THOMAS D. SIMPSON
Board of Governors of the Federal Reserve System

Changes in the Financial System: Implications for Monetary Policy

FOR NEARLY A DECADE, money stock objectives have been announced publicly by the Federal Reserve Board, and, for much longer, observers have focused on the money stock as an indicator or guide to monetary policy. Also in the past decade, the financial system has undergone rapid change—through spontaneous market developments and regulatory reforms—and this change has implications for the relationship between money and other macroeconomic variables. The public has been offered a growing array of new or modified financial assets, including assets that can be used for making payments. Negotiable orders of withdrawal (NOW accounts), which are functionally equivalent to demand deposits except that they yield interest, have spread nationwide over this period; moreover, in early 1983 interest-rate ceilings were lifted on those NOW accounts that qualify, in terms of size, as Super NOWs. In addition, money market mutual funds have become widely available over this period, and the money market deposit account has been introduced; both have limited checking privileges and other transactions capabilities. Management of cash has also been facilitated by greatly improved availability of other liquid investments, such as overnight repurchase agreements and Eurodollars.

The potential liquidity of portfolios has been enhanced further by an expanding array of credit services, especially revolving credit lines. At the retail level, commercial banks and a growing number of financial

The views expressed in this paper are those of the author and do not necessarily reflect the views of the Board of Governors of the Federal Reserve System or other members of its staff. Comments and assistance from David S. Jones, Richard D. Porter, David B. Humphrey, Bonnie Garrett, Patrick Parkinson, Michael Prell, Donald Kohn, David E. Lindsey, and members of the Brookings Panel are gratefully acknowledged.

organizations offer consumers lines of credit that are secured by equity in real estate or holdings of securities, many of which are accessible by check.

At the same time, the payments system has been changing—most visibly in the form of electronic funds transfers—and with these changes the effective cost of making transactions has been declining, thereby encouraging other adjustments to portfolio behavior. Meanwhile, depositors have responded to the generally high level of interest rates that have prevailed since the latter part of the 1970s by intensifying efforts to reduce holdings of monetary assets having relatively low or zero explicit yields.

Under these circumstances, it would be surprising if the money–income relationship had not been disturbed or altered. This paper examines recent and prospective changes to the relationship among money, interest rates, and income, focusing on the M1 measure of the money stock. Even though reduced policy weight has been given to M1 in the past couple of years, observers have continued to direct much of their attention to this aggregate. Also, a number of the changes affecting M1 are affecting the broader measures of the money stock as well; indeed, with regard to the effects of deregulation of interest rate ceilings, the broader measures might be viewed as being in a more advanced state of evolution.[1]

In the next section I present a variety of evidence suggesting that the M1–income relationship has indeed been changing over the past decade, especially over the past few years. The evidence of change is followed by a more detailed investigation of the large rise in M1 relative to income in 1982–83, focusing on the role of NOW accounts. From there I examine likely future changes to the financial system that can be expected to influence the money–income relationship both in a transitional and a permanent way and thus affect the reliability of the money stock as a guide to policy. In the final section I focus on the likely contours of the money–income relationship once the system has adapted to current and prospective change. In particular, I examine the following questions: Can the narrow money stock be a reliable guide to policy? If so, what are the implications of changes in the financial system for setting and adjusting money stock objectives and monetary control procedures?

1. Some special difficulties of the broader measures are explored in Thomas D. Simpson and Patrick Parkinson, "Some Implications of Financial Innovation in the United States," Staff Studies (Board of Governors of the Federal Reserve System, forthcoming).

Empirical Evidence

A variety of empirical evidence suggests that changes in the availability of financial assets, in the opportunity costs of holding money balances, and in transactions costs have disrupted and altered the relation between money stock measures and the economy. Around the mid-1970s, and again in 1981, times when interest rates were falling, M1 grew slowly relative to the gross national product; there evidently were large downward shifts in the demand for narrow money balances during these periods.[2] The strong rise in M1 velocity was followed by its exceptional weakness through 1983:1. Velocity of M1 contracted at an unprecedented 5.5 percent annual rate from 1981:4 to 1983:1 and expanded at only about a 2 percent annual rate over the remainder of 1983, an unusually sluggish expansion during the early stage of economic recovery.

Econometric evidence confirms the impression that the money–income relationship has departed recently from historical norms. Table 1 shows forecast errors from a St. Louis–type, reduced-form equation relating growth in nominal GNP to contemporaneous and lagged growth in M1 and a fiscal variable; this approach allows for lags between changes in money and income, and thus forecasts from such an equation should be affected less than velocity by large variations in money growth.[3] In 1981, the equation registered quite sizable misses, although these misses tended to be offsetting from one quarter to the next, with little tendency to underpredict or overpredict over the year as a whole. By contrast, in 1982 the equation began to overpredict GNP growth systematically; the overprediction was greatest—at a 13.1 percent annual rate—in 1982:4

2. See John P. Judd and John L. Scadding, "The Search for a Stable Money Demand Function: A Survey of the Post-1973 Literature," *Journal of Economic Literature,* vol. 20 (September 1982), pp. 993–1023. Behavior of M1 velocity in 1981 should be viewed in the context of the introduction of NOW accounts nationwide, which boosted the demand for M1 as funds were shifted from non-M1 sources to newly opened NOW accounts. It is estimated that after allowing for these effects M1 velocity rose 8 percent from the fourth quarter of 1980 to the fourth quarter of 1981 in comparison with the 5½ percent increase shown in the actual M1 figures.

3. Reduced-form equations of this type do not incorporate explicitly an interest rate influence on the money-income relationship but incorporate such an influence only indirectly through growth in money and the fiscal variable. To the extent that the reduced-form relationship is misspecified, predictive performance will diminish relative to that of a better-specified money demand equation—with the predictive performance tending to erode directly with the size of the interest-elasticity of money demand.

