceived "permanent" conditions. According (at least) to some versions the formulation of a strategy removes the inference problem from nominal impulses. Agents would know not only the total value of the money stock (or monetary growth), but also the transitory and the strategic component. The choice of strategy would again be irrelevant under the circumstances.

The irrelevance thesis seemed to apply a final death sentence to any activist dispositions. But such expectations would surely underrate the resourcefulness of our profession. Stanley Fischer [1977] published an admirably elegant argument demonstrating that feedback rules could be formulated within a system satisfying the conditions of rational expectations. The demonstrations depends on overlapping wage contracts implying the occurrence of the term $E_{t-2}p_t$ in the supply function. The overlapping contractual structure implies that at any particular moment some prices exist which reflect information available at a *prior* period. The new shocks, while fully perceived by agents and monetary authorities, offer an exploitable leverage for monetary strategies affecting the real variables. This new information, not reflected by some of the prices guiding *current* transactions, can be used to formulate a feedback rule modifying the variance of output.

Lawrence Weiss [1980] resurrected the possibility of an activist monetary policy consistent with rational expectations with an alternative argument. His analysis proceeds in the context of a Lucas-type information structure with agents confronted by a local-global inference problem. The result establishing real effects of systematic and fully perceived monetary policies is assured by the adroit imposition of segmented information patterns. Capitalists and monetary authorities know in specific ways more than labor suppliers. They possess actually full information. Labor suppliers on the other hand can observe the local money wage, but must infer the relevant real wage from incomplete information. They do not know the general price level and must infer from incomplete information the contribution of real and nominal effects to changing local money wages. A rigid segmentation of information between social groups produces a system with a specific nonhomogeneity in nominal values. This nonhomogeneity determines the

wedge ensuring a real leverage to systematic feedback rules.

The analytic aspects of the demonstrations made by Fischer and Weiss are not contestable. But we may well wonder about the relevance of the analysis. In one context agents possess global information and know the rule guiding the behavior of the authorities. It is not clear why under the circumstances agents would erect the postulated structure of contractual arrangements. It would seem more efficient to formulate employment-wage contracts for each period on the basis of identical information absorbed by all contracts. We do of course observe a wide spectrum of overlapping contractual arrangements. It seems most natural to follow Fischer's example and combine this institutional fact with rationally formed expectations in the context of full information employed by all agents. This combination certainly involves no logical inconsistency. But rational behavior proceeding with the information specified seems not likely to produce such contractual arrangements. Their prevalence would thus suggest some reexamination of the conditions imposed on the analysis motivating Fischer's contribution.

The other context seems substantially more contrived (more "sophisticated"?) without focusing our attention on some fundamental issues. An arbitrary segmentation of information about specific realization of stochastic processes with uniform full possession of structural knowledge by all agents can hardly persist in view of the potential gains to be expected by any supplier of information. The crucial behavior element constituting rational expectations seems hardly compatible with an ad hoc assumption of persistent information segmentation. A more serious challenge to the irrelevance thesis was formulated by Robert King [1980]. The operation of an economy-wide capital market superimposed on the local-global process with its typical information structure opens an additional information channel about global conditions via the rate of interest. King demonstrated that under these structural conditions rational expectations cannot prevent *prospective* monetary feedbacks from affecting the distribution of real variables.

The implication beyond the irrelevance thesis bearing on the price indeterminancy under an interest targeting policy attracted comparatively little attention. It may be argued that this implication offers compelling evidence against the rational expectations analysis, at least when formulated in some prevalent forms. This argument would of course be based on the proposition that some countries, e.g., the United States, did follow over the postwar period an interest targeting procedure with no detrimental effect on price determinancy. McCallum [1980] attempted to reconcile the rational expectation approach with the fact of a somewhat impure interest targeting tainted with monetary consideration in order to preserve price determinancy. But indeterminancy of prices is not a logical consequence of interest rate policies proceeding within a context of rational expectations. We cannot exorcise an interest rate policy by invoking rational expectations. The analysis containing rational expectations was usually developed without regard to stock-flow interactions. An extension of the rational expectation analysis into the realm of stock-flow problems implies however the consistent

application of an interest rate policy within a system ensuring a determinate price level. This seems particularly noteworthy as the analysis developed by Brunner-Cukierman-Meltzer [1981] yields this result in a system with highly classical features: the usual homogeneity conditions, a dichotomy between the real and monetary sector in rational expectation equilibrium and a classical production function. The crucial property of the system may be summarized in a compact fashion

$$(26) \quad f[y_t, y^*_t, y^p_t, p^*_t, \Delta S, S_{t-1}, r_t, v_t, x_t, m_t] = 0$$

The letter f denotes the structure of the system interrelating actual output y_t, planned output y^*_t, permanent output y^p_t, prices actually set at p^*_t, actual changes in inventory stocks ΔS_t, the inherited stock S_{t-1}, the nominal rate of interest r_t, the real rate v_t and the vector of exogenous driving forces x_t consisting of productivity shock and an aggregate demand shock (distributed by Walrus law over other markets). A monetary shock m_t terminates the array. The information problem confronting agents is expressed by the incomplete information concerning the composition of x_t and m_t. They observe both magnitudes without any relevant lags but do not know whether observed changes signify permanent or transitory effects. Prices p^*_t are set relative to the inferred (or perceived) permanent state of the shock variables derived from all available data about current and past values. Current prices are thus *inflexible* relative to *perceived transitory* shocks.

The analysis of the system proceeds in three steps of "ascending levels." We approach first the stock equilibrium as a basic anchor of the system's behavior. This stock equilibrium satisfies the conditions $y_t = y^*_t = y^p_t$; $\Delta S_t = 0$; $S_{t-1} = S^p_t$; $r_t = r^p_t$, $v_t = v^p_t$, $x_t = x^*_t$ and $m_t = m^*_t$.
The stock equilibrium thus ensues when all values including inventory stocks are fully adjusted to the perceived permanent condition expressed by x^*_t and m^*_t. The latter magnitudes represent the perceived permanent values of the shocks and occur as an optimal forecast of x_t and m_t based on all the available relevant information. The difference $(x_t - x^*_t)$ or $(m_t - m^*_t)$ expresses thus the perceived transitory component of the observed shocks. With the stock equilibrium or "permanent values" available we move to the "flow equilibrium values at disequilibrated stocks." These values are obtained by setting:
$y_t = y^*_t$; $\Delta S_t = \Delta S^*_t$; $r_t = r^*_t$, $v_t = v^*_t$, $x_t = x^*_t$ and $m_t = m^*_t$.
The flow equilibrium values, including the price level p^*_t, reflect the perceived permanent state of the shocks *and* the inherited stocks S_{t-1} which generally differ from the permanent stock S^p_t. The flow equilibrium system determines a rational expectations path for S^*_t, y^*_t, r^*_t and v^*_t converging to the respective permanent values. This convergence is directly ensured, without involving an extraneous transversality condition, by the structure of the economic system. Lastly, the actual values emerge by inserting in (26) the values for y^p, y^*_t, and p^*_t from the prior stock or flow equilibrium solution. The prevailing shock values thus determine actual output y_t, actual nominal (and

real) rate of interest, and the actual changes in inventories. The latter feed back into planned production y^*_{t+1} for the subsequent period. The actual values y_t, r_t, v_t, ΔS_t (or S_t) depend thus on inherited stocks S_{t-1} and the actual shock values. This analysis decomposes the observed movement of the output into three components: the evolution of a permanent component y^p_t, the evolution of a component $y^*_t - y^p_t$ reflecting the system's stock disequilibrium, and lastly a component $y_t - y^*_t$ summarizing the impact of perceived transitory productivity, aggregate demand, and monetary shocks.

The imposition of an interest rate policy can proceed within this system without producing any peculiar problems in spite of the full rigors of rational expectations. Suppose the authorities impose an interest rate target $\bar{r}$. The stock equilibrium condition delivers a corresponding (permanent) real rate and determines thus, with the nominal target rate, $\bar{r}$, an anticipated permanent rate of inflation. This implies furthermore that expected permanent monetary growth m^p_t must correspond to this inflation anticipation imposed by the choice of r. The level of the interest rate employed in the context of the interest targeting strategy thus determines the anticipated permanent inflation rate. This rate fixes moreover the permanent monetary growth imposed under the circumstances on the system. The real sector also determines in response to the perceived permanent conditions the expected flow equilibrium profile of the real rate ${}_tv^*_{t+i}$ (i.e., expected on the basis of information in t for t+i). This profile implies a corresponding profile of the flow equilibrium values of anticipated inflation rates ${}_t\pi^*_{t+i} = \bar{r} - {}_tv^*_{t+i}$. With the assured convergence of ${}_tv^*_{t+i}$ to its corresponding permanent value v^p_t the sequence ${}_t\pi^*_{t+i}$ necessarily converges to $\pi^p_t = m^p_t$. The determination of permanent monetary growth fixes moreover the permanent price level p^p_t and its expected profile ${}_tp^p_{t+i} = (1 + m^p_t)\,{}_tp^p_{t+i-1}$. These specifications imply furthermore a complete profile for the expected flow equilibrium price-level ${}_tp^*_{t+i}$. It is easily demonstrated that ${}_tp^*_{t+i}$ converges to ${}_tp^p_{t+i}$ as $i \to \infty$. And in a last step we obtain the profile of expected flow equilibrium rates of monetary growth ${}_tm^*_{t+i}$ as an endogenous result imposed on central bank behavior by interest targeting. The system assures the consistency of the expected monetary- evolution. This consistency is expressed by the following equality

$$\lim_{n\to\infty} \prod_{i=0}^{n} (1 + {}_tm^*_{t+i}) = \lim_{n\to\infty} (1 + m^p_t)^n$$

In order to anchor the system it is postulated that the two expressions can be approximated for a finite product over k periods.

The general pattern imposed on the money supply process by interest targeting can be exhibited with the aid of formula (27)

$$(27) \quad m_t = m^*_t + g(x_t - x^*_t, f) = \mu(\bar{r}, x^*_t, S_{t-1}; f) + g(x_t - x^*_t; f)$$

The actual growth rate in t follows a complicated pattern constituted by two components. The first component, i.e., m^*_t, is determined by the real sector structure contained in f, the inherited inventory stock S_{t-1}, the perceived permanent nonmonetary shocks x^*_t and the interest target $\bar{r}$. The combination (f, x^*_t, S_{t-1}) fixes the flow equilibrium profile of ${}_tv_{t+i}$. This profile combined with $\bar{r}$ yields via the profile of ${}_tp^*_{t+1}$ the profile of ${}_tm^*_{t+i}$ and thus the initial value m^*_t. The second component reflects the operation of perceived transitory nonmonetary shocks operating via perceived transitory movements in desired real balances.

Expression (27) defines the task imposed on the monetary authorities by the commitment to interest targeting. The authorities cannot rely on passive adjustments of money stock or monetary growth to a money demand conditioned by the targeted interest rate for an automatic execution of their policy. Such passive automaticity only applies to the second component in expression (27). But the first component anchors with the determination of the mean the whole money supply process. The authorities must know the structure f and the inherited inventory stocks in order to fix for any time t the mean m^*_t appropriate for any given target rate $\bar{r}$. We conclude thus that a strategy addressed to interest targeting poses no indeterminacy problem in the context of stock-flow interaction in spite of rational expectations. This strategy confronts policymakers however with a demanding information requirement, and most particularly with the question how to institutionalize, in the absence of automatic adjustments, the determination of the shifting anchor value m^*_t of actual monetary growth. An interest targeting approach produces an ever changing level of m^*_t over time as x^*_t and S_{t-1} move over time. It also imposes ever changing levels of anticipated permanent inflation rates. These requirements for a coherent execution of interest targeting probably form the crucial obstacles to this strategy and not any potential indeterminacy.

III. The Irrelevance of Full Information and the Strategy Problem under Diffuse Uncertainty

A. The Dubious Case for an Activist Regime

The case for activist policymaking bearing both on the choice of "control variables" and the setting of their respective values has been well formulated in the context of a literature postulating an asymmetric information pattern. Relying on full structural information monetary authorities can rationally select the best control variables and can also adjust them optimally on the basis of available data information to changing conditions. An activist presumption seemed the rational consequence of this situation. Rational expectations removed this asymmetry of available information implicit in traditional policy analysis initiated with Jan Tinberger [1952]. The symmetric possession of full structural information appeared to destroy the case for activist strategies by rendering the choice of strategy irrelevant. The profession's imaginative resourcefulness quickly responded to this challenge and

vindicated in some sense the case for activist policymaking. It is important to understand, however, that this vindication yields a minimal substantive content. It involves simply (a perfectly correct) denial of the proposition that no activist strategy formulated in the context of rational expectation could ever affect the distribution of real variables, and most particularly the distribution of economic activity. But this denial offers, contrary to the impression conveyed in discussions, no rational basis for the activist pursuit of monetary policy. Such pursuit must be justified, by the very nature of the case, relative to a fully specified structural hypothesis about the economic process. This hypothesis must be sufficiently confirmed moreover by critical experience to attract a professional consensus in this matter. We note a similar situation in the case of the traditional policy analysis. The usual policy analysis really establishes upon careful examination the following proposition: A structure exists, such that if policymakers possess full information about the structure, then some activist regime will dominate in terms of relevant performance characteristics a nonactivist regime. But the antecedent clause of this statement conflicts violently with the facts of our world. We do not possess such knowledge, neither do policymakers, their staffs, or academic advisors. The antecedent clause of the proposition summarizing the traditional analysis is falsified by our prevalent uncertainty. The concluding clause, not necessarily false, remains however without operational significance, without justification and without evidential support.

Fischer's emphasis bearing on the pervasive fact of overlapping contractual arrangement should encourage us to reexamine the compatibility of the full (structural) information assumption with this observation. The issue can hardly center on the rational expectation assumption itself. Once we assume full information it seems unlikely that agents would not exploit this information. The problem must lie with the full information assumption permeating our traditional policy analysis. The blatant fact of uncertain and partial knowledge expressed by conflicting propositions and formulations intrudes occasionally on the awareness of various authors in the policy literature. We note in this context that Woglin recently cautioned the reader and argued: "Given a lack of information about the structural parameters, one might justify the 'second best' approach of following a pure money stock rule. . . . " With enough information, however, the monetary authority should choose the optimal monetary instrument by looking at all the structural parameters of the model [1979, p. 95]. The problem is partially recognized but misleadingly described. A strategy adjusted to the fact of diffuse uncertainty is not a "second best strategy." The "best" strategy is simply irrelevant under the circumstances. But the problem reaches beyond the uncertainty of parameters within a fixed framework, most particularly the framework used by Woglin to exercise his analysis. The pervasive fact of diffuse uncertainty is also noted by Kalchbrenner and Tinsley. They observe that "there have been few applications of optimal control design to the prominent large scale forecasting models." The authors continue: "These pilot applications have not caused much excitement because the policy recommendations do not seem to be particularly robust; that is, the instrument solution paths are sensitive to rela-

tively small specification changes in the model or loss function." [1975, p. 14] They also refer to a survey prepared by Christ "observing that the forecast performances of the prominent macro models were similar but the certainty equivalent policy multiplier implications were remarkably dissimilar." In one stunning chart, Christ illustrates that "plots of the final form multipliers of monetary policy . . . estimated by the several structural models almost completely cover the positive orthant." [1975, p. 41] This conclusion is still confirmed by the analysis of alternative macro-models published recently by the Congressional Budget Office [1977].

