Recent Behavior of Velocity: Alternative Measures of Money

by John B. Carlson and Susan M. Byrne

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Introduction

The unusual weakness of the M2 monetary aggregate over the past year or so has raised concerns about implications for the economy and has brought into question the reliability of this measure as a guide for policy. These concerns heightened last summer as initial reports indicated that M2 declined in the third quarter, leaving it around the lower bound of its target range. Historically, such sharp slowdowns in money growth have been associated with subsequent weakness in economic activity.[1]

By contrast, growth in the narrower M1 measure has been robust, having increased almost 9 percent in 1991. Growth in the monetary base has also been strong, driven to some extent by the transitory foreign demand for U.S. currency during the Gulf War. Moreover, Poole (1991) and Motley (1988) have proposed alternative measures of money that suggest monetary policy is not as stringent as it might appear.

From time to time, policymakers reexamine the potential usefulness of alternative measures of money as policy guides. Indeed, in the mid-1980s, the Federal Open Market Committee (FOMC) abandoned M1 as its primary policy target in favor of M2. One basis for forsaking M1 is most clearly evident in the marked change in the historical pattern of its velocity, defined as the ratio of nominal income to M1 (see figure 1).

Over much of the postwar period, M1 velocity increased steadily along a trend rate of 3 percent. In the early 1980s, however, this measure became substantially more variable with no clear trend. The disruption in the historical pattern was attributed largely to financial innovation in conjunction with deregulation and disinflation.[2]

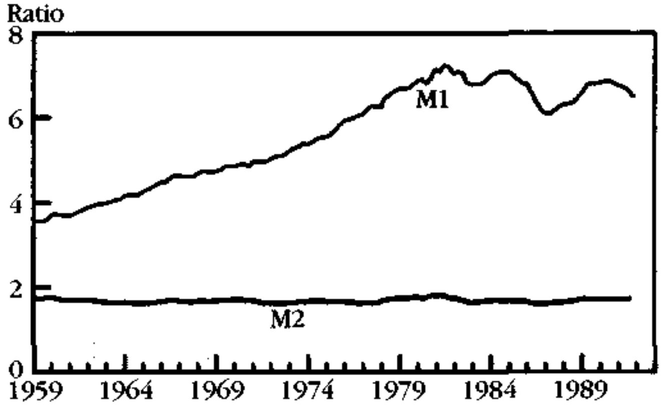
M2 velocity, on the other hand, appeared to be unaffected by these events. Although the measure has always varied systematically with interest rates, it is essentially trendless both before and after the early 1980s (see figure 1). In fact, since the founding of the Federal Reserve in 1913, M2

■ 1 Although revisions to the data revealed that initial reports understated M2 growth during the summer and for the year, the revised figures were still inexplicably sluggish. We recognize, however, that the association between money growth and economic activity does not imply causality. For a discussion of this issue, see Carlstrom and Gamber (1990).

■ 2 For a discussion of the breakdown of M1 velocity and its implications for monetary targeting, see Poole (1988). For a brief summary of the effects of financial innovation, deregulation, and disinflation on M1 and its velocity, see Judd and Scadding (1982) and Carlson (1989).

FIGURE 1

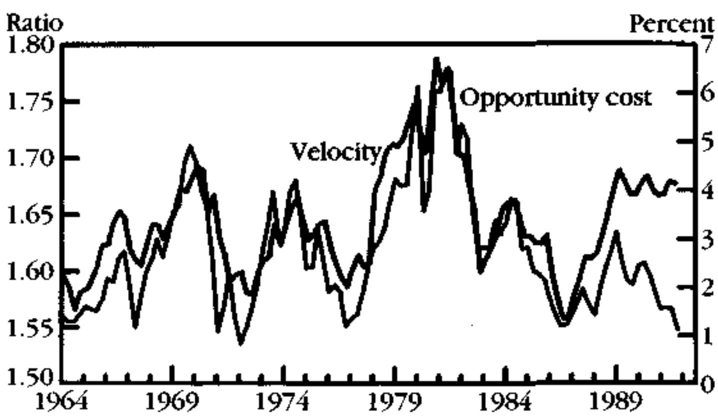
M1 and M2 Velocity



SOURCE: Board of Governors of the Federal Reserve System.

FIGURE 2

M2 Velocity and Opportunity Cost



SOURCE: Board of Governors of the Federal Reserve System.

and nominal income have grown at approximately the same rate, suggesting the existence of a relatively simple and enduring relationship between the two.

On the surface, there is little basis for believing that M2 velocity has behaved unusually over the past few years; after all, it is currently close to its *trendless* long-run average. What is unusual, however, is that around 1989, an apparent break occurred in the relationship between M2 velocity and the opportunity cost of the aggregate, defined as the difference between the market interest rate and the rates paid on M2 instruments (see figure 2).[3] Since then, M2 velocity has been trending up while its opportunity cost has been falling. Yet, history suggests that velocity should be declining, at least in the short run. Understanding this anomaly is, of course, important for interpreting the aggregate's recent weakness.

