The Demand for M2, Opportunity Cost, and Financial Change

by John B. Carlson and Sharon E. Parrott

John B. Carlson is an economist and Sharon E. Parrott is a research assistant at the Federal Reserve Bank of Cleveland. The authors gratefully acknowledge helpful discussions with Michael Bagshaw, William Gavin, Jeffrey Hallman, Gregory Hess, Kim Kowalewski, and Yash Mehra. They would also like to thank Thomas Lee for identifying a coding error that affected results presented in an earlier draft.

Introduction

The role of money in the implementation of monetary policy has waxed and waned over the past 30 years. Policymakers' attention to money has been largely related to their confidence in the stability of the relationship between measures of money and the ultimate objectives of monetary policy, particularly the rate of inflation.

The link between inflation and money growth has long been grounded in the quantity theory of money. A key relationship in this link is the demand for money. Indeed, in an influential restatement of the quantity theory, Milton Friedman (1966) argued that "the quantity theory is in the first instance a theory of money demand." Friedman's point was predicated on the empirical hypothesis that the demand for money is one of the most stable relationships in the economy.[1] Despite some unexplained behavior in the mid-1970s, the money demand function was widely perceived as reasonably stable and reliable through the balance of that decade.[2]

The high-water mark for the role of money in monetary policy was reached in the late 1970s, when the Federal Reserve adopted a disinflation strategy in which annual targets for monetary growth played a key role. This strategy was coupled with an operating procedure that automatically reacted to deviations of money from prespecified short-run paths. Although some analysts criticized the procedure for not producing gradually slowing money growth, trend money growth ultimately slowed, as did the inflation rate.[3] Moreover, money markets reacted systematically to announced changes in the money supply, providing evidence that the short-run financial market implications of the procedure were widely understood and anticipated.

In 1980, Congress passed legislation authorizing significant changes in U.S. banking regulations, including the elimination of most interest-rate restrictions. Many analysts believed that such deregulation would enable depository institutions to pay higher yields on deposits and thereby

■ 1 Hendry and Ericsson (1990) provide some evidence that a constant, conditional money demand model cannot be inverted to obtain a constant model of prices for narrow measures of money. We do not pursue this issue.

■ 2 For evidence on the breakdown of conventional money demand models in the mid-1970s, see Goldfeld (1976) and Judd and Scadding (1982).

■ 3 To appreciate the difficulty in choosing prespecified monetary targets to reduce the inflation rate, see Poole (1988).

claim a larger share of the household portfolio. This, in turn, would affect the relationship between money measures (comprised largely of deposits) and the level of economic activity.

Concerns about the impact of deregulation on the stability of money demand appeared to be warranted for the narrower money measures such as M1. The introduction of interest-bearing checking nationwide and new deposit instruments such as money market deposit accounts (MMDAs) greatly affected long-established depositor behavior. Common specifications for M1 demand did not survive deregulation. And while attempts have been made to rectify M1 demand in the short run, no consensus has yet emerged on any particular empirical form.[4]

Research on M2 demand, however, has yielded evidence of stable short-run specifications for this aggregate, at least in the post–World War II period (see Moore, Porter, and Small [1990], Hetzel and Mehra [1987], and Mehra [1991]). But in 1989 and 1990, M2 grew more slowly than these models had predicted. Two hypotheses have been proposed to account for this. The first is that at least part of the unexplained behavior is related to the mismeasurement of the opportunity cost of M2. The second is that the restructuring of the savings and loan (thrift) industry has affected M2 growth.

This paper presents a specification of M2 demand that adopts the general framework used by Moore, Porter, and Small (hereafter referred to as MPS), but uses an alternative measure of opportunity cost. We attempt to capture the effects of thrift restructuring on the adjustment of M2 to its equilibrium level. The estimated regression remains stable throughout the period of deregulation, and the results suggest that the model's performance can be improved by measuring opportunity cost more precisely. Moreover, our results are consistent with the hypothesis that recent M2 weakness is partly related to the thrift industry restructuring and is thus largely a temporary phenomenon.