Table 1. St. Louis Equation Simulation Results[a]

Year and quarter	*Actual GNP growth*[b]	*Predicted GNP growth*[b]	*Error (actual less predicted)*
1981:1	20.5	12.4	8.1
2	6.6	16.5	−9.9
3	13.3	6.5	6.8
4	3.7	10.2	−6.5
1982:1	−1.4	9.6	−11.0
2	6.6	5.2	1.4
3	2.7	13.3	−10.6
4	2.5	15.6	−13.1
1983:1	8.2	11.2	−3.0
2	13.3	17.2	−3.9
3	11.5	19.0	−7.5
4	9.1	11.4	−2.3
1984:1	12.8	10.8	2.0

a. Model is available from author on request.
b. Seasonally adjusted annual rates.

(which also happens to have been when the Federal Open Market Committee elected to de-emphasize the M1 measure). The equation continued to overpredict throughout 1983, but to a much smaller extent, and it slightly underpredicted GNP growth in 1984:1.

Similar evidence of a departure from historical M1–income patterns can be found in predictions derived from money-demand models, which incorporate an interest-rate impact directly. Table 2 presents simulation errors of standard and nonlinear M1 demand models. (The nonlinear model results in table 2 are discussed in the next section.) The standard model is a Goldfeld-type money-demand equation relating real money balances (through a distributed lag) to real income and interest rates; the equation used was estimated through mid-1974, just prior to evident downward shifts in money demand. This type of specification is based on an inventory approach to the demand for transactions balances, and it explained M1 behavior quite well prior to the mid-1970s. The prediction errors in table 2 for 1982 and 1983 show a pattern that is broadly consistent with the reduced-form equation errors of table 1; the money-demand equation systematically underpredicts M1 growth in 1982 and 1983 until 1983:4. However, the size of the forecast errors is on balance much smaller, in large measure because the effect of interest rates on money demand is allowed for explicitly. Because of the sharp drop in

Table 2. Actual and Predicted M1 Growth from Standard and Nonlinear M1 Demand Models[a]

Year and quarter	*Actual M1 growth[b]*	*Predicted M1 growth[b]*		*Error (actual less predicted)*		*Addendum*	
		Standard model	*Nonlinear model*	*Standard model*	*Nonlinear model*	*Absolute change (billions of dollars)*	
						M1	*Other checkable deposits*
1981:1	4.6	6.5	10.1	−1.9	−5.5	4.7	25.2
2	8.0	8.5	5.3	−0.5	2.7	8.4	13.3
3	3.1	7.8	4.7	−4.7	−1.5	3.4	5.4
4	4.6	9.6	10.3	−5.0	−5.8	4.9	4.3
1982:1	10.3	5.4	9.2	4.9	1.1	11.2	8.4
2	2.2	1.8	6.1	0.4	−3.9	2.5	3.2
3	6.1	4.3	6.5	1.8	−0.4	6.9	4.7
4	15.4	6.7	8.5	8.7	6.9	17.6	9.1
1983:1	12.8	6.9	11.3	5.9	1.5	15.2	10.6
2	11.6	6.7	10.2	4.9	1.4	14.3	7.9
3	9.5	6.9	7.0	2.6	2.5	11.9	6.3
4	4.8	7.7	6.4	−2.9	−1.6	6.2	2.9
1984:1	7.2	8.1	6.8	−0.9	0.4	9.4	5.2

a. Standard and nonlinear models are available from the author on request. Predictions are from a dynamic simulation starting in 1974:3.
b. Seasonally adjusted annual rates (not compounded).

interest rates following mid-1982, this model predicted a pickup in money growth in the second half of 1982 and the first half of 1983. Nevertheless, the largest underpredictions occurred in 1982:4 and 1983:1. Forecast errors diminished over 1983, a period when interest rates varied less than they had prior to late 1982; in the last two quarters shown, the model overpredicted growth in M1.

Possible Explanations of Recent Behavior

Much of the attention given to explaining very strong M1 growth in 1982 and early 1983, a time of recession and early recovery, has focused on the contribution of the sharp drop in short-term interest rates following mid-year 1982.[4] Work by the Federal Reserve Board staff has been

4. See Flint Brayton, Terry Farr, and Richard Porter, "Alternative Money Demand Specifications and Recent Growth in M1" (Board of Governors of the Federal Reserve System, Division of Research and Statistics, May 1983); John P. Judd and Rose McElhattan, "The Behavior of Money and the Economy in 1982–83," *Economic Review,* Federal

directed at the other-checkable-deposit component of M1, mostly NOW accounts, which is responsible for most of the strength in M1 over 1982 and 1983.[5] This work is reflected in the nonlinear model whose results are presented in table 2. The model explicitly incorporates the different own rates of return (yields) on different classes of M1 deposits—ordinary NOW accounts can earn up to a 5.25 percent rate of return and Super NOWs earn an unregulated rate of return—and thus includes their different opportunity costs. Changes in market rates have their greatest relative impact on the opportunity cost of holding ordinary NOW accounts, which are subject to a fixed-rate ceiling. For example, a drop in market rates from 13 percent to 9 percent—a decline of roughly a third—would reduce the opportunity cost of holding such NOW accounts, yielding 5.25 percent, by half, from nearly 8 percentage points to nearly 4 percentage points.