This article examines the factors that some analysts believe account for the unusual behavior of M2 and its velocity. We also discuss alternative measures of money recently proposed by Poole, and estimate a demand function for an expanded measure of M2. The analysis suggests that part of the anomalous behavior of M2 velocity is related to the ongoing restructuring of the savings and loan (thrift) industry. Although the implications for the long run are unclear, M2 velocity is likely to remain higher over the near term than one might otherwise expect given the level of its opportunity cost.

I. Velocity and the Demand for Money

The concept of velocity is central to discussions of monetary policy, largely because it affords the Federal Reserve a straightforward and relatively nontechnical language that Congress and the public can easily understand.[4] The fact that M2 velocity has been trendless makes it easy to convey to the public why the M2 aggregate might be viewed as a reliable guide over the long term. As the simple ratio of income to money, however, velocity embodies some complex structural relationships.

Economic explanations for the behavior of velocity have generally focused on the existence of a "stable" money demand function. The notion of stability typically implies that this function should have relatively few arguments, and that it should include some measure of spending or economic activity (see Friedman [1956]).[5] If the function were to require knowledge about a large number of variables in order to pin it down, the simple relationship between money and economic activity would be less predictable.

For many years, economists were confident that reasonably stable money demand specifications could be estimated for narrow definitions of money. Many specifications were based on the inventory-theoretic models of Baumol (1952)

■ 3 More precisely, the interest rate paid on M2 instruments is the weighted average of the component rates, where the weights are relative shares. The market rate is the weighted average of yields on the three-month Treasury bill and the three-year Treasury note, with weights being shares of both the non-time deposit (zero-maturity) and small time deposit components of M2. For further discussion of this opportunity cost measure, see Carlson and Parrott (1991).

■ 4 Since 1978, the FOMC has been required by law to report to Congress on its annual monetary objectives. The Committee's progress is reviewed at midyear and again at the beginning of the following year, when the next set of objectives is reported.

■ 5 For a recent comprehensive survey of the empirical literature spawned by Friedman's restatement, see Judd and Scadding (1982).

and Tobin (1956). One theoretical result of such models was that the income elasticity of cash balances is less than one, implying that the velocity of money would rise secularly.

This seemed to square with estimates of income elasticity associated with conventional specifications of M1 demand. Estimates of interest elasticity, however, were much lower than the theoretical models predicted.[6] Although Hoffman and Rasche (1989) recently obtained more substantial estimates of the long-run interest elasticity of M1, it is doubtful that stable short-run specifications for M1 demand exist. The evidence suggests that changes in the structure of the financial industry have affected M1 demand in too many ways to pin down.[7]

Because M2 velocity appeared to be impervious to the financial changes of the 1970s and early 1980s, attention turned toward finding stable short-run specifications for M2 demand. One of the most promising was developed by Moore, Porter, and Small (1990), hereafter referred to as MPS. They applied econometric techniques that enabled them to take account of the stationarity of M2 velocity and found that a reasonably stable M2 demand specification could be estimated, at least through 1988. Since then, however, their model has overpredicted M2 growth, raising questions about whether M2 velocity has drifted upward.

MPS specified M2 demand in an error-correction framework, noting two advantages to this approach.[8] First, error-correction regressors — entered as first differences in the levels — are more likely to be stationary and are much less colinear than they would be as undifferenced regressors. Second, the long- and short-run money demand relationships are clearly distinguished.

The long-run money demand function is specified as

$$(1) \qquad m_t = \alpha + y_t + \beta s_t + e_t ,$$

where $m_t = \log\,(M2)$, $y_t = \log\,(\textit{nominal GNP})$, and $s = \log\,(\textit{opportunity cost})$. Note that the unitary coefficient on nominal GNP ensures that equation (1) also specifies a relationship in which long-run velocity varies only with opportunity cost.[9] Since one might expect M2 opportunity cost to be essentially trendless in the long run, M2 velocity would also be trendless. Thus, although equation (1) may specify a partial equilibrium for the level of M2, the implied long-run general equilibrium for its velocity is essentially a constant.

