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Michael T. Belongia
Federal Reserve Bank of St. Louis
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ABSTRACT

Mascaro and Meltzer have implied, but not tested, that increased uncertainty about monetary policy will reduce real income. This proposition is tested directly by adding a Kalman filter estimate of monetary uncertainty to a St. Louis-type GNP equation. The results indicate that increased uncertainty about monetary policy has permanent negative effects on both the level and growth rate of GNP.

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I. INTRODUCTION

Mascaro and Meltzer (1983) have provided evidence that higher interest rates and increased demand for money are associated with increased variability in short-run money growth. On the theoretical basis of an IS-LM model, Mascaro and Meltzer argue that variable money growth is likely to be associated with declines in the levels of both real and nominal GNP. Unfortunately, this direct relationship between erratic Fed policy and GNP is never tested directly.

This note tests directly the Mascaro-Meltzer proposition that variable money growth has a negative effect on GNP. Using a St. Louis-type GNP equation, the variance of one-period-ahead forecast errors for M1 growth are introduced as a measure of uncertainty about the future course of monetary policy. Our results indicate that, over two different sample periods, variable short-run money growth is associated with a significant, permanent reduction in both the level and growth rate of GNP.

II. A REVIEW OF THE ARGUMENT

The notion that increased uncertainty causes an increase in the demand for (precautionary) money holdings has a rich history dating back to Keynes (1936), Tobin (1958) and Friedman and Schwartz (1963). In its most simple form, individuals are

confronted with a tradeoff between holding zero-yield cash balances and government bonds. Yields can be increased by holding more bonds but only at the risk of rising interest rates and a loss in bond value. Conversely, risk can be avoided by holding more cash but only at the loss of foregone yields. Models based on this tradeoff suggest that a more risky economic environment will tend to increase money demand because individuals prefer greater liquidity when uncertainty increases. Mascaro and Meltzer support this result with respect to σ_m, their measure of the variability of monetary policy.[1/]

Their analysis, however, stops short of estimating whether such a shift in money demand will have the effects on velocity and output implied by (their) figure 1. As the figure shows, increased variability of monetary policy tends to increase the demand for money, shift LM to LM' and move the equilibrium from A to B. One result of this first round effect will be higher interest rates which, through a real balance effect, will shift IS_o to IS_1 and determine a new equilibrium at C. So long as LM shifts by a larger amount and IS_o is not vertical, real output will decline to something like y_1^e. Also, as derived by Mascaro and Meltzer, the consequent effects of variable money growth on money demand, interest rates and output will be permanent unless policy becomes less variable and risk premia fall such that these values return to their pre-shock values.

This conclusion, however, is necessarily an empirical proposition. The individual results reported by Mascaro and Meltzer for the effect of σ_m on interest rates and money demand do not show whether the leftward shift in LM caused by increased money demand dominates the rightward shift in IS that results from the real balance effect. A more direct approach to testing this proposition is outlined in the next section.

III. MONETARY UNCERTAINTY IN A MODIFIED ST. LOUIS EQUATION

Adjustment dynamics are likely to reveal the level shifts depicted in figure 1 as short-run declines in the growth rate of GNP. Moreover, if the short-run effect of variable money growth on inflation is small, as suggested by Mascaro and Meltzer, Friedman (1983) and others, inferences about the path of real output can be discerned from the behavior of nominal GNP. Under these assumptions, the effects of variable money growth on the growth rate of nominal GNP are examined by estimating the following equation:

$$\dot{GNP}_t = \alpha_0 + \sum_{i=0}^{p} \beta_i \dot{M}_{t-i} + \sum_{j=0}^{q} \tau_j V_{t-j} + \sum_{k=0}^{n} \delta_k EP_{t-k} + \tau_0 S_t + \varepsilon_t \quad (1)$$

where $\dot{GNP}$ and $\dot{M}$ are, respectively, the annualized rates of change of nominal GNP and M1; V is the multi-state Kalman filter estimate of the variance of one-quarter ahead forecasts

of M1 growth; EP is the percentage change in the relative price of energy; and S is average number of work days lost in a quarter from strike activity, deflated by the civilian labor force.[2/] Lag lengths p, q and n were determined in pre-test estimation.[3/]

A word on the estimate of uncertainty about monetary policy (V) plotted in figure 2 may also be in order. Moving standard deviations [Mascaro-Meltzer; Slovin and Sushka (1983); Klein (1977)] and regression residuals [Barro (1977)] have been popular empirical measures of uncertainty. Bomhoff's (1983) multi-state Kalman filter estimates of money growth uncertainty have several desirable properties. First, because it is the variance of one-period-ahead forecast errors, the Kalman filter estimates are true ex ante estimates of uncertainty. Second, the algorithm separates permanent from transitory shocks to a time series, such that a one-time temporary change (e.g., 1980's credit controls) are not measured as permanent changes in uncertainty. Finally, a rate of learning can be applied to reflect gradual adjustments by agents to changing weights on the permanent and transitory components of a series' shocks. In each respect, the Kalman filter estimates of uncertainty reflect an evolving set of information.[4/]

Since the hypothesized declines in the levels of income and output are likely to be observed as short-run declines in their growth rates, several null hypotheses are relevant to

effect on the level, but not growth rate, of nominal income. This result implies that the increases in money demand and interest rates caused by variable money growth have short-run output effects but do not affect factors that determine the long run growth rate of GNP. It also is interesting to note that the sum of coefficients associated with M1 growth is not significantly different from one after a direct measure of money variability is added to the equation. In a manner consistent with earlier studies, work stoppages have a negative effect on GNP growth and changes in the relative price of energy have no impact on the long-run growth rate of income.

