THE ILLUSION OF
STABILIZATION POLICY?

Steven L. Green

Herschel I. Grossman

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ABSTRACT

For the period 1959-1972 money growth in the United States
was positively correlated with past inflation and negatively
correlated with past unemployment, whereas for the period 1973-
1984 this correlation pattern was reversed. International data,
moreover, show that the eight largest western economies exhibit a
wide variety of patterns for these correlations, and these
patterns seem to be unrelated to average inflation. Theoretical
analysis reveals that a model in which the monetary authority is
concerned only with controlling inflation is consistent with any
pattern of sample correlations of money growth with past
inflation and past unemployment. This analysis suggests that
international differences in these sample correlations result
from differences in the sample variances of disturbances to
productivity growth and to aggregate demand. Specifically, the
analysis suggests that the critical difference between the pre-
1973 and post-1973 periods for the United States was a decrease
in the importance of transitory disturbances to aggregate demand
relative to permanent disturbances to productivity growth. More
generally, these results imply that we cannot readily infer the
objectives of the monetary authority from observed patterns of
monetary policy.

Steven Green   Herschel Grossman
Research Department   Department of Economics
Federal Reserve Bank of Dallas   Brown University
Dallas, TX 75222   Providence, RI 02912

1.   Inflation and Patterns of Money Growth

For the period 1959-1972 money growth in the United States was positively correlated with past inflation and negatively correlated with past unemployment, whereas for the period 1973-1984 this correlation pattern was reversed. Moreover, as summarized in the table, international data show that the eight largest western economics exhibit a wide variety of patterns for these correlations. This paper develops a positive theoretical model of monetary policy that shows that intertemporal and international differences in these sample correlations can result from differences in the sample variances of disturbances to productivity growth and to aggregate demand. The distinctive feature of this model is the assumption that monetary authorities behave as if their sole objective was the achievement of a given target path for inflation.

This parsimonious theoretical specification of the objectives of monetary policy contrasts sharply with theories that attribute observed patterns of monetary growth to alleged stabilization objectives. In a widely accepted example of such an analysis, John Taylor (1981, 1982) characterizes monetary policy in the United States as excessively accommodative of inflation, and he attributes this defect to overzealous attempts to prevent negative supply shocks, which are inflationary, from eroding real money balances, depressing aggregate demand, and increasing unemployment.

Taylor's assumption that the Federal Reserve has behaved as if it is greatly concerned about unemployment suggests a positive response of money growth to increases in both inflation and unemployment. But, as the table indicates, positive correlations of money growth with past inflation and past unemployment are not a persistent feature of the data either for the United States or for other economies. In fact, none of the eight large economies

TABLE

	Period	Average Annual Inflation Rate	Correlation of Money Growth with Past Inflation	Correlation of Money Growth with Past Unemployment
Italy	73.1 - 85.1	15.7%	-.36	-.31
United Kingdom	73.1 - 85.1	13.1%	.23	0
France	75.1 - 84.4	10.6%	.39	0
Canada	73.1 - 85.1	8.9%	-.25	.31
United States	73.1 - 85.1	7.9%	-.24	.44
The Netherlands	73.1 - 85.1	6.4%	.52	0
West Germany	73.1 - 85.1	4.8%	0	0
Switzerland	75.1 - 85.1	3.2%	0	0
United States	59.1 - 72.4	2.7%	.60	-.46

Current money growth is defined as the difference between the logs of M1 (or a comparable aggregate) in quarter t and in quarter $t-4$.

Past inflation is defined as the difference between the logs of the consumer price index in quarter $t-4$ and in quarter $t-8$.

Past unemployment is defined as the average unemployment rate for quarter $t-4$ through $t-7$.

The correlation between x and y, given by $r(x,y)$, is defined as

$$r(x,y) = [\sum(x-\bar{x})(y-\bar{y})] [\sum(x-\bar{x})^2 \sum(y-\bar{y})^2]^{-1/2}.$$

Approximate standard errors for the above estimates are given by $1/\sqrt{N}$, where N is the sample size. For the sample period 73.1 to 85.1, $N = 49$ and the approximate standard error is 0.143. Only those estimates greater than one standard error in absolute value are reported; otherwise, a zero is entered in the table.

provide an example in which both of these correlations are positive. Most notably, although the sample correlation of money growth with past inflation for the United States is positive for the entire interval 1959-84, during the period 1973-85, when apparently large negative supply shocks occurred, this sample correlation was negative. Moreover, during the earlier period, 1959-72, when the correlation of money growth with past inflation was highly positive, the correlation of money growth with past unemployment was negative.