The second component of the MPS model is a dynamic equation based on an error-correction adjustment specification:

$$(2) \qquad \Delta m_t = a + b e_{t-1} + \sum_{i=1}^{u} c_i \Delta m_{t-i} + \sum_{i=0}^{v} d_i \Delta s_{t-i} + \sum_{i=0}^{w} f_i \Delta y_{t-i} + \sum_{i=1}^{q} \sum_{j=0}^{u} g_{ij} \Delta x_{i,t-j} + \varepsilon_t ,$$

where e_{t-1} is the deviation of money from its long-run equilibrium value (derived from equation [1]) and ε_t is white noise. Adjustment speed is determined by changes in the lagged values of M2 and in the current and lagged values of the opportunity cost and scale variable. The general form of the model allows other variables to affect adjustment speed (both current and lagged values). These variables, which need not affect long-run equilibrium money balances, include any factors that influence the adjustment process.[10]

Equation (2) essentially specifies the short-run convergence process of M2 to its equilibrium value. When the coefficient on the error-correction term is negative, convergence is ensured. Substituting (1) into (2) yields

$$(3) \qquad \Delta m_t = a - b\alpha - b\beta s_{t-1} + b\,(m_{t-1} - y_{t-1}) + \sum_{i=16}^{u} c_i \Delta m_{t-i} + \sum_{i=0}^{v} d_i \Delta s_{t-i} + \sum_{i=1}^{w} f_i \Delta y_{t-i} + \sum_{i=1}^{q} \sum_{j=0}^{u} g_{ij} \Delta x_{i,t-j} + \varepsilon_t .$$

■ 6 For a possible explanation of this discrepancy, see Poole (1988).

■ 7 Although Hendry and Ericsson (1990) have found "stable" specifications, these generally include many explanatory variables and hence are not convincingly useful for predicting changes in the simple link between M1 and economic activity.

■ 8 Earlier advocates of this framework include Baba, Hendry, and Starr (1988).

■ 9 MPS include a time index as a regressor to estimate any drift in M2 velocity directly. Although they find the coefficient to be significant, the drift is negligible (around 0.03 percent per year).

■ 10 MPS also specify a set of error-correction models for determining interest rates paid on the components of M2. They find that many bank deposit rates adjust relatively slowly to changes in money market interest rates. However, because their specifications are not very durable, we will focus only on the demand for M2 given the opportunity cost, not on how the opportunity cost is determined.

BOX 1

CP Specification

The CP specification and estimated coefficients are

$$\Delta m_t = -.053 - .009s_{t-1} - .138\,(m_{t-1} - y_{t-1})$$
$$(4.44) \quad (4.60) \quad (5.13)$$

$$+ .245\Delta m_{t-1} - .007\Delta s_t - .007\Delta s_{t-1}$$
$$(3.08) \quad (3.32) \quad (3.39)$$

$$+ .186\Delta c_t + .241\Delta x_{t-1} + .031 REGDUM + \varepsilon_t$$
$$(2.87) \quad (3.30) \quad (7.38)$$

Adj. R^2 = .74; SEE = .0040; est. period = 1964:IQ to 1986:IVQ,

where s is a measure of opportunity cost, c is personal consumption expenditures, x is thrift deposits (including other checkables, money market deposit accounts [MMDAs], savings deposits, small and large time deposits, and term repurchase agreements [RPs]), and *REGDUM* is a qualitative variable that equals zero in all quarters except 1983:IQ, when it equals one.[a] Because thrift restructuring has been ongoing since 1988, and because we seek to avoid high influence points given the substantial changes in the industry since that time, equation (4) is estimated before the thrift crisis (1964:IQ to 1986:IVQ) and simulated through 1990. All parameters are significant at the 5 percent level or better.

a. Following MPS, we present results that approximate log(s) using a first-order Taylor series expansion when the opportunity cost is less than 0.5. We also estimate the model using the simple log of opportunity cost. Although the simple measure improves the in-sample fit, out-of-sample simulations are less favorable. Nevertheless, the usefulness of the Taylog transformation remains an open issue, though beyond the scope of this study.

MPS estimate a version of equation (3) over the 1964:IQ to 1986:IIQ period. They find that their specification is relatively stable, despite the advent of both deregulation and, perhaps more significantly, disinflation. Beginning in 1988, however, it begins to overpredict M2 growth.

The implications of this overprediction for velocity depend on what parameters of the M2 demand function may be changing. If any of those in the long-run specification (equation [1]) have changed, then M2 velocity will likely fluctuate around a new, higher equilibrium level. If, on the other hand, the error-correction process is misspecified, the divergence between interest rates and velocity could be temporary.

II. The MPS Specification and Thrift Restructuring

Carlson and Parrott (1991), hereafter CP, propose a specification of equation (3) that includes the change in thrift deposits as a determinant in the error-correction equation (see box 1).[11] They argue that this change is a proxy for deposit-pricing effects that, though related to the thrift restructuring, are not adequately captured in the measure of opportunity cost. This implicitly assumes that the effects of restructuring influence the adjustment of M2 to its equilibrium level, but do not affect the equilibrium level itself.

These effects may arise when failing thrifts are liquidated and time deposit contracts are abrogated. Because many of these deposits were contracted at rates substantially higher than those paid in recent years, holders of these deposits realize a sharp drop in their returns when contracts are nullified. Since the historical series on time-deposit yields records only the rate paid on new contracts, it understates this recent decline. Thus, the measure of opportunity cost is inadequate. For holders of abrogated contracts, opportunity cost has increased; in contrast, measured opportunity cost has fallen in recent years.