The relationship among the elasticity of the demand for a component of money with respect to the open-market rate of interest, the elasticity with respect to the opportunity cost, and the own rate paid on money balances is given by

$$E_{m,i} = E_{m,\,i_o} \cdot E_{i_o,i}, \tag{1}$$

where $E_{m,i}$ is the elasticity with respect to the market rate, E_{m,i_o} is the elasticity with respect to the opportunity cost, and $E_{i_o,i}$ is the elasticity

Reserve Bank of San Francisco (Summer 1983), pp. 46–51; Milton Friedman, "Why a Surge in Inflation Is Likely Next Year," *Wall Street Journal,* September 1, 1983; and John A. Tatom, "Was the 1982 Velocity Decline Unusual?" *Review of the St. Louis Federal Reserve Bank,* vol. 65 (August/September 1983), pp. 5–15. Friedman and Tatom both maintain that the weakness in M1 velocity in 1982 and 1983 was consistent with historical experience. Neither explanation places much emphasis on the changing opportunity costs of holding M1 balances, although theory would imply that the growing availability of NOW and Super NOW accounts having own yields will affect the relation between the amount of money demanded and income. Both Friedman and Tatom employ ad hoc methodologies, and their conclusions suggest that large departures of M1 velocity from historical norms could occur again. Friedman's interpretation implies that a sudden change in uncertainty or large swings in interest rates could lead to such a result, while Tatom's findings imply that departures could stem from large swings in the degree of slack in the economy.

5. Brayton, Farr, and Porter, "Alternative Money Demand Specifications." This model imposes the same elasticity with respect to the opportunity cost on both other checkable deposits and demand deposits, based on the assumption that transactions motives underly the demand for both components. To the extent that liquid asset motives also affect the demand for other checkable deposits, opportunity cost elasticities might be different; for example, the interest elasticity of other checkable deposits would be greater if liquid asset elasticities were above transaction elasticities, a situation that seems plausible based on estimates of the interest elasticity of passbook savings accounts.

of the opportunity cost with respect to the market interest rate. When money balances earn interest (i_n), the elasticity of the opportunity cost with respect to the market rate can be expressed as

$$E_{i_o,i} = \left(1 - \frac{\Delta i_n}{\Delta i}\right) \frac{i}{i - i_n}. \tag{2}$$

With a fixed own rate, $\bar{i}_n$, less than the market rate, equation 2 reduces to

$$E_{i_o,i} = \frac{i}{i - \bar{i}_n} > 1 \tag{3}$$

and thus

$$E_{m,i} = E_{m,i_o} \cdot \frac{i}{i - \bar{i}_n}. \tag{4}$$

Consequently, for a given E_{m,i_o} the elasticity of the demand for components having a fixed own yield will be greater than for those having a zero yield.

The interest elasticities in the nonlinear model can be summarized briefly. The level of the elasticity of money demand with respect to the opportunity cost, E_{m,i_o}, varies directly with the size of the opportunity cost. Thus E_{m,i_o} is smaller for NOW accounts than for demand deposits. However, a larger $E_{i_o,i}$ associated with NOW accounts more than offsets the lower elasticity with respect to the opportunity cost, yielding a higher elasticity of demand for ordinary NOW accounts with respect to the market rate. By contrast, the model yields an elasticity of demand for Super NOWs with respect to market rates below that of both demand deposits and ordinary NOWs. If the yield on Super NOWs is proportional to the market rate, then $E_{i_o,i}$ will be unity and the market-rate elasticity for Super NOWs will equal their opportunity cost elasticity, E_{m,i_o}. But in the empirical nonlinear model, E_{m,i_o} is small when the spread of the market rate over the own rate is narrow, so that the market rate elasticity for Super NOWs is also low.

The 1982–83 forecast errors for the nonlinear model (table 2) show it predicted considerably stronger M1 demand than the standard model and averaged smaller errors. For 1983 the nonlinear model quite accurately predicted the rapid first-half growth of M1 that followed the January 1983 introduction of Super NOWs. The predictions of both models were poor for 1981 and for 1982:4. In 1983:4 and 1984:1, however,

the nonlinear model's forecast errors were very small, about one half those for the standard model.

It is important to note that the revised model implies that the elasticity of the demand for M1 with respect to the open market rate has changed with the growing importance of NOW accounts; market-rate interest elasticity has risen, according to this model, as the proportion of NOW accounts subject to fixed ceilings has grown. The revised model also implies that in the future the market rate elasticity will fall as the proportion of M1 that is subject to an unregulated own rate grows; the model predicts the drop in elasticity because of the direct relationship between the (absolute value of) E_{m,i_o} and the level of the opportunity cost, which diminishes as more M1 earns an unregulated rate of interest, and because of the decline toward unity in $E_{i_o,i}$ as regulatory restrictions on the own rate are removed.

Another model, developed by staff at the Federal Reserve Bank of San Francisco, explains an even greater portion of strong M1 growth in the last half of 1982 and the first half of 1983 because it contains an appreciably larger elasticity of M1 with respect to the open market interest rate.[6] Adherents of this model argue that the open market interest rate elasticity has not changed in recent years with the growing importance of NOW accounts, in contrast to the implications of the nonlinear, Federal Reserve Board staff model. The model is estimated over a sample period beginning in the mid-1970s and has a long-run interest elasticity that (in absolute value) exceeds -0.15. There is reason to doubt such a large elasticity estimate; similarly specified equations estimated over longer sample periods, beginning in the late 1950s or the 1960s, generally have M1 interest elasticities of approximately -0.10. Indeed, the San Francisco model itself yields a long-run interest elasticity of about -0.10 when the sample period starts at the end of the 1950s, which is more in line with elasticities of the standard and nonlinear quarterly models.

The San Francisco model implies that M1 velocity will vary more with swings in interest rates than historical analysis over longer periods would suggest, even though the opportunity cost of holding M1 deposits will tend to vary less as the process of deregulation continues. As a consequence, this approach would suggest that relatively large variations in money stock growth objectives will be required to stabilize income

6. See Judd and McElhattan, "The Behavior of Money and the Economy."

growth during periods when shifts in spending imply large variations in interest rates. One should be skeptical about how the San Francisco model will perform in the future. First, it embodies an elasticity that, for no apparent underlying reason, is noticeably above those of other models. Second, by not incorporating differing own rates on the various M1 components, it cannot capture the influence of further growth in Super NOWs and deregulation of other M1 components.