I. The Error-Correction Framework

Empirical aggregate money-demand functions estimated in the postwar period typically include some measure of the opportunity cost of holding money (most often a short-term interest rate) and a scale variable such as income or spending. This research has generally found evidence of inertia in the response of money demand to changes in opportunity costs and spending. Early postwar specifications attempted to capture this inertia as a partial-adjustment specification. This approach was sometimes identified as the conventional specification or the Goldfeld equation (see Goldfeld [1973]). Alternatively, researchers have handled the inertia by using a distributed lag (of either the levels or the first differences of the levels) of the regressors.

MPS were among the first advocates of specifying the inertia in an error-correction framework. They noted two advantages to this approach. 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.

In addition, Hendry and Ericsson note that the error-correction framework generalizes the conventional partial-adjustment model in a way that allows for separate rates of reaction to the various determinants of money demand, reflecting different costs of adjustment. They further argue that the error-correction specification is related to theories of money adjustment such as the model developed by Miller and Orr (1966). In these models, the short-run factors determine money movements *given* desired bands, while the long-run factors influence the levels of the bands themselves.

We follow the approach of MPS, but specify the long-run money demand function 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 this expression also specifies a relationship in which long-run velocity varies only with opportunity cost.[5] The second component is a dynamic specification based on an error-correction adjustment specification:

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

4 For a stable short-run specification of M1 demand, see Hendry and Ericsson (1990). For an examination of long-run M1 demand, see Hoffman and Rasche (1989).

5 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—about 0.03 percent per year (see appendix).

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 opportunity cost and the scale variable. The general form of the model allows other variables, x_{it}, to affect adjustment speed (both current and lagged values). These variables, which need not affect equilibrium money balances, include any factors that influence the adjustment process.

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 assured. Substituting (1) into (2) yields

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

We estimate a version of equation (3).

II. Measuring Opportunity Cost

By definition, the opportunity cost of money is the forgone interest income from holding a monetary asset in lieu of some higher-yielding non-monetary, but otherwise comparable, asset. A common practice in the money demand literature has been to measure opportunity cost using a market yield on some short-term security, such as a Treasury bill (T-bill) or commercial paper. This seemed appropriate for the narrow money measures during much of the postwar period, because holders of currency and demand deposits did not receive explicit interest payments on these instruments.

However, many instruments in the broader monetary aggregates, such as M2, have yielded explicit interest. During regulation, yields responded at least partially to market conditions when interest-rate ceilings were not exceeded. In principle, the forgone interest for each of these instruments is the difference between its yield and the yield on some close substitute.

An innovation of MPS was to measure the opportunity cost of M2 as the difference between the rate paid on M2 deposits and the rate earned on a T-bill. The rate paid on M2, or its *own* rate, is a weighted average of the rates paid on M2 components (which include small time deposits, MMDAs, other checkable deposits, passbook savings accounts, and repurchase agreements [RPs]), where the weights are equal to the corresponding component's share of M2.

The three-month T-bill is generally considered a close substitute for many M2 components because, like most of these, it is of short maturity and is relatively risk free. However, M2 components vary in liquidity. Some deposits, such as interest-bearing checking accounts, are available on demand, while other components, such as small time deposits, may not be accessible without penalty for several years.

One hypothesis of this paper is that the opportunity cost of M2 is more appropriately calculated as a weighted average of the differences between each M2 component and a market instrument of comparable maturity. Such a measure would allow for the variation in M2 maturities and hence would account for the interest forgone by not holding more likely substitutes. Unfortunately, data constraints make such a calculation impossible before 1983.