The CP specification is estimated before 1988 to avoid high influence points given the collapse in thrift deposits thereafter. (Out-of-sample simulations after 1988 account for most of the shortfall evident in the MPS model.) The results are consistent both with the hypothesis that thrift restructuring has played a major role in the recent M2 weakness, and with the belief that this realignment will not significantly alter long-run velocity.

It is important to note that the CP specification does not examine the potential for effects on the equilibrium level of velocity. Unfortunately, the data are not of sufficient duration to discriminate convincingly between long- and short-run effects. Nevertheless, the depository restructuring hypothesis is consistent with previous anomalies in the relationship between interest rates and velocity.

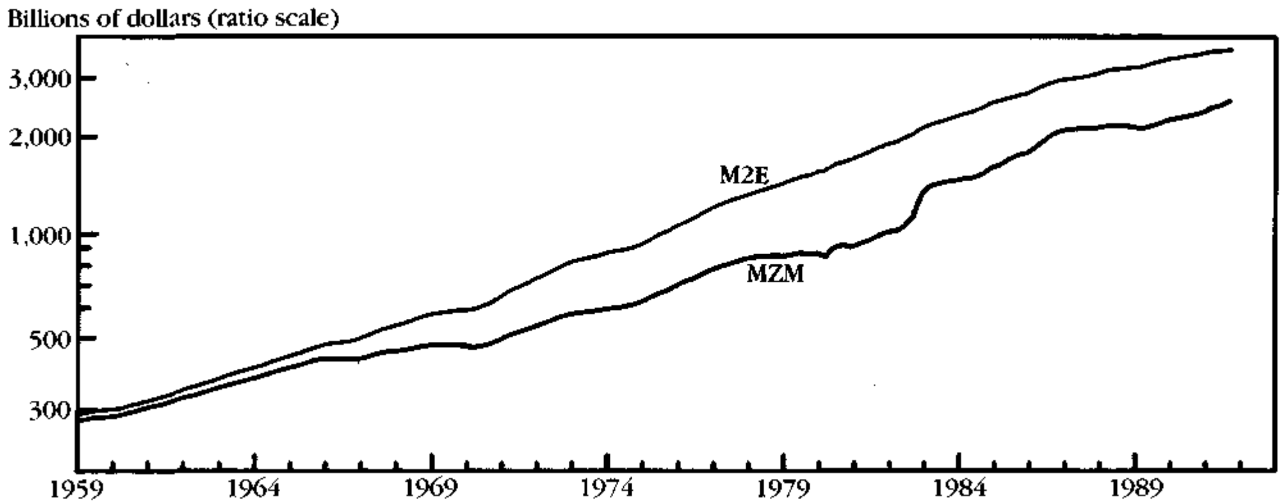
For example, M2 velocity appeared to be unusually low in the mid-1980s, given the level of its opportunity cost (see figure 2). Soon after the advent of deregulation, many analysts speculated that M2 velocity would shift downward.[12] It was believed that deregulation left the depositories in a better position to compete for funds to

11 For an alternative approach, see Duca (1991).

12 See Hallman, Porter, and Small (1989).

FIGURE 3

MZM and M2E



NOTE: M2E equals M2 plus institution-only MMMFs. MZM equals M2E minus small time deposits. Shaded areas represent recessions. Estimated trough date for 1990–91 recession is 1991:IIQ.
SOURCE: Board of Governors of the Federal Reserve System.

expand their market share of credit; hence, many argued that deposits included in M2 would increase as a share of the nation's portfolio. This in turn implied that M2 velocity would fall.

III. Alternative Measures of Money

Historically, when money demand specifications have broken down, analysts have found that the problem is often reflective of the particular definition of money being used. Over time, financial innovations occur, resulting in new instruments that have properties similar to more than one asset. For example, money market mutual funds (MMMFs), first offered in the early 1970s, have characteristics of both transactions deposits and mutual funds. Moreover, when regulations change, such as the elimination of Regulation Q, the range of assets for which deposits are substitutable can be substantially affected. Hence, financial innovation and deregulation can blur the functional distinctions between the monetary aggregates.

Poole (1991) recently identified three functional components of M2: 1) traditional transactions balances (currency plus checkable deposits) that are defined as M1, 2) savings balances that can be converted without notice into transactions balances (such as MMMFs and statement savings accounts at banks), and 3) small time deposits (defined as certificates of deposit denominated in amounts of less than $100,000) that can be converted into transactions balances (without penalty) only upon maturity.

