MONETARY AGGREGATES AND MONETARY POLICY

Robert H. RASCHE
Michigan State University

At a quick glance, the behavior of various monetary aggregates in the recent past is quite bewildering. Since the beginning of 1991 (through June, 1992) M1 has grown at an annual rate of 10.5 percent, the adjusted monetary base at an annual rate of 7.8 percent, adjusted reserves at an annual rate of 11.1 percent, but M2 has grown at an annual rate of only 2.4 percent. Since January, 1992, M1 has grown at an annual rate of 11.3 percent, but M2 at an annual rate of only .8 percent. In the summer of 1991 M2 effectively stayed constant, while February, 1992 it has actually fallen slightly.

This disparate behavior of the various monetary aggregates has provoked recent discussions of monetary policy that are reminiscent of and appear to closely parallel the debate over the behavior of the narrowly defined monetary aggregates approximately a decade ago. In his most recent Humphrey-Hawkins testimony, Chairman Greenspan stated:

The relationship between money and spending also has been profoundly affected by the process of balance sheet restructuring...My previous testimony to the Congress noted that aberrant monetary behavior emerged in 1990 and has since intensified. ...reduced depository intermediation stemmed from emerging problems of asset quality, which in turn prompted both the pulling back of depositories from lending and responses by regulators that reinforce those tendencies. ...Looking ahead, the recent increases in M2 velocity may well continue, although the uncertainties in this regard are considerable.

Almost ten years ago, in February, 1983, Chairman Volcker stated in his Humphrey-Hawkins presentation:

In setting our monetary and credit objectives for 1983, the Federal Reserve has had no choice but to take into account the fact that "normal" past relationships between money and the economy did not hold in 1982, and may be in the process of continuing change. Part of the problem lies in the ongoing process of deregulation and financial innovation that has resulted in a new array of deposit and financial instruments, some of which lie at the very border of "transactions" and "savings" accounts, defying clear statistical categories.

The common thread in both of these presentations is that there is something historically unprecedented and perhaps unique in the behavior of the aggregate under consideration. The experience of 1982 led to the removal of M1 from the pantheon of aggregates that the Fed monitored,

and the reestablishment of a borrowed reserves operating procedure, which over time has evolved back to the Federal funds rate operating procedure that existed throughout the 1970s. The singular distinction between the present funds rate operating procedure and that of the 1970s is that the current FOMC appears to be much more aggressive about implementing changes in the funds rate target, and hence the operating procedure is not characterized by the inertia of the 1970s. It seems possible that the current allegations that M2 behavior is not consistent with past patterns could lead to a downgrading of this aggregate in discussions of appropriate monetary policy and a return to the monetary policy operating procedure of the late 1960s in which short-term interest rates were the exclusive focus of policy discussions.

Are we really in a situation in which the behavior of monetary aggregates is inexplicable, and where there are no discernible relationships between monetary aggregates and economic activity? Some analysts (B. Friedman [1988], Friedman and Kuttner [1992]) clearly are convinced that this is the case, and that the behavior of monetary aggregates should be minimized in policy discussions. Other analyses of the U.S. data (Lucas [1988], Poole [1988], Hoffman and Rasche [1991] and King, Plosser, Stock and Watson [1992]) suggest that systematic historical relationships are responsible for the behavior of M1 over the past decade. Similarly, recent behavior of M2 can be shown to be consistent with previous episodes.

M1 Behavior Since 1980

The velocity of M1 on a quarterly basis from 1959-92:1, relative to gross domestic product (GDP) is plotted in Figure 1. Clearly this series has behaved much differently since about 1980. Gone is the upward trend that persisted since the 1950s. If anything there is a slight negative trend over the most recent 11 years. In addition, fluctuations in this velocity measure over the recent period have huge amplitude compared to the fluctuations of the previous twenty-five years. At a first glance it is tempting to dismiss any claim to systematic velocity behavior before and after 1980 as lunacy.

Figure 2 presents M1 velocity data in a somewhat different light. The data plotted here are annual averages of the Treasury bill rate and the reciprocal of M1 velocity; a textbook representation of a money demand specification. The solid line is a long-run (or equilibrium) velocity relationship estimated from the quarterly data in Figure 1 over a sample period of 1956-1990, using the model that Dennis Hoffman and I have published (Hoffman and Rasche [1991]).¹ That model allows for a substantial long-run interest elasticity (approximately .55) of velocity with respect to the Treasury Bill rate. The boxes are a scatter plot of the actual annual observations of the Treasury bill rate and

the reciprocal of M1 velocity. The solid box is the 1991 observation (which is not included in the sample period of the estimation). A plot of the quarterly observations would exhibit more variation around the estimated long-run money demand relationship, but the story is the same: with a simple constant elasticity relationship the movement of interest rates describe the fundamental behavior of M1 velocity over the three and a half decades.