It appears that M1 growth in late 1983 and early 1984 has been about in line with forecasts from models of money demand, especially those of the nonlinear model. Nevertheless, even that econometric model did not capture well the behavior of M1 in the past few years, a period during which the range of monies and near-monies has expanded further and opportunity and transactions costs have been changing. Compounding current uncertainties about the underlying behavior of M1 is the likelihood that the money–income relationship is in transition, with questions remaining about what the ultimate pattern will be and the rate at which progress toward such a pattern is occurring.

Characteristics of the Money–Income Relationship in the Future

The process of deregulating the nontransactions components of the broader money stock measures is drawing to a close. This process began with the introduction in mid-1978 of the six-month money market certificate having a market-determined ceiling; it was aided greatly by authorization of the money market deposit account in late 1982 and was nearly completed on October 1, 1983, by the removal of rate ceilings and minimum denomination requirements on time deposits with maturities of 32 days or longer.[7]

DEREGULATION AND TRANSACTIONS DEPOSITS

For transactions deposits—that is, M1—the process has much further to go. Although interest-bearing M1 deposits currently account for about

7. Still subject to rate ceilings are passbook savings accounts—amounting to less than 15 percent of M2—and a negligible amount of time deposits with maturities of 7 to 31 days issued in denominations below $2,500 (such time accounts in denominations of more than $2,500 have been deregulated). The deregulation of savings deposits and 7- to 31-day time deposits in denominations below $2,500 is scheduled for early 1986.

a quarter of M1, unregulated M1 deposits—Super NOWs—make up only 8 percent of this monetary aggregate. Under current schedules, the deregulation of remaining NOW accounts will be completed in early 1986. Moreover, Congress has been giving serious attention to removing the statutory prohibition on the payment of interest on demand deposits, a move which would enable businesses—the major money stock holders not eligible for NOWs—to earn explicit interest on balances held in checking accounts. Competitive pressures and experience thus far suggest that rates offered on unregulated M1 deposits will tend toward rates prevailing in the open market on very short-term instruments of comparable risk, after allowing for the costs of intermediation. Intermediation costs include the costs to depositories of managing liquid assets used to ensure redemption of balances subject to immediate withdrawal and costs of holding non-interest-earning reserves to meet reserve requirements. (At a market interest rate of 10 percent this latter cost tends toward 120 basis points at the margin.) The tendency for the rate on M1 deposits to be near open market rates would be strengthened if interest were paid on required reserves against such deposits; Congress is addressing this issue in regard to reserve balances held at the Federal Reserve against Super NOWs and money market deposit accounts.

With further deregulation, competitive pressures are likely to drive down significantly the opportunity cost of holding M1 balances in the form of ordinary NOW accounts and, in the event of legislative action, demand deposits. In addition to being much smaller, opportunity costs of such M1 deposits can be expected to vary by much smaller amounts than open market rates, although perhaps proportionately to market yields.[8] A halving of the opportunity cost amounts to only a 60-basis-point change when the initial level of the opportunity cost is 120 basis points; the corresponding change in open market rates might be 500 basis points, as would be the case if rates fell from 10 percent to 5 percent.

8. It is possible that depositories would only sluggishly adjust their offering rates to movements in open market rates, perhaps giving rise to changes in the opportunity cost in the short run, in basis-point terms, that are close to changes in the market rate. In other words, prior to full adjustment of offering rates by depositories, the percentage change in the opportunity cost could exceed that of the market rate and the sensitivity of M1 deposits to open market rates could be greater. Competitive pressures and large responses of deposits to such disequilibria would be expected to encourage relatively prompt adjustment of offering rates, especially on those accounts that are most sensitive to variations in opportunity costs.

The public is likely to be much less responsive to proportionate changes in the opportunity cost of holding M1 balances when the level of the opportunity cost is very small, as in this example, than when it is large. Consequently, the elasticity of M1 with respect to the open market rate is likely to be relatively small once the deregulation of M1 deposits is complete, a property embodied in the nonlinear quarterly model discussed in the previous section.

With a much smaller opportunity cost of holding M1 deposits, the demand for this aggregate could be buffeted more than it has been by shifting preferences for assets. The cost of retaining in M1 the proceeds of maturing assets or asset sales before reinvesting would be reduced, and M1 deposits would become a more attractive repository of speculative balances when depositors anticipate that longer-term rates will rise.[9] Other factors affecting the demand for liquidity, such as shifting concerns about the outlook for employment and earnings, may come to play a more important role in affecting the demand for M1 as it becomes a more attractive portfolio asset. In late 1981 and early 1982 the demand for NOW accounts, passbook savings, and other very liquid assets in household portfolios strengthened (while transaction demands weakened and rates dropped only moderately), perhaps reflecting a desire to be better able to cushion an earnings disruption, which at that time seemed more likely. On the other hand, if the opportunity cost of holding M1 balances were small, it would reduce incentives for financial institutions to introduce, and depositors to seek, M1 substitutes, thus possibly stabilizing M1 holdings.

The underlying demand for narrow money is probably being affected by changing transactions costs of transferring between M1 and other assets. The introduction of the money market deposit account in late 1982 lowered transactions costs. At present, all types of depositors have this convenient and highly attractive liquid alternative to holding M1 deposits. Funds can be placed in these accounts for as short as overnight

9. Viewed alternatively, the reduction in the opportunity cost of holding M1 balances results in a widening of the trigger points that prompt investment of M1 balances (when the upper point of the M1 holding range is reached) and liquidation of an asset to replenish such balances (when the lower point is reached). Consequently, holdings of M1 balances are likely to vary more with all types of transactions—those associated both with income and with the exchange of all types of assets. Also, shifting rate expectations—which need not be universally or even widely held—would contribute to fluctuations in the demand to hold M1 balances.

and transferred by telephone or automatic teller machine to a checking account at the same institution; moreover, the accounts are insured to $100,000 and have a principal that is fixed.[10] Also, the growing availability of repurchase agreements and money market mutual funds, most of which have convenient withdrawal privileges, has been adding to the number of attractive, low transactions cost, liquid investments available as outlets for excess M1 balances. Convenient, low-cost, revolving credit arrangements, which have become increasingly available to both households and firms, similarly enable depositors to hold smaller amounts of transactions deposits; such credit arrangements in effect lower transactions costs, facilitating profitable investment of transactions deposits as resulting shortfalls in transactions accounts are covered by favorably priced extensions of credit. It is likely that the public is continuing to adapt its behavior to these financial developments.