Although M2 has served well until recently, Poole questions its longer-term durability as the appropriate measure of money. He proposes two alternative aggregates. The first, based on a principle advanced by Friedman and Schwartz (1970), views money as a "temporary abode of purchasing power." To satisfy this principle, Poole advocates including all instruments available with zero maturity. Thus, he would broaden M1 to include all savings balances that can be immediately converted into transactions balances (hereafter called MZM).[13]

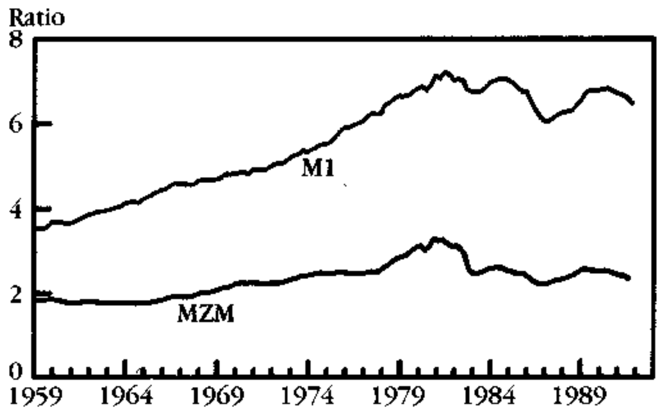
Poole also advocates expanding the M2 measure (M2E hereafter) to include MMMFs available to institutions only. He notes that these instruments allow institutions to earn interest on checkable accounts in the face of the long-standing and still-effective prohibition of interest payments on demand deposits. The time series of the two measures are illustrated in figure 3.

Prior to 1980, MZM velocity seemed to be trending up, although at a slower rate than that of M1. Since 1983, however, MZM's velocity has appeared to be the more stable of the two series

13 Although Motley (1988) proposed a measure of zero-maturity instruments, the logical antecedent to this measure is Friedman and Schwartz's M2 aggregate, which consists of all commercial bank deposits (demand plus time and savings).

FIGURE 4

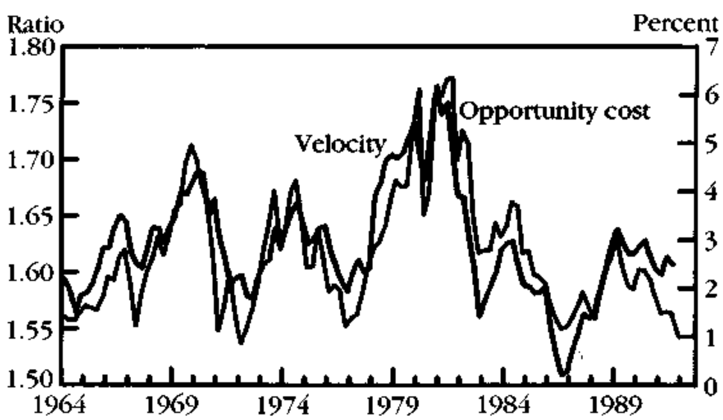
M1 and MZM Velocity



SOURCE: Board of Governors of the Federal Reserve System.

FIGURE 5

M2E Velocity and Opportunity Cost



SOURCE: Board of Governors of the Federal Reserve System.

(see figure 4).[14] Poole recognizes that the stability of MZM velocity (manifest only since deregulation) does not provide a sufficient empirical basis for choosing this aggregate over the broader alternatives. Nevertheless, he prefers it because, as a comprehensive measure of assets that serve as a temporary abode of purchasing power, MZM should be durably linked to spending. Moreover, he essentially argues that the trend in MZM velocity prior to 1980 was largely a consequence of Regulation Q, which distorted the competition between time deposits and nonregulated depository assets.

Without Regulation Q, banks have much less incentive for developing regulatory avoidance schemes, such as automatic transfer accounts, that distort the relationship between measured transactions deposits and spending.[15] Also, it seems reasonable to assume that without interest-rate regulation, banks will treat small time deposits much more like managed liabilities, enabling them to compete more directly in capital markets. Thus, the volume of small CDs will be more indicative of changes in the competitive positions of depositories than of monetary conditions.

It also seems less likely that nondepository competitors will have the same incentives to invest in financial innovations that seek to compete directly with depository savings instruments. For example, the explosive growth of MMMFs was due in large part to the inability of depositories to compete for funds on the same footing with liquid instruments offering market rates of return. In the absence of binding constraints, it is unlikely that we will see the same burst of financial innovation as occurred under Regulation Q; hence, one might expect a more stable link between zero-maturity instruments and economic activity. Since it remains to be seen whether the principle guiding the choice of MZM will lead to an empirically more robust measure of money, however, Poole recommends that M2 and MZM be given equal weight in policy deliberations.

The velocity of M2E appears to have characteristics that suggest its relationship to the economy is less disrupted by regulatory change than that of M2 (see figure 5). Indeed, M2E velocity has been falling in recent years roughly commensurate with the decline in opportunity cost. This more consistent pattern suggests that over the whole sample period, the demand for M2E has been relatively more stable than the demand for M2.