A somewhat different picture using the quarterly data is presented in Figure 3. Here the actual quarterly M1 velocity is plotted as the solid line, while the predicted long-run M1 velocity, *based on the current quarterly value* of the Treasury bill rate is plotted as the broken line. There are large deviations between the two lines, but these deviations are not permanent: the two lines cross repeatedly.²

There are two conclusions to be drawn from this analysis of Figures 2-3. The first is that the recent rapid growth of M1 relative to nominal income growth (the decline in M1 velocity) is a predictable consequence of the decline in the Treasury bill rate from its peak of 7.90 percent in March, 1990 to the recent level of around 3.15 percent. The second is that the full impact on M1 velocity of the 92 percent decline in the Treasury bill rate (measured as log differences) over the past 2 and 1/2 years has not been fully realized yet. Note in Figure 3 that the dotted line is considerably below the actual velocity line. The implication of this is that if the Fed maintains the Treasury bill rate at current levels for some period of time (say over the next year) we should expect to see M1 velocity continue to fall. While the dynamics of the adjustment process to the reduction in nominal interest rates is not identified in the model used here, the adjustments of velocity to various shocks appear to be largely completed in about two years. Hence prolonged growth in M1 relative to GDP will be inconsistent with the Fed's stated objective of reducing inflation.

The same type of relationship held for base velocity for the two decades through the end of the 1980s (see Hoffman and Rasche [1991]), but probably with a lower long-run interest elasticity than M1 velocity. With the major currency exports of a couple of years ago there appears to have been a permanent shift in the level of base velocity, but otherwise the relationship driving the long-run behavior of base velocity was probably unaffected. Therefore it is likely that the same factors that are responsible for the rapid growth of M1 in the recent past are responsible for the rapid growth of the monetary base measures.

Behavior of M2 Since 1990

Quarterly M2 velocity for 55-92:1 is plotted in Figure 4. The broken line is the mean of M2 velocity for that period. Again, velocity is measured relative to the recently revised GDP numbers. The mean here is changed very little from that reported by Hallman, Porter, and Small [1992] for quarterly M2 velocity relative to GNP over the period 55-88:1. As in the case of M1 velocity deviations from the estimated long-run M1 demand equation, the deviations of M2 velocity from the mean M2 velocity are strictly transitory.³ However, it is important to note that the variance of M2 velocity around its mean is very large.

The shaded areas in Figure 4 represent the NBER recession phases. I have arbitrarily dated the end of the 1990-1991 recession with the second quarter of 1991, though it should be noted that the NBER has yet to date the trough of this recession. The characteristic post-war historical behavior of M2 velocity is a sharp decline during recessions or shortly thereafter. The traditional explanation of this is that market rates of interest fall quickly during these periods, but that the rates of interest paid on various components of M2 are considerably more sluggish, so that as the opportunity cost of holding M2 balances (measured by the spread between market rates and own rates) falls and M2 velocity falls. This spread between the Treasury bill rate and the "own rate" on M2 as measured by the staff of the Board of Governors is plotted in Figure 5. Note that this spread dropped substantially in 1985-1986, so the large decline in M2 velocity at this time is consistent with the conventional wisdom. The last two years do not fit the conventional wisdom. The rate spread plotted in Figure 5 dropped throughout the most recent recession as it did in past recessions and remains close to the post-war minimum value. However, it can be seen from Figure 4 that M2 velocity did not behave in the characteristic manner. There was a very small decline in M2 velocity in the year following the cyclical peak, but since then it has increased so that at the latest observation (92:1) it is close to the value at the beginning of the recession.

The recent increase in M2 velocity can be traced to the behavior of the small time deposit component of M2. Small time deposits outstanding are plotted in Figure 6 and it can be observed there that they have declined dramatically and steadily since the beginning of the 1990 recession. If we exclude these small time deposits from M2 and construct the zero maturity money aggregate that Poole [1991] proposed (MZM), it can be seen in Figure 1 that the velocity of M2 excluding the small time deposits has declined steadily for the last several years.