In addition, Taylor's argument that accommodation of inflation is responsible for excessive inflation suggests a positive relation between the correlation of money growth with past inflation and the average inflation rate. The table shows that money growth is positively correlated with recent past inflation in the United Kingdom and France, both of which had relatively high average inflation, and that money growth is uncorrelated with recent past inflation in West Germany and Switzerland, which were the economies with lowest average inflation. The data for other counties, however, contradict this pattern. The correlation between money growth and past inflation is positive for the United States in the earlier period and for the Netherlands, both of which had lower average inflation than the United States in the later period, and is negative for both Canada, which had higher average inflation than the United States, and Italy, which had the highest average inflation.

The international data also show a similar absence of a clear relation between average inflation and the responsiveness of money growth to past unemployment. Canada is the only economy, besides the United States for the later period, for which money growth is positively correlated with past unemployment. In Italy, the highest inflation economy, this correlation is negative. It is also worth noting that the patterns of correlation of money growth with past growth rates of aggregate output show a similar absence of any clear relation to

average inflation. These findings imply that neither the
positive correlations of money growth with past inflation in
France, the United Kingdom, and the Netherlands nor the high
average inflation in Italy, France, and the United Kingdom is a
consequence of zealous concern for stabilizing unemployment (or
output growth).

Another problem with Taylor's argument is that it leads to
the question of why the Federal Reserve has persistently followed
an inefficient policy. Taylor suggests "that at least until
recently, the superiority of the less-accommodative policy has
not generally been realized or believed" (1982, p. 84). This
explanation accords with standard monetarist criticisms of
Federal Reserve policy, perhaps best exemplified in the
historical research of Friedman and Schwartz (1963), that
attribute bad monetary policy to idiosyncratic shortcomings of
the monetary authorities, especially ignorance and perhaps also
cowardice. A complementary line of historical analysis argues
that bad policy results from perverse bureaucratic incentives--
see, for example, Toma (1982, 1985). Both of these theories of
excessive inflation imply that the solution to the alleged
problem of inefficient accommodation of inflation is the
promulgation of laws that effectively constrain the monetary
authority to pursue efficient policies. A difficulty with these
theories as positive economics is that they provide no
explanation for the absence of such apparently desirable laws,
beyond the implication that the basic problem is that the higher
political authorities and the public are unenlightened.

Another theory that emphasizes concern about unemployment,
developed in the work of Kydland and Prescott (1977) and Barro
and Gordon (August 1983), focuses on assumed incentives for the
monetary authority to produce unanticipated inflation and
attributes inefficient monetary policy to the consequent time-
inconsistency of efficient monetary policy. Barro and Gordon
suggest that negative productivity innovations that

contemporaneously increase both unemployment and inflation also
increase the incentive for the Federal Reserve to try to produce
unanticipated inflation, with the result of higher money growth
and inflation in subsequent periods. But, as we have seen, no
pattern of persistently positive correlations of money growth
with past inflation and past unemployment is evident in the data.

The analysis that follows identifies factors that are
unrelated to stabilization objectives and average inflation and
that provide a general explanation for correlations of money
growth with past inflation and past unemployment and for
international differences in these correlations. This analysis
focuses on hypothetical differences in the sample variances of
disturbances to productivity growth and to aggregate demand. To
sharpen this focus, the analysis assumes that the only objective
for monetary policy is the achievement of a given target time
path for inflation. Importantly, the analysis abstracts from
perversity or stupidity on the part of monetary authorities or
the public and from time-consistency problems associated with
incentives to produce unanticipated inflation.