The discrepancy between the full information assumption and the reality of our knowledge becomes revealed in a variety of ways and forms. Most of the contributions exploring the choice of control variables and opportunities for activist adjustments usually conclude, of course, that the nature of the choices "are essentially an empirical issue." But this conclusion just tells us what we knew already, i.e., that the strategy issue involves questions beyond a purely logical realm. The concluding remark attesting the empirical nature of the issue thus reveals the uncertain range of inconclusive information bearing on the strategy problem. We also note the frequent allusions made in this context to the effect "that the world is complex." The world is indeed "complex" relative to the requirements necessary for the rational determination of an activist strategy. We need detailed knowledge of the structure which is not available in any reliable form. That makes the world unavoidably "complex." It is remarkable however that policymakers, their staffs or academic advisors, after bemoaning this "complexity" still find it possible (by divine intuition not accessible to others) to settle on a finely tuned course of monetary policy justified in very specific historical terms.

Our problem seems also to lurk behind a traditional juxtaposition of approaches to monetary policy, juxtaposing "discretion" and "rules." The evolution of policy analysis selectively surveyed in previous sections would suggest that this juxtaposition falsifies the nature of the issue. The choice appears to be between alternative rules, defining alternative strategies, of conducting monetary policy. The "discretionary" component of the choice, in conjunction with the judgmental intrusions observed in the Fed's actual policymaking procedures, reveals however the true state of uncertain and dubious information pertaining to the requirements of activist policymaking. A judicious vocabulary usefully contributes to the obfuscation of the essential irrationality of the "discretionary" policymaking proceeding against the background of "discretionary information."

Advocates of activist monetary strategies objected in recent years to the more or less implicit information requirements imposed on agents in the rational expectations literature. It is argued that we can hardly expect agents to possess (reliably) the structural information laid out with the analysis. This seems particularly unreasonable in view of the difficulties confronting our profession in this respect. Indeed. But if this assumption is unreasonable for private agents why should it be reasonable for policymakers, their staffs, and academic advisors? The very same groups rejecting the rational expectations

literature on grounds of comparatively poor structural information proceed with arguments implicitly attributing to themselves or to policymakers a monopoly of perfect structural information [Ben Friedman, 1977].

The fundamental information problem confronting the rational choice of a monetary strategy may be characterized with the aid of the following schema

$$\text{(a)}\quad \dot{x}_t = f_t[x_t, a_{1t}, a_{2t}, u_t]$$

$$\text{(28)}\quad \text{(b)}\quad a_{1t} = d_{1t}[x_t, u^{*1}_t; d^{*1}_{2t}, f^{*1}_t]$$

$$\text{(c)}\quad a_{2t} = d_{2t}[x_t, u^{*2}_t; d^{*2}_{1t}, f^{*2}_t]$$

The state vector x_t evolves over time in accordance with a structure f_t and in response to actions a_{1t} by private agents, actions a_{2t} executed by policy agencies and a shock vector u_t. The actions a_{1t} of private agents depend on a disposition d_{1t} summarizing their decision propensities. These actions depend thus on the current state and the underlying shocks u^{*1}_t perceived by the agents. The decision propensity is moreover conditioned by the agents' perception f^{*1}_t of the structure and of the policy agencies' disposition d^{*1}_{2t}. A corresponding disposition d_{2t} governs the actions of policy agencies. These actions depend in accordance with d_{2t} on the current state and the agencies' perception u^{*2}_t of underlying shocks. The disposition d_{2t} is moreover conditioned by the policy agencies' perceptions f^{*2}, d^{*2}_{1t}, of the structure and private agents' dispositions.

The crucial assumption justifying an activist regime of monetary policymaking specifies that policymakers reliably possess all the relevant detailed information. This means in particular that $f^{*2}_t = f_t$, $d^{*2}_{1t} = d_{1t}$ and u^{*2}_t correspond to the objectively best estimate of shock realizations given full knowledge of f. But these assumptions cannot survive the most cursory examination of our actual state of knowledge. What remains of the case for activist policy procedures? With f^{*2}_t, and d^{*2}_{1t} substantially deviating from the relevant structure f_t and disposition d_{1t} and d^{*1}_{2t} uncertainly shifting in accordance with private agents' perceptions, drifting in response to unclear signals bearing on the policy agencies' behavior, policymaking moves in a murky jungle. There is no assurance under the circumstances that any particular activist course exemplified by choice of d_{2t}, (including a pattern of ad hoc actions motivated by an immediately prevailing state x_t) will improve in any way the evolution expressed by the state path. There is no rational foundation under the circumstances for the policy deliberations characterizing the prevalent literature or the procedures dominating most central banks.

The problem is actually amplified by what may be called the "Lucas effect." Lucas effectively demonstrated [1976] the dependence of d_{1t} on d^{*1}_{2t}. Variations in policy regimes expressed by changes in d_{2t} thus induce modifications in private agents' dispositions governing their actions. This conse-

quence undermines the usefulness of simulating alternative policy regimes in the context of an invariant structure and propensity (f, d_1). John Taylor correctly argued however [1979] that an invariant structure f can be separated from the affected disposition pattern d_1. The latter's dependence on d_{2t} can thus be explicitly recognized. With a reliable estimate of the invariant portion of the total structure, i.e., f, and a reliable formulation of the dependence $d_1(d_2)$ alternative policy regimes can be correctly evaluated with full recognition of the "Lucas effect." But Taylor's argument proceeds again within the context of sufficient information for the purpose at hand. The Lucas effect operates in contrast with a pervasive influence in the context of diffuse information about the structure and also about the nature of prevailing strategies pursued by the monetary authorities. Recognition of changing policy regimes proceeds with uncertain and uneven speed and there will be little basis for the authorities to judge reliably the changes in d_{1t} actually produced. The information problem bearing on the structure f persists moreover. This combination yields no assurance that the more likely outcome of policy regimes d_{2t} sequentially adjusted to perceived private dispositions d^{*2}_{1t} within a dubiously known structure f^{*2}_t would not produce intermittent and perverse destabilization patterns in the time path of the state vector. Once we move however into the realm of uncertain structural information we should also recognize another dimension of a generalized Lucas effect reaching into the structure f_t itself. This aspect was probably recognized on an nonanalytic level by Gordon and Hynes [1970] at a comparatively early stage. These authors emphasized the communications and information dissemination process associated with the operation of the market mechanisms. In the context of incomplete structural information suffered by agents this communications process produces intermittent modifications of the perceived opportunity set. These modifications may be induced by relative price changes, but may involve dimensions beyond the price vector confronting agents. They pertain most particularly to potential transactions disregarded and excluded under prior information states. The emergence of financial innovations on the supply side of financial markets and enlarged horizons (perceived opportunity set) for potential investments by households observed in the United States over the past decades exemplifies my point. The dependence of perceived opportunity sets on the evolution of the state vector under the impulse of stochastic shocks and public actions leads us to reject the idea of an invariant structure convergingly approximated by an ever expanding econometric model. The structure f_t is itself time dependent under the circumstances and well expressed by some of the available pilot studies exploiting the stochastic coefficent approach [Mullineaux, 1980]. This time-variant behavior of f resulting from the information-dissemination process produced by the market mechanism perpetuates the wedge between the different perceptions f_t^* of f_t held by private agents or policy agencies. The information problem confronting the rational formulation of activist strategies remains thus entrenched beyond the hopeful patience for a larger sample or for a larger model with more equations.

The reservations about any activist regime on grounds of diffuse uncertainty about the structure of the economic process extends, as we noted previously, to strategies involving a targeting of interest rates. Equation (27) reveals the options available to a central bank. It either maintains the expectation of permanent inflation by adjusting the target nominal rate $\bar{r}$ concurrently with the real rate $v_t^p = v(x_t^*; f)$, or it holds on to $\bar{r}$ and lets the expectation of permanent inflation move opposite to the changes in the permanent real rate. Agents require under both options full information about the procedure selected. This requires under the second option in particular an immediate adjustment in the public's expected permanent rate of inflation from period to period as the perceived permanent nonmonetary shocks evolve. The load of the information requirement imposed by an interest targeting policy is thus at least as large as for any activist regime. It reaches actually beyond the standard requirement of full information enjoyed by the policymakers. It also includes a requirement of full information by agents on the market place. A "strategy" of interest targeting under diffuse uncertainty about the structure f and the stochastic structure controlling nonmonetary shocks faces under the circumstances described the dangers of potential destabilization discussed with the aid of the expression (28).

B. The Case for a Nonactivist Regime under Diffuse Uncertainty

The description of the strategy problem under diffuse information pertaining to structural detail encourages reservations concerning activist dispositions but yields no clear answer. Milton Friedman made his famous case for a nonactivist strategy of a constant monetary growth (CMG) more than 30 years ago precisely on the basis of diffuse and uncertain structural information [1953]. He formulated the problem on subsequent occasions in terms of long and variable lags built into the process transmitting monetary (and other) impulses. But this apparently somewhat special formulation need not distract us. The emphasis on "long lags" in particular, may be somewhat irrelevant at this stage in view of the results presented by Fisher-Cooper [1973] and also in view of the inherently endogenous character of these lags determined by the markets' information process. "Long lags" may be shortened without alleviation of the state of diffuse information. Friedman's essential argument remains however correct in my judgment. Whatever reservations and objections I have encountered in the literature postulate without exception some levels of reliable information which would rationally justify abandoning a nonactivist policy. But they also fail without exception to provide any support for their specific information levels assumed for purposes of their discussion. Neither have I observed a groundswell of professional concensus around the specific information patterns adduced.

My argument develops Friedman's original idea in the context of an alternative formulation with more explicit attention to the nature of the information problem. We use for the present purpose the language system offered by the quantity equation. This choice need not prejudge our issue. It

offers but a useful organization of the analysis with implications ultimately dependent on the patterns of diffuse information and the associated assessment of rules. It will be shown that the interest targeting case familiar from Poole's argument can be subsumed under the strategy cases examined.

$$(29) \quad \phi M\bar{V} + (1-\phi^*)M^*V^*x + PG = P(Y - \Delta N)$$

introduces the basic frame expressing aggregate nominal demand confronting the market value of supply. The latter is a product of price level P multiplied by "final sales," i.e., output Y corrected for inventory accumulation ΔN of suppliers. Aggregate nominal demand is the sum of three components. The first term describes the private domestic sector's demand for domestic output. This demand occurs as a product of an allocation parameter ϕ multiplying *total* private expenditures $M\bar{V}$. This magnitude is the product of domestic money stock M and domestic *private* expenditure velocity $\bar{V}$. The parameter ϕ determines the allocation of total private domestic expenditures between domestic and foreign output. This allocation parameter will depend in general on relative domestic and foreign prices and the exchange rate. The second term on the left describes the foreign demand for domestic output. This component is the product of total foreign private expenditures $M^*\bar{V}^*x$, expressed in domestic units by application of the exchange rate x, and the allocation parameter $(1-\phi^*)$. This parameter describes the allocation of total foreign private expenditures to the acquisition of domestic output. Total foreign expenditure is again a product of money stock, i.e., M* and the appropriate private expenditure velocity $\bar{V}^*$. The last term PG measures the value of the domestic output absorbed by the government sector.

The expression introduced with equation (29) is usefully translated into a more familiar format with a standard velocity expression V. The translation reveals some of the background processes shaping the behavior of the usual velocity measure. It reveals in particular that the use of the standard formula as a language system does not "disregard" aspects of fiscal policy or the position of an open economy. Equation (30) presents the standard formula expressed in

$$(30) \quad \Delta m + \Delta v = \Delta p + \Delta y$$

logarithmic first differences in order to focus on rates of change. The standard velocity V, such that $\log V = v$, is defined under the circumstances by equation (31)

$$(31) \quad V = \frac{\phi}{1-g-n}\bar{V} + \frac{1-\phi T^*}{1-g-n}\frac{M^*x}{M}\bar{V}^*$$

where n and g are proportions of inventory and government absorption char-

acterized by the equations $\Delta N = nY$ and $G = gY$. The standard velocity V multiplying money stock M in order to yield total output at market value appears thus as a linear combination of domestic and foreign private expenditure velocities $\overline{V}$ and $\overline{V^*}$. The coefficients of the linear combination depend on the domestic and foreign parameters allocating total private expenditures between domestic and foreign goods, the proportion of inventory accumulation and government absorption.

We proceed to introduce four more specifications. These are addressed to the supply side. Equation

$$\text{(a)} \quad \Delta p = \Delta p_1 + \Delta p_2$$

$$\text{(b)} \quad \Delta y = \Delta z + \Delta ny$$

(32)

$$\text{(c)} \quad \Delta p_1 = E\,[\text{aand}|\, I_t]$$

$$\text{with aand} = \Delta m + \Delta v - \Delta ny - u$$

$$\text{(d)} \quad \Delta p_2 = \theta \Delta z + u$$

(32b) decomposes output into a normal component ny determined by the prevalent "permanent" underlying real conditions of the economic process and a more or less transitory component deviating from the normal level. This formulation expresses the conjecture [Beveridge-Nelson, 1981; Nelson-Plosser, 1980] that most National Bureau time series can be usefully approximated as the sum of a random walk and a stationary process. A corresponding partition is applied to the movement of the price level. The second component, i.e., Δp_2, expresses transitory (i.e., less durable) movements in the price level associated with the transitory output component Δz and reflecting partly a stochastic element u.

The first component of the change in price level approximates the notion of a persistent rate of inflation. Agents adjust the price setting to the perceived momentum of nominal aggregate demand ($\Delta m + \Delta v$) adjusted for changes in normal output and the chance element associated with the second component in price changes. This price setting proceeds in the context of the partial ignorance (or partial knowledge) about the structure of the economic process. It is conditioned by any clues and signals available to agents bearing on the crucial development of the adjusted nominal aggregate demand. The information problem is moreover reflected by the circumstance that the expectation E differs from the objective expectation E* corresponding to the prevailing stochastic structure governing the economic process. The expectation E is thus formed according to the very incomplete information about the structure of the relevant processes conditioning the signs watched by the agents. It follows that even with a constant E* the "subjective" expectation E will change with shifting information bearing on the process determining E*.