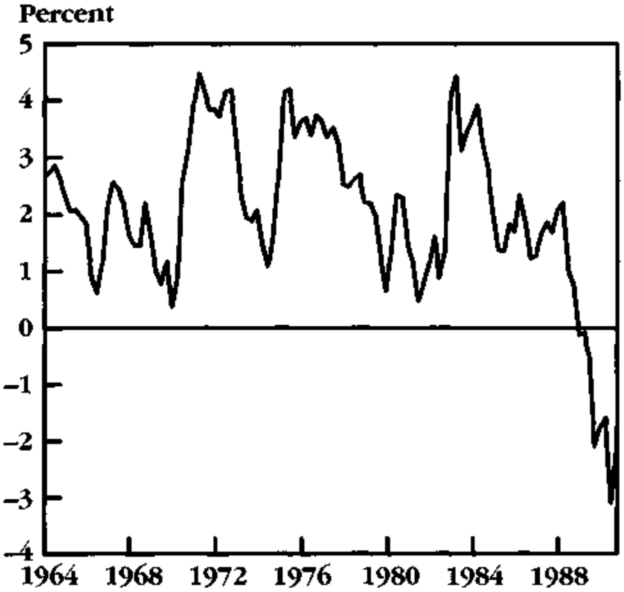
Although it is not possible to match each M2 component perfectly with a market instrument of equal maturity, one can achieve closer correspondence between rates paid on these components and on alternative assets than is realized by the measure now employed. For example, a closer approximation of the alternative asset rate can be constructed using a weighted average of the three-month T-bill rate and the three-year Treasury note (T-note) rate. The weight for the three-year T-note rate is the small time deposit share of M2, and the weight for the three-month T-bill rate is the non-small time deposit share of M2.[6]

Some analysts have found that yield curve steepness variables are statistically significant in money demand models that use the conventional opportunity cost measure. Using our measure of opportunity cost, however, the yield curve variable becomes insignificant. This suggests that the M2 components' relative shares are important in calculating opportunity cost.

■ 6 It should be emphasized that this alternative measure is still an approximation. We are not matching maturities, since our measure of the own rate uses the interest rate paid on the six-month certificate of deposit (CD) as the rate paid on all time deposits. Nevertheless, the introduction of the longer-term T-note rate into the calculation appears to improve the model.

FIGURE 1

Change in Thrift Deposits, 1964 – 1990



NOTE: Percent changes are expressed as quarterly rates.
SOURCE: DRI/McGraw Hill.

III. The Thrift Hypothesis

Over the past two years, many models of M2 demand have been consistently overpredicting M2 growth. Some analysts have argued that the unexplained weakness in this aggregate is related to the ongoing restructuring of the savings and loan industry (see Furlong and Trehan [1990]). As figure 1 shows, thrift deposits have contracted significantly since 1988. Although banks have acquired some of these funds, the additional increase in bank deposits has only partially offset the contraction at thrifts.

After the savings and loan industry's problems became evident, these institutions came under increasing regulatory pressure. Regulators no longer allowed thrifts to bid for funds above market interest rates. And the closure of thrifts, as Furlong and Trehan argue, led to changes in deposit pricing strategy for the entire deposit market. To the extent that institutions paying above-market rates were eventually closed, their competitors were able to offer lower interest rates because they no longer had to compete against the insolvent thrifts. Furthermore, when the insolvent thrifts were closed and their assets sold to other financial institutions, many contracts were abrogated. When the assets were absorbed, the interest-rate "contracts" were renegotiated. This meant that the above-market interest rates offered by the thrifts were no longer available.

As Furlong and Trehan note, interest rates on MMDAs and on small time deposit accounts have recently been lower than one would have expected prior to the thrift industry restructuring. This has caused an increase in the opportunity cost of M2 and has led many depositors to transfer their funds, at least temporarily, out of M2.

While the thrift restructuring hypothesis explains why deposit rates may be unusually low, it is unclear why the money demand function is overpredicting M2 growth. If deposit rates are lower than expected, then opportunity cost should be higher than expected, which in turn should imply lower money demand. That is, the weakness in M2 growth should be explained by higher opportunity cost.

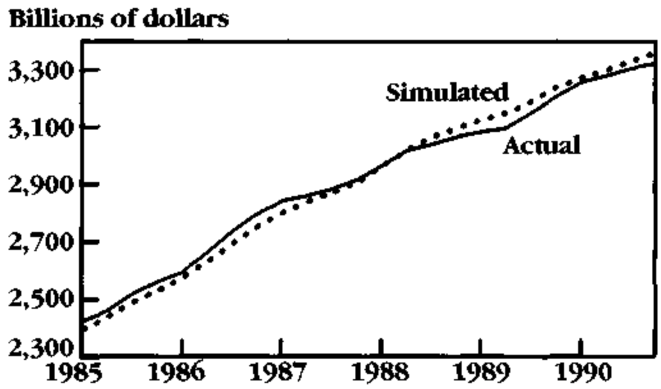
One hypothesis for the shortfall in money demand is that the changed pricing behavior is not captured completely by the measured opportunity cost. Although refining the opportunity cost measure by partially accounting for the variation in rates across maturities does improve the model, the measurement of the M2 own rate also presents problems for our analysis. As noted previously, the own rate is computed as a weighted average of the rates paid on various M2 deposits. Surveys conducted by the Federal Reserve and the Office of Thrift Supervision (OTS) ask respondent depositories to indicate the "most common rate paid" on various types of deposits.

