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MONEY SURPRISES AND SHORT-TERM INTEREST RATES: RECONCILING CONTRADICTORY FINDINGS

John H. Makin

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Cambridge MA 02138

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ABSTRACT

This note attempts to reconcile contradictory findings regarding the impact of money surprises on short term interest rates. Expectations effects regarding anticipated monetary policy and anticipated inflation suggest a positive relationship. Liquidity and output effects of monetary surprises suggest a negative relationship. It is shown that intra-day data and end-of-period data will capture expectations effects while period average data will capture liquidity/output effects. Seemingly contradictory results are reconciled by differences in dependent variables employed by various authors.

John H. Makin
Fiscal Affairs Department
Room 6-101
International Monetary Fund
Washington, D.C. 20431

(202) 477-6102

I. Introduction

The impact upon short-term nominal interest rates of "surprise" or unanticipated movements in the money supply has been the focus of a number of empirical investigations conducted since adoption in October, 1979 by the Federal Reserve of new operating procedures. There are, however, seemingly contradictory findings among the results of these investigations. The aim of this paper is to suggest means of reconciling these contradictory findings. The effort seems justified in light of the sharply elevated means and variances of money surprises since October of 1979 reported by Roley (1982) and Makin (1982.a).

Those who see a positive relationship between money surprises and interest rates emphasize two types of expectations effects. Grossman (1981) and Roley (1982) see positive money surprises resulting in higher nominal rates due to anticipated future tightening moves by the monetary authority committed to money growth targets. Roley (1982) finds this effect far more pronounced after October, 1979. Mishkin (1982), on the other hand, links positive money surprises with anticipated inflation, thereby explaining their positive association with short term rates.

A negative relationship between money surprises and short run interest rates is explained by liquidity or output effects. Liquidity effects arise from an excess money supply condition associated with a money surprise when prices are "sticky" as suggested in Khan (1980) and Makin (1982.a). Assuming that real income does not rise sufficiently to absorb excess money supply as a result of a positive money "surprise," the expected real interest rate must fall to equate money supply and demand.[1] Alternatively, Makin (1982.b) argues from a structural model that a positive money surprise elevates real output, income and thereby saving so that a new equilibrium with higher real investment (equal to higher real saving) requires a lower expected, after-tax real rate.[2] This in turn will see a lower nominal interest rate at a given level of expected inflation and at given levels of any other variables which may affect the expected after-tax real rate.

Reconciliation of these findings will be seen likely to depend upon differences in sampling intervals, different methods of measuring unobservable money surprises and careful consideration of possible two-way causality between money surprises and interest rates. The intention here is not to "settle" differences in perspective regarding the relationship between money surprises and interest rates and no claim is made that all questions raised are satisfactorily resolved. Rather, the questions explored will hopefully alert investigators to the particular significance of some seemingly innocuous assumptions and measurement techniques.

II. Surprises and Expected Policy

There is no conflict between the findings of Makin (1982.a, 1982.b) and those of Grossman (1981) and Roley (1982) which rationalize a rise in nominal interest rates during the one and one-half hours following a positive money surprise as a response to expected tightening by the Fed. In Makin (1982.b) the question investigated is whether, <u>during</u> the quarter in which money is above its anticipated path, there is downward pressure on interest rates. Failure to reject the hypothesis that this is true is not inconsistent with discovery of a pure expectations effect whereby an announced weekly money supply number above the consensus forecast results in higher rates over the period from 3:30 p.m. before the announcement to 5:00 p.m. which in turn reflects anticipated tightening by the Fed.

Roley and Grossman are sampling rates over only a one and one half hour interval precisely in order to capture a pure expectations effect by reducing to a minimum the possibility that other shocks will impinge upon the market and occlude its appearance. Alternatively, Makin's finding with quarterly data is simply that over a quarter when an effort is made to control for behavior of other variables operating on the interest rate, it is not possible to reject the hypothesis embedded in his model that money surprises depress the nominal rate. The precise form of the quarterly data employed becomes relevant in discussing differences between results of Mishkin (1982) and Makin (1982.a, 1982.b), to which we now turn.