The price setting expectation E appears thus relative to the central anchor E* as a random term with a distribution determined in principle at any moment by the structure of underlying processes and the nature of agents' information absorption patterns.

The prevailing state of diffuse structural uncertainty is moreover characterized by a set S of possible states s of the world. These states do not refer to positions of the economic system typically represented by a state vector. They represent the range of structural conditions governing the evolution of the economic process. They subsume in particular also the stochastic structure of all inputs into the process. They subsume moreover a range of possible fiscal policy regimes. Such regimes modify the processes shaping the behavior of Δv and affect over the longer run also the behavior of Δny. The monetary strategy or monetary policy regime will be denoted with π. The combination (s,π) describes thus a definite monetary regime operating in a specific structural state. On the basis of a given inheritance expressed by some initial condition of the economic process the pair (s, π) fully determines the stochastic path of the economic system. To any pair (s, π) a specific pattern of the system's evolution becomes thus associated.

The specification laid down in (32) allows us to rearrange (30) into the following expression (33)

$$(33) \quad \Delta z = \frac{1}{1+\theta}\,[(aand - E^*) + (E^* - E)]$$

The two expectations E and E* are applied to the adjusted nominal aggregate demand aand. The magnitude Δz expresses the object of stabilization policies. Such policies are addressed to lower the variability of Δz. This variability is well expressed by the variance $E^*[\Delta z - E^*(\Delta z)]^2 = E^*(\Delta z)^2$. Upon application of the expectation E* to the expression in equation (33) we derive after some rearrangement equation (34)

$$(34) \quad E^*(\Delta z)^2 = \frac{1}{(1+\theta)^2}\,[NV + PV + UC]$$

with the following definition for NV, PV, UC

$$NV = \sigma^2(\Delta v|\, s,\pi) + \sigma^2(\Delta ny|\, s,\pi) + \sigma^2(u|\, s,\pi)$$

$$PV = [\sigma(\Delta m|\, s,\pi) + \rho_{mv}(s,\pi)\cdot\sigma(\Delta v|\, s,\pi]^2 - \rho^2{}_{mv}(s,\pi)\cdot\sigma^2(\Delta v|\, s,\pi)$$

$$UC = E^*[E\Delta m - E^*\Delta m]^2 + E^*[E\Delta v - E^*\Delta v]^2 + E^*[E\Delta ny - E^*\Delta ny]^2$$

The notation $\sigma^2(x|\, s,\pi)$ refers to the variance of $x = \Delta m, \Delta v, \Delta ny, u$; ρ_{mv} represents the correlation between Δm and Δv. All variances and the correlation ρ_{mv} depend on the state s and also, particularly those of Δm, Δv and ρ_{mv} on the monetary regime π. The variances are thus functions of (s,π) and cor-

respondingly conditioned. The parameter θ, while not (necessarily stochastic) depends also on (s,π). The specific dependence of θ on π has been formulated by Lucas [1976]. The reader will note that all covariances with the exception of Δm and Δv, are disregarded at this stage.

Equation (34) partitions the total variance of Δz into three distinct components; the "natural variance NV, the policy variance PV, and the uncertainty component UC." The natural variance emerges from the processes conditioning the behavior of Δv, and Δny and u. We caution however that the term used (i.e., natural variance) should not be misleadingly burdened with metaphysical meanings. It is most probably not independent of policy regimes governing the economic process. Monetary analysis informs us that different choices of π yield different behavior patterns of Δv. The natural variation is moreover exposed to the influence of the fiscal regime impounded into the possible states. The second item, i.e., the policy variation PV, is substantially determined by the choice of monetary strategy in the context of a particular state s. The last term reveals the pervasive structural uncertainty suffered by agents. The nature of the existing uncertainty shapes the behavior of the "estimates" represented by the expectation E relative to the true mathematical expectation E^*. This uncertainty component, and most particularly its first term, is quite sensitive to the nature of the policy regime and depends moreover, via the nature of the prevailing institutional regime, on the state s. This aspect will be examined in the following section of the paper.

In order to proceed with some ordering of the possible strategies a criterion function needs to be formulated. The following expression is proposed for this purpose.

$$(35) \quad C(s,\pi) = \frac{E^*(\Delta z)^2}{NV} - \frac{1}{(1+\theta)^2} = \frac{1}{(1+\theta)^2}\left[\frac{PV}{NV} + \frac{UC}{NV}\right]$$

The criterion is clearly a function of s and π. It is defined as the sum of the policy variation and the uncertainty component per unit of natural variation, modified with the expression $(1+\theta)^{-2}$. We disregard for the moment the uncertainty component and reintroduce it subsequently. We obtain under the circumstances a natural zero point for the criterion function at $PV = 0$. Monetary regimes producing a positive value of PV thus destabilize the economy, whereas regimes generating negative values for PV actively stabilize the process. Regimes satisfying $PV = 0$ may be characterized as neutral regimes.

The criterion function defines a decision matrix. The columns of the matrix may be linked to the possible states. The rows are associated on the other hand with strategies available to the monetary authorities. Each row represents a particular regime π. The broad structure of this matrix determines our argument. One particular property of the matrix is obtained by reflecting on the optimal choice of π for any given specific state s. The expression for the policy variation in equation (31) determines the condition for an optimal selection of π as follows

$$(36)\quad \sigma(\Delta m|s,\pi) = -\rho_{mv}(s,\pi)\cdot\sigma(\Delta v|s,\pi)$$

The criterion function acquires under the circumstances the following form

$$(37)\quad C(s,\pi) = -\frac{1}{(1+\theta)^2}\rho^2{}_{mv}(s,\pi)\frac{\sigma^2(\Delta v|s,\pi)}{\sigma^2(\Delta v|s,\pi)+\sigma^2(\Delta ny|s,\pi)+\sigma^2(u|s,\pi)}$$

All terms on the right side constituting the product are positive. We obtain thus a negative criterion value. We recognize according to (37) that there exists for every feasible state of the world a monetary regime π which effectively stabilizes the economy. This optimal regime $\hat{\pi}(s)$ lowers the total variability of Δz below the reference point formulated in terms of the "natural variance." We also note that all three terms of the product defining the optimal criterion value assume values in the open unit interval. This is immediately obvious for the first and third term. The middle term reflects the association between Δm and Δv in a genuine stochastic context precluding the emergence of a perfect correlation $|\rho_{mv}| = 1$. It follows therefore that every column of the matrix possesses some negative elements. These negative elements are however all bounded from below and exceed algebraically minus one. States producing comparatively smaller ρ^2_{mv} and $\sigma^2(\Delta v/s\pi)$ or comparatively larger $\sigma^2(\Delta ny|s,\pi)$, $\sigma^2(u|s,\pi)$ or θ raise the minimal value in the respective columns nearer to zero from below. These structural conditions attenuate thus the net stabilizing effect of an optimal regime.

A special case contained in Poole's analysis may be examined for a moment at this point. Suppose we omit all considerations of supply behavior according to the traditional IS-LM procedure. This implies the following conditions: $\sigma^2(\Delta ny|s,\pi) = \sigma^2(u|s,\pi) = \theta = 0$. Assume furthermore that the variance of the output market disturbances vanishes. Poole's analysis determines under the circumstances that an interest targeting strategy lowers the variance of output to zero. A monetary regime addressed to the proper targeting of interest rates achieves perfect stability. This means that in terms of the framework used in this section, and with the conditions imposed, the optimal policy regime satisfies the conditions

$$(38)\quad \sigma(\Delta m|s,\pi) = -\rho_{mv}(s,\pi)\cdot\sigma(\Delta v|s,\pi) \text{ and } \rho_{mv}(s,\pi) = -1.$$

These conditions, combined with the conditions characterizing the omission of supply behavior yield the perfect stability expressed by $E^*(\Delta z)^2 = 0$. This special case may possess its educational virtue for classrooms but can hardly contend for admission in the feasible range of considerations.

A second property of the matrix directs our attention to values of the criterion function in each row. We recognize that for each policy regime π feasible states exist which convert π into a destabilizing process. In other words, for every π there occurs s, such that the pair (s,π) produces a variance of Δz exceeding the natural variance. The existence of this property can be demonstrated with the aid of simple examples or with the aid of simulation exer-

cises executed with various models.

A last property needs to be presented. The matrix exhibits at least one row containing only zeroes. We note in other words the existence of at least one strategy π satisfying the condition

$$(39) \quad \sigma(\Delta m|s,\pi) = \rho_{mv}(s,\pi) = 0 \text{ for every } s$$

These conditions imply that PV = 0. The matrix contains thus rows characterizing the operation of a neutral regime. An effective policy of constant monetary growth would clearly satisfy the condition (39). Other monetary regimes involving variations in monetary growth could "in principle" satisfy the same conditions. But the information requirement associated with alternative regimes would raise the uncertainty component UC beyond the level determined by a strategy of constant monetary growth. This aspect will be considered in a subsequent paragraph.

The general structure of the decision matrix crucially influences the choice of a strategy. The matrix informs us that we could "luck in" and select a regime ensuring a stabilizing effect on the time path of output. But we do not know the actual state s within the feasible range of uncertainty. We can therefore not ascertain an optimal π precisely geared to the prevailing s. Whatever policymakers, their staffs, or academics may tell us, the idea that we know s and can therefore appropriately select π is a grand illusion. But every activist strategy runs the risk of a destabilizing performance. There is no assurance that the perceived or believed state s guiding the choice of π is anywhere near the relevant structural condition s. The risk is moreover not symmetric. The "positive risks" of "lucking in" are bounded from below. The net stabilization effect may frequently be comparatively modest. Whatever the situation may be however, the net stabilization effect remains a fraction of the natural variation. The destabilizing potential is on the other hand much larger and could push the actual variance to a substantial multiple of the natural variance. The history of monetary policy in the United States, Germany, or Switzerland over the past 60 years should reveal with its unfortunate experiences some aspects of the asymmetry in risks associated with activist strategies. The choice of a nonactivist strategy, expressed by a constant monetary growth, effectively avoids the asymmetry of positive and negative risks associated with any activist regime. The selection of this neutral regime assures us that

$$PV = 0 \text{ and } E^*(\Delta z)^2 = \frac{1}{(1+\theta)^2} NV$$

This regime precludes the destabilization potential inherent in all activist strategies. It also forfeits on the other hand potential stabilization effects. We should not expect that a neutral strategy proceeds without any costs. But in my judgment the asymmetry of risks tilts the balance very definitely towards the pursuit of nonactivist monetary control strategies.

The case for a nonactivist strategy receives additional support from three aspects neglected so far. We already noted the dependence of $\sigma^2(\Delta v|\, s,\pi)$ and $\sigma^2(u|\, s,\pi)$ on the policy regime. The reliable execution of a policy maintaining a constant monetary growth would probably also lower the variance of Δ v and of u. Monetary regimes cultivating an unreliable course with frequent shifts raise most likely the variance of both Δ v and u. The removal of at least this component of uncertainty imposed by the monetary authorities contributes to constrain $\sigma^2(\Delta v|\, s,\pi)$ and $\sigma^2(u|\, s,\pi)$.

The operation of the generalized Lucas effect also deserves our attention. Whatever the initial state may be, the choice of π will induce a shift in s according to the narrower Lucas effect and the process explored by Kydland-Prescott [1977]. This shift is reenforced over time by the more general effect discussed above and generated by the information dissemination aspects of the market mechanism. It follows that the relevant cell in the matrix will drift along any particular row determined by a prevailing regime. This pattern increases the uncertainty confronting policymakers and raises the risks associated with an activist regime. An argument advanced by Sir John Hicks refers to aspects of the economic process generating a similar pattern of shifts along any row of the matrix [1974]. Hicks discusses the sensitivity of the multiplier process with respect to the pattern of initial conditions most particularly represented by the distribution of inventories. He notes that the magnitude of the multiplier effect triggered by autonomous expenditure shocks (or monetary policy for that matter) varies with the initial conditions. Variations in initial conditions can be expected under the circumstances to be associated, for any given fiscal or monetary action, with substantially different values of Δv over the subsequent periods. These differences in initial conditions contribute to the distinction between the possible states s defining the matrix columns. Activist regimes experience under the circumstances crucial difficulties in systematically avoiding destabilizing impulses.

The behavior of fiscal policy also reenforces, as we may note in passing, the case for a "neutral regime." The history of fiscal policymaking in the United States and possibly some other countries, is burdened with shifting uncertainties and unexpected twists and turns, modifications, revisions, etc. The political economy of fiscal policymaking should prepare us for such patterns. The neat resolutions of Pareto-optimal tax structures or efficient expenditure programs may be useful devices to evaluate reality, but they certainly do not describe the product of reality. Fiscal policymaking thus supplements the shifts along a row in the decision matrix already produced by the extended Lucas effect.

Our last point to be considered involves probably the most important element discriminating between activist regimes and a neutral strategy. It weighs, most likely, more heavily in the ultimate balance affecting the choice between the two classes of strategies. We omitted so far any considerations of the uncertainty component UC. The diffuse state of information discussed in the previous paragraph of this section assures the occurrence of positive

values for all three terms constituting UC. This implies that the reference point of the decision matrix moves beyond zero into the positive range. It also follows that the minimal value $C(s,\pi)$ in each column s moves closer to zero. The relevant magnitude of "lucking in" expressed by the relative net stabilization effect thus declines. The recognition of UC twists the asymmetry of risks still further against the adoption of activist regimes.

The nature of this uncertainty terms requires some attention. Agents perennially face the world with woefully incomplete information. They note the changing conditions affecting their position. Their self-interest naturally drives them to look for signals bearing on the future evolution of crucial conditions. But whatever the array of observations available to agents, they still need to make inferences about the nature of the variations observed. They will respond in general very differently to more or less transitory changes or to more permanent changes. Agents will rarely ever know whether any particular modification in surrounding conditions is permanent or transitory. But in order to make decisions and to act they will need their best judgment in this matter. The perceptions determined by this inferential judgment hardly coincide with the actual state. The perceived permanent and transitory conditions will differ from the actual conditions even in the context of full stochastic structural information [Brunner-Cukierman-Meltzer, 1980]. The larger the operation of transitory variations, expressed in terms of relative variances, the larger looms the agents' inference problems. Their perception of both permanent and transitory conditions affecting their operations becomes less reliable under the circumstances. Even major changes in permanent conditions require substantial time before they will be incorporated in the agents' perception. They tend thus to be misconceived for a time, depending on the relative noise in the observation, as essentially transitory occurrences. The inference problem continuously confronting agents coping with their social environment suffers a "quantum jump" once we move beyond the realm of full knowledge of the stochastic process. The "noise-level" in the data is substantially enhanced. Perceptions tend to diverge markedly from the true values. They also tend to be more volatile than in the context of a known stochastic structure. These patterns produced by a pervasive inference problem, imposed on agents by a fate of diffuse uncertainty, dominate the uncertainty component UC occurring in the total variance of output. The shifting sample of incomplete information pertaining to data and their interpretation determines the components in UC cast up by the economic process, i.e., $E^*[E\Delta v - E^*\Delta v]^2 + E^*[E\Delta ny - E^*\Delta ny]^2$. These components may be conditioned to some extent over a longer run by aspects of economic policymaking. The nature of the fiscal policy regime should be expected to exert some influence in this respect. The prevailing monetary regime on the other hand would dominate the first term, i.e., $E^*[E\Delta m - E^*\Delta m]^2$ and probably to some extent also the velocity term.