The decline in small time deposits is not unprecedented. While such deposits grew almost continuously throughout the 1960s and 1970s, there have been three periods in the 1980s during which the outstanding volume of these deposits declined. Two of these incidents occurred long before the thrift crisis became everyday news. The reason for these declines does not seem particularly mysterious. In Figure 7 the rate on small time deposits of six-month maturity (as collected by the staff of the Board of Governors) is plotted with the Treasury bill rate. It is evident that over the decade the small time deposit rate has tracked the path of the Treasury bill rate quite closely.⁴ This rate clearly is not sluggish in response to changes in market rates. In Figure 8 the spread of the six-month small time deposit rate over the rate paid on other checkable deposits (OCD) is plotted. The three periods during the 1980s in which the outstanding volume of small time deposits declined correspond to the three periods in which this spread fell. Over the last year to eighteen months this spread has been consistently below one percent and close to the historical lows observed in 1986. The only question is why the decline in small time deposits in the recent past has been so dramatic relative to the decline in 1986. The most frequently cited explanation for the extent of the recent decline in these deposits is the thrift crisis, since the decline in small time deposits at thrifts is much larger than the decline in such deposits at commercial banks. This is part of Chairman Greenspan's rationalization of the recent behavior of M2.

It is probably premature to jump to the conclusion that this behavior of small time deposits represents a unique portfolio restructuring. The major difference in the behavior of the rate spread shown in Figure 8 in 1991-1992 compared to 1986 is that the spread rebounded quickly from its minimum in 1986 while at the present time it has remained near the 1986 minimum for almost a year and a half. Given the long maturity of a large portion of the outstanding small time deposits (Poole [1991]) and the "substantial penalty for early withdrawals," the potential exists for rolling a much larger fraction of the outstanding balances over into other assets in response to the present low rate spread than existed during the short lived decline in the spread in 1986. The decline in outstanding small time deposits in 1986 and 1991-1992 are quite similar to the declines in outstanding large time deposits in 1968 and 1970 when Reg Q ceilings were allowed to become binding. In those two cases, the size of the "runoff" in large CDs was directly related to the length of time that the Reg Q ceiling remained effective. A second factor is the difference in the shape of the yield curve in the recent past compared to 1986. In May, 1992 the yield on 5 year Treasury bonds was 6.69 percent; in December, 1986 it was 6.67 percent. However, in December, 1986 the spread between the two year and five year Treasury rates was only 40 basis points; in May, 1992 this spread was 166 basis points. If the yield curve on small time deposits has a shape similar to that in the Treasury market, then in recent months there is considerably more incentive to roll maturing

intermediate maturity small time deposits over into longer term nondeposit assets. Therefore, a reasonable alternative hypothesis is that the recently observed behavior of small time deposit balances is a normal portfolio adjustment in response to the prevailing structure of interest rates, and would have occurred regardless of the severity or existence of the thrift crisis. Discriminating between these two alternative views of the recent behavior of small time deposits (and M2) will take a considerable amount of careful research, and a definitive answer may not be possible at the present time, given the short history of small time deposit behavior in the absence of interest rate regulation.

If the view that the decline in small time deposits is a normal response to changes in the structure of interest rates, proposals which advocate additional Fed intervention to lower short-term interest rates must be examined with considerable caution. Further reductions in the funds rate target are not likely to have much impact on the spread between small time deposit rates and rates offered on other checkable deposits, since banks will not find it profitable to bid aggressively for such deposits when short-term lending rates are low. Increasing the funds rate in an effort to improve the yield on small time deposits relative to longer term maturity nondeposit assets and stimulate the growth of M2 is not a policy that will be considered in the present circumstances. Under these conditions it is possible that short-run manipulation of M2 growth by the Fed may be difficult or impossible.

The Velocity of Zero Maturity Money

The velocity of zero maturity money (VELMZM) is plotted in Figure 1 along with the velocity of M1. There are many similarities between these two measures. Both show positive trends throughout the 1960s and 1970s; negative trends in the 1980s and much larger amplitude fluctuations in the 1980s compared with the previous decades. The velocity of zero maturity money has declined relative to the decline in M1 velocity since the beginning of the 1990 recession in about the same relationship that occurred during 1986. The trends in zero maturity money velocity before and after 1980 appear to be smaller in absolute value than those in M1, and the fluctuations of the former measure have much smaller amplitude than those of the latter measure during the 1980s. At a quick glance it would appear that if M1 velocity is driven in the long run by a relatively high interest elasticity (Figure 2) then the long-run behavior of zero maturity money velocity could be similarly explained but with a much lower interest elasticity. I have been unable to isolate such a relationship statistically. The reason seems straightforward. The problem is in the behavior of this velocity measure in the 1978-1982 period when zero maturity money deposits were substantially affected

by Req Q ceilings and other deposit regulations. In the late 1970s VELMZM rose very quickly, but this increase was completely reversed in the 1981-1982 period when banks were authorized to issue insured money market deposit accounts. Separating shifts in the demand curve for zero money deposits from the impact of changes in interest rates (movements along the demand curve for these deposits) during this period is extremely difficult and will require considerable more research that I have not accomplished to the present. Until we understand the behavior of the velocity of this aggregate in the absence of regulatory changes, my judgement is that it is premature to make it a significant factor in monetary policy decisions.