III. Inflationary Expectations and the Impact of Money Surprises

The results of Mishkin (1982) and Makin (1982.b) are not as easily reconciled although a number of avenues can readily be explored as there exist significant differences in both their theoretical frameworks and in the data employed to test hypotheses.

Mishkin appears to derive his estimated equation from "the liquidity preference approach to the demand for money." It is convenient to write a money demand equation in log form from which to derive Mishkin's estimating equation.

(1) $$(m_t - p_t) = \beta y_t - \gamma i_t + \varepsilon_t \qquad (\beta, \gamma > 0)$$

where m_t = log of money supply

p_t = log of the price level

y_t = log of real output

i_t = nominal interest rate.

Inverting equation (1) and solving for an expression for the nominal interest rate and for the expected nominal interest rate as of time "t-1" conditional on information at time "t-1" gives:

(2) $$i_t - {}_{t-1}i^e_t = \gamma^{-1}[\beta(y_t - {}_{t-1}y^e_t) + (p_t - {}_{t-1}p^e_t) - (m_t - {}_{t-1}m^e_t + \varepsilon_t].$$

Equation (2) is essentially Mishkin's equation (8). Writing a forward rate as ${}_{t-1}i^e_t$ plus a risk premium and substituting into (2) gives the final equation estimated by Mishkin:[3]

(3) $$i_t - {}_{t-1}F_t = -a_0 - a_1\sigma_t + \gamma^{-1}[\beta(y_t - {}_{t-1}y^e_t) + (p_t - {}_{t-1}p^e_t)$$

$$- (m_t - {}_{t-1}m^e_t) + \varepsilon_t]$$

where $a_0 + a_1\sigma_t$ measures the risk premium.

Equation (3) implies positive coefficients on output and price surprises and a negative coefficient on the money surprise. Mishkin finds the former two positive coefficients but finds a positive coefficient on the money surprise. This he attributes, it appears, to a rise in inflationary expectations associated with a positive money surprise.

Mishkin's result whereby a positive money surprise will elevate nominal interest is not consistent with liquidity preference theory unless a positive money surprise is taken as a measure of the level of expected inflation. Alternatively the result may be a statistical artifact, explainable in terms of failure to take account of relationships among his "independent" explanatory variables, or in terms of failure to consider a possible response of money surprises to shocks to money demand (a possibility which Mishkin admits) or in terms of simple mismeasurement of surprises.

Consider first the relationship between money surprises and price and output surprises. If they are positively correlated as would be suggested by a number of theories including typical "rational" supply equations, when the money surprise appears alone on the right-hand side of equation (3) (as in 1.1 and 1.5 of Mishkin's Table 1) it proxies for price and output surprises which are positively associated with unanticipated changes in the interest rate. Indeed when the equation is re-estimated with price and output surprises present along with money surprises the coefficient on the money surprise term falls by 20 to 30 percent but remains significantly positive. Still, the estimated coefficient on the price surprise term is not significantly different from zero and the large estimated standard error may be due to multicollinearity. The best way to answer these questions would be to look directly at the correlation matrix for the "independent" variables examined by Mishkin (1982).

Another reason for a positive estimated coefficient on the money surprise term, mentioned briefly by Mishkin, relates to the possibility that money surprises are positively related to the error term in the money demand equation. If, during Mishkin's 1959-76 sample period, positive shocks to money demand caused the Fed to react with an increase in the money supply in order partially to smooth interest rates, then the money surprise term proxies for, ε_t, the error term in the money demand equation which in turn ought to be positively associated with surprise increases in the interest rate under liquidity preference theory.

It is important also to remember that Mishkin (1982) properly employs end of period interest rates in an effort to capture the hypothesized impact of a money surprise upon inflationary expectations. In contrast, to test for liquidity and output effects Makin (1982.a, 1982.b) employs period average interest rates so that interest rates during, say, the fourth quarter are related to a money surprise which will not be known until the end of the quarter. This procedure, which amounts to relating interest rates at time "t-1" to a money surprise discovered at time "t" allows a liquidity or output effect (induced by money being above or below its expected path over the quarter) to operate before the expectations effect (linked to the appearance of a money "surprise" at quarter's end) appears.