Nevertheless, before it returned to a more consistent relationship with interest rates, M2E velocity was still unusually low over most of the 1980s. As suggested above, this could reflect the unsustainable attempt by depositories to increase their market share once they were freed from the regulatory constraints that limited the types of loans they could make. Perhaps the best example of this was in the thrift industry.

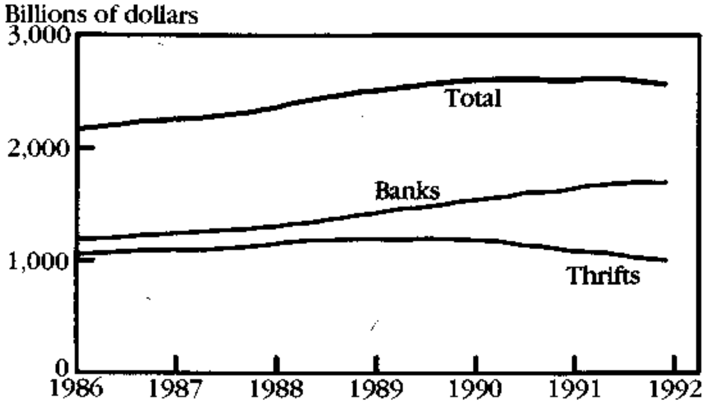
By the early 1980s, the rising cost of funds, reflecting accelerating inflation, had left many thrifts that were holding relatively low-yielding mortgages insolvent. Kane (1989, p. 4) argues that, with nothing to lose, these "zombie" institutions attempted "to grow out of their problems by undertaking long-shot lending and funding activities" that essentially renewed and ex-

■ 14 Because there is no empirical basis for assuming that MZM velocity has been stable, we do not estimate a demand function below.

■ 15 Although the existence of reserve requirements on transactions deposits leaves some incentive intact, the effects of most potential avoidance schemes would probably be internalized in zero-maturity assets.

FIGURE 6

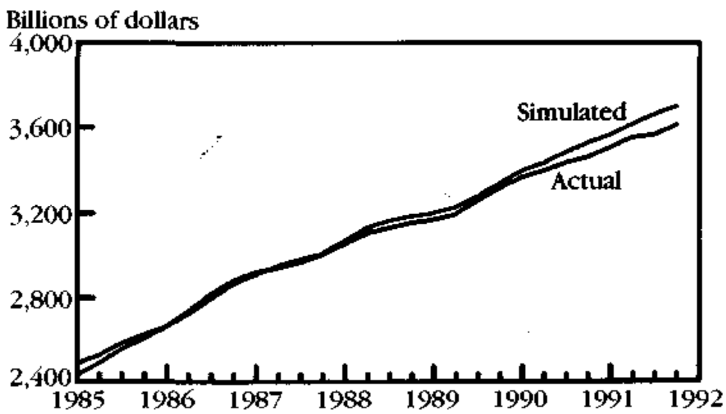
Nontransactions Deposits



SOURCE: Board of Governors of the Federal Reserve System.

FIGURE 7

Simulated and Actual M2E: Based on Equation (4)



SOURCE: Authors' calculations.

panded the lost bets of the past. To finance this expansion, thrifts offered a premium on deposits, leading to a sharp increase in the depository component of M2E (and M2) relative to income, thereby decreasing velocity.[16] With the understanding that such instruments were federally guaranteed, depositors were all too willing to provide the funds. As the decade unfolded, however, it became clear that this strategy was not sustainable.

Beginning in 1989, Congress and the Bush administration officially recognized the insolvency of both a large portion of the savings and loan industry and the thrift deposit insurance fund. In August of that year, they allocated funds as the first step in resolving the insurance crisis, and to close zombie thrifts. The weakness in deposit growth since 1988 is to some extent an unwinding of the unsustainable depository share of credit markets.

IV. The Demand for M2E

We estimate two variations of the velocity specification (equation [3]) using the M2E measure.[17] The first regression includes a temporary intercept shift variable embodying the hypothesis that the unsustainable expansion of depositories affected equilibrium velocity in the 1980s. It presumes that the overextension of depository intermediation was financed largely by time deposits, which are closer substitutes for capital market instruments than are money market securities. This hypothesis would explain why a large part of the runoff of nontransactions deposits at thrifts did not find its way back to other depositories, but was instead transferred to nondepository investment vehicles (see figure 6).

