WHO SHOULD CONTROL THE MONEY SUPPLY?

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Section I of this paper develops a model determining some motivational peculiarities of an optimal monetary authority, an authority who chooses a socially optimal money growth rate and thereby a socially optimal inflation rate. The model assumes: (a) that discretionary policy is desirable and (b) that all possible authorities have the same information. Section II rationalizes the assumption of the desirability of discretionary policy and, at the same time, specifies the optimal form of such policy under rational expectations. The section also indicates that an assumption of rational expectations strengthens rather than weakens, as its proponents are wont to assume, the case for discretionary monetary policy. Section III relaxes the assumption that all possible monetary authorities have the same information. In doing so, it exposes a dilemma unique to problem of finding an optimal monetary authority: A monetary authority with the efficient motivation belongs to such a small subset of the available experts that he is highly unlikely to possess anything close to the information required to carry out effective policy. The model thus explains both the unusual motivational characteristics and the poor performance of observed monetary authorities.

The model assumes that there are both positive and negative welfare effects of the actual rate of inflation, independent of the expected rate of inflation. Positive effects occur, for example, whenever money creation is a superior form of taxation. Negative effects occur, for example, when real resources are used up in the process of changing prices, say because different

sellers raise prices at different times, thereby creating socially wasteful shopping opportunities, the magnitude or frequency of which vary directly with the actual inflation rate.

At the heart of the model is a finite horizon, perfect information, noncooperative game -- a game without binding commitments -- between well-intentioned governmental authorities and the public. The solutions to such interactions are typically nonoptimal. (This was pointed out through examples several years ago (Buchanan, Thompson, 1974a), and has been recently established in an abstract environment (Kydland and Prescott).) Our contribution here, like elsewhere (1979, 1980), is (1) to show that certain governmental forms overcome such inefficiencies without resorting to inflexible legislative commitments or relying on unrealistic psychological commitments on the part of governmental authorities and (2) to point out that such efficient governmental forms are the dominant forms observed in the real world.

I. The Optimal Monetary Authority

We begin by assuming a policy maker with a personal utility function identical to a social welfare function, a function depending, among other things, on the actual rate of inflation, I, and, in a strictly positive fashion, on transfers from rich to poor, T. Assume further that the monetary authority can control only the supply of money at some future date, a variable affecting only the rate of inflation, I. The higher the excess of this rate over the expected rate of inflation, E(I), the greater the transfer from creditors to debtors and therefore rich to poor. (Evidence that the poor are debtors to the rich is found in Bach-Stephenson.)

So, summarizing, the relevant, differentiable, welfare-utility function of the monetary authority is $U(T(I-E(I)),I)$ where $U_T > 0$, $T' > 0$, and $T(0) = 0$. At the policy maker's optimum, the value of I, I*, satisfies the marginal condition:

$$U_T T' + U_I = 0. \tag{1}$$

Equation (1) describes, of course, an "equity-efficiency trade-off," a situation in which the marginal efficiency loss from unexpected inflation, $-U_I$, equals the marginal gain in social welfare from the transfers resulting from unexpected inflation, $U_T T'$.

Note, however, that the expected rate of inflation, which is beyond the control of the monetary authority, has yet to be determined. Assuming rational expectations on the part of the borrowers and lenders, it must be that $E(I) = I^*$. The public sees who the monetary authority is, correctly anticipates his solution, and thereby forces a solution value of E(I) to

be such that $T^* = 0$. This would be true regardless of social arrangements. Therefore, with social welfare maximized recognizing the inability to independently vary E(I), the relevant constraint being $T \equiv 0$, the constrained maximum occurs at I**, where

$$U_I = 0 \ . \tag{2}$$

The contrast between the normal bureaucrat's optimum and the social optimum is shown in Figure 1. The Figure also shows that $I^{**} < I^*$. That is, the socially optimal rate of inflation is strictly less than the normal bureaucrat's optimum. Our normal, redistribution-oriented bureaucrat cannot achieve the optimum for he cannot pre-commit himself to a certain value of I. If the value of I were down at I**, he could not resist the temptation to inflate. After all, the marginal efficiency loss from a little more inflation at I** is essentially zero while there is a substantial redistributional gain. The rate of inflation under the redistribution-oriented authority has to rise to where he perceives the redistributional gains from additional inflation to be offset by the efficiency losses. At his solution, the authority appreciates the significant efficiency gain from a lower inflation rate but cannot tolerate the redistribution toward the wealthy that the lower rate would induce.