Implications for the Role of Monetary Aggregates in Monetary Policy

I think that there are several conclusions about the role of monetary aggregates in monetary policy that can be drawn from the above discussion. First with respect to M2 it is important to distinguish between the transitory nature of shocks to M2 velocity and the variance of those shocks. The fact that M2 velocity has returned to its mean during the post-war period implies nothing about the variance around that mean. In fact that variance is considerable. The coefficient of variation of M2 velocity (standard deviation relative to sample mean) in quarterly data is 2.9 percent. Therefore, from quarter-to-quarter large changes can occur in nominal GDP independent of changes in M2. The collapse of the economy is not guaranteed by any short period of slow M2 growth anymore than an explosion in inflation is guaranteed by a similarly short period of high M2 growth. Second, there may be market conditions, such as have been experienced recently, in which Federal Reserve actions to lower short-term interest rates have no impact on increasing the growth rate of M2, and indeed may be counter productive in that objective.

With respect to narrower monetary aggregates such as the base or M1, policy has to be designed to cope with permanent changes in trends such as occurred around 1980. My conclusion is that the change in velocity trend in these aggregates can be attributed to changes in interest rate trends. My view is that the most plausible cause of the change in interest rate trends is a change in inflation expectations. Under these conditions, changes in monetary policy regimes which affect inflation expectations will in turn affect nominal interest rate trends and velocity trends.

Monetary rules which do not allow for feedback from velocity changes are not going to work very well under these conditions if the objective of monetary policy is the stabilization of nominal income. For example, suppose that inflation, expected inflation, nominal interest rates and velocity have been drifting upward. Further suppose that with these initial conditions the monetary authority desires to stabilize the inflation rate and sets a monetary growth objective equal to a projected

growth rate for natural output plus a desired stabilized inflation rate, minus the historically observed drift in the velocity of a narrowly defined monetary aggregate. If this money growth rate is maintained after expected inflation is stabilized, the drift in nominal interest rates will have disappeared and the actual steady rate of inflation will prove to be lower than the planned rate.

Meltzer [1987] and McCallum [1988] propose alternatives to a fixed money (base) growth rule that allow feedback from velocity onto the planned growth in money (base). These rules are designed to account for permanent shocks to velocity, but not to respond to transitory velocity shocks. The rules set the growth rate of the monetary base equal to a desired growth of nominal income less a moving average of the drift in base velocity. McCallum's rule provides an additional adjustment to base growth as nominal income is observed to deviate from nominal natural output. These rules establish base growth consistent with the planned stable inflation once stabilization is achieved and adjust base growth to compensate for the declining velocity drift during the transition period to the stabilized inflation rate.

However, the above conclusion depends critically on the credibility of the monetary authority. As long as private agents believe that the monetary authority is following the feedback rule consistently, then inflation expectations should adjust either in anticipation of or with the observation of falling inflation over time and the feedback mechanism will adjust base growth as desired. Both the Meltzer and McCallum rules are deterministic. In practice stochastic fluctuations around such deterministic rules will be observed which may make direct verification of the rule difficult. If the monetary authority lacks credibility, feedback rules such as these could prove unstable. Suppose the rule is implemented by the monetary authority and inflation and inflation expectations begin to stabilize. This lowers the drift in velocity and the feedback rule calls for base growth to be adjusted upward. The McCallum rule which ultimately restores nominal income to a specified path of nominal potential income requires that base growth and nominal income growth overshoot equilibrium base growth and equilibrium income growth during the transition period. If the rule is not well understood by private agents, or if the increase in base and nominal income growth is interpreted by such agents as an abandonment of the rule, then inflation expectations could start adjusting upward. This would change the drift of velocity and the rule would then call for reductions in base growth. It is not difficult to conceive of a situation where the monetary authority lacks credibility, in which the Meltzer-McCallum rules suffer from instrument instability (Holbrook [1972]), if the observed behavior of the monetary base affects inflation expectations, and through this the drift of

base velocity. Therefore, a prerequisite for the success of these types of monetary rules is a good and convincing explanation by the monetary authorities of their objectives and how they are seeking to obtain those objectives.