THE ELECTRONIC REVOLUTION AND OTHER INFLUENCES

The recent advances in electronic payment systems promise to further reduce transaction costs and thus to alter payments practices. Automated clearing houses are handling a small but growing volume of payments, and plans are being made for same-day settlement of electronic payments messages through these centers. Many automatic teller machines and point-of-sale terminals permit the depositor to transfer funds among accounts as well as to make payments; the number of these machines is expanding rapidly, and experiments have begun involving on-line withdrawals from M1 accounts using debit cards. A large and growing number of corporations currently have on-line connections to their banks that enable them to send payments messages electronically, reducing wage and salary costs at both the firm and its bank.

Beyond their impact on transactions costs, many of these electronic developments are affecting money demand by reducing uncertainty about daily receipts and expenditures. Customers having on-line systems with their banks are able to monitor more readily their balances and the transactions flowing through their accounts. Parties to automated clear-

10. Restrictions apply to withdrawals from money market deposit accounts. Up to six transfers per month may be made from such accounts, no more than three by draft; however, an unlimited number of withdrawals can be made in person, including those from automatic teller machines.

ing house transactions know in advance when funds are going to be transferred between accounts. Similarly, a move to same-day settlement of automated clearing house transactions likely will reduce cash managers' uncertainties about their collected, and thus investable, balances since more will be known about the amount of daily debits and credits to their accounts. The greater the certainty about daily receipts and expenditures, the greater is the potential for investing M1 balances, assuming that opportunity costs of holding M1 balances continue to encourage economization.

The responsiveness of M1 to income may also be undergoing change as a result of these financial developments. Should depositors come to view M1 deposits as an attractive repository of liquid balances, the demand for M1 will be influenced more than previously by portfolio considerations. Inventory theories of the demand for transactions balances imply an income elasticity below unity, and standard econometric models of M1 demand have in the past generally yielded estimates of long-run income elasticities that are below unity. The demand for other liquid assets, though, might be inferred to have a long-run income elasticity of unity, owing to the tendency for income to vary proportionately with wealth, which is the appropriate scale variable in portfolio models. To the extent that the income elasticity of M1 demand rises toward unity, the cyclical behavior of M1 can be expected to change, with growth in M1 more nearly matching growth of income, at least when averaged over several quarters. To the extent, though, that wealth influences on M1 become more important, the money–income relationship in the short run could become looser since the income–wealth relationship is relatively loose in the short run.

Some Implications

As the above discussion demonstrates, rapid financial change continues to affect the behavior of M1 and thus the setting of M1 growth objectives. Considerable uncertainty surrounds the contours of the relationship that now exists among M1, income, interest rates, and other economic developments and that will exist once the transition phase has drawn to a close. Both during and after the transition, the reliability of the money stock as a guide to monetary policy will be open to question.

The preceding discussion strongly suggests that the interest elasticity of M1 demand will be much lower once the deregulation process has ended and that the demand to hold M1 balances will continue to be "noisy," especially over short periods; in other words, M1 can be expected to continue to fluctuate unpredictably for reasons that are not linked to variations in income, interest rates, or other identifiable causes. Should the relation come to be dominated by noise or by portfolio allocation considerations that are only weakly related to income and interest rates, then the issue of M1 targeting might properly be relegated to discussions of monetary history; attempts to stabilize M1 growth under these circumstances would only heighten income and interest rate volatility.

In the event that the relationship involving M1, income, and interest rates becomes more predictable, the reduced interest elasticity of M1 demand will have implications for setting and revising monetary growth objectives. Consider first the appropriate setting of year-to-year monetary targets. With either a large or a small elasticity, the longer-term objective of reducing inflation by slowing spending growth by a steady amount each year would translate into a policy of slowing over time the rate of money growth. However, the smaller the interest elasticity of money demand, the more closely this objective corresponds to a uniform year-to-year deceleration of money stock growth at the desired rate of reduction in spending growth.[11] Because of the changes in interest rates along the desired spending path, a high elasticity would require a variable rate of monetary deceleration to achieve a steady deceleration of spending growth.

Indeed, with a high interest elasticity it is actually possible for the money growth target consistent with a steady deceleration of spending to rise from one year to the next; this would occur if a relatively large decline in interest rates were to occur owing, say, to a large decline in inflation expectations. With a high elasticity, this rate reduction could increase growth in the quantity of money demanded by more than the deceleration of income reduces growth in money demand. This has been referred to as the "reentry problem" associated with a successful anti-inflationary policy. The acceleration of M1 growth in 1982—from 5.1

11. The result would be similar if it were assumed that inflation expectations and interest rates are somewhat sticky in adjusting to deceleration of spending growth.

percent in 1981 to 8.8 percent in 1982—at a time when M1 velocity declined by an unprecedented 5.4 percent can be viewed as a manifestation of the reentry problem; as noted above, the greater importance of fixed-ceiling NOW accounts in recent years appears to have increased the elasticity of M1 with respect to open market rates and heightened this problem. On the other hand, in a completely deregulated environment, the reentry problem would be lessened since the decline in interest rates accompanying the decline in inflation would not have a similarly depressing impact on velocity.

In any event, during the course of a targeting period (currently a year) monetary and goods market disturbances will occur, affecting interest rates and income, and producing departures of money from path. With a more interest-inelastic demand for money, disturbances can lead to different outcomes for the money stock, income, and interest rates, with the difference depending on the operating procedures.