Now suppose there is a possible monetary authority that has a peculiar utility function in that this authority, unlike most others, has no preference for redistributions to the poor. If he were the monetary authority, he would set an I such that $U_I = 0$. The public, seeing this, sets E(I) equal to his solution I. His solution is therefore identical to the constrained welfare maximizing solution described in (2), the social optimum at I**.

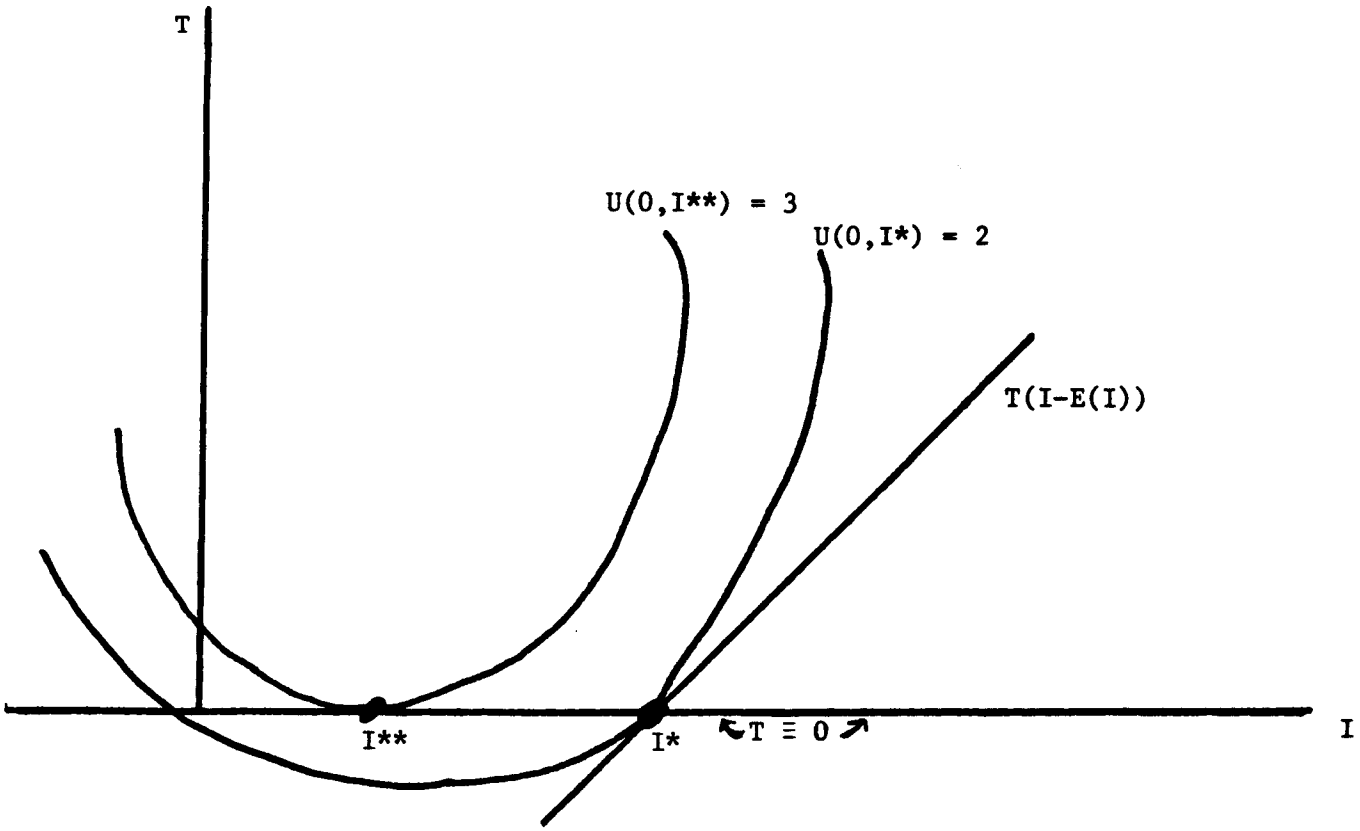

Figure 1

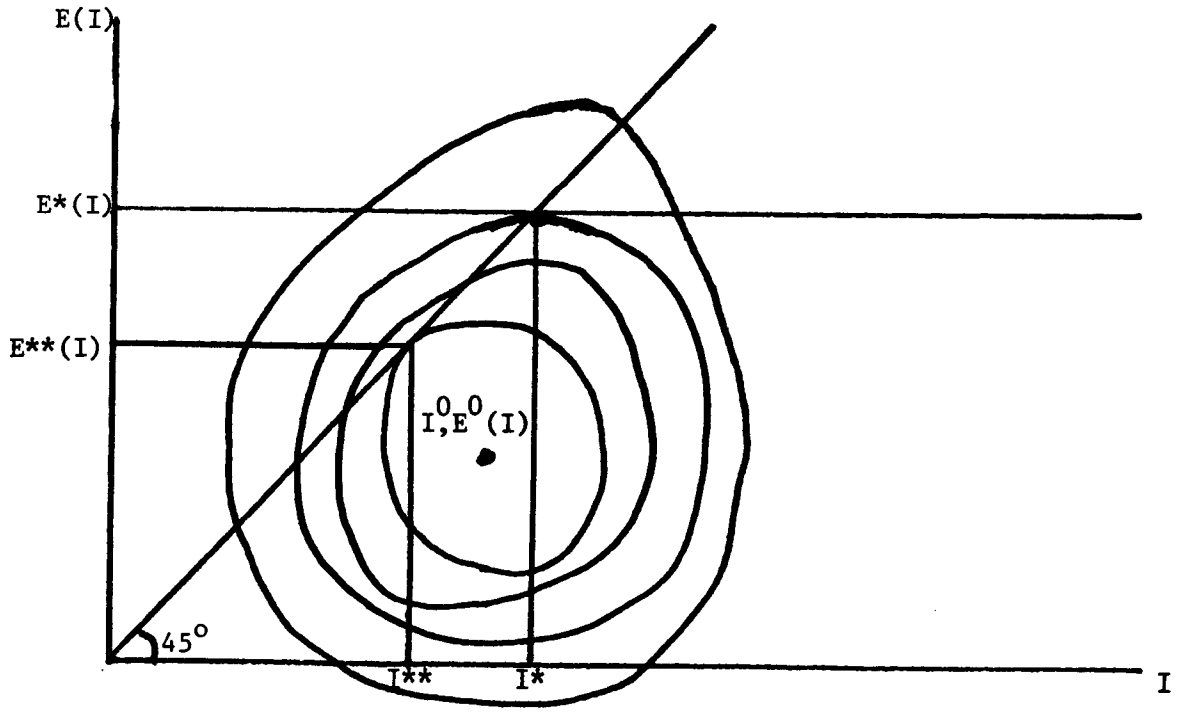

Figure 2

More generally now, let social welfare depend on both E(I) and I, where the unconstrained welfare maximum, $(I^o, E^o(I))$, has $E^o(I) \neq I^o$. (See Figure 2; it is assumed that $\partial U/\partial E(I) < 0$ (Bailey) except at very low E(I) (Thompson, 1977).) Since this solution is, in fact, infeasible, social welfare must be maximized subject to the constraint that E(I) is equal to I. At the resulting optimum, (I**, E**(I)), increases in I come at the cost of equal increases in E(I) so that the social value of increasing I by an extra 1% equals the social cost of increasing E(I) by 1%. But a monetary authority with representative preferences will, taking the expected inflation rate as given, expand I to I*, where its marginal value is zero (Figure 2). The only way to achieve a social optimum is to find an authority who somehow feels an artificial (non-social) cost of expanding I equal to the social cost of expanding E(I). This takes an authority with such unusual preferences that it would seem more reliable to find one who believed that it was an empirical fact that whenever he changed the actual rate of inflation, the expected rate changed by the same amount. Since no sane authority would believe that his actual money supply change is perfectly anticipated regardless of the change he selects, this may not, at first glance, appear very helpful. But think of our problem as occurring in the first among several periods and specify the affected rates to be the <u>future</u> -- not current -- expected inflation rates. The belief then becomes at least qualitatively reasonable if we also relax the