The uncertainty associated with activist regimes reaches beyond the state of the world. Such regimes do not operate in the manner described by an analysis of optimal controls. The subsequent discussion of the political econ-

omy of monetary policymaking elaborates the irrelevance of activist regimes formulated in accordance with optimal control procedures. This kind of "activism" will hardly be tolerated by the forces shaping the behavior of political institutions. Activist policymaking usually emerges in the form of a "discretionary" practice. This practice creates uncertainties beyond the location of the true column in the decision matrix. It confronts agents on the market place with an additional uncertainty pertaining to the course followed by the monetary authorities and the specific actions to be expected. The pervasive nature of this supplementary uncertainty is reflected by the hordes of well-paid people interpreting the last signals and clues contained in recent actions and utterances of central bank officials or embedded in the last observations. A variety of indicators would suggest that, even with a comparatively constant coefficient of determination of monetary growth, the uncertainty about the course of policy in the 1970s substantially increased beyond the level prevailing in the 1950s or early 1960s. Discretionary policies contribute thus to raise the uncertainty component. They raise the first term directly and also the second term indirectly via supplementary and difficult to infer shorter run variabilities in velocity. This result is produced by the exposure of agents to complications of their information problem beyond the uncertainties produced by the "state of nature" and fiscal policy. The choice of an nonactivist strategy of constant monetary growth removes the information problem artificially imposed by discretionary policymaking. A reliably executed strategy of constant monetary growth lowers the first term in the uncertainty component UC to the vanishing point and most likely moderates the second term in the uncertainty component for the reasons indicated above.

We noted previously that a strategy lowering the policy variation to zero could conceivably still exhibit substantial variations in E* over time. But such variations unavoidably burden agents with additional information problems. A short-run pattern of moving E* values expresses again an activist disposition operating under the usual institutional arrangements within a substantially discretionary context. This strategy pattern is thus bound to generate a nonvanishing first term in the uncertainty component. This argument bears with particular significance on proposals advocating a return to the gold standard. The dependence of a major source component of the monetary base on the balance of payments impounds disturbances from all over the world into the domestic monetary growth. This is amplified by the uncertainty associated with the relation between the domestic credit and foreign reserve sources of the base. A return to the gold standard produces under the circumstances a positive PV component and a positive term $E^*[E\Delta m - E^*\Delta m]^2$. A return to the gold standard offers no particular assurance of a stable price level or of a substantially lowered policy variation PV or uncertainty component UC.

Two aspects of the argument advanced in support of a nonactivist regime need to be distinguished. Our cognitive endeavors typically begin with some more or less articulated idea bearing on some phenomena or problem. The explication of this idea, i.e., its translation into a more developed argu-

ment or formulation, is seldom uniquely determined. This applies to our case. The argument advanced in this section may not be the most effective explication of the basic idea governing the case for a nonactivist regime. There are always grounds to hope for a more adequate formulation of the central issue. One aspect of the argument advanced may be reexamined however at this stage. For any given pair (s,π) there is in principle a well-defined expectation E^* of the adjusted aggregate nominal demand aand. This need not apply necessarily to the "subjective" expectation E summarizing the agents' inference problem under a state of diffuse uncertainty. This aspect may deserve some further attention. Consider for our purposes the movement of a specific price, say of the i'th good. The supplier of such a good conceivably looks at his price in the context of the general price movement. The change of price i at time t, expressed by $\Delta p(i,t)$ is partitioned under the circumstances into two components

$$\Delta p(i,t) = a(i,t) + s(i,t)$$

where a(i,t) describes the i'th market's assessment of the aggregate price movement common to all specific prices, i.e., for all i. The second term denotes in contrast the i'th market's perception of specific or relative price movements. Both aggregate and specific terms are a sum of (perceived) permanent and transitory terms indicated by the subscripts 1 and 2. We obtain thus

$$\Delta p(i,t) = [a_1(i,t) + s_1(i,t)] + [a_2(i,t) + s_2(i,t)]$$

$$= \delta(i,t) + \tau(i,t)$$

The first term (i.e., δ) expresses the i'th market's assessment of permanent conditions, whereas τ summarizes the perceived transitory movements. Aggregation over all markets yields

$$\Delta p = \delta + \tau$$

The second term (i.e., τ) corresponds with the component Δp_2 and is linked with more or less transitory output movements. The first term reflects the agents' prevailing assessments of the persistent trend in underlying conditions. This assessment may be influenced by a wide variety of signals and clues observed by the agents. The relevant information set used by the agents may in particular not be related explicitly with the components of adjusted aggregate nominal demand. It would thus appear that $\delta(i,t)$, the generic component of δ , is formed as the projection of $\Delta p(i,t)$ on the relevant range of perceived permanent condition, a projection shaped by some information set I(i,t) affecting suppliers on market i.

Several aspects of this modified argument bear on our problem. We note

first that absence of any explicit recognition of the components of aand does not disconnect the subjective assessments from the agent's perception of aand. The competitive drive of self-interested agents tends to link over time their best assessment of $\Delta p(i,t)$ via δ (i,t), with the perceived evolution of aand. The modified story implicitly loosens however the connection somewhat. It also directs attention to the sensitive exposure of δ (as an average over all markets) to possibly volatile shifts in the composition of the distribution of δ(i,t). Neither aspect affects the policy variation PV, but they do bear importantly on the uncertainty component UC. The latter need be expressed under the circumstances as E^* $[E(\Delta p| I(i,t) - E^*aand]^2$ where the first term represents the average over all markets of δ(i,t) based on I(i,t). The modified story actually reenforces the relevance of the uncertainty component. It reenforces also, so it would appear, the importance of lowering the information burden imposed on agents. A strategy of constant monetary growth would create certainty in one realm of pertinent information influencing the agents' price-setting behavior. Lastly, the portion of volatile shifts in the distribution of the δ (i,t) affecting δ generated by shifting perceptions of the stance assumed by discretionary policies could be effectively removed. The net effect essentially involves an increase in the information level with a corresponding improvement in the inferential patterns. The consequence is a lower contribution of the uncertainty component to the output variance.

IV. Aspects of Political Economy and Institutional Policy

The prevalence of diffuse uncertainty determines an important strand in the case on behalf of a strategy anchored with a constant monetary growth (i.e., CMGS). An examination of the array of arguments advanced in justification of discretionary and potentially activist policies reveals however a second strand. It involves in particular a specific view of the political economy of political institutions. But attention to this second strand does not yet complete my arguments. There remains the question of controllability and the practical feasibility of controlling monetary growth. This question involves several issues under the general heading of an institutional policy which still requires the readers' attention.

A. Aspects of the Political Economy of CMGS

Advocates of a discretionary policy invoke beyond the required information level possessed by policymaking staffs also a "goodwill" or "public interest theory" of the operation and behavior of political institutions. This means essentially that we can reasonably expect the staffs of policymaking agencies to concentrate their efforts on the rational exploitation of their fully available information for the maximization of some appropriate social welfare function. The personnel of the political institutions, liberated from the social pressure of the market system's compelling attention to self-interested

behavior, would know no other incentive but to serve (responsively and responsibly) the public interest.

This section raises some delicate issues. Many professionals are easily disposed to attribute *any* position or view bearing on socio-political issues to an ideological commitment. Others seem ever ready to impugn ideas deviating from their views as an expression of "narrow and ideological" positions. This pattern of "media fallacies" is however singularly shallow. Our approach to the evaluation of a political institution is conditioned by two alternative hypotheses about man and his basic behavior: the sociological model of man and the model of a resourcefully evaluating maximizing man introduced by the Scottish moral philosopher of the 18th century into the social sciences [Brunner-Meckling, 1977]. The two alternative conceptions involve radically different and ultimately assessable assertions about our world. The "public interest theory" permeating much of the interventionist literature appears essentially as a special case of the sociological model of man. I contend that the alternative hypothesis offers as a matter of empirical fact a more relevant explanation of man's behavior in the context of both market *and* political institutions. The difference between the two conceptions sharpens the conflict surrounding the choice of strategy resulting from the analysis of prevailing information levels.

A systematic application of economic analysis to the realm of political institutions reveals a basic ambivalence of political structure. The emergence of political structure is a necessary condition for a civilized society. The social productivity of political structure which removes a particular form of negative sum game of social interaction is well understood. But the institutions constituting a political structure also create new opportunities for different forms of more or less regulated negative sum games. Every political institution can be characterized by the opportunities offered for new areas of self-interested exploitation. These opportunities will condition the behavior of the staff operating the political agency and also the behavior of agents in the market place with potential exposure to the institution. The correlation between motivating intentions and actual performance becomes quite haphazard under the circumstances. The staff, following the basic pattern of human behavior, will explore opportunities for self-interested self-expression over a wide range of forms and actions. The staff's supply behavior is encouraged by the prospect of potential transactions with a demand emerging from "outside" groups of agents exploring the potential opportunities associated with the political institution [Kane, 1980]. A choice of activist strategies is therefore not translated into a well-established and generally understood pattern described by optimal control procedures or optimal techniques of information extraction. Some special study groups tolerated by the organization at a safe distance from the policymaking centers may be committed to such exercises. The incentive structure of the organization conditioning the staffs' behavior, reenforced by the pervasive state of diffuse uncertainty implicitly acknowledged in the discussions and procedures characterizing the interaction between staff and policymakers, converts activist dispositions into the

reality of "discretionary policies." Such policies produce, almost without exception, substantial uncertainty about the course actually pursued by the monetary authorities. This uncertainty is well expressed with the secret maintained by the authorities over many years about their decisionmaking. It is also expressed by the Fed's disregard of Congressional recommendations and resolutions, and the large number of people gainfully employed to watch and interpret the Fed. Activism thus means in the institutional context of our world a regime lowering the agents' information level and thus burdening economic operators with a larger inference problem in their decisionmaking. The political economy of a political institution exemplified by a central bank thus tends to raise the policy variation PV beyond the minimum level achievable under a social optimum in each column. The same circumstances also raise the uncertainty component.

We should also note an interesting connection with the information problem discussed in previous sections. The policymakers' and their staffs' "entrepreneurial behavior," expressed in "discretionary explorations," would be severely limited under full symmetric information about the structure. The full information would foster feedbacks from groups of agents constraining such explorations. This feedback would operate against the survival of patterns producing large and persistent surprises. This political feedback mechanism would be suspended however in a system contrasting a public sector monopoly of full information with a passively ignorant private sector. These circumstances would allow the authorities to trade off performance degrees of achievable stabilization for important arguments in their utility functions. Policymaking enters under the circumstances the realm of relevant agency problems. The analysis of such problems informs us that agents' behavior will diverge from the principals' interests as a function of the principals' information and monitoring costs [Jensen-Meckling, 1976]. "Discretion" thus enters the traditional formulation of policy analysis. This situation means that optimization exercises are descriptively irrelevant even in the most favorable context of full information monopolistically enjoyed by the authorities. They will not be used, the private sector in its ignorance cannot use them to compute its social loss, and the authorities will hardly be interested to know this loss. The discretionary element is further strengthened under the symmetric case of diffuse uncertainty dominating the world we live in [Brunner, 1975]. This information level offers policymakers and staff ample opportunities to feel that "discretionary procedures" are really in the public interest.

A strategy of constant monetary growth is well designed to break this pattern conditioned by the incentive structure and opportunities characterizing a political agency. But we cannot expect in general that this strategy will spontaneously emerge from within a central bank. Exceptions occur, and I refer in particular to the Swiss National Bank. These exceptions offer actually useful information about the general aspects of the political economy discussed above. But the spontaneous emergence usually involves special features of a temporary management. Without a firm institutionalization of a

constant monetary growth rule central banks will eventually persist with a "discretionary policy." The commitment involved by the neutral strategy must be imposed by explicit legislative action supplemented with appropriate conditions or dismissals from office (for policymakers and staff) for repeated nonperformance.

The commitment would have to contain two important strands. One strand addresses the accepted inflationary trend and the other specifies rules for revising the level of constant monetary growth imposed on the central bank. The first strand is required in order to anchor the level of constant monetary growth. In the 1920s economists discussed in some detail the "best" choice among alternative paths of price and wage levels. Milton Friedman renewed the discussion with his analysis of the optimal money stock [1969]. This theoretical argument seems however hardly relevant under diffuse uncertainty in a world with a complex array of distortionary taxes. The "pragmatic proposal" made by Milton Friedman seems more relevant for our purposes, viz., that monetary policy should maintain over time a stable price level. This choice minimizes in my judgment the "invitations to accommodate" associated with policies anchored by the inherited inflation. The estimate of the noninflationary level of monetary growth involves furthermore estimations of the trend in velocity and the pattern exhibited by normal output. This task is not insoluble and is actually less demanding than the large scale econometric modeling executed in the past. Undoubtedly the procedure involves errors in setting the benchmark for monetary growth. These errors are however small compared to the magnitude of the problem confronting us over the past 15 years.

Still, the occurrence of such errors directs our attention to the importance of the second strand. This attention is reenforced by the possible changes in underlying conditions shaping the trend in velocity and of normal output. The monetary rule must allow some flexibility to recognize changes in relevant circumstances. We note in this context an obligation of the central bank under this procedure to invest the staff work necessary for an intermittent assessment and monitoring of the relevant course in velocity and normal output. The flexibility needed for adjustments in the benchmark level of monetary growth must be severely constrained however and the procedures need be subjected to public examination. The rules of revision should prevent frequent and arbitrary changes and impose a heavy burden of evidence on policymakers in order to lower the likelihood of accommodation to transitory events. Stanley Fischer [1980] argued recently that monetary policy should proceed with a constant monetary growth in the face of "minor disturbances" but accommodate or respond to large actual or potential disturbances. This proposal could essentially coincide with the proposal advanced above, once it is supplemented with a "revision rule" assuring a cautious filtering of information in order to extract reliably the innovations permanently built into the economic evolution. Fischer's proposal, as it stands, without clarification of the nature of actual disturbances and the open-ended reference to potential disturbances, would impose no serious con-

straints on the discretionary explorations and accommodations by an established bureaucracy. Fischer buttresses his case with the argument that the Federal Reserve authorities have probably learned their lesson by now so that their tragic mistake during the Great Depression would not be repeated. But our recent experience suggests not so much a learning as a reversal in the kind of failure. The failures of the 30s and the failure of the 70s spring ultimately from the same source: the Federal Reserve's conception revealed by their interpretations and the procedures used to implement discretionary policy [Brunner-Meltzer, 1964].