The aggregated own rate computed from these surveys masks the shape of the interest-rate distribution in two ways. First, if depositories pay different rates on accounts of the same type, then the Federal Reserve uses the rate paid on the largest number of deposits to compute the own rate. For example, depositories may have many levels, or tiers, of MMDAs, each requiring a different minimum balance and paying a different interest rate. Second, the distribution of rates across depositories could be skewed if a few institutions pay much lower or much higher rates than average.

Depositories that need funds are more likely to be on the high end of the interest-rate distribution and are therefore likely to be the institutions most responsible for the growth of deposits. Unfortunately, the own rate now used will drown out the rates reported by banks paying the "fringe" rates; that is, those banks having the greatest effect on

FIGURE 2

Simulated and Actual M2: Estimation Period = 1964:IQ – 1986:IVQ



SOURCE: Simulations based on authors' model.

the demand for deposits by drawing funds from outside the depository sector.[7]

A key hypothesis of this paper is that the change in thrift deposits is a proxy for deposit pricing effects not captured by our measure of opportunity cost. In other words, the effect of thrift restructuring on M2 demand may be viewed as another kind of measurement problem. Because deposit pricing has at times been more aggressive at thrifts than at banks, thrift deposit growth could incorporate information about the skewness in the distribution of deposit rates. The rates on the extreme end of the distribution might well account for a disproportionate share of the change in thrift deposits. For example, in the early to middle 1980s, some thrifts expanded their market share of deposits and other money market instruments by offering extremely attractive (and, more important, unsustainable) rates.

Interest-rate skewness, while not sustainable in the long run, might affect the adjustment of M2 to its equilibrium level. To examine this hypothesis, we include both the lagged change in thrift deposits and the lagged change in M2 in the error-correction equation.[8] Because the thrift variable is largely a component of M2, we would not expect it to add anything to the regression unless it includes information not contained in the lagged change in M2.[9]

IV. Empirical Results

The regression estimated in this paper as an alternative to the MPS equation is given by

$$(4) \quad \underset{}{\nabla m_t} = \underset{(4.44)}{-.053} - \underset{(4.60)}{.009\, s_{t-1}} - \underset{(5.13)}{.138(m_{t-1} - y_{t-1})} + \underset{(3.08)}{.245\, \nabla m_{t-1}} - \underset{(3.32)}{.007\, \nabla s_t} - \underset{(3.39)}{.007\, \nabla s_{t-1}} + \underset{(2.87)}{.186 \nabla c_t} + \underset{(3.30)}{.214\, \nabla x_{t-1}} + \underset{(7.38)}{.031 REGDUM} + \varepsilon_t$$

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

where s is our alternative measure of opportunity cost, c is personal consumption expenditures, x is thrift deposits (including other checkables, MMDAs, savings deposits, small and large time deposits, and term RPs), and *REGDUM* is a qualitative variable that equals zero in all quarters except 1983:IQ, when it equals one.[10] 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.

7 A second problem is that the Federal Reserve and the OTS neither collect the same information on their surveys nor compute the aggregate rate for M2 deposits in the same manner. The OTS computes an aggregate rate for each type of deposit at thrift institutions. This is calculated by asking for the "most common rate paid" on a given type of account and weighting that rate by the *total number of deposits* at the entire institution, not by deposits in the given type of account. This method implicitly assumes that every thrift has a similar distribution of deposits. The Federal Reserve, on the other hand, weights its aggregate rates by the amount of deposits in the given type of account—a more accurate method of computing weighted averages. However, the own rate is calculated using both OTS and Federal Reserve data.