assumption that the public has perfect information over the preferences of the authority and therefore (Kreps-Wilson) admit some adaptive expectations. But our optimal authority is extreme. He believes that popular inflationary expectations are -- rather than "rational" -- "perfectly extrapolative" in that the current inflation rate his policy produces will be the expected inflation rate for all of the future periods of his reign. When this authority, like our distributionally neutral authority, also feels relatively insignificant benefits from differences between current

actual and current expected inflation rates, he will feel that the only significant welfare effect of lowering the actual inflation rate is to lower the expected inflation rate by about the same amount and will therefore choose an inflation rate that is approximately equal to the optimum at I**, which is less than I* as long as $\partial U/\partial E(I) < 0$ at $(I^*, E^*(I))$.

In the extreme case that the expectations of the public are -- in fact -- perfectly extrapolative rather than rational in that the expected future inflation rate equals the actual past rate, the distributional problem will remain. A redistribution oriented authority will still continually overinflate because of his incentive to achieve short-run redistributional benefits. But the above generalization of the problem does not. An informed, non-redistribution-oriented, monetary authority, would then treat an increase in I as an increase in future E(I) and hence choose the optimal inflation rate. However, as recent empirical estimates indicate that a 1% increase in the actual inflation rate increases the popularly expected rate by less than 0.1% (Jacobs and Jones), it is likely our optimal monetary authority must substantially overestimate the elasticity of inflationary expectations.

The generalized model extends to some degree to any bureaucrat and serves to explain the seemingly excessive concern with "precedents" in successful bureaucracies. But the special model, and the corresponding argument against a redistribution-oriented authority, loses its force for ordinary governmental bureaucrats because of the relatively insignificant potential for unexpected changes in their policy variables to improve the social disbribution of wealth. Nevertheless, other, game-theoretically identical, arguments exist to rationalize the presence of non-altruistic bureaucrats in other areas of government (Thompson, 1980).