B. Institutional Aspects of Monetary Control

The most compelling case for a CMG policy based on diffuse uncertainty and aspects of the political economy of political institutions does not establish its feasibility. There still remains the question bearing on the controllability of monetary growth. This question addresses essentially two requirements almost systematically neglected by central banks. Monetary control and the degree of controllability (or uncontrollability) does not emerge from "autonomous or inherent social patterns." The achievable degree of controllability, expressed by the variance of the distribution of monetary growth conditioned on variables directly controllable by the central banks, is substantially influenced by the institutional arrangements governing the monetary system and the internal implementation procedures applied by monetary authorities. The controllability issue thus involves ramifications which can be subsumed under an institutional policy combined with suitable implementation procedures.

1. The Control Problem: The Requirement of Institutional Policy

The potential significance of an institutional policy and the need for monetary authorities to direct active attention to this issue can already be recognized in the essentially hostile landscape of rational expectations analysis. Sargent-Wallace demonstrated the irrelevance thesis for deterministic feedback rules. The distribution of output was clearly independent of any monetary strategy under the circumstances. But strategies strictly confined to purely deterministic patterns hardly form the stuff of our reality. Even the best laid and explicit strategy beyond the range of "discretionary policies" will suffer a stochastic margin of unpredictable deviations. It follows under the circumstances that the distribution of output is influenced by the stochastic component of the money supply process with the irrelevance thesis confined to the systematic component of this process. The stochastic element of the money supply process impounded into the distribution of output results from two distinct sources. One source involves the relative indefiniteness of discretionary policymaking conditioned by the quality of the implementation procedure. The other source pertains to the pattern of prevailing institutions affecting the supply of liabilities and the acquisition and holding of

various assets by financial intermediaries. We recognize thus that even in the world of rational expectations, formed in the context of full symmetric information, monetary policymakers can substantially influence the distribution of real variables by means of an institutional policy. Thus an opportunity emerges to lower the conditional variance of monetary growth and correspondingly lower the variance of output by appropriate institutional structuring. It would appear that the problem is actually more serious in our world of diffuse uncertainty with the pervasive inference problem imposed on agents. An institutional restructuring effectively lowering the conditional variance of monetary growth improves the information content of the social signaling system, lowers the likelihood of eventually falsified interpretations and inferences made about the course of monetary affairs.

The problem may be usefully organized by partitioning monetary growth into the multiplier component $\Delta\mu$ and the monetary base component Δb:

$$\Delta m = \Delta\mu + \Delta b$$

The variance of Δm and the first term in the uncertainty component appear now in the form

$$\sigma^2(\Delta m|s,\pi) = \sigma^2(\Delta\mu|s,\pi) + \sigma^2(\Delta b|s,\pi) + 2\rho_{\mu b}(s,\pi)\sigma(\Delta\mu|s,\pi)\cdot\sigma(\Delta b|s,\pi)$$

and

$$E^*[E\Delta m - E^*\Delta m]^2 = E^*[E\Delta\mu - E^*\Delta\mu]^2 + E^*[E\Delta b - E^*\Delta b]^2 + \text{covariance term}$$

In the context of our formulation institutional policy means that the system should be confined to a particular subclass of all possible states which satisfy the requirement of the institutional policy. A well-chosen arrangement lowers the variances of both $\Delta\mu$ and Δb and also compresses the first term of the uncertainty component. A neutral strategy thus imposes on the central bank an obligation to examine thoroughly the changes required in order to minimize the two expressions above.

The partition of the variances into the multiplier and the base component indicates two directions for the required institutional policy. One direction addresses the customs and procedures of the central bank bearing on the supply of base money. These supply conditions are completely determined by the conditions governing the accrual of assets and nonmonetary liabilities to the central banks' balance sheet. Among these asset accrual conditions may be noted the structuring of float, the practices of the discount window or the range of "eligible assets" and their respective acquisition conditions. Most of the central banks I have observed could, by suitable modifications, lower the variance $\sigma^2(\Delta b|s,\pi)$. This applies in particular to the Bank of England, Bundesbank, the French and Belgian National Banks. The operation of the

central bank also affects the variance of the multiplier. This effect is clearly demonstrated by the experiences in the United States during the 1930s. Part of the most glaring variability of the multiplier observed over the decades was mostly due to unexpected variations in the currency ratio. These movements were moreover mostly due to some policy failure of one kind or another (1930–33 and Carter's credit control measures of March 1980). Apart from such policy failures our problem centers the choice of a subclass of possible states by an adroit institutional policy applied to the structuring of financial intermediaries. The variance of the multiplier with the corresponding term in the uncertainty component usually involves structural aspects of the financial system. It would appear that neither the supply conditions of liabilities nor the arrangements governing reserve holding or reserve adjustments prevailing in many countries are well designed for the execution of an CMG policy. Central banks possess ample resources for an effective examination of this problem and thus can obtain reliable guidance for proper action in the range of institutional policy. It is remarkable to note however that this issue was systematically neglected by the monetary authorities. Unfortunately, the professional literature also neglected this issue until the most recent years [Gehrig, 1980]. The neglect of an institutional policy adjusted to the interests of monetary control forms actually a natural product of the political economy of policymaking. Institutional policy usually proceeded without any attention to *monetary* policy, or the controllability of monetary growth, essentially as an instrument of wealth redistribution. It follows under the circumstances that *existing* arrangements are at the very best randomly adjusted to the purposes of monetary control.

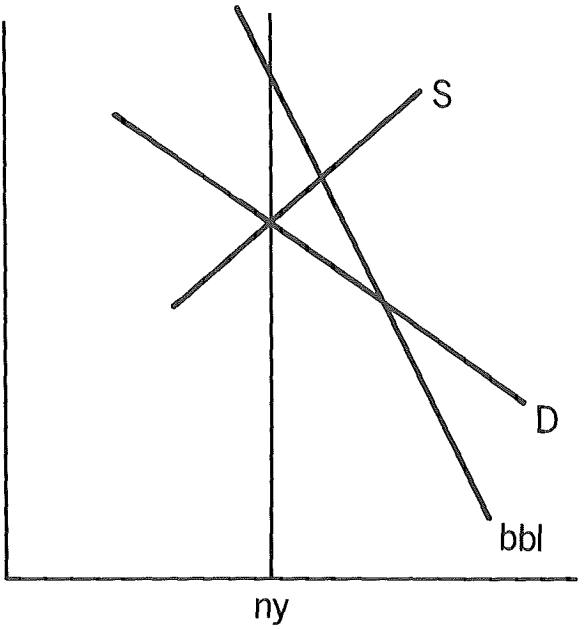
Two objections to a policy of monetary control need be considered here. Christ [1979] and McCallum [1980] explored the dynamic stability of the stock adjustment process in the case of dominant bond financing of government deficits. It appears to follow that a CMG rule which shifts the burden of financing budget deficits to bond issues would inject an unstable pattern into the system. Several aspects need attention in this respect. We note first that this stability (or instability) issue is logically separate and independent from the "internal stability of the system" expressed by a natural rate hypothesis and reflected by the system's movement relative to normal output. Secondly, the potential (or actual) instability of the system's adjustment of financial stocks offers really, upon further consideration, no serious problem. It is an analytic nicety derived in an incomplete context without pragmatic significance for monetary control policy. All the available pieces of analysis agree that the response of the aggregate demand line in the price output plane to an increase in outstanding government debt is of small order of significance compared to the shift produced by a monetary action. An unstable pattern of the debt adjustment process revealed by possible divergence of the state point from the balanced budget locus [Brunner, 1976] essentially produces a negative contribution to the velocity trend. But a 1 percentage point contribution to this trend requires, on the basis of some broad estimates made on previous occasions, a massive deficit never observed in peace time (so far) in this coun-

try. Whatever the negative contribution to trend may be however, the benchmark level of monetary growth can be correspondingly adjusted. Moreover, even a moderately rising normal output with a progressive tax schedule offsets the potential instability injected by bond financing.

The problem may be outlined with the aid of a diagram used in our earlier studies bearing on this issue [Brunner-Meltzer, 1976]. Four lines are drawn in the price output plane: the normal output line ny, aggregate demand D, aggregate supply S and the balanced budget line bbl (locus of p–y combinations balancing the budget). The graph shows the state point, determined by D and S, to the left and below the balanced budget line. The prevailing state thus produces a deficit. Stock instability means that the aggregate demand line is pushed by the increasing stock of bonds to the left or rises less than the balanced budget line. A positive normal growth moreover means that the cluster consisting of D, S, and ny moves jointly to the right. This clearly lowers the gap between the state point and the balanced budget line. The required noninflationary benchmark level of monetary growth adds an additional offsetting rightwards push to the aggregate demand line. This offset is moreover geared to a benchmark level reflecting any negative trend in velocity produced by an "unstable" bond financing process. One last point remains to be considered. Suppose one would abandon the CMG rule on grounds of the Christ-McCallum argument. But the alternative to the CMG policy would still be a discretionary policy satisfying under the circumstances shifting accommodation pressures to finance the deficit.

Another objection to a CMG policy invokes the persistent occurrence of measurement errors. Our profession has indeed become sensitive to the measurement errors in monetary aggregates. Financial innovations and the evolving multiplicity of financial assets with shifting substitution relations conditioned over recent years intermittent measurement problems. The "new view" provided in this context a relevant emphasis, fully recognized in previous work however, that an analysis of money supply processes needs to incorporate the play of relative yields on asset markets. A more faddist component of the "new view" merged with a Radcliffian heritage stressing the (almost) impossible task of separating money from nonmoney financial assets. The facts of measurement problems are clear and obvious. It is also clear that many of the monetary authorities substantially neglected this problem. But there is no inherent impossibility of approximately separating all items typically satisfying the characteristics of a "transaction dominating" asset from other asset items held in the public's balance sheet. The public's behavior reveals moreover, quite clearly, that it barely suffers under the great difficulties professed by economists of discriminating between money and nonmoney financial items. In contrast with economists' rhetoric, the public demonstrates a clear recognition of the difference between "money" and "credit." There remains however an ineradicable measurement error. But this error seems modest compared to the current magnitude of the problem to be addressed by monetary control. Countries with a potentially larger mea-

Figure 3



surement problem, as for instance Switzerland, found it quite possible to obtain measures offering an adequate basis for the execution of monetary control at a low inflationary level. The contribution of any virtuous cycles to the anti-inflationary course was essentially induced by the determined adherence (with the exception of five months in the winter 1978/79) to a monetary control policy. Lastly, the financial innovations experienced in the United States evolved to a large extent in response to public and particularly to monetary policies. The joint occurrence of accelerating inflation and various prohibitions on liability supplies by financial intermediaries encouraged a search both by suppliers and demanders for new forms of transaction-dominating assets or for substitutes involving modest transaction costs. Removal of these conditions via suitable institutional policies and a monetary control policy with CMG would probably lower the rate of financial innovation to a gradual pace contributing to the basic trend in velocity. These aspects were well covered by Stanley Fischer [1980] and they reenforce the need for a rule, governing revisions in the benchmark level of monetary growth. Lastly, with measurement errors of the money stock most likely independent of errors in measures of output or the price level, the error is impounded into a corresponding error for velocity with the opposite sign. With a dominantly white noise character over shorter periods the error poses no serious threat. A

maintained error basically requires a corresponding adjustment of monetary growth to the observed velocity trend reflecting this error. Somewhat more difficult are errors with uncertain and moderate persistence structure. Still, such persistence would be impounded in the patterns of observed velocity and thus influence the proper choice of benchmark level. The measurement problem needs to be seriously explored and a policy of monetary control would invest more systematic intelligence and effort than observed in the past to some regular monitoring of the measurements. But there is little ground for asserting that the measurement problem precludes monetary control. What would be the alternative? Either discretionary policy protected by ignorance of the relevant facts or an interest rate policy. The consequences of the first choice are sufficiently known. The second choice depends heavily on a narrow subclass of all possible states exhibiting dominant money market disturbances supplemented with a total disregard of the controllability issue discussed in earlier paragraphs. In either of the two alternatives to a policy of monetary control we risk the potential dangers of erratically permanent inflation and the potential threat of destabilizing monetary regimes.

2. The Control Problem: The Requirement of Suitable Implementation

The tactics associated with the strategy of a constant monetary growth have been characterized as a two-stage procedure [Ben Friedman, 1977]. This description means that policy does not work "backwards" directly from the ultimate goal variables (output, unemployment, employment, possibly inflation) to the required setting of the policy instrument. This one-stage procedure typically characterizes the standard policy analyses. Tobin formulated this position as follows: "There is really no substitute for making policy backwards, from the desired feasible paths of the objective variables that really matter to the mixture of policy instruments that can bring them about. . . . The procedure requires a model — there is no getting away from that. Models are highly imperfect, but they are indispensable. The model used for policymaking need not be any of the well-known forecasting models. It should represent the policymakers' beliefs about the way the world works and it should be explicit. Any policymaker or advisor who thinks he is not using a model is kidding both himself and us. He would be well advised to make explicit both his objectives for the economy and the model that expresses his view of the links of the economic variables of ultimate social concern to his policy instruments" [Tobin, 1977, p. 763].

The two-stage procedure differs in several important aspects from the policymaking process recommended by Tobin. First, it interposes an "intermediate target" between the policy instruments of the central bank and the "ultimate goals with social significance." The policymakers are instructed to adjust their "gears and levers" in order to maintain monetary growth within a tolerance centered around the target path. The argument in prior sections should have made clear that using monetary growth as an intermediate target does not follow from any particular "social value" assigned to money. It

is considered the best strategy ensuring a tolerable performance of the monetary authorities in the context of our political realities and in the face of a diffuse uncertainty. Secondly, the determination of the benchmark level of monetary growth does not aim at an inherently impossible task, viz., to produce even approximately a specific time path of the ultimate goal variables. It is aimed at a stable price level (in the average over a sufficient horizon) and is adjusted to the *average* behavior of velocity and normal output. The two-stage tactic appears thus as a part of the necessary implementation of our neutral strategy. It follows thus directly from the information and political conditions governing the choice of strategy. The crucial difference with Tobin lies precisely in these conditions. They do not involve social values. Tobin's argument would be quite valid and empirically relevant if we possessed reliable and detailed knowledge of the structure and if we could accept the goodwill theory of political agencies as an empirically relevant description of political institutions. It presents the standard case for "rational activism." The tactical procedure of two-staging would indeed be inefficient as demonstrated so lucidly by Ben Friedman. Contrary to Tobin, it would offer a substitute, but a poor one indeed, to the procedure exemplified for our purposes by the information extraction approach. But Tobin's description does not relevantly bear on our world. He offers no evidence that we possess the required knowledge. The reference to *some* (any?) model required for the policymaking procedure remains programmatically empty. Or should we seriously commit ourselves to whatever specific beliefs about the economy policymakers, their staffs, and academic advisors would hold at any particular time? There is substantial evidence that the optimal control settings are not robust with respect to variations over a spectrum of models. This result holds even if we remain within a class of models cast in a Keynesian mold. Tobin's argument could be seriously discussed once we were shown that the wide variations in conjectures bearing on detailed structural properties exert a comparatively small influence on the consequences of activist policymaking. But all the information we possess at this stage would reject this claim. And can we really expect a political agency committed to prior beliefs of dubious cognitive status to examine critically, beyond the details of specific formulations, its basic preconceptions? The history of the Federal Reserve System, or of the Bank of England, or of other central banks, offers ample evidence rejecting such expectations. Under the circumstances actually prevailing in our life the two-stage tactic has been presented as the most efficient solution. It is useless to judge it in a context which violates the prevailing conditions surrounding actual policymaking.