A final possible reason for an erroneous inference that money surprises cause a surprise increase in interest rates stems from a difficulty inherent in all investigations of the impact of unanticipated changes in money or other variables. Does the investigator's surprise really measure the actual surprise which confronted economic agents during the sample period under investigation? A great many questions arise here which I have discussed at some length elsewhere in Makin (1982.a, 1982.b). The basic problem in the context of Mishkin's paper can be stated simply. If his surprise is mismeasured so that it is partly anticipated then the coefficient on the mismeasured surprise will be positively biased insofar as anticipated money growth measures anticipated inflation which is in turn positively correlated with interest rates. Mishkin's univariate model of expected money growth is an arbitrary AR-4 process. If the residuals from that representation or from his forecasting equation used in Panel B of Table 1 are not white noise his money surprise is partly anticipated and the estimated coefficient on the money surprise will be positively biased. In fact, this result is likely since Mishkin filters his seasonally unadjusted data with an AR-4 model which very likely leaves seasonality in his measure of money surprises. This inference is supported by Mishkin's reference to unpublished results employing seasonally adjusted data for which "standard errors are somewhat larger" (p. 70).[4]

IV. Concluding Remarks

There is strong evidence that weekly money surprises result by way of an expected policy response by the Fed, in an immediate (within 1.5 hours) rise in short term interest rates. Such a short interval of time is required to capture the pure policy expectations effect advanced by Grossman (1981) and Roley (1982) to explain this result. These arguments are particularly compelling with regard to the period since October, 1979 during which the Fed appears to have assigned more weight to money supply targets than to interest rate targets.

Most theories suggest that in the absence of a policy expectations effect a money surprise ought to depress nominal interest rates either directly (based on liquidity preference theory) or by way of negative pressure on the expected after-tax real rate required to satisfy a simple general equilibrium model. Mishkin (1982) argues that his finding that a positive money surprise causes an unanticipated increase in short term interest rate is due to the new information that the positive money surprise conveys about anticipated inflation.

Mishkin's result is possible reconciliable with Makin's due to his use of end of period data on interest rates which ought to capture expectations effects in contrast with Makin's use of period average data on interest rates which ought to capture liquidity and output effects. Still, it is important to remember that there exist four potential sources of positive bias (described in Section III) in the estimated relationship between money surprises and interest rates reported by Mishkin (1982). Added to this is the fact that better proxies than money surprises exist to measure anticipated inflation. Makin (1982.a, 1982.b) employs survey data, which is only weakly correlated with money surprises, as a direct measure of anticipated inflation. In the presence of such a direct measure of anticipated inflation, it is not possible to reject the hypothesis that a surprise increase in money depresses the expected after-tax real rate and thereby, the nominal interest rate on 3 month Treasury bills.

FOOTNOTES

1. The nominal interest rate must fall due to a drop in the expected real rate since anticipated inflation will not be negatively related to a positive money surprise.

2. The positive income effect also elevates real money demand thereby putting positive pressure on the real rate, but the impact of the saving effect is likely to dominate for typical values of the interest elasticity of money demand as shown in Makin (1982.b).

3. Mishkin's equation actually has surprise growth rates of the right-hand side variables in equation (3) but this is identical to log-level surprises since $(m_t - m_{t-1}) - ({}_{t-1}m_t^e - m_{t-1}) = (m_t - {}_{t-1}m_t^e)$.

4. Using seasonally unadjusted data, all eight of Mishkin's reported money surprise terms are significant at the 5 percent level or better (with 6 of 8 significant at the 1 percent level). Using seasonally adjusted data, Mishkin (1981) reports only 1 of 8 money surprise terms significant at the 1 percent level, 2 of 8 significant at the 5 percent level and 5 of 8 not significant at the 5 percent level.

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