These results also are robust with respect to sample period. When the estimation period is extended through 1982:2 and several quarters of large increases in uncertainty are added to the sample, variable money growth exerts significantly negative effects on both the level and growth rate of GNP. Apparently the severe and abrupt shocks to monetary policy in 1980-81, which raised measured uncertainty to levels substantially above its previous 10-year trend, were large enough to have significant allocative effects on investment and the equilibrium capital-labor ratio not present when uncertainty was following the low and stable path of the 1970s. The estimated effects of M1 growth, work stoppages and the relative price of energy also are consistent across sample periods.

The effect of monetary uncertainty might be seen most clearly by examining its impact on GNP on trend velocity. Subtracting the significant sum coefficient for monetary uncertainty, ΣT_k, from the model's intercept, we see that the estimated trend growth rate of velocity falls by about 0.5 percentage points (4.812 - 0.532 ≈ 4.280). This result is consistent with the theoretical reasoning that, by increasing money demand, greater uncertainty will tend to reduce velocity. And, ceteris paribus, lower velocity implies lower GNP.

V. CONCLUSIONS

Mascaro and Meltzer showed that uncertainty about future monetary policies may be associated with higher levels of interest rates and money demand. An untested implication of their study is that greater uncertainty about future money growth also could cause a reduction in the level and growth of output. This note applied a St. Louis-type GNP equation to the question of policy uncertainty and income growth. We found that short-run variability in M1 growth has significant negative and permanent effects on both the level and growth rate of GNP.

FOOTNOTES

I am indebted to Allan Meltzer, Rik Hafer and Cliff Stone for their helpful comments and to E.J. Bomhoff and Clemens J.M. Kool for providing their Kalman filter estimates of monetary uncertainty. The views expressed do not necessarily reflect those of the Federal Reserve Bank of St. Louis or the Board of Governors of the Federal Reserve System. The usual caveat applies.

1/ Mascaro and Meltzer measure uncertainty about monetary policy by transforming the residuals from a univariate time series model fit to the log-levels of M1; their transformation was $[\frac{1}{4} \sum_{i=1}^{4} \epsilon_{t-i}]^{1/2}$, where ϵ_{t-i} are the time series residuals.

2/ Further documentation on these two latter variables and their effects on income growth can be found in Tatom (1981).

3/ Approaches to pre-test estimation discussed by Pagano and Hartley (1981); Fey and Jain (1982) and Mallows (1973) were applied to this problem and each pre-test statistic suggested the use of contemporaneous and two lagged values for $\dot{M}$ and EP and contemporaneous and seven lagged terms for the measure of money growth variability. Pre-test statistics also indicated that high-employment government expenditures, typically included in St. Louis-type models as a measure of fiscal stimulus, offered no significant marginal contribution to the model's explanatory power. As such, this variable was omitted from the estimating equation.

4/ See Bomhoff, chapter 4 and appendix 1, for more detail on the use of this algorithm to generate measures of

monetary uncertainty. The values used in estimating equation (1) correspond to data plotted in figure 5.2, p. 147 in Bomhoff.

5/ The effect would be the end-product of a sequence of events like the following. Wealth is composed of capital and real balances. Increased uncertainty about the course of monetary policy increases the demand for money, raises the amount of real balances and increases the real rate of interest. A higher real rate of interest reduces real wealth. And, with lower real wealth and larger real money balances, the capital stock falls and real income is reduced.

TABLE 1

Estimates of the GNP Equation[a/]

	II/1967-IV/1979	II/1967-II/1982
α_o	4.877 (2.43)	4.812 (2.28)
$\dot{M}_t$	0.670 (2.58)	0.443 (2.34)
$\dot{M}_{t-1}$	0.183 (0.69)	0.124 (0.66)
$\dot{M}_{t-2}$	0.104 (0.43)	0.426 (2.44)
$\Sigma\dot{M}$	0.957 (0.13) [b/]	0.992 (0.02)
V_t	-0.323 (0.43)	-0.362 (1.40)
V_{t-1}	1.326 (1.64)	0.214 (0.63)
V_{t-2}	1.031 (1.26)	0.620 (1.96)
V_{t-3}	-1.767 (2.03)	0.216 (0.73)
V_{t-4}	-1.271 (1.44)	-0.761 (2.29)
V_{t-5}	1.688 (2.08)	1.052 (3.10)
V_{t-6}	-0.695 (0.92)	-0.894 (2.59)
V_{t-7}	-0.304 (0.42)	-0.617 (2.00)
ΣV	-0.667 (1.06)	-0.532 (2.12)
EP_o	-0.097 (1.96)	-0.083 (1.80)
EP_1	0.169 (2.62)	0.142 (2.29)
EP_2	-0.156 (2.97)	-0.140 (2.81)
ΣEP	-0.084 (1.74)	-0.081 (1.85)
S	-0.521 (2.04)	-0.530 (2.03)
$\bar{R}^2$	0.47	0.52
D-W	2.07	2.12
SEE	3.088	3.240