Tobin's recommendation has never been accepted by the Federal Reserve authorities. They proceeded over the years with one form or another of a two-stage tactic. We need not describe at this stage in any detail the complex procedure developed by the Federal Open Market Committee. A recent study by Lombra-Moran surveyed the material in some depth [1980]. Two strands of the Federal Reserve's policymaking require our attention however: the relevant conceptions governing evaluations and decisions and the

implementation procedures applied. The staff's conception has been well described by Lombra-Moran as a traditional Keynesian view centered on the multiplier mechanism and the Phillips curve, with long lags for monetary effects and shorter lags for fiscal policy, and with inflation dominated by the movement of unit labor costs "remotely related" to monetary policy or monetary evolutions. It is thus basically a conception which easily justifies a wide range of accommodating patterns for monetary policymaking. It easily justifies in particular that monetary policy should accommodate any inherited rate of inflation. Such a policy would avoid, according to the ruling conception, the high social cost of disinflation with little danger of accelerating inflation. It is moreover a conception encouraging an activist disposition in policymaking. It naturally invites recommendations of income policies in any attempt to curb inflation.[1]

The staff's conception should not necessarily be attributed to the policymakers. At this date it is difficult to judge the views of the world, or at least of their assigned corner of the world, held by members of the FOMC. This was not always the case. The works published by Riefles and Burgess in the 1920s conveyed a clear sense of the theory used by the Fed's top managers in order to interpret their world. One may conjecture however that the Keynesian vision supplied by the staff provides a "gravitational center" with substantial variations on the basic theme occurring between a shifting membership and also over time for specific members.

In the context of the Fed's tradition the basic theme influences the general nature of the procedure. The detail changed over the decades and particularly over the past 15 years with the pressures brought on the FOMC to become more attentive to the evolution of monetary aggregates. Congressional resolutions and legislation compelled the Fed over the past five years to formulate "longer run" target paths for monetary growth covering four quarters. We note that Lombra-Moran find this horizon unconvincing in the context of the staff's view of the (exogenously imposed?) length of lags controlling monetary impulses. But the continuous execution of policy requires a short-run procedure. This is centered on the demand for money as visualized and formulated in a specific way by the staff. This money demand specifies the dependence of money stock on the federal funds rate and national income. The latter magnitude is essentially predetermined for short-run implementation by the longer run projections prepared by the staff. With income fixed in this manner the money demand function yields a relation between money stock and the federal funds rate. Shorter run targets for monetary growth serve to link the ongoing process with the four-quarter target horizon. Implementation of the near-term targets is based on the relation between money and the federal funds rate prepared by the staff for the meetings of the FOMC. The staff's central relation associates with any given target path of the money stock a specific level of the federal funds rate. Once

[1] This aspect was emphasized by Robert Weintraub during the discussion at the Conference.

the FOMC decides on the target path there emerges thus an appropriate federal fund rate guiding the account manager's actions over the near future. It is noteworthy at this point that the FOMC frequently modifies the staff's best estimate of the crucial relation between the money stock and the federal funds rate. Lombra-Moran observed that "in 20 out of 37 meetings the FOMC either lowered the staff's projected federal funds rate for a given money stock, or lowered the targeted money stock growth for a given federal funds rate, or lowered both the staff funds rate and money stock projection" [pp. 44/45, 1980]. The authors note, moreover that "the motivation of the FOMC seems clear. First, the modifications helped to secure a clear conscience; and secondly, they desired to control the money stock, but without generating large interest rate fluctuations. What is not clear is the FOMC's rationalization for deviating from the staff's projections" [p. 45, 1980]. The FOMC shows thus substantial unwillingness to rely on a specific model. It exhibited on the contrary a remarkable disposition to impose frequent modifications evolving from a convergence of subjective judgments. This convergence starts moreover from the model's product already containing more or less extensive judgmental manipulation by the staff. One wonders under the circumstances about the nature of the convergence and the extent it is really dominated by immediate political conveniences or the particular incentives confronting individual members operating in this organizational context.

One wonders of course most particularly about the quality of the performance observed under this procedure. Lombra-Moran find the quality of "nonfinancial forecasting" quite respectable and difficult to fault in comparison with alternative forecasting performances. In a similar vein Brunner-Meltzer found in their study of Federal Reserve policymaking prepared for a Congressional Committee [1964] that the FOMC's record in recognizing turning points of the business cycle was difficult to improve upon. But there remains the fact, particularly over the last five years under the acknowledged obligation to control monetary growth, that this magnitude moved unreliably beyond an acceptable target band. The findings of Lombra-Moran and a preliminary investigation made by Karnowsky leads us to conclude that the low quality of monetary control cannot be attributed to the forecasting record bearing on nonfinancial variables. It emerges as an inevitable consequence of the demand-oriented implementation of a presumed policy of monetary control. This procedure relies on an essentially unreliable relation involving a variety of loose ends governed by stochastic processes difficult to perceive adequately. The incorporation of an interest rate structure into a "Poolean" analysis in a previous section reveals the problem. The disturbances operating on money demand are augmented by the variance V(z) of the term structure element in the relation connecting a short rate with the federal funds rate. This augmentation of the variance beyond the genuine money demand disturbances lowers the quality of the estimated function used by the staff for its monetary control purposes. The procedure contributes in this manner to its unreliable performance as an instrument of monetary control.

As matters stand, the Fed's procedures allow in the light of the observed performance two radically distinct interpretations. One is suggested by the Fed's perennial disposition to attribute persistent or any uncomfortable deviations from the targeted path to shifts in money demand. This excuse is a natural consequence of the demand-oriented procedure in the context of the ruling paradigm and offers, in addition, substantial political advantages to the policymakers or, most particularly, to their staff. It also offers an opportunity to argue, along the lines suggested by a "Poolean" analysis, that the "demand-determined errors in monetary growth" are innocuous and actually represent a stabilizing response by the Federal Reserve authorities. But this argument really implies that the FOMC's implementation produces a demand-determined money stock. The target path would be satisfied just in case the vagaries of the public's money demand produced, purely by chance, such a result. This interpretation implies of course that the FOMC has really no meaningful monetary target. They are a rhetorical device to cope with the outside pressures confronting the Fed without any real significance however. Another interpretation suggests that the Fed more or less sincerely attempts to cope with a targeted path for monetary growth. The tactical implementation of this new strategy is however conditioned by an undigested tradition of interest rate targeting and a conception still dominated by a Keynesian vision of the relevant processes.[2]

This implementation, probably well adjusted to a wide class of more or less accommodative or activist strategies, is poorly designed for the execution of a monetary control policy. The Federal Reserve's tactical procedure actually combines in a crucial way diverse strands which tend to produce an essentially unreliable performance surrounded with persistent uncertainty. It relies on a very specific relation provided by a money demand function, with little justification that this particular money demand, or any particular money demand so far specified, can bear the heavy burden imposed on it by the requirements of policymaking. The vested interests of the staff have been clearly visible in their attitudes pertaining to this critical ingredient of existing policymaking. The significant injection of judgmental operations on the staff and the FOMC level involve on the other hand an implicit admission of the actually prevailing state of diffuse uncertainty. Lombra-Moran commented in their examination of Federal Reserve procedures on the FOMC's unwillingness to commit themselves to the discipline Tobin wishes to impose on them. Their attitudes reveal that they recognize, at least more or less implicitly, the nature of our diffuse uncertainty. But they fail unfortunately to cope with this uncertainty and to draw the logical conclusion from this fact. The result is an execution of occasionally adequate actions perennially threatening us with the swamp of an unreliable and unpredictable "discretion" in the context of a strategy producing a potential destabilization with a built-in inflationary bias.

[2] Denis Karnowsky stressed these alternative interpretations at the occasion of a discussion of these issues in Rome.

Monetary control requires thus beyond an institutional policy also a well formulated tactical procedure adjusted for purposes of efficient execution of the neutral strategy. A tactical procedure designed for this purpose has been proposed for many years by the Shadow Open Market Committee. Over the past three years James Johannes and Robert Rasche developed in detail some crucial technical aspects of the procedure [1979, 1980]. A very similar procedure has been used over the past years by the Swiss National Bank [Schiltknecht, 1978, 1980]. The results drawn from the Swiss National Bank and the Johannes-Rasche work establish that the proposal outlined is probably superior to the Fed's traditional procedure and also superior to the old procedure modified for the new operation allegedly introduced last winter.

The procedure begins with the determination of the benchmark level of monetary growth discussed above. A second step determines the link between money stock and monetary base. This link is constituted by the monetary multiplier. The staff needs to prepare this groundwork along the lines pioneered by Johannes-Rasche or the Swiss National Bank. The required statistical work traces the profile of the multiplier over the next four quarters. Once equipped with this profile the staff moves to the third step and derives the resulting profile for the monetary base. The portion for the next quarter ahead is singled out as an immediate guide for action. The FOMC instructs at this stage the account manager about the required increase in the monetary base. This increase can be achieved any time with suitable asset acquisitions (or disposals) by the Federal Reserve authorities. The staff at the Federal Reserve Bank of New York would have to prepare weekly estimates for all the source items of the base except the volume of Federal Reserve credit (net of float). They would also report weekly on the previous week's outcome. This information flow will guide the account manager's actions addressed to the required modification of Federal Reserve credit. Lastly, with the accrual of weekly and monthly data the staff should recheck the best estimate of the multiplier profile. The FOMC should refrain however from revising instructions on such a short-run basis..

The technical work required for this tactical procedure is actually less complex than for the procedure actually in existence. It also involves more reliable patterns than used by the demand-oriented technique developed by the Federal Reserve staff. The work assigned moreover to the staff of the Federal Reserve Bank of New York has been routinely carried out for many years. It would simply be redirected for another purpose.

The procedure proposed may quite properly be juxtaposed, as a "supply-oriented" procedure, to the Fed's "demand-oriented" procedure. This juxtaposition should avoid however the analytically untenable associations with "new or old views." Both approaches are based on an equilibrium analysis of the money supply process in the context of an asset market interaction [Brunner, 1971, 1973]. The "demand-oriented" approach remains however confined to a two-asset world with a Keynesian vision about the nature of the transmission mechanism. The "supply-oriented" approach is based in con-

trast on an asset market interaction involving substitutions between financial and real assets. This implies that targeting errors under the demand-oriented approach are necessarily imputed to disturbances of money demand. The alternative formulation of an equilibrium system would recognize that under an interest targeting procedure of monetary control the control errors reflect disturbances of *all* the relevant asset markets. The two approaches differ in particular in terms of the crucial strand selected for control purposes. The "demand-oriented" approach relies on the structural money demand relation. The "supply-oriented" version uses the multiplier connection in the sense of a solution of the equilibrium system containing however a conception of money demand distinct from the Fed's Keynesian view. The difference determines in my judgment a more reliable tactical procedure substantially less exposed to the danger of very loose and judgmentally arbitrary relations centered on a very narrow view of money demand.

The potential feasibility of the "supply-oriented" approach can be noted, apart from the successful execution of an anti-inflationary policy by the Swiss National Bank, by the results of a recent experiment conducted by Johannes and Rasche. This study compared the approach outlined above involving adjustments in the monetary base directed to produce the desired monetary growth with the newly evolved tactics proposed last winter by the Fed. The Fed's new procedure links in a crucial step the money stock with the banks' volume of nonborrowed reserves. Whatever the role of the federal funds rate and the inherited "demand orientation" may be in this process, the procedure, if actually carried out, would involve some shift in the direction of a "supply-oriented" approach. The crucial question must then be addressed to the comparative qualities of the alternative linkages, one expressed by a base multiplier and the other by a reserve multiplier. A comparison of the two multipliers reveals that they respond very differently to underlying changes. The reserve multiplier is in particular quite sensitive to variations in the currency ratio. A preliminary computation shows moreover that the reserve multiplier is systematically more sensitive to variations in the proximate determinants expressed by an array of allocation parameters than the base multiplier. Tables 1 and 2 summarize the results of the comparison based on the 12 months January 1979 to December 1979. The same statistical procedures were used to obtain one-month and two-month ahead forecasts for the respective multipliers. The computations were carried out for two sets of estimates of the relevant reserve variables, one provided by the Board of Governors and one by the Federal Reserve Bank of St. Louis. Table 1 (for M-1) demonstrates a clear superiority for the monetary base, measured either way, over the reserve control procedure when expressed in terms of both mean error or the root mean square error of the respective multiplier forecast. The pattern is repeated for money stock M-2 in Table 2. The relative differences are actually quite remarkable in both tables. The results also suggest moreover that some attention to the operation of the discount window could improve the controllability of monetary growth at least moderately even in the United States.