2. Analytical Framework

Consider the following setup, which, although simple, is
quite general and includes as special cases the essential
properties of several well known models. The key assumptions
about the proximate determination of wages and employment are the
setting of the nominal wage rate in period t equal to the
rational expectation of its market-clearing level conditional on
information available in period t-i,

(1) $W_t = E_{t-i} W_t^*,$ $i = 0,1,2, \ldots$

the production function relating output to employment of labor
services and to other factors,

(2) $Y_t = \alpha N_t + Z_t$, $\quad 0 < \alpha < 1$,

and the setting of employment and output to equate the marginal product of labor services to the real wage rate,

(3) $N_t = (1-\alpha)^{-1}(P_t - W_t + \ln \alpha + Z_t)$,

where W_t is the log of the nominal wage rate in period t,

                W_t^* is the log of the nominal wage rate that would be consistent with clearing the labor market in period t,

                E_{t-i} is an operator that denotes an expectation conditional on information available in period $t-i$,

                Y_t is the log of output in period t,

                N_t is the log of employment of labor services in period t,

                Z_t measures the total effect of exogenous stochastic variables that influence labor productivity in period t,

    and P_t is the log of the output price level in period t.

The results reported by Nelson and Plosser (1982) suggest the specification that the growth rate of productivity, ΔZ_t, is the sum of a permanent component, g_t, assumed to be a random walk with innovation ε_t, and a transitory component, z_t, assumed to be a white noise — that is,

(4) $\Delta Z_t = g_t + z_t = g_{t-1} + \varepsilon_t + z_t$,

where ε_t and z_t have zero means and stationary variances $V(\varepsilon)$ and $V(z)$ and are uncorrelated serially and with other random variables.

The analysis assumes that the monetary authority revises policy at a regular interval. In this framework, this decision-making interval defines the length of a period. Thus, monetary policy in period t is based on information available in period t-1.

Within this framework, three special cases of equation (1), which differ according to the value of the parameter i, are worth noting:

(a) If i equals zero, the nominal wage rate responds to current information. In this case, forecast errors made by private agents play no role. Actual employment always equals the supply of labor services and changes in employment and output correspond to changes in labor supply and productivity.

(b) If i equals unity, the nominal wage rate is predetermined, but wage setting and policy making are synchronized. In this case, given that employment adjusts to equate the marginal product and the real wage rate, unanticipated realizations of either output price or productivity can cause actual employment to differ from the supply of labor services. Nevertheless, because, with i equal to unity, the monetary authority has no informational advantage, monetary policy does not systematically affect employment and output. [Although this model focuses on the unpredictability of labor demand, rather than on incomplete contemporaneous information, the main implications in this case are isomorphic to those of the classic equilibrium monetary business cycle models--for example, Lucas (1973) and Barro (1976).]

(c) If i equals two or more, not only is the nominal wage rate predetermined, but the monetary authority also reacts to new information more frequently than nominal wages are adjusted. [The seminal paper by Fischer (1977), integrating rational expectations into a Keynesian framework, analyzed this case.] This informational advantage means that the monetary authority's

systematic policy of controlling inflation can have side effects on unemployment. The analysis that follows uses this case. For simplicity, it assumes that i equals two.

The first step in analyzing the implications of equations (1) - (3) is to determine the market-clearing wage rate by substituting the supply of labor services, denoted N*, for N_t in equation (3) and solving for

$$(5) \quad W_t^* = P_t + \ln \alpha + Z_t - (1-\alpha)N^*.$$

For simplicity, the analysis treats labor supply as constant. The next step is to determine the actual nominal wage rate by applying the operator E_{t-2} to equation (5) and substituting into equation (1) to get

$$(6) \quad W_t = E_{t-2}P_t + \ln \alpha + E_{t-2}Z_t - (1-\alpha)N^*.$$

To determine employment substitute equation (6) into equation (3), which yields

$$(7) \quad N_t - N^* = (1-\alpha)^{-1}(P_t - E_{t-2}P_t + Z_t - E_{t-2}Z_t).$$

Equation (7) indicates that the difference between actual employment and labor supply is proportionate to the sum of wage setters' forecast errors for the output price level and for productivity. Specifically, positive forecast errors for output price and productivity cause excess employment. The forecast error in productivity reflects exogenous innovations in the components of ΔZ_t. The forecast error in output price remains to be analyzed. Finally, to determine unemployment, define U_t to be the deviation in the log of unemployment from a constant (equilibrium) level associated with equality between N_t and N*, and assume that

(8) $U_t = - (N_t - N^*)$.