II/67-IV/79 Ho: $V_t = V_{t-1} = \ldots = V_{t-7} = 0$; F = 2.32

II/67-II/82 Ho: $V_t = V_{t-1} = \ldots = V_{t-7} = 0$; F = 3.42

a/ Absolute values of t-statistics in parentheses.

b/ This statistic applies to the null hypothesis $\sum_{i=0}^{2} \dot{M}_{t-i} = 1$.

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FIGURE 1. The effect of more variable money growth on income in an IS-LM model

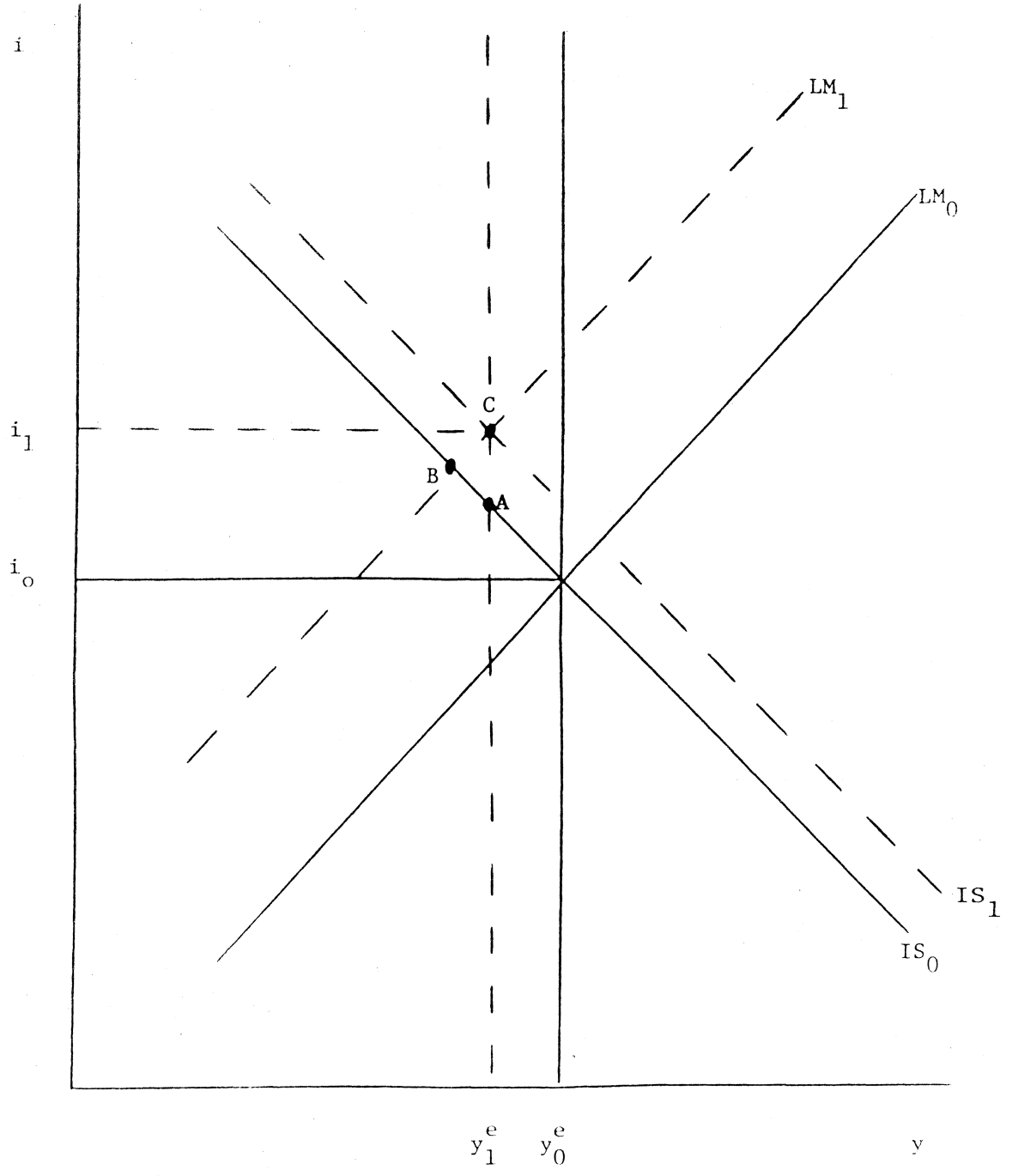

FIGURE 2. Kalman filter estimates of uncertainty about monetary policy.