The first specification does not include the thrift-change variable proposed by CP. The estimated coefficients are

$$(4)\quad \Delta m_t = -.076 - .012 s_{t-1} - .189(m_{t-1} - y_{t-1})$$
$$\qquad (5.13)\quad (5.25)\qquad (5.62)$$

$$+ .421 \Delta m_{t-1} - .008 \Delta s_t - .005 \Delta s_{t-1}$$
$$(6.91)\qquad (4.27)\qquad (1.92)$$

$$+ .292 \Delta c_t + .005 DBUDUM_{t-1}$$
$$(4.27)\qquad (2.81)$$

$$+ .024 REGDUM + \varepsilon_t$$
$$(5.61)$$

Adj. R^2 = .72; SEE = .0043; est. period = 1964:IQ to 1989:IVQ,

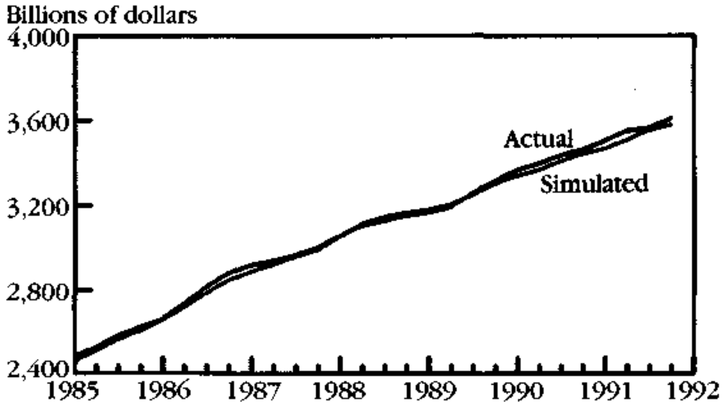
where s is a measure of M2E opportunity cost, c is personal consumption expenditures, *DBUDUM* is the temporary intercept shift variable, and *REGDUM* is a qualitative variable accounting

■ **16** As CP note, such a premium is not adequately incorporated in measured yields. Thus, measured M2E opportunity cost probably overstates true opportunity cost. This would explain why M2 velocity appears to be low relative to its measured opportunity cost.

■ **17** Although Hoffman and Rasche (1989) find a stable long-run relationship between real M1, interest rates, and real income, they question the existence of a stable short-run specification for M1 demand. Hendry and Ericsson (1990) do find stable short-run specifications for the narrow measure, but raise a number of issues that are beyond the scope of this paper. We focus on the short-run demand for M2E, which has the virtue of a trendless velocity over the past 30 years.

FIGURE 8

Simulated and Actual M2E: Based on Equation (5)



SOURCE: Authors' calculations.

for the introduction of nationwide NOW accounts. *DBUDUM* and *REGDUM* equal zero in all periods except 1981:IVQ – 1988:IIQ and 1983:IQ, respectively, when they equal one.

The estimated coefficient on *DBUDUM* is positive and statistically significant. This is consistent with the hypothesis that equilibrium velocity was temporarily low in the 1980s. Though the model has reasonably good in-sample properties, out-of-sample simulations indicate that it overpredicts M2E growth in 1991 (see figure 7). The 1991:IIIQ drop in M2E (and the sharp rise in its velocity) is greater than two standard deviations of its predicted value based on in-sample experience.[18]

One explanation for the shortfall in M2 is that the savings and loan restructuring peaked in the summer months of 1991. Thus, the second regression extends equation (4) to include the change in thrift deposits as a regressor in the error-correction specification:

$$(5)\quad \Delta m_t = -.079 - .011 s_{t-1} - .194(m_{t-1} - y_{t-1})$$
$$\quad (5.64)\quad (5.07)\quad (6.10)$$

$$+ .271\Delta m_{t-1} - .008\Delta s_t - .006\Delta s_{t-1}$$
$$(3.77)\quad (4.05)\quad (2.56)$$

$$+ .240\Delta c_t + .004 DBUDUM_{t-1}$$
$$(3.62)\quad (3.18)$$

$$+ .027 REGDUM + .180\Delta x_{t-1} + \varepsilon_t$$
$$(6.37)\quad (3.31)$$

Adj. R^2 = .75; SEE = .0041; est. period = 1964:IQ to 1989:IVQ,

where x denotes thrift institution deposits (including other checkables, MMDAs, savings deposits, small and large time deposits, and term RPs). The coefficient on the thrift proxy is statistically significant, but somewhat smaller than in the CP specification. This suggests that depository restructuring is an important and continuing factor, at least in the short run. Out-of-sample simulations of M2E demand tend to underpredict M2E over most of the past three years, but the bias has been small (see figure 8). Thus, although not immune to the structural change, the measure would seem to warrant a closer look.

V. Conclusion

Changes in the structure of the U.S. financial industry have justifiably brought into question the reliability of M2 as a guide for monetary policy. The aggregate's appeal as an intermediate policy guide has been largely due to its relatively stable and simple relationship with income and interest rates. Over most of the past 30 years, this stability was manifest in the behavior of M2 velocity, which, though influenced by interest rates, ultimately reverted to a trendless mean.