Finally, some analysts object to the implementation of monetary policy through the monetary base, since the base is largely currency, and that large quantities of currency may be held by foreigners and/or are held as a result of illegal activities. From time to time, the level of the base outstanding can change considerably as major currency exports occur. These arguments strike me as a basis for devoting some additional resources to obtaining better data on the holdings of base money in the domestic economy, not for ruling out monetary policies implemented through the monetary base.

NOTES

1. The data used in the current estimation are the 1992 Federal Reserve revised measures of the money stock for 1959-1992 and my [1987] estimates of a M1 series consistent with current definitions of M1 for the earlier years. GDP for 1959-1992 are the current Bureau of Economic Analysis revisions. For the earlier years the older (pre 1991) revisions of GDP and real GDP were used. These were adjusted to the 1959 annual levels of the current revisions.
2. There are two ways of testing for the temporary nature of these deviations. The first is one of the several "unit root" tests where the null hypothesis is that the deviations are permanent and the alternative hypothesis is that they are transitory. The second is a class of tests in which the null hypothesis is that the deviations are transitory and the alternative hypothesis is that they are permanent. Using a Phillips-Perron test to implement the first approach, we reject the null hypothesis of permanent deviations. Using a KPSS [1991] test as adapted by Shin [1992] to implement the second approach, we fail to reject the null hypothesis of transitory deviations.
3. Here we have tested deviations of M2 velocity from its mean using Phillips-Perron tests for which the null hypothesis is that the deviations are permanent and using KPSS tests for which the null hypothesis is that the deviations are temporary. In the former case we reject the null hypothesis; in the latter case we fail to reject the null hypothesis. Thus the results of both types of tests are consistent and support the conclusion in Hallman, Porter, and Small [1992] that deviations of M2 velocity from its mean in the post-war period are transitory.
4. It would be interesting to observe the entire term structure of rates on small time deposits, but I do not have any additional information on these rates at the present time, and I am told that it is difficult to obtain consistent data series for other maturities. The rate on six month deposits is used by the staff of the Board of Governors as the yield on all small time deposits in the construction of an effective yield on M2.

BIBLIOGRAPHY

- Friedman, B.M., 1988, "Monetary Policy without Quantity Variables," *American Economic Review*, 78:440-5.
- Friedman, B.M. and Kuttner, K.K., 1992, "Money, Income, Prices and Interest Rates," *American Economic Review*, 82:472-91.
- Hallman, J.J., Porter, R.D., and Small, D.H., 1991, "Is the Price Level Tied to the M2 Monetary Aggregate in the Long Run?," *American Economic Review*, 81:841-58.
- Hoffman, D.L., and Rasche, R.H., 1991, "Long-Run Income and Interest Elasticities of Money Demand in the U.S.," *Review of Economics and Statistics*, 78:665-74.
- Holbrook, R.S., 1972, "Optimal Economic Policy and the Problem of Instrument Instability," *American Economic Review*, 62:231-55.
- King, R., Plosser, C.I., Stock, J.H., and Watson, M.W., 1991, "Stochastic Trends and Economic Fluctuations," *American Economic Review*, 81:819-40.
- Kwaitkowski, D., Phillips, P.C.B., Schmidt, P. and Shin, Y., 1991, "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root: How Sure are we that Economic Time Series have a Unit Root," Michigan State University, Department of Economics (mimeo).
- Lucas, R.E., 1988, "Money Demand in the United States: A Quantitative Review," *Carnegie-Rochester Conference Series on Public Policy*, 29:137-168.
- McCallum, B.T., 1988, "Robustness Properties of a Rule for Monetary Policy," *Carnegie-Rochester Conference Series on Public Policy*, 29:173-203.
- Meltzer, A.H., 1987, "Limits of Short-run Stabilization Policy," *Economic Inquiry*, 25:1-14.
- Poole, W., 1991, "Choosing a Monetary Aggregate: Another Look," *Shadow Open Market Committee Policy Statement and Position Papers*, Bradley Policy Research Center Public Policy Studies, Working Paper Series, PPS 91-02:91-104.
- Shin, Y., 1992, "A Residual-Based Test of the Null of Cointegration against the Alternative of No Cointegration," Michigan State University, Department of Economics (mimeo).

Figure 4
M2 Velocity 55-92

Figure 5
Treasury Bill Rate - M2 Rate Spread

Figure 7
6 Month Small Time Deposit Rate --- Treasury Bill Rate

Figure 8
6 Month Small Time Deposit - OCD Rate Spread