II. Why Discretion?

An apparent substitute for hiring a monetary authority with motivational peculiarities is to legislatively freeze the money supply or tie it to some observed economic index. Such legislative constraints would put the redistributive power of a monetary authority on a rough par with that of other governmental authorities. But we do not observe such constraints This is presumably because appropriately timed, discretionary variations in the money supply provide efficient countercyclical offsets to exogenous shocks in aggregate demand or supply.

Such offsets are of social value as they prevent significant, inefficient variations in production and employment due to overly inelastic wage expectations of certain kinds of labor. I call this the "confusion theory" of unemployment, the overly inelastic wage expectation being based on the inability of certain workers to distinguish a shock altering the wage level from one altering only relative wages between different locations (Thompson, 1974b, 1977). An advantage of the theory is that it enables us to model Keynesian-type unemployment within a fully competitive, general temporary equilibrium model (Thompson, 1974b, 1977) rather than naively imposing a question-begging, fixed price on a Walrasian model (Hicks). For some reason, our temporary equilibrium theorists have failed to see this and have insisted on modeling Keynesian unemployment by imposing an artificial money wage on a temporary or a full equilibrium Walrasian model. These authors have, en masse, failed to see that inefficient unemployment in a competitive model is the sensible result of certain laborer's having an incorrect perception of a <u>future</u> wage rate (possibly a wage for a job in a new location) and is therefore representable in a particular kind of temporary equilibrium. (For a survey of the numerous,