Under a reserves operating procedure, such as one focusing on the supply of nonborrowed reserves, both goods market and monetary (money demand and money supply) disturbances will have larger effects on interest rates the more inelastic is the demand for money.[12] However, for a given setting of the reserves instrument, goods market disturbances will have a smaller impact on income as larger interest rate changes cushion the impact of spending disturbances on income. The heightened impact of monetary disturbances on interest rates, though, will increase the response of income. By inducing larger changes in borrowed reserves and desired holdings of excess reserves, larger interest rate changes will produce greater departures of the money stock from path in response to disturbances from the goods market or from money demand. Departures of the money stock from path will tend to be damped, however, when there are money supply disturbances (such as shifts in excess reserve holdings, the mix of deposits with different reserve requirements, or the amount of borrowed reserves); larger rate movements will induce larger changes in borrowings and excess reserves that partially offset the impact of the money supply disturbance.

If the incidence of monetary and spending disturbances were unchanged, the monetary authorities might wish to offset the heightened

12. William Poole, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macromodel," *Quarterly Journal of Economics,* vol. 84 (May 1970), pp. 197–216.

impact of disturbances on interest rates and reestablish the responses in interest rates and income produced under the more interest-elastic money-demand relationship. This could be achieved by institutional changes to the reserves-based monetary control mechanism that would enhance the responsiveness of the supply of money to interest rate changes. These include measures that would increase the interest elasticity of demands for borrowed reserves or excess reserves (through liberalized carryover), or that would increase the interest elasticity of the supply of nonborrowed reserves. Measures that enhance the interest elasticity of the supply of money would be of even greater importance for stabilization objectives if the mix of disturbances were to change, with monetary disturbances (in particular, noise in money demand) growing in importance.

When disturbances from any source lead to departures of the money stock from path, a resetting of the instrument (say, the path for nonborrowed reserves) is implied. To achieve a given expected change in interest rates and income, smaller instrument changes are implied by a less interest-elastic demand for money, because a given change in the supply of reserves will have a greater impact on interest rates. Equivalently, a longer horizon for returning the money stock toward its annual path would be implied by a smaller interest elasticity.[13] Moreover, the ultimate response of the money stock to a given change in interest rates (and income) would be smaller.

Under an operating procedure that stabilizes the short-term rate of interest (such as the federal funds rate operating procedure in use before October 1979), spending or monetary disturbances will have impacts on income and the money stock that are independent of the interest elasticity of money demand. Adjustment of the interest rate instrument to departures of money from path could be made in the same way as with a higher interest elasticity. But with a lower interest elasticity, the response of the money stock to such changes in the interest rate would be smaller, because the quantity of money demanded would respond less. In other words, the rate at which the money stock returns to path would be slower

13. The issue of choosing the rate of return to path is explored in Peter A. Tinsley and others, "Money Market Impacts of Alternative Operating Procedures," in Federal Reserve Staff, *New Monetary Control Procedures*, vol. 2 (Board of Governors of the Federal Reserve System, February 1981).

and the ultimate response of the money stock to the readjustment of the instrument would be smaller.

In sum, the rapid pace of financial change in recent years and impending changes in the future give rise to uncertainties about the reliability of the narrow money stock as a guide to monetary policy, let alone the desirability of rigidly targeting monetary growth. At present, the monetary system is in transition, and the basic features of the money-income relationship are blurred, implying heightened uncertainty about the appropriate setting of money stock objectives. The above discussion does not predict whether uncertainty about the velocity relationship will eventually be greater or less than it was historically, although it does suggest that uncertainty will be considerable during the transition period. Once the transition has been completed, it will take time to identify the contours of the new money-income relationship and whether noise in this relationship has diminished sufficiently to warrant a narrower annual target range. The very recent tendency for M1 growth to conform closely to model forecasts, however, suggests that the relationship may be stabilizing. Some features of the money-income relationship seem more evident in the longer run, especially a lower interest elasticity of money demand.

The fundamental question regarding the usefulness of the money stock as a guide to policy once the transition is complete, though, is whether the money-income or velocity relationship will be dominated by noise in a new financial environment. A growing array of liquid alternatives to M1 balances, lower transactions costs, and a greater tendency for shifting portfolio-allocation considerations to influence money holdings could add significantly to the volatility of money demand. On the other hand, these factors may prove to be unimportant and the behavior of money may once again conform relatively closely to variations in income and, to a lesser extent than previously, interest rates, implying that stabilization objectives could be achieved through control of the money stock. In the meantime, however, the considerable degree of uncertainty about velocity behavior associated with rapid change to the financial system suggests that the central bank's ability to stabilize the economy through heavy reliance on narrow money as an intermediate target probably has diminished.

Comments and Discussion

Alan S. Blinder: Simpson's paper is (in my words, not his) an intelligent brief about why the Federal Reserve should not have done what it did between October 1979 and October 1982. I find it quite convincing and wonder if Simpson's boss does, too. The paper does five main things:

1. Argues that all the financial innovation and deregulation of recent years creates a strong a priori presumption that money demand shifted
2. Usefully collects a variety of empirical evidence in support of this argument—including simple velocity calculations, St. Louis equations, and conventional money-demand equations
3. Offers an explanation of recent money-demand behavior in terms of varying interest elasticities
4. Speculates that in the future the portion of M1 subject to interest-rate regulations will shrink, with the following results: (*a*) the interest elasticity of money demand will fall, (*b*) money demand will become more sensitive to shifting asset preferences, and (*c*) money demand will become more related to wealth, as in the portfolio approach, than to income, as in the transactions approach
5. Argues that targeting on money growth can be particularly hazardous during a transition period like the present or, I might add, the recent past

I am in broad agreement with each of these points and so will confine my remarks to amplifying a few of them, picking a few nits, and putting into the author's mouth some words about monetary policy.