Although M2 velocity, by itself, indicates nothing unusual, its relationship with interest rates has been disrupted in the last few years. This appears to be related to a breakdown in M2 demand after 1988, which probably reflects to some extent the restructuring of depositories.

We examine the velocities of two alternative measures of money: MZM and M2E. Of these, M2E holds the most promise, because its velocity appears to be least affected by the events of recent years. Moreover, velocity specifications of money demand seem to be more durable for the M2E measure than for M2.

Nonetheless, we must stress the tentative nature of any conclusions based on the analysis above. Unfortunately, money demand theory has not advanced to a state in which empirical hypotheses are sharply defined and testable. This perhaps reflects the tension arising from the idea that if money demand is to be useful for policy, it should have relatively few determinants.

On the other hand, as Judd and Scadding (1982) note, the fundamental source of the instability of money demand has been the excessive growth in money. They argue that the failure of

18 We recognize that statistical tests comparing M2 and M2E may not be very meaningful. However, from a monetary targeting point of view, it is much more persuasive if one can demonstrate an empirical basis for believing that the velocity of the targeted aggregate is relatively stationary

monetary policy to restrain inflation led to the high market interest rates that, in combination with regulatory restraints, induced much of the financial innovation disrupting the relationship between M1 and the economy. Similarly, one might argue that rising inflation was the fundamental source of the unsustainable expansion — and ultimate collapse — of the thrift industry.

References

Baba, Yoshihisa, David F. Hendry, and Ross M. Starr. "U.S. Money Demand, 1960 – 1984," Discussion Papers in Economics, No. 27, Nuffield College, Oxford, England, January 1988.

Baumol, William J. "The Transactions Demand for Cash: An Inventory Theoretic Approach," *Quarterly Journal of Economics,* vol. 66 (November 1952), pp. 545 – 56.

Carlson, John B. "The Stability of Money Demand, Its Interest Sensitivity, and Some Implications for Money as a Policy Guide," Federal Reserve Bank of Cleveland, *Economic Review,* vol. 25, no. 3 (1989 Quarter 3), pp. 2 – 13.

______, **and Sharon E. Parrott.** "The Demand for M2, Opportunity Cost, and Financial Change," Federal Reserve Bank of Cleveland, *Economic Review,* vol. 27, no. 2 (1991 Quarter 2), pp. 2 – 11.

Carlstrom, Charles T., and Edward N. Gamber. "Does the Fed Cause Christmas?" Federal Reserve Bank of Cleveland, *Economic Commentary,* January 1, 1990.

Duca, John V. "The Case of the 'Missing M2'," Federal Reserve Bank of Dallas, mimeo. December 1991.

Friedman, Milton. "The Quantity Theory of Money — A Restatement," in Milton Friedman, ed., *Studies in the Quantity Theory of Money.* Chicago: University of Chicago Press, 1956, pp. 3 – 21.

______, **and Anna Schwartz.** *Monetary Statistics of the United States: Estimates, Sources, Methods.* New York: National Bureau of Economic Research, 1970.

Hallman, Jeffrey J., Richard D. Porter, and David H. Small. "M2 per Unit of Potential GNP as an Anchor for the Price Level," Board of Governors of the Federal Reserve System, Staff Studies 157, April 1989.

Hendry, David F., and Neil R. Ericsson. "Modeling the Demand for Narrow Money in the United Kingdom and the United States," Board of Governors of the Federal Reserve System, International Finance Discussion Papers No. 383, July 1990.

Hoffman, Dennis, and Robert H. Rasche. "Long-Run Income and Interest Elasticities of Money Demand in the United States," National Bureau of Economic Research, Working Paper No. 2949, April 1989.

Judd, John P., 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, no. 3 (September 1982), pp. 993 – 1023.

Kane, Edward J. *The S&L Insurance Mess: How Did It Happen?* Washington, D.C.: The Urban Institute, 1989.

Moore, George R., Richard D. Porter, and David H. Small. "Modeling the Disaggregated Demands for M2 and M1: The U.S. Experience in the 1980s," in Peter Hooper et al., eds., *Financial Sectors in Open Economies: Empirical Analysis and Policy Issues.* Washington, D.C.: Board of Governors of the Federal Reserve System, 1990, pp. 21–105.

Motley, Brian. "Should M2 Be Redefined?" Federal Reserve Bank of San Francisco, *Economic Review,* Winter 1988, pp. 33 – 51.

Poole, William. "Monetary Policy Lessons of Recent Inflation and Disinflation," *Journal of Economic Perspectives,* vol. 2 (Summer 1988), pp. 73 – 100.

______. Statement before the Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance, and Urban Affairs, U.S. House of Representatives, November 6, 1991.

Tobin, James. "The Interest-Elasticity of Transactions Demand for Cash," *Review of Economics and Statistics,* vol. 38, no. 3 (August 1956), pp. 241 – 47.