The remaining elements in specifying the behavior of private agents are the assumption that output price adjusts each period to equate actual output and output demand, and a general specification of output demand,

(9) $Y_t = k(M_t - P_t) + X_t$, $k \geqslant 1$.

where M_t is the log of a nominal monetary aggregate in period t and X_t measures the total effect of other variables that influence output demand. For simplicity, the analysis assumes that k equals unity. This assumption means that the analysis abstracts from induced, as opposed to autonomous, changes in velocity and also from the effect of current productivity innovations on employment. (With k equal to unity, the increase in the price level resulting from a negative productity innovation is just enough to reduce real wages in line with the reduction in the marginal product of labor services, so that employment does not change.) The analysis also assumes that the demand disturbance X_t is the sum of a permanent component, D_t, assumed to be a random walk with innovation e_t, and a transitory component, x_t, assumed to be a white noise—that is,

(10) $X_t = D_t + x_t = D_{t-1} + e_t + x_t$,

where e_t and x_t have zero means and stationary variances $V(e)$ and $V(x)$ and are uncorrelated serially and with other random variables.

The distinctive feature of the model is the assumption that the only objective of the monetary authority in period t-1 is to set M_t to achieve an exogenous target value, denoted by Π_{t-1}, for the inflation rate from period t-1 to period t. The

assumption that the inflation target is exogenous--specifically, independent of the time series of unemployment--ensures that the inflation target is not acting as a proxy for a stabilization objective. Assume also that monetary control is precise and that the information set of private agents in period t-1 includes Π_{t-1}.

Although monetary control is precise, because Z_t and X_t are stochastic variables, the monetary authority in general cannot achieve its inflation target exactly. Nevertheless, it can set M_t to equate expected inflation to the target--that is, $E_{t-1}P_t - P_{t-1} = \Pi_{t-1}$. Given that inflation deviates from its target value by only a white-noise forecast error, the time series properties of actual inflation suggest the specification of Π_t as an autoregressive process. For simplicity, however, the analysis assumes that the inflation target is constant--that is, $\Pi_t = \Pi$ for all t. Accordingly, expectations about the price level are

(11) $E_{t-1}P_t = P_{t-1} + \Pi$ and

(12) $E_{t-2}P_t = P_{t-2} + 2\Pi$.

3.   Correlations of Money Growth with Past Inflation and Past Unemployment

The analysis of the model given by equations (1) through (12) involves solving for current money growth, past inflation, and past unemployment in terms of realizations of the exogenous random shocks, and using these solutions to calculate the implied covariances between current money growth and past inflation and between current money growth and past unemployment. Substituting equation (2) for Y_t and equation (7) for N_t into equation (9) gives

(13) $\alpha N^* + \alpha(1-\alpha)^{-1}(P_t - E_{t-2}P_t + Z_t - E_{t-2}Z_t) + Z_t$

$$= M_t - P_t + X_t.$$

Applying the operator E_{t-1} to equation (13) yields, after setting $E_{t-1}M_t$ equal to M_t,

(14) $M_t = \Pi + P_{t-1} + E_{t-1}Z_t - E_{t-1}X_t + \alpha N^*$

$$+ \alpha(1-\alpha)^{-1}(E_{t-1}P_t - E_{t-2}P_t + E_{t-1}Z_t - E_{t-2}Z_t).$$

Equation (14) says that the monetary authority's choice of M_t depends on the price level in period $t-1$ and on the monetary authority's inflation target, on its forecasts of productivity, output demand, and labor supply for period t, and on the difference between its current forecasts of prices and productivity in period t and the forecasts on which nominal wages for period t were based.

Substituting equation (14) for M_t into equation (13) gives, after substituting equations (11) and (12) for $E_{t-1}P_t$ and $E_{t-2}P_t$,

(15) $\Delta P_t = \Pi - (Z_t - E_{t-1}Z_t) + (1-\alpha)(X_t - E_{t-1}X_t).$

Equation (15) says that either a negative forecast error for productivity or a positive forecast error for demand causes inflation to exceed the monetary authority's target.