First, I agree entirely that—given all that has occurred since, say, 1978—it would be surprising indeed if the demand for the somewhat arbitrary collection of assets that we call M1 had not shifted dramatically.

But I would put more emphasis on the role of inflation, first, in inducing private financial innovation to get around increasingly dysfunctional regulations and, second, in persuading policymakers to change the regulations. I do not imagine that Simpson would disagree with this, but his paper does begin by mentioning "spontaneous market developments."

Regarding shifts in money demand, I agree with Simpson entirely and never cease to be amazed at how some people still try to deny that there has been a shift in the money-income relationship. To Simpson's evidence I simply add the following data, which show that during the nine-quarter period 1981:1 to 1983:1 there was actually a remarkably strong *negative* correlation between money growth and nominal GNP growth.

Year and quarter	*Quarterly growth at annual rates*				
	Nominal GNP	*M1*	*M1 velocity*	*M2*	*M2 velocity*
1981:1	20.5	4.7	15.1	7.3	12.3
2	6.6	8.1	−1.4	10.9	−3.9
3	13.3	3.2	9.8	8.3	4.6
4	3.7	4.6	−0.9	10.9	−6.5
1982:1	−1.4	10.7	−10.9	9.9	−10.3
2	6.6	2.2	4.3	7.5	−0.8
3	2.7	6.3	−3.4	9.7	−6.4
4	2.5	16.3	−11.9	11.0	−7.7
1983:1	8.2	13.4	−4.6	22.1	−11.4
2	13.3	12.1	1.1	11.0	2.1
3	11.5	9.8	1.5	7.1	4.1
4	9.1	4.9	4.0	8.7	0.4

I would only enter a few quibbles with Simpson's evidence. First, as one who does most of his transactions through a broker/dealer money market mutual fund, I question the concentration on M1 rather than M2—though I do not think that replacing M1 by M2 would change the qualitative results very much. (The huge shift of funds into money market deposit accounts also seems to argue for using M2.) Second, knowing the standard errors of the equations would help to tell whether the prediction errors in tables 1 and 2 are "big" or not. Third, would it not be better to model the adjustment of actual to desired money balances

in nominal terms, as Goldfeld has suggested, rather than in real terms?[1] I am told this fits the data better.

Simpson's discussion of the effect of institutional change on interest elasticities is both useful and germane. His main point is that the introduction of conventional NOW accounts (which pay a fixed, but positive, rate of interest) should be expected to *raise* the elasticity of money demand with respect to the *market* interest rate, but the spread of Super NOWs (which pay a floating rate) should be expected to *lower* it.

But the Federal Reserve's nonlinear model apparently does more than this; it actually makes the elasticity with respect to the *opportunity cost* vary with the size of opportunity cost. Simpson shows that the nonlinear model fits the recent episode better than the standard one. What we would like to know, of course, is whether this is simply a result of successful curve-fitting or really tells us something about behavior. For this reason, it would be nice to have a rationale for the nonlinear specification.

Talking about the future is much more fun than talking about the past; we need not be constrained by facts. For the most part, Simpson's crystal ball seems reasonable to me. I am confident, as he is, that the fraction of balances subject to interest rate regulations will shrink over time.

Will M1 be more portfolio-oriented than transactions-oriented in a freer financial environment? Probably, but that depends a lot on the definition of M1 in the year 2000; there is no reason to think it will be the 1984 definition. Will the ratio of Y to M in the future be more or less stable than it has been in the past? That, too, must depend on the definition.

Some time after all the regulations are gone, after interstate banking is in full swing, after Citibank, Merrill Lynch, and the financial arm of Sears all deal on an equal footing in deposits, mortgages, stock brokerage, insurance, and so on, a new, stable monetary order should emerge. In this brave new financial world, part of the Federal Reserve's job will be to draw the M borderline so as not to place two assets that are perfect substitutes on either side of the border—just as we would not want a monetary aggregate that includes quarters but excludes dimes. If it can

1. Stephen M. Goldfeld, "The Case of the Missing Money," *BPEA, 3:1976*, pp. 683–730.

do this, I do not see why the ratio of Y to M in the future might not be just as stable (or just as unstable!) as it has been in the past.

In other words, while monetarism may have suffered a TKO in recent years, we should not prematurely declare its retirement from the ring.

I come, at last, to monetary policy. I certainly agree with Simpson, and have said so on several occasions, that all this innovation, all this bouncing around of money demand, makes targeting on the growth of money supply hazardous at best during a transitional period. I only wish Simpson had explained all this to Paul Volcker in October of 1979, as I did to my Princeton freshmen. But perhaps he did.

Though Simpson spends a good deal of time explaining why we should not use a money target during the transition period, he says nothing about what we should do. Of course, he works on Constitution Avenue. But I operate under no such constraints.

Much attention is being accorded nowadays to abandoning all intermediate targets and going directly to nominal GNP targeting. The problem, of course, is that nominal GNP targeting is not a policy because the Federal Reserve cannot control nominal GNP. To translate this idea into a policy, we presumably need to devise a feedback rule with changes in something it can control, like bank reserves or interest rates, on the left-hand side and deviations of nominal GNP from target on the right-hand side. I know that none of this is news to the Board's staff, but it would be interesting to learn what is on their minds in this regard.

Some proposals wind up putting an intermediate target for monetary policy on the left-hand side, and it seems to me that two of the principal candidates for this honor now are credit and the real rate of interest.[2] Benjamin Friedman has written extensively about credit, so I will say nothing more about that except to reiterate the Kaldor-Goodhart-Lucas-Murphy critique: finding a constant credit-income ratio during a period in which the Federal Reserve is not controlling credit does not imply that the ratio will remain constant once credit in the aggregate is being controlled.

Since economists seem to have ignored targeting of real interest rates, let me advertise an interesting working paper by Paul Jenkins and Carl

2. Simpson's paper demolishes money as a candidate, and the monetarists long ago pointed out the problem with nominal interest rate targeting.