Table 1
Comparison of Summary Forecast Error Statistics for BOG and St. Louis Defined Reserve Aggregates

	M1							
	Reserve Aggregate							
Statistic	Total Member Reserves		Nonborrowed Member Reserves		Monetary Base		Net Monetary Base	
	One-Month Forecasts							
	BOG	StL	BOG	StL	BOG	StL	BOG	StL
ME	-.0207	-.0059	-.0033	.0067	-.0017	-.0012	-.0003	.0002
RMSE	.0872	.0877	.0988	.0971	.0127	.0131	.0130	.0139
RMSE/$\bar{m}_1$	.0099	.0100	.0109	.0107	.0050	.0051	.0051	.0054
	Two-Month Forecasts							
ME	-.0219	-.0116	.0131	.0091	-.0014	-.0004	.0013	.0019
RMSE	.1251	.1091	.1582	.1473	.0177	.0168	.0203	.0202
RMSE/$\bar{m}_1$	.0142	.0124	.0174	.0162	.0070	.0066	.0079	.0079

ME = mean error, RMSE = root mean squared error, $\bar{m}$ = average money multiplier (actual)

Table 2
Comparison of Summary Forecast Error Statistics for BOG and St. Louis Defined Reserve Aggregates

	M2							
Statistic	Total Member Reserves		Nonborrowed Member Reserves		Monetary Base		Net Monetary Base	
	One-Month Forecasts							
	BOG	StL	BOG	StL	BOG	StL	BOG	StL
ME	-.0384	-.0101	.0027	.0298	-.0015	-.0026	.0021	.0040
RMSE	.1977	.1853	.2333	.2292	.0275	.0229	.0293	.0294
RMSE/$\bar{m}_2$	.0092	.0087	.0106	.0104	.0045	.0037	.0047	.0047
	Two-Month Forecasts							
ME	-.0388	-.0134	.0451	.0741	-.0004	.0009	.0064	.0099
RMSE	.2722	.2262	.3530	.3223	.0399	.0342	.0454	.0427
RMSE/$\bar{m}_2$	.0127	.0106	.0160	.0146	.0065	.0055	.0073	.0068

ME = mean error, RMSE = root mean squared error, $\bar{m}$ = average money multiplier (actual)

The proposal developed by the Shadow Open Market Committee may not offer the most appropriate procedure under all circumstances. The initiation of the procedure may be obstructed by inadequate data about the money stock or insufficient staff work available for this purpose. These problems associated with a serious reexamination of the monetary strategy hardly matter in the context of modest changes in the price level accompanied by minor fluctuations in economic activity. They may confront us in a relevant sense however as a result of a massive inflationary heritage. The situation in the United Kingdom offers probably a good example in this respect. But the very magnitude of the problem suggests a solution. The monetary authorities should be advised to concentrate on controlling the monetary base and move its growth path to a noninflationary benchmark level. This control over the monetary base offers no technical problems. It may require some changes in customs and prevailing arrangements. In several cases, most particularly among European central banks, the custom of operating as a "lender of *first* resort" must be abandoned and replaced by a "lender of *last* resort." This change in discount policy provides the technical facility to hold even the weekly magnitude of the monetary base close to the desired path. A persistent and large decline in the growth rate of the monetary base unavoidably lowers, on the *average*, also the growth of any relevant monetary aggregate. These aggregates may shift around in divergent ways and exhibit all sorts of countermovements over shorter periods. None can run away on a persistent course however with the monetary base held along a path of low growth.

The information level required for the execution of such a policy may be compared to the information used by a car driver in order to ensure undamaged survival. Hardly any driver knows the numerical relation between speed and the pressure on the gas pedal. This relation varies between cars and varies over time for any given car. But the driver knows that at any time and for any car an increase in the pressure on the gas pedal raises the speed and a lower pressure reduces the speed. This knowledge supplemented with a corresponding information about the brake suffices for most of us to avoid chaos on the streets. Many other examples with a similar information level, most particularly from medicine, could be adduced for our purpose. But the point should be clear. Whatever the average growth rate of relevant monetary aggregates may be, a persistent retardation in the monetary base will lower their growth. It follows that the average growth rate of any relevant monetary aggregate can be lowered by sufficient deceleration of the monetary base. The experience of the Swiss National Bank demonstrates moreover that with a credible policy of maintaining the monetary base along an announced path the public essentially disregards temporary gyrations in the growth rate of important monetary aggregates. Such variations are viewed by agents in the market place as transitory noise with little significance for the movement of the price level and the exchange rate over time. Lastly, with a control over the monetary base under way and inflation subsiding a central bank should set its staff to work on the preparations required to improve monetary control.

V. Conclusions and Summary

The arguments advanced in support of activist monetary policymaking follow from two crucial assumptions. It is postulated that policymakers possessing *full and reliable knowledge* about the economy's response structure can naturally be expected to exploit this information in the "*public interest*" for purposes of economic stabilization. The first assumption does indeed justify the application of an activist regime. The second assumption assures us moreover that the opportunity guaranteed by the first assumption will be efficiently and reliably exploited. Advocacy of an activist regime is unavoidable once we accept the two fundamental postulates. Both postulates are however blatantly false.

We suffer neither under total ignorance nor do we enjoy full knowledge. Our life moves in a grey zone of partial knowledge and partial ignorance. Most particularly, the products emerging from our professional work reveal a wide range of diffuse uncertainty about the detailed response structure of the economy. This fact persists whatever the subjective feelings of any policymaker or academic may suggest. We may be inclined moreover to disregard the variation in structural patterns obtained over the whole range of our professional work and peddle *our* result as the only relevant product competing (unfortunately) with counterfeit products x. Such attitudes probably express a rational wealth maximizing posture but hardly reflect a rational cognitive commitment. Our existing knowledge thoroughly fails under the circumstances to satisfy the information level required for the successful execution of an activist regime. Inspection of any one of the formulae defining the required monetary regime demonstrates this point. Any activist regime, optimally specified relative to *some* state of affairs, *destabilizes* the economy in the context of *alternative* states. Activist regimes offer a *chance* at stabilizing the economy, but also run a *risk* of destabilization. There is unfortunately no way to remove the risk and realize the chance. The risk and chance combination is moreover not symmetric. The chance is limited and the risk open-ended. A nonactivist regime emerges under the circumstances characterized by a diffuse uncertainty as the safest strategy. It does not assure us that economic fluctuations will be avoided. But it will assure us that monetary policymaking does not impose additional uncertainties on the agents operating on the market place. It assures us moreover that monetary policy does not destabilize an economy in the manner observed during the 1930s or over the past 15 years. A neutral regime will effectively avoid any major deflation and inflation.

Considerations of important aspects of the political economy of nonmarket institutions reenforce the case for a nonactivist regime. An activist regime under diffuse uncertainty suffered by policymakers and the public produces the quagmire of a "discretionary policy." One is quite unlikely to find political agencies operated according to any sense of a "public interest." This assertion is advanced, as the previous assertion bearing on the crucial information level, as an assessable statement about our world. The pervasive

information problem confronting the citizen's evaluation of political agencies offers opportunities to trade off the citizen's interests for political and personal advantages enjoyed by the personnel in the agencies. The historical pattern of activism will not be shaped therefore according to the neat and predictable pattern elaborated by an optimal control approach. It emerges in the form of a "discretionary procedure" attuned to political incentives and pressures with shifts, turns, and twists involving erratic movements enlarging the agents' inference problem. The imposition of a nonactivist regime constrains the private exploitation and social misuse of an activist disposition. This regime lowers the political temptation built into the monetary agency.

The choice of a nonactivist strategy rationally requires the selection of well-suited tactical procedures. These procedures bear on institutional arrangements facilitating monetary control and the implementation exercised by a central bank. The latter aspect is probably more important in most countries at this stage. Two procedures are proposed which differ according to the required information level. Both are operational and can be applied if and when the political will exists. Moreover, both require inputs of low information levels compared to the requirements imposed by an activist regime.

It is unfortunately not obvious however why the political will should ever exist. The same analysis based on the political economy of political institutions which reenforced our case on behalf of a nonactivist regime also implies that under most circumstances we should expect a determined opposition by the monetary agencies and their staffs to such regimes. Such opposition can effectively block under a screen of sympathetic rhetoric the execution of a monetary control policy. The consequences of this political failure will be familiar. We will continue to experience permanent and erratic inflation with intermittent episodes of stagflation or international currency crises.

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Discussion

Henry Kaufman*

I think it is very difficult for anyone to follow Karl Brunner and certainly very difficult for me coming from the market place. I have spent quite a bit of time reading Karl's paper, trying to summarize it and trying then to put down on paper what I thought his broad arguments were in favor of a neutral monetary posture. I think Karl supports a nonactivist role for monetary policy expressed, of course, by a constant money growth role. He says that this kind of posture reduces the variance of money velocity and uncertainty of the output that it produces. He also claims that an activist view of policy depends on a rather naive sense of political institutions. This view holds that policymakers and staff people seek to maximize social welfare and not their own self-interest.

Finally Karl says that he feels that a supply approach is more direct over a broad menu of financial assets. Then he gets down to what he really proposes and that is this constant monetary growth. He goes on to suggest that very strict Congressional or legal limits be imposed on certain types of monetary variables and he even goes on to suggest that people in this room be fired or dismissed for nonperformance. Therefore the Federal Reserve's role should be a very passive one, presumably eliminating many of the regional banks, perhaps having just clerks run the central reserve system.

There are a number of problems in this paper. Karl of course focuses on a transaction variable, money narrowly defined, instead of what I would tend to favor and that is a broader measure of credit. The information gap makes it rather difficult to determine the proper growth rate of money in order to achieve stable prices. My problem is to know what money is. It seems to me that we as market participants and practitioners in the field constantly update our definition of money and what we put in to our current definition is a perception not necessarily of current events but at least of something that happened in the past. In the early part of this year, the central bank admitted that its concept of money was incomplete and we went from M-1 and M-2 to M-1A, M-1B and a redefinition of M-2 and M-3 and so on.

I believe that financial innovation accelerates in an environment in which we try to establish targets for money and where the burden of fighting inflation is extraordinarily large on monetary management without assistance from other arms of government. The innovative process in the financial market just intensifies. We therefore, I believe, create more near-money assets. We shorten the liabilities structure, the maturity structure tends to shrink or we create financial assets that remove the risks. For example, it should not be surprising in hindsight to anyone why we have created variable

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interest rate mortgages, why we have a floating prime rate and why we have variable floating rate notes in the domestic and particularly in the international markets. This is a movement towards liabilities or financial assets from which we tend to remove risks as well as move closer to a date of maturity. And therefore we move closer to a concept of credit that is not distinguishable from money. Now this concept has some repercussions because ultimately it changes the financial system and the problems of managing money no matter how we define it. As we move on with this kind of an approach, I believe that the ultimate consequences will be to decrease the role and importance of the open market and increase the role of the commercial banking system. Just a little page out of near history will tend to suggest this. In the last 12 months interest rates have been extraordinarily volatile. Part of this volatility is due to the effort by the central bank to move towards a monetarist approach. The volatility of interest rates, once interest rates were going down, resulted in a rush to issue long bonds and the moment interest rates moved up in the summer months the issuance of long bonds stopped. In turn, the reliquification stopped, and the importance of the commercial banking system as an institution in the credit market increased. This kind of volatility seems to indicate that investors buy bonds not for their traditional purpose to assure a contractual income but basically for their potential of price gain. As a consequence, we modify a bond, reduce its significance, and shift the entire lending arrangement between institution and lender rather than the open market, and thus create more near-money assets, not assets over which risks are perceived.

There are other problems associated with money. One is just in implementing the monetary procedure which some people here are going to talk about. Namely, how do we control a monetary aggregate over a short-time span and seasonally adjust it? In the period ahead, we are going to rely very importantly on monetarism to stabilize our economy because other arms of the government are not working. What do we find? We find we have NOW accounts, ATS transfers, repurchase agreements, money market funds all sitting in the monetary aggregates which we seasonally adjust weekly and monthly and for which we set targets. We seem to do this with an air of certainty but it can't be done because the seasonal adjustment factor is improper and incorrect in the final analysis. Why therefore should we have that great confidence that this procedure over the next 12 months is going to be adequate?

Next, let me indicate my other problem. Even if the monetarist approach were the correct one as it is now stated, it would seem to me that there is one aspect that monetarists do not adequately bring to the fore. That is monetarism alone should never be the full stabilizing arm of policy. In the period ahead or in the recent past we would have had a far different environment if other arms of government had come into the battle against inflation. If you assume that monetarism has to carry the burden from here on, you set a target for monetary growth, you set a target then for GNP growth, you then in turn also have a clear-cut indication of how much real growth we probably

will have and most of the underlying force will be inflation. There is an assumption that following this policy we will ultimately wring out the inflationary problem. I believe underlying that however is the likely consequence that we will have stagflation. The will of the people, of consumers, of businessmen, of institutional leaders does not seem strong enough to endure a monetarist squeeze of the inflationary problem. Traditionally, reliance mainly on monetary policy over this period makes it quite obvious, if fiscal policy remains aggressive as it has been, that the role of government will increase and the role of the private sector will decrease. With more concentration within the financial system and within a number of institutions, it is the private sector that will diminish in importance. It is the governmental sector that will remain important because there is no way out under this approach that government will be denied money. It won't. The private sector is the one that will be denied in this approach if large deficits persist.

In dealing with our problems, it is a credit system that should be addressed. It isn't a monetarist system, it isn't the money system. Who distinguishes today between money and credit? The two are just not talked about in that fashion anymore in the real world. It would seem to me that monetary policy at some point in time has to focus on the instability of the credit system. It is very understandable why the credit system is volatile and so responsive to changes. We live in a free market society. There is no reason to assume that monetarism or a credit system can be highly stable. I don't think it can be. But I do think we have to focus beyond M-1A and M-1B. We have to think about managing credit. This is where the innovative edge is of the private market, and this is where the influence has to be from the Central Bank — on the credit system and not on the monetary aggregates per se.

Discussion

James Tobin*

Clearly I was not asked to discuss Karl Brunner's paper in anticipation that I would agree with it. That would not have been a rational expectation. Because I do intend to fill my assigned role, I should like to preface my critical remarks by acknowledging the debt that all of us in monetary theory and macroeconomics owe Karl Brunner, both for his own contributions to our knowledge and for his leadership in promoting and publishing research and policy debate on both sides of the Atlantic. No one has been more intensely and continuously dedicated to the advancement of the field. The powerful and formidable paper before us today is characteristic of Karl's work in several respects. He tackles fundamental and important issues, knows the relevant literature thoroughly, seeks conclusions of ambitious generality, and pursues the logic of his argument fearlessly and rigorously.

Although Karl and I frequently disagree in policy conclusions, we agree in many features of our theoretical models of asset stocks and flows, monetary and nonmonetary. Ben Friedman (1978) has pointed out, accurately I believe, the qualitative similarities of Brunner-Meltzer and Tobin or Tobin-Brainard models. I have never understood how Brunner and Meltzer could derive monetarist conclusions about monetary and fiscal policies from multi-asset models. But that is not our topic today.

The central thesis of the paper is that monetary policy should generate a steady path of money supply, paying no attention to the current state, recent history, or projected future of the economy. In the course of my comments I shall express my doubts that this proposition can be proved or disproved deductively. I know also the difficulties of resolving the issue by appealing to empirical evidence, ambiguous as it is bound to be.

Nevertheless, in an effort to place some burden of proof on Karl and other advocates of nonreactive policy, I begin by calling attention to a striking chart I have borrowed from Martin Baily (1978, p. 14). It shows that the year-to-year volatility of changes in real GNP was smaller and average growth greater after 1946 than before the second world war. Moreover, performance by these two counts was much better in the 1960s than in the 1950s and 1970s. (The chart ends in 1976, but adding more recent years would only reinforce its telling point.) It is generally agreed that compensatory countercyclical macroeconomic policy, based on information "fed back" from the economy to policy-makers, was more important after 1946 than in earlier peacetime periods. It is generally perceived that, for better or worse, reactive policy was especially important in the 1960s.