Finally, substituting equation (7) for N_t and equation (12) for $E_{t-2}P_t$ into equation (8) gives

(16) $U_t = -(1-\alpha)^{-1}(\Delta P_t - \Pi + \Delta P_{t-1} - \Pi + Z_t - E_{t-2}Z_t).$

Equation (16) says that either inflation below its target or a negative forecast error for productivity cause unemployment to exceed its constant equilibrium level.

To calculate the relevant covariances for a simple, but revealing, case assume that the information set of all agents in period $t-i$ includes the permanent and transitory components of ΔZ_{t-i} and X_{t-i}. Given the stochastic processes specified by equations (4) and (9), this assumption implies that

$$\Delta E_{t-1} Z_t = g_{t-3} + \epsilon_{t-2} + 2\epsilon_{t-1} + z_{t-1},$$

$$\Delta E_{t-1} Z_t - \Delta E_{t-2} Z_t = -2\epsilon_{t-2} + 2\epsilon_{t-1} - z_{t-2} + z_{t-1},$$

$$Z_{t-1} - E_{t-2} Z_{t-1} = \epsilon_{t-1} + z_{t-1},$$

$$Z_{t-1} - E_{t-3} Z_{t-1} = 2\epsilon_{t-2} + \epsilon_{t-1} + z_{t-2} + z_{t-1},$$

$$E_{t-1} X_t - E_{t-2} X_{t-1} = e_{t-1}, \quad \text{and}$$

$$X_{t-1} - E_{t-2} X_{t-1} = e_{t-1} + x_{t-1}.$$

[If, in contrast to this specification, the information set of wage setters and the monetary authority does not include the permanent and transitory components of the disturbances, then realized forecast errors would exhibit signs of positive serial correlation in a small sample that contained one or more dominant large innovations to one or both of the permanent components. The important papers by Brunner, Cukierman, and Meltzer (1980, 1983) analyze various implications of this effect, although they treat money growth as exogenous rather than, as in the present model, as derived from the objectives of the monetary authority.]

Differencing equation (14) and backdating equations (15) and (16), after combining these equations and substituting the above expressions for the expectations and the forecast errors, yields

(17) $\Delta M_t = \Pi + g_{t-3} + (1-\alpha)^{-1}\varepsilon_{t-1} + [1-\alpha(1-\alpha)^{-1}]\varepsilon_{t-2}$

$$+ x_{t-1} - \alpha(e_{t-2} + x_{t-2}).$$

(18) $\Delta P_{t-1} = \Pi - \varepsilon_{t-1} - z_{t-1} + (1-\alpha)(e_{t-1} + x_{t-1}),$ and

(19) $U_{t-1} = - [(1-\alpha)^{-1}\varepsilon_{t-2} + e_{t-1} + x_{t-1} + e_{t-2} + x_{t-2}].$

Equations (17), (18), and (19) imply

(20) $\text{cov}(\Delta M_t, \Delta P_{t-1}) = - (1-\alpha)^{-1}V(\varepsilon) + (1-\alpha)V(x)$ and

(21) $\text{cov}(\Delta M_t, U_{t-1}) = (2\alpha-1)(1-\alpha)^{-2}V(\varepsilon) + \alpha V(e) - V(x).$

Equations (20) and (21) express the covariances of money growth with past inflation and past unemployment as linear functions of the variances of the underlying random variables. Depending on the relative size of these underlying variances, the two covariances of interest can be positive, negative, or zero. The relations between the underlying variances and the two covariances of interest arise as follows:

A negative disturbance to productivity growth in period $t-1$ causes output growth to be low and inflation to be high in period $t-1$. If the disturbance to productivity growth is transitory, i.e., a negative realization of z_{t-1}, the monetary authority in period $t-1$ expects inflation to decrease to its previous rate in period t without any adjustment in money growth. If, alternatively, the disturbance to productivity growth was permanent, i.e., a negative realization of ε_{t-1}, the

monetary authority in period t-1 expects that, without any adjustment in money growth, output growth would continue to be low and inflation would continue to be high in period t. Accordingly, in order to achieve its inflation target, the monetary authority would decrease money growth in period t. In this way, permanent disturbances to productivity growth in period t-1 cause high inflation in period t-1 to be associated with low money growth in period t.