inappropriate unemployment models built upon the original oversight of Hicks, see Grandmont or Drazen.) The importance of this error is that it has obscured the simple policy guide provided by a temporary equilibrium theory of unemployment. In particular, the theory implies that the inefficiency arising from involuntary unemployment is due solely to inaccurate future wage expectations. For example, if we were in the depths of a depression with an extremely high level of unemployment, the unemployed workers, having discovered their past errors and understanding that the money wage level is lower than they had thought, would return to employment along an optimal time path without any interventionist monetary policy; effective expansionary policy would fool them into returning to work too quickly. Policy intervention is justified only during a time period in which the policy maker knows the future wage level better than the uninformed laborers. In such a period, an optimal policy is to change the money supply to offset the exogenous shift in the aggregate demand or supply of labor and thereby leave the money wage unaffected by the latter shock. (The policy does not induce errors by the informed workers as long as they either see both shocks or have rational expectations and therefore see that the exogenous shock has no effect on the post-policy money wage level.) Optimal policy is preventative, not reactionary; we cannot help by "curing" a depression; we can only help by preventing one. And we could, if we had perfect information regarding near-future equilibrium wage levels, have perfect, completely preventative, countercyclical monetary policy.[1]

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[1]While our temporary equilibrium-policy theory need not be restricted to a single commodity, labor is the only competitively marketed commodity we know of for which government authorities often have systematic information advantages concerning future market prices over many of the market transactors. The absence of a capital market for human capital prevents specialist-speculators from entering and revealing variations in labor values in different areas to the less informed owners of labor.

The possibility of exogenous shocks in the money wage level and, correspondingly inefficient employment fluctuations, adds a new argument to our social welfare function. Interpreting I as a money wage level, $|I-E(I)|$ would appear as a new, separate, negative-derivative argument in the social welfare function. Nevertheless, if there were perfect, preventative policy in the above sense, then the Section I maximal solutions, all of which have the property that $|I - E(I)| = 0$, would also maximize the expanded welfare function, regardless of the type of monetary authority.

The value of I would be adjusted for unsystematic aggregate shocks so as to justify the value of E(I) set at the non-shock solution value of I to the policy-maker's non-shock optimization problem. Exogenous aggregative shocks would affect neither I* nor E*(I). Those satisfied with perfect policy models can proceed to Section III.

Now suppose that the unsystematic changes in aggregate demand cannot be perfectly observed by the monetary authority. E(I) would then equal I only in a statistical sense. That is, when money supplies do not vary so as to always realize the otherwise faulty wage expectations of uninformed workers, E(I) will differ for different individuals, the average E(I) exceeding I when there is "involuntary unemployment" and falling short of I when there is "cyclical overemployment." And only the mathematical expectation of the average E(I) - I can, under rational expectations, be set equal to 0. The variance of the distribution of I - E(I), σ, about its zero mean will thus positively enter the social welfare function, as will any current deviation of I from E(I). A current deviation in aggregate output will be represented by $Y - Y^{o}$, where Y^{o} is the optimal level of output, a known function of the previously observed level of output, Y_{-1}. Hence, there is a direct social disutility for $|Y - f(Y_{-1})|$, which is isomorphic to $|I - E(I)|$, the expression entering our indirect social welfare function. $|I - E(I)|$ is,

under rational expectations, determined by off-trend changes ("innovations") in the money supply, M, and unexpected, exogenous, aggregate demand changes, A. Hence, $Y = f(Y_{-1}) + g(M,A)$. Since A cannot be perfectly observed, M cannot be perfectly correlated with A so as to neutralize its effect and make $g = 0$ always, but we may make M a statistical function of A so as to reduce the expected effect of A on $Y - f(Y_{-1})$. We do this in the following way: A particular aggregate shock is either observed or unobserved by the monetary authority. If it is unobserved, our problem is over in that no change in M or the expected I of this policy maker can be based on an unobserved shock. The deviation of Y from Y^o is unavoidable. But suppose A is observed by the monetary authority. Then he sets an M such that $g = 0$, and there is no real fluctuation. Because $I = E(I)$ under these conditions, there is still no change in the Section I solution. Finally, as such a policy minimizes σ, the variance of $I - E(I)$, there is again no policy conflict and we can therefore maintain the policy framework of Section I despite the authority's imperfect ability to observe exogenous shocks.[2]