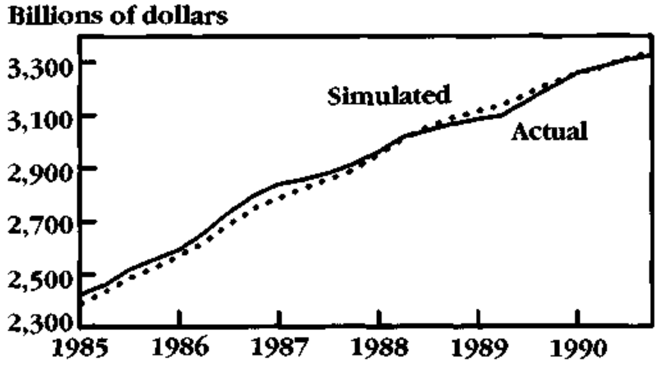
8 We also looked at the thrift share of the deposit market as a proxy for deposit pricing effects. Although this variable enters significantly in some models of money demand, it is not significant here.

9 An underlying assumption is that pricing strategies persist over several quarters. This persistence is reflected in the strength (weakness) of thrift deposit growth relative to M2 growth, and accounts for the unique information when both variables are included in the regression.

10 Following the practice of MPS, we present results that approximate s using a first-order Taylor series expansion (Taylog) when the opportunity cost is less than 0.5. We also estimate the model using the simple log of opportunity cost. While 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.

FIGURE 3

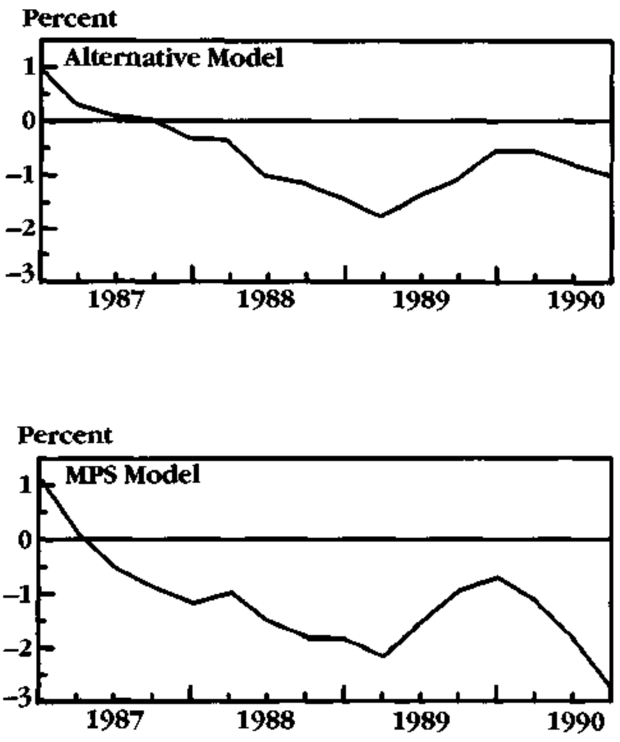
Simulated and Actual M2: Estimation Period = 1964:IQ – 1989:IVQ



SOURCE: Simulations based on authors' model.

FIGURE 4

Simulation Residuals: Estimation Period = 1964:IQ – 1986:IVQ



SOURCE: Simulations based on authors' and MPS's models.

Figure 2 illustrates that although the model overpredicts M2 growth in 1989, the gap narrows in 1990. When we extend the estimation period through 1989:IVQ, the adjusted R^2 increases further, to 0.77, and the out-of-sample simulation errors become smaller (see figure 3).

The measure of opportunity cost discussed above appears superior to the measure calculated by MPS, improving fit and out-of-sample simulation performance.[11] Changes in the estimates of the opportunity cost variable coefficients show that the choice of opportunity cost measure is also important. When the alternative rate is used, the coefficients for each of the opportunity cost variables—the first difference, the lagged difference, and the lagged level of opportunity cost—increase in absolute value, indicating that those variables explain a larger share of the changes in M2.

The change in thrift deposits is also highly significant, both before and after 1986. When this variable is excluded from the model, out-of-sample simulation errors cumulate substantially after 1988. Moreover, the lagged thrift variable clearly adds something that the lagged change in M2 does not explain. This suggests that the thrift variable is capturing potential effects related to the thrift restructuring, and is consistent with the hypothesis that our thrift variable is capturing part of the skewness of the own-rate distribution.