This reduction in money growth in period t, which wage setters in period t-2 did not anticipate, causes unemployment temporarily to be high in period t. The monetary authority in period t, consequently, expects two opposing influences on inflation in period t+1. The continuing low productivity growth will tend to make inflation high, whereas the recovery of employment will tend to make inflation low. Accordingly, whether or not, in order to achieve its inflation target, the monetary authority keeps money growth low in period t+1 depends on the size of the parameter α. To the extent that the parameter α exceeds one-half, the effect of the recovery of employment dominates, and permanent disturbances to productivity growth in period t-1 cause high unemployment in period t to be associated with high money growth in period t+1.

A positive disturbance to demand in period t-1 also causes inflation to be high in period t-1. If the disturbance to demand is transitory, i.e., a positive realization of x_{t-1}, the monetary authority in period t-1 expects demand to decline in period t. Accordingly, to achieve its inflation target, the monetary authority would increase money growth in period t. In this way, transitory disturbances to demand period t-1 cause high inflation in period t-1 to be associated with high money growth in period t. If, alternatively, the disturbance to demand is permanent, i.e., a positive realization of e_{t-1}, the monetary authority in period t-1 expects demand to remain

constant and inflation to decrease to its previous rate in
period t without any change in money growth.

Positive disturbances to demand in period t-1 also cause
unemployment to be low and output to be high in periods t-1
and t. Thus, transitory disturbances in demand in period t-1
cause low unemployment in period t-1 to be associated with high
money growth in period t. The monetary authority in period
t, however, expects unemployment to return to its normal level
and output growth to be low in period t+1. Accordingly, the
monetary authority in period t expects that, without any
adjustment in money growth, inflation would be high in period
t+1. To achieve its inflation target, it would decrease money
growth in period t+1. In this way, disturbances to demand in
period t-1, either permanent or transitory, cause low
unemployment in period t to be associated with low money growth
in period t+1. The net effect is that permanent disturbances to
demand cause positive comovements of money growth and past
unemployment, whereas, given that α is less than unity,
transitory disturbances to demand cause negative comovements of
money growth with past unemployment.

This analysis suggests that intertemporal and international
differences in the pattern of correlation of money growth with
past inflation and with past unemployment can result from
international differences in the relative magnitudes of the
sample variances of the underlying permanent and transitory
disturbances. Equations (20) and (21) indicate that in this
model the critical factor is the magnitude of transitory
disturbances to demand, given by $V(x)$, relative to the
magnitudes of permanent disturbances to demand and to
productivity, given by $V(e)$ and $V(\varepsilon)$. Specifically, the
analysis suggests that the change in the pattern of correlation
in the United States from the earlier to later period results
from a decrease in $V(x)$ relative to both $V(e)$ and $V(\varepsilon)$.

As explanations for the pattern of correlations for the other economies, assuming that α is about one-half, the analysis suggests that in Italy $V(x)$ was larger than $V(e)$ but smaller than four times $V(\varepsilon)$, that in the United Kingdom, France, and the Netherlands $V(x)$ was large relative to $V(\varepsilon)$ but was about the same size as $V(e)$, that in Canada, as in the United States for the later period, $V(x)$ was smaller than $V(e)$ and smaller than four times $V(\varepsilon)$, and that in Switzerland and West Germany $V(x)$ was about equal to $V(e)$ and also about equal to four times $V(\varepsilon)$.

5.   Summary

International data show that the eight largest western economics exhibit a wide variety of patterns for the correlations of money growth with past inflation and past unemployment and that these patterns seem to be unrelated to average inflation. Theoretical analysis shows that a model in which the monetary authority behaves as if its sole objective is control of inflation is consistent with any pattern of correlations of money growth with past inflation and past unemployment. Moreover, this analysis suggests that intertemporal and international differences in these sample correlations result from differences in the sample variances of disturbances to productivity growth and to aggregate demand. Specifically, the analysis suggests that the critical difference between the pre-1973 and post-1973 periods for the United States was a decrease in the importance of transitory disturbances to aggregate demand relative to permanent disturbances to aggregate demand and to productivity growth.

More generally, these results imply that we cannot readily infer the objectives of the monetary authority from observed patterns of monetary policy. Specifically, the idea that monetary policy, either in the United States or in other countries, has attempted to stabilize real activity and to control unemployment may be an illusion.

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