The reason we have escaped the familiar, short-run policy trade-off between employment and wage inflation is that our optimal, strictly

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[2]The minimization of σ does not imply the minimization of the variance of $(Y - Y^o)$. The prevention of some output fluctuations increases the magnitude of others. Once workers figure out that fewer changes in the aggregate wage level actually occur, they are more likely to rationally mistake any given aggregative wage change for a relative wage change. As a result, employment will be more susceptible to a given, unneutralized aggregative shock (i.e., $\partial q/\partial A$ increases with our countercyclical policy). The effect of successful countercyclical policy on the variance of output is ambiguous. But there is still an improved allocation of resources even if the sum of the output variations is unaffected. This is because workers are simultaneously adjusting better to the relative wage shifts that must also be occurring in order to keep expectations rational. That is, a relative wage decrease is simultaneously more likely to be interpreted as such and correctly adjusted to with a job switch. So the "natural," or "frictional", level of employment expands and becomes more efficient as the workers rationally adjust to the sometimes-effective countercyclical policy (Thompson, 1977).

preventative, wage increases are increases from otherwise subnormal to normal, optimal, wage levels. A policy producing abnormal wage inflation cannot improve the allocation of labor.

We should allow the optimal level of I to depend on past observations, which we have summarized in Y_{-1}. In such a case, the optimal money supply at the upcoming date would depend on Y_{-1}, introducing a "systematic" element into actual and optimal monetary policy. Under rational expectations, such a policy alters both I and E(I) given Y_{-1} by the same amount and therefore has no effect on $Y - Y^{o}$. It represents no policy "innovation." Hence, although the Section I value of I** varies with experience, the assumption of rational expectations allows the policy maker to "fine tune" the actual and expected rates of inflation accordingly without inducing inefficient aggregate fluctuations as well as to use his occasional information advantage to prevent some such fluctuations.

Moreover, in the special case in which social welfare is not altered by various values of I within a given interval of optimal I, the assumption of rational expectations prevents the policy maker from introducing economic fluctuations by imposing a pointless but systematic policy function on the economy. Suppose, for example, that he expands the money supply in the depths of a depression. This introduces equally greater values of both I and E(I) without affecting the optimality of the laissez-faire recovery path.

Viewed in the above light, rational expectations protects us against ill-conceived, systematic, countercyclical policies and therefore provides new support for discretionary monetary policy. The popular impression to the contrary is based on the above-described misformulation of the underlying welfare problem posed by aggregative economic fluctuations.

III. Empirical Application

Summarizing the above argument, our optimal monetary authority: (1) has distributionally neutral preferences; he is not your normal, somewhat-redistribution-oriented, politically dependent, government bureaucrat; (2) believes that increases in the actual rate of inflation increase expected rates of inflation by similar amounts even though the actual increases in the expected inflation rates of others are typically much lower; and (3) is able to apply preventative policy, responding to aggregative demand or supply shocks with monetary shocks before the former have significant, easily observable, effects.

It's bad enough that each of these three characteristics is, taken by itself, fairly rare. What's worse is that someone who satisfies the first two requirements is highly unlikely to satisfy the third. An anti-welfare conservative with grossly exaggerated views of the sensitivity of future-to-current inflation rates is very unlikely to be also both willing to pre-emptively intervene in the macroeconomy and able to do so in a way that systematically neutralizes aggregative demand or supply shocks before they substantially affect the economy. Since most observed monetary authorities do appear to come close to satisfying the first two, rather demanding, criteria, they should not be expected to also be aggressive, high-quality, macroeconomic experts. We should therefore not be surprised when, for example, even the most recent U.S. monetary authorities allow unnecessary booms by failing to tighten money supplies in the face of obvious shifts down in the world demand for dollars (1973, 1978) and allow recessions by failing to lossen money supplies in the face of obvious jumps in non-labor input costs

(1974, 1979). Furthermore, to the extent that we have foregone some of the first two attributes to obtain a somewhat more capable fine tuner, the model rationalizes our apparent tendency to produce somewhat excessive inflation rates.

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