In 1970, responding to years of monetarist criticism and to the demands

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of Congressional committees influenced by monetarist staff, the Federal Reserve began expressing its policies in terms of targets for monetary aggregates. This shift in policy did not usher in an era of greater stability of either output or prices. Neither did similar swings to monetarism in other countries. The coaches make the usual excuse: the players on the field, the central bankers, did not follow the game plan. (President Johnson didn't follow the game plan of his Keynesian coaches in 1966 either, but this has not saved the "New Economics" from blame for the Vietnam war inflation.) The monetarists argued that the use of the federal funds rate as a week-to-week control instrument undermined the Fed's control of monetary aggregates.

A year ago the Fed surrendered to this criticism, but that monetarist victory too has turned sour. The new procedures, focused on reserve supplies and allowing wide swings in interest rates, have not stabilized monetary aggregates or more important and remote macroeconomic variables. Karl says there is a procedure that will do better, but to me it doesn't look enough different from what the Fed is doing now. The endemic problem, extensively documented in papers for this Conference, is that the money-supply-multiplier is very volatile in the short run. Quarter-to-quarter rates of change of Ms are almost wholly uncorrelated with quarter-to-quarter rates of change of reserves or base money.

The next line of defense is, as Karl has proposed in this paper, to make the world over, imposing a design that gives monetarist propositions a better chance to work. The recipe includes abolition of interest rate ceilings even on demand deposits, making reserve requirements uniform and contemporaneous, relaxation of regulatory constraints on asset portfolios of banks and other intermediaries, floating the Federal Reserve discount rate, and other reforms in the same free market spirit.

In my opinion, the design does not go far enough to make the world safe for monetarism. I think Henry Simons understood better than his modern quantity theory descendants what would be required: 100 percent reserves on demand deposits, none on other liabilities, no government debt instruments shorter than consols, no central bank lending. To those items I would add: no government insurance of any liabilities other than 100 percent reserve deposits. Simons' idea is to create as wide a gulf as possible between "money" and everything else, letting free markets and *caveat emptor* reign in all nonmonetary financial markets and intermediaries. I strongly doubt that stability of 100 percent money in a Simons world would mean *economic* stability, but anyway "*the* money supply" could be stabilized and then we could see. To avoid misunderstanding, I stress that *I* am not advocating reconstruction of financial institutions and markets along these lines, only suggesting to monetarists what they should advocate.

Karl Brunner offers us a meta-theory in support of his recommendation that economic policy-makers eschew feedbacks from the economy affected by their policies. As I understand it, his argument is that a "nonactivist" policy is the choice that minimizes maximum loss. We don't know which of many, many possible structures characterizes our economy. For any activist

policy rule, there is at least one possible structure in which the policy spells disaster; but there is no structure in which "doing nothing" spells disaster. He says, "every activist strategy runs the risk of a destabilizing performance." I think that is true, but I don't see why it is not also true of every nonactivist strategy. I just do not follow the argument, and in any case I don't see how an issue of this kind can be resolved by *a priori* reasoning or with such great generality. Surely an agnostic list of possible structures and states of the world must include some in which markets and expectations, unassisted and unfettered, are unstable.

The definition of "doing nothing" is in any practical situation intrinsically arbitrary and slippery. Let me give you an example. As we all know, the Federal Reserve has suffered much blame for the Great Depression because M-1 and M-2 fell from 1929 to 1933. If stability of policy, "doing nothing," is defined by those aggregates, the Fed appears to have caused and prolonged the Depression by active deflationary policy (though quite the opposite of an active countercyclical feedback rule!). But by other measures it is not true that the Fed did nothing. The monetary base rose in every year (2.1 percent, 8.6 percent, 3.8 percent, 3.4 percent), and the supply of bank reserves, though it fell slightly in 1931, was the same at the end of 1932 as at the end of 1929. (Friedman and Schwartz, 1963, pp. 739–740). Only by a definition of policy in terms of monetary aggregates that reflect a large component of endogenous feedback from the economy can it be said that the Fed followed an activist policy of deflation.

Karl Brunner describes the formidable information requirements of using feedback rules to set monetary instruments for economic stabilization. But the quantities of transactions money he wishes to stabilize — and not to vary in response to observations or projections of the state of the economy — are endogenous variables, many steps removed from the instruments the central bank controls directly and precisely. Controlling endogenous Ms, given their connections to economy-wide developments, imposes qualitatively the same informational requirements on the Fed as more ambitious macroeconomic objectives. The other papers at this Conference tell us that the informational requirements are quantitatively formidable too. Karl has rightly reminded us that demands for monetary aggregates depend on opportunity costs relative to a host of alternative assets, from Treasury bills to consumers' durable goods. (Incidentally, I of course agree with the reminder, a correction to mindless application of simple two-asset textbook models. What I never understand is why monetarists regard this point as supporting their policy conclusions.) This means that money demand is hopelessly enmeshed with the whole economic process, so that the aggregates cannot be controlled without information that far transcends financial institutions and markets. Why can't Karl's own arguments be used to argue that attempting to control Ms with subscripts bigger than zero will more likely destabilize than stabilize, and to conclude that consequently the minimax strategy is simply to fix the amount or the growth rate of base money, or even better, of the Fed's portfolio, not seasonally adjusted? Some language in Karl's paper,

and certainly recent statements of the Shadow Open Market Committee, go in this direction. But then, as my Great Depression story illustrates, the economy can slip away from the policy-makers.

What is Karl's bottom line, his ultimate policy recommendation? He thinks the Fed does not, can never, know enough to be issued a driver's license, and he wouldn't trust the Open Market Committee with one anyway. Presumably, given his theory of the political process, his respect for the cognition and motivation of Presidents and Congresses is even lower. Does he then favor a Constitutional amendment fixing the rate of growth of some monetary aggregate, and prescribing in the amendment or entrusting to the Supreme Court the definition and measurement of the aggregate and the procedures for revising the rule in changed circumstances (he mentions changes in long-run trends of real growth and velocity)? Speaking of instabilities, I suspect that economists might have a hard time convincing the intelligent lay public that we should freeze into constitutional stone money supply rules that assume a trend in velocity that we cannot explain, much less guarantee to continue. Moreover, transition to the new noninflationary regime will alter the real demand for money, increasing it as open-market nominal interest rates fall, especially if all deposits are allowed to bear market-determined rates. Some provision for the transition would be necessary.

Can democratic governments, in the waning years of the twentieth century, forswear all responsibility for real macroeconomic outcomes? Can they confine themselves to providing a certain ration of base money, or transactions money, and leave performance in terms of production to markets, collective bargaining, and other activities of private agents and institutions? This is what Karl Brunner is recommending, and it is a sharp reversal of commitments made in the Employment Act of 1946, reaffirmed in the Humphrey-Hawkins legislation, and entrenched even more strongly though informally in contemporary American politics. I do not think the reversal is either realistically feasible or wise.

I turn now to some general comments on the issues of policy activism. I do not believe that the case for "activist" macroeconomic policies — by which I mean policies that depend on observations of the current and past state of the economy and on conditional projections of future states — depends on the policy-makers' possession of full structural information, whether by "divine intuition" (Brunner's phrase) or other means. It does depend on the policy-makers' possession of information, whether generally available and understood or not, to which private agents individually and collectively will not quickly adjust through markets or other channels. That information is often provided by current and recent observations, given the serial persistence of economic shocks. There are surely times when one doesn't need very precise knowledge of structure to see that the risks of moving the economy the wrong way or too far the right way are very small — the 1930s, the early 1960s, the late 1960s.

Nature sometimes jumps, contrary to Marshall, but the surprises are not quickly reversed. The central bank may or may not be better informed than

some private agents. But it differs from all private agents in other important respects. Its operations are not limited by past commitments or by liquidity or by credit limitations in the capital markets. Its objectives are not those of a private firm or household or bank. These differential characteristics are the reasons for the original and traditional role of the central bank as lender of last resort and guarantor against panic. As Henry Kaufman reminds us from his experience, financial markets are not immune to waves of destabilizing irrational speculation. The central bank is in a position to take a longer and more fundamental view, to provide an anchor so that the actions of private agents in the markets can be stabilizing rather than destabilizing. This is true in foreign exchange markets as well as other financial markets. One implication of Brunner's hands-off policy is neglect, whether benign or not, of the foreign exchange markets. He does not discuss this implication, which seems especially serious for so large an actor in the world economy as the United States.

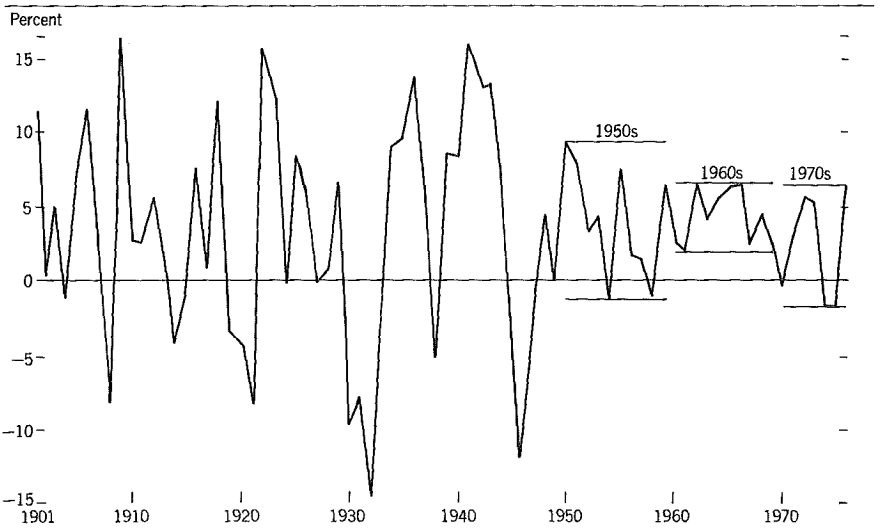
"Fine tuning" was an unfortunate phrase, a caricature of activist policy. A good helmsman does not overwork the tiller, and an amateur shower-taker suffers cycles of scalding and freezing water. Undoubtedly the economy generates a lot of noise policy-makers do best to ignore. I don't think their task is well or completely described as one of offsetting the errors in well-behaved normal processes whose mean values are perfectly satisfactory. Among the possible structures in Karl's s vector are some that have multiple equilibria, or persistent departures from unique equilibrium paths. The Keynesian message to policy-makers is that they should help the economy get to the best equilibrium path. It may not be fashionable these days to admit that market economies can get stuck on far-from-optimal tracks, but it is certainly not their recent performance that supports current fashion. The likelihood of macroeconomic market failures arises clearly enough from the incompleteness of markets: savers do not place specific orders for delivery of future consumption goods on definite dates in particular states of the world, workers are not able to communicate their readiness to buy the goods they would produce if they were employed. Some of these failures are inextricably tangled with the institution of money, and indeed are part of the price societies pay for the greater efficiency of monetary exchange compared to barter. Even "rational expectations" do not reliably fill these gaps, and it is the task of macro policies to ameliorate these market failures, no less than the analogous public function Brunner recognizes in microeconomics.

Brunner cites, in partial support of his thesis, the policy-ineffectiveness theorems of the rational expectations school, the "new classical macroeconomics." But in the end he does not rest his case on these propositions, which would after all say that any known policy rule, whether feedback formula or blind constant growth, is neither better nor worse than any other. (On this basis, the spirit of Brunner's minimax strategy suggests using a feedback rule, on the outside chance that Keynesians might sometimes be right.) Moreover, in the absence of continuous market clearing by price as assumed in new classical theory, the anticipation of policy does not always negate it but may rein-

force it. As Martin Baily (1978) shows in the article from which I excerpted Figure 1, response of investors to compensatory countercyclical policy does a lot of the work of the policy itself.

Rational expectations theorists have rightly directed our attention to the incentives for private agents to adapt their behavior to the policies they perceive governments to be following. As Karl Brunner observes, we have no justification for assuming that private agents will not learn both what policymakers know and what they systematically do. At the same time, we should not attribute miracles of optimization to households and businesses. Imagine that Karl was writing a memo for a large corporation, say GM or IBM, rather than for the Fed. Like all of us, such a company faces an unknowable environment. Imagine the stable policy he would recommend to the management: do nothing, for the risks of doing something are always larger. More seriously, I think Herbert Simon and Sidney Winter are right that any decision-maker in a situation of diffuse uncertainty relies on some simple but not eternal rules of behavior rather than reoptimizing every day. These rules likely contain feedback elements as well as elements of stability designed to avert overreactions to transient information. Although they assume certain features of the general macroeconomic environment, including monetary policy, they will change, but change only slowly, on evidence that the environment has changed. For runs of significant length, but not forever, macroeconomic policy-makers can and should assume these rules to persist and make policy

Chart 1 The Rate of Growth of Real Gross National Product, 1901-1976



Sources: U.S. Bureau of the Census, *Historical Statistics of the United States: Colonial Times to 1970*, pt. 1 (Government Printing Office, 1975), series F3; *Economic Report of the President, January 1977*, p. 188; *Survey of Current Business*, vol. 57 (July 1977), table 1.2.

accordingly. After decades of compensatory policy, a shift to inactive policy would be a surprise to which it would take private agents some time to adapt.

Karl begins his paper with an account, maybe a caricature, of what he calls a standard Keynesian view of monetary policy. I don't know whose views this account is meant to describe; they are certainly not mine. I think the issue of interest targeting has been greatly overblown ever since the great Accord of 1951. The use of a temporary and variable interest rate target for week-to-week operations is not the same thing as pegging. I would not have the Fed stick with any target, interest rate or monetary quantity, without regard to the projected and observed economic consequences. I regard interest rates and monetary aggregates as joint and simultaneous endogenous outcomes of the interaction of Fed operations in financial markets with private demands and supplies. It is not correct, in my view, to regard the transmission process as a linear chain from Fed operations to monetary aggregates to financial markets and the real economy.

I shall conclude by repeating here my view that the Fed should abandon the monetary aggregates and express target brackets for one to three years ahead in terms of growth of nominal gross national income. It would be better, perhaps, to avoid the implied point-for-point tradeoff between real growth and inflation by stating a rectangle of brackets for the two components. Anyway the Fed would simply be committing itself to adjust its instruments so as to bring about a desired course of macroeconomic variables of true concern, without committing itself to any particular tracks of intermediate variables. Both consistency of policy and credibility require that the Fed's targets be also those of the Administration and Congress in budgetmaking. One advantage would be that, for a transitional period of disinflation, these targets would mean a lot more to the businesses and unions who make prices and wages than multiple targets for esoteric monetary aggregates. The Chairman of the Federal Reserve may be threatening the economy with Thatcher-like austerity, but his message does not get across as clearly as that of the Prime Minister.

This is the third conference the Bank has sponsored on Controlling Monetary Aggregates. I think the general verdict of this one is against this method of making monetary policy. Maybe the next one could be on Controlling Nominal and Real Income.

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