Our equation compares favorably with that of MPS (see appendix). Improvement in fit is substantial, from 0.68 to 0.74, and as figure 4 indicates, the bias in the MPS model appears to be widening. More important, the stability of our model does not rely on the inclusion of numerous qualitative variables. Indeed, we account only for the temporary effect caused by the watershed of regulatory changes that occurred in 1983. To test for stability before and after 1983, we employ a Chow test and reject the hypothesis that the parameters have changed.

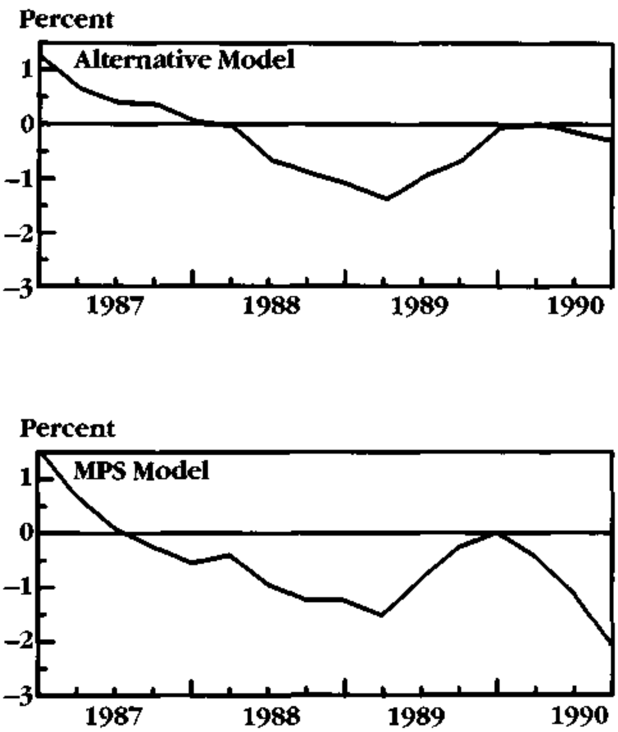
Figure 5 compares the simulation residuals for the two models when the sample periods are extended through 1989:IVQ. Note that both models improve. The 1990 errors are negligible in the alternative model, while the MPS model continues to underpredict M2 growth.

To assess the robustness of our thrift proxy, we examine the stability of its coefficient as the sample size is varied. Figure 6A illustrates the estimated value of the sample (bounded by two standard deviations) as the sample size is increased by one quarter, beginning with 1985:IQ

11 We estimate the model without the thrift variable for the period 1964:IQ to 1986:IVQ. Although the in-sample fit is only marginally better for the MPS measure, the average out-of-sample bias is 57 percent higher.

FIGURE 5

Simulation Residuals: Estimation Period = 1964:IQ – 1989:IVQ



SOURCE: Simulations based on authors' and MPS's models.

to 1989:IVQ and moving backward in time. Although the coefficient does vary to some extent, it tends to stabilize as the sample is increased and is never statistically insignificant.

To see how important the most recent experience is, we repeat this experiment with an initial sample period of 1982:IQ to 1986:IVQ (see figure 6B). The results, while not as favorable, illustrate the relative stability of the thrift factor as a determinant of money demand. However, our findings also suggest that the influence of the recent data is relatively substantial.

Finally, figure 6C shows the value of the coefficient for an initial estimation period of 1964:IQ to 1968:IVQ, and for each quarter forward. The coefficient begins to stabilize in the early to middle 1970s. This finding is consistent with the hypothesis that the thrift deposit change may proxy for deposit pricing skewness. Prior to this time, deposit-rate competition for funds was largely constrained by Regulation Q. In 1973, however, regulators began to erode this constraint by introducing exempt deposit instruments such as "wild card CDs."[12]

V. Summary and Conclusions

We investigate two hypotheses that may explain the unexpected slowness in M2 growth. First, we attempt to measure more accurately an aggregate opportunity cost of M2. The results suggest that some share of small time deposits is more likely to be a substitute for instruments with maturities of longer than three months. Although the alternative measure is a crude approximation of an "ideal" aggregate, it improves the fit of the model substantially.