Walsh.[3] They construct a Poole-type model with flexible prices and rational expectations and show that there is a strong case for real interest rate targeting—I do not mean pegging—if financial sector shocks are the dominant source of disturbances. This formalizes an intuitive notion that some of us have had for a long time: that real interest rate targeting might make sense in a regime of rapid financial innovation. It may be an idea that deserves more thought than it has been given to date.[4]

General Discussion

James Duesenberry pointed out that the adaptation of the money–income relationship to deregulation might have a long way yet to go. The velocity of M1 was about two at the end of World War II, when the opportunity cost of M1 was very low because market rates were low. Velocity tripled in the period when rising market rates and continued regulation widened the opportunity cost of M1. Now, if the opportunity cost is going to be very small again as a result of deregulation, velocity could conceivably trend all the way back to its early postwar level. It was impossible to forecast whether such a huge change would take place; but the uncertainty about where the money–income relationship would head would be very great for an indeterminate period of time.

Robert Hall viewed the instability of the money–income relationship as permanent rather than as just a transitional problem. With M1 bearing a return closely related to market returns, it becomes a much closer substitute for other assets in the economy. The instability of velocity, which he regarded as a substantial problem throughout U.S. history, will thus become even greater and will apply to any monetary aggregate, because all will be more substitutable for other assets as the result of deregulation. Benjamin Friedman observed that there is some evidence that wealth has historically helped to explain the demand for money. As

3. Jenkins and Walsh, "Real Interest Rates, Credit Markets, and Economic Stabilization" (Princeton University, October 1983).

4. The principal differences between targeting nominal interest rates and targeting real interest rates are as follows: (*a*) With a nominal interest rate target, the Federal Reserve's short-run reaction to an upward (downward) shock to inflationary expectations is to relax (restrict) monetary conditions in order to drive the real rate down (up). With a real-rate target, there is no such reaction. (*b*) A real interest rate target is harder to implement unless and until there are indexed bonds. Of these differences, (*a*) clearly favors adoption of a real-rate target whereas (*b*) favors a nominal-rate target.

deregulation makes M1 and other monetary aggregates increasingly important as portfolio assets, as distinct from assets held mainly for transactions purposes, fluctuations in total wealth will now be increasingly important in determining the demand for monetary aggregates, including M1. Because fluctuations in household financial wealth are dominated by fluctuations in common stocks, the relationship of any monetary aggregate to income will be more unstable than in the past, making it an inappropriate target for the conduct of policy.

Ralph Bryant took the argument of unstable money demands a step further by emphasizing the international aspects of asset choices. As national financial markets have become more integrated, asset demands by domestic residents have become increasingly responsive to foreign variables. The liquid assets conventionally deemed to be money become closer substitutes for assets held abroad and for assets denominated in foreign currencies, which further loosens the relationship between domestic money and nominal GNP.

Hall suggested that nominal GNP was a politically understandable, though imperfect, target on which to focus monetary policy. This left the question of how the Federal Reserve would conduct policy so as to achieve this target. Of the three usual candidates—reserves or some variant of it such as the monetary base, a credit variable, or interest rates—Hall argued that only nominal interest rates were both under the Federal Reserve's control and free of the instability problem. Hall proposed raising nominal rates whenever the level of nominal GNP exceeded target and reducing them in the opposite case. He noted that the alternative of pegging real interest rates, which is sometimes advocated, adds the needless complexity of trying to infer the expected inflation rate at any moment. Edmund Phelps added that aiming for a real interest rate target was dangerous because the appropriate level of real rates was unknowable. Structural changes, including changes in the structural budget deficit, alter the appropriate level of the real interest rate for stabilization policy.

Phelps objected to targeting nominal GNP because it implied that real growth and inflation should always be traded-off evenly. He saw no reason for policymakers to accept higher inflation if real growth slowed for reasons that might be permanent, or to aim for deflation if real growth were to surge. Rather he proposed stabilizing growth of money wages, echoing an earlier suggestion of Keynes. Duesenberry took the criticism

of a nominal GNP target a step further, arguing that such a formula could never be expected to guide what is essentially a political-economic process. Like Phelps, he questioned whether we should always, or even usually, want to change real GNP by 1 percent to offset every 1 percent shock to the price level. But even for the longer run, periods when inflation control is the main political concern would alternate with periods when mass unemployment is the major worry. Controlling nominal GNP is currently popular because it puts a ceiling on inflation; but at other times it might limit the improvement in employment that could be accomplished when that is the major problem. Duesenberry also warned that policy could not use debt as an instrument of control because, short of instituting credit controls, policy could not control debt directly; furthermore, the observed correlation between debt and nominal GNP came largely from GNP giving rise to debt.

Bryant argued for a sharper distinction between ultimate targets for policy and the instruments used to try to achieve those targets, and between instrument choice and the procedures used to vary the instruments. A rule for policy could pertain only to an instrument. Bryant argued against an instrument rule and advocated an eclectic approach to policy that allows the Federal Reserve to look at and respond to a number of developments. The long-run benefits of a credible policy commitment could perhaps be realized by a policy stance that promised to react to some types of economic disturbances but to remain passive in the face of others. Such a "halfway" approach to discretionary policy might be a constructive compromise between the rigidity of simple rules and the possible credibility problems associated with unconstrained activism.

Thomas Simpson defended the case for monetary targeting, although with more flexibility than many of its advocates would permit. He reasoned that monetary targeting provides the public with timely information about monetary developments. If actual outcomes differ from target, the public can infer either that actual economic developments will be different than they had expected, or that policymakers will explain why there had been a change in the relationship between these developments and the monetary targets. In this process, the monetary authorities will be sensitive to the public's preferences and will, before long, alter their targets if public preferences demand it. Simpson regarded the episode of 1979–83 as an example of this kind of role for monetary targeting.