Second, we explore potential effects of the change in thrift deposits on the adjustment of money demand to its long-run equilibrium level. Although the economic foundations of the latter hypothesis may be unclear, our preliminary analysis suggests that the inclusion of lagged thrift deposit growth in the error-correction equation helps to account for the weakness in M2. The thrift variable's statistical significance in estimation periods predating the recent restructuring is surprising and needs to be explained.

We are encouraged by the out-of-sample performance of our model and believe that further improvements can be made in the measurement of opportunity cost. Our results are consistent both with the hypothesis that thrift restructuring has played a role in the recent weakness of M2 and with the belief that the restructuring will have only a minimal effect on long-run velocity.

This study also highlights the difficulty that policymakers face in choosing the appropriate target for M2. Our findings suggest that desired M2 growth should be conditioned on expectations concerning the continued effect of thrift restructuring, as well as on future movements in the term structure of interest rates. The analysis does not address how to predict the behavior of these conditioning factors, however.

Appendix: The MPS Money Demand Model

The MPS model, like the one described above, is an error-correction model that assumes a long-run velocity following a constant, but nonzero, trend.[13] The regression and estimated coefficients are given in box 1 on page 10.

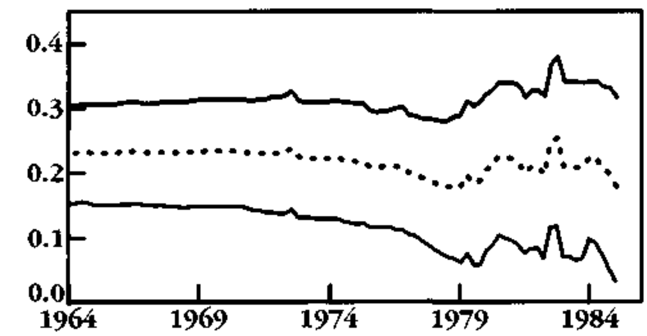
■ 12 For an analysis of the competitive implications of this exempt instrument, see Kane (1978).

■ 13 Much of this discussion is based on Small and Porter (1989).

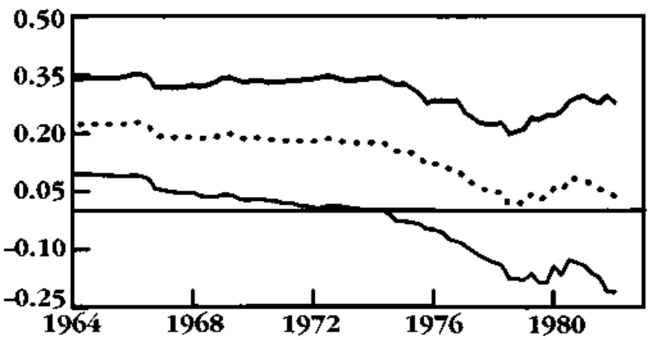
FIGURE 6

Coefficient of the Thrift Variable

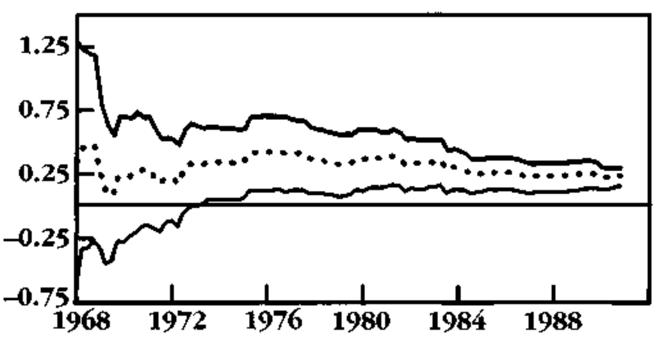
A. ESTIMATED FOR EACH PERIOD BACKWARD FROM 1985:IQ TO 1989:IVQ



B. ESTIMATED FOR EACH PERIOD BACKWARD FROM 1982:IQ TO 1986:IVQ



C. ESTIMATED FOR EACH PERIOD FORWARD FROM 1964:IQ TO 1968:IVQ



—— Plus two standard deviations
—— Minus two standard deviations

SOURCE: Simulations based on authors' model.

MPS specify the long-run equilibrium money demand function as

$$m_t = \alpha + y_t + \beta s_t + \gamma T_t + e_t,$$

where $m_t = \log(M2)$, $y_t = \log(\textit{nominal GNP})$, $s = \log(\textit{opportunity cost})$, and $T =$ time. This specification allows M2 velocity to drift over time, although the estimated coefficient indicates that this drift is negligible in the short run. Since MMDA in the adjustment equation is essentially an intercept shift variable, the statistical significance of its coefficient can be interpreted as a one-time downward shift in the M2 velocity trend.

In addition to imposing convergence of long-run equilibrium through the error-correction term, MPS also impose a short-run "convergence" restriction that requires the sum of the coefficients of $\nabla\log(M2_{t-1})$, $\nabla\log(Consump_t)$, $\nabla\log(Consump_{t-1})$, and $\nabla\log(Consump_{t-2})$ to equal one.

There are a number of other differences between the MPS model and ours. Aside from differences in the measurement of opportunity cost, MPS include variables that are not employed in our new specification of money demand, specifically, *DUM83Q2*, $\nabla\log(Consump_{t-1})$, $\nabla\log(Consump_{t-2})$, *Time*, ∇*CCDUM*, and *MMDA*. We tested the restriction on the sum of the coefficients on consumption and M2 variables, but since the restriction was not statistically justifiable, we did not impose it in our specification. In addition, the coefficients on *MMDA* and *Time* became statistically insignificant under our specification. Thus, our results are consistent with the hypothesis that, in the long run, M2 velocity depends only on its opportunity cost.

While both models fit reasonably well during the estimation period, the new specification behaves better out of sample, yielding smaller forecast errors. In addition, our model is less reliant on hard-to-predict dummy variables whose effects are unlikely to be permanent with respect to the growth rate of M2.

BOX 1

MPS Model and Estimated Coefficients

$$
\begin{aligned}
\nabla \log(M2_t) = {} & \underset{(5.55)}{-.076} + \underset{(6.04)}{.508}\, \nabla \log(M2_{t-1}) - \underset{(-2.57)}{.000077}\, Time \\
& - \underset{(-6.25)}{.010}\, \text{Taylog}\,(Opp_{t-1}) - \underset{(-5.60)}{.185}\, [\log(M2_{t-1}) - \log(GNP_{t-1})] \\
& + \underset{(3.89)}{.288}\, \nabla \log(Consump_t) + \underset{(1.64)}{.120}\, \nabla \log(Consump_{t-1}) \\
& + \underset{(1.37)}{.085}\, \nabla \log(Consump_{t-2}) - \underset{(-5.56)}{.0089}\, \nabla \text{Taylog}\,(Opp_t) \\
& + \underset{(2.43)}{.0056}\, MMDA - \underset{(-2.86)}{.0103}\, \nabla CCDUM \\
& + \underset{(5.64)}{.0271}\, DUM83Q1 - \underset{(-1.36)}{.0075}\, DUM83Q2
\end{aligned}
$$

Adj. R^2 = .68; estimation period = 1964:IQ to 1986:IIQ.

Taylog :	The natural logarithm of values greater than 50 basis points and the linear approximation of those values less than 50 basis points.
Time :	Time trend, which increases by one each quarter.
Opp :	Opportunity cost of M2.
Consump :	Personal consumption expenditure.
MMDA :	Dummy variable used to denote the permanent shift in money growth resulting from the introduction of money market deposit accounts. It takes the value zero before 1983:IQ and one thereafter.
CCDUM :	Dummy variable to correct for credit controls in place in 1980:IIQ. It takes the value one in 1980:IIQ, zero otherwise.
DUM83Q1:	Dummy variable to correct for the short-run shock to M2 caused by deregulation, which led to the introduction of MMDAs and negotiable order of withdrawal (NOW) accounts. It takes the value one in 1983:IQ, zero otherwise.
DUM83Q2:	Dummy variable to correct for the second quarter in which NOW accounts were allowed. It takes the value one in 1983:IIQ, zero otherwise.

NOTE: *T*-statistics are in parentheses.

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