The Demand for M1 by Households: An Evaluation of Its Stability

By V. Vance Roley

The reliability of the narrowly defined money supply, M1, as a monetary policy guide has been questioned following the events of 1982 and 1983. During that period, M1 grew very rapidly and the turnover or velocity of M1 underwent an unprecedented decline.

Some observers argue that the 1982-83 drop in velocity was caused by an unpredictable shift in the M1 velocity function during the 1982-83 period.[1] According to this argument, the relationship between M1 velocity and the factors that determine M1 velocity deviated from historical norms during the 1982-83 period. If this argument is valid, the 1982-83 decline in M1 velocity would not have been predicted by reference to historical experience. Other observers hold that movements in some of the determinants of M1 velocity caused the 1982-83 velocity decline.[2] According to this explanation, the M1 velocity function was stable during the 1982-83 period and the drop in velocity would have been predicted based on historical experience.

The predictability of M1 velocity is important for monetary policymaking. Predictable

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[1] See, for example, *Economic Report of the President*, 1983, pp. 21-22, and Alan S. Blinder, "Comment," *Brookings Papers on Economic Activity*, 1984:1, pp. 266-270.

[2] Many explanations of the 1982-83 velocity decline rely on the fall in short-term interest rates beginning in mid-1982 and/or the effects of financial deregulation since 1981. See, for example, John P. Judd and Rose McElhattan, "The Behavior of Money and the Economy in 1982-83," *Economic Review*, Federal Reserve Bank of San Francisco, Summer 1983, pp. 46-51; Flint Brayton, Terry Farr, and Richard Porter, "Alternative Money Demand Specifications and Recent Growth in M1," mimeo, Board of Governors of the Federal Reserve System, May 1983; Phillip Cagan, "Monetary Policy and Subduing Inflation," *Essays in Contemporary Economic Problems: Disinflation*, American Enterprise Institute, 1984, pp. 21-53; Michael J. Hamburger, "Recent Velocity Behavior, the Demand for Money and Monetary Policy," Conference on Monetary Targeting and Velocity, Federal Reserve Bank of San Francisco, 1983; and R. W. Hafer, "The Money-GNP Link: Assessing Alternative Transactions Measures," *Review*, Federal Reserve Bank of St. Louis, March 1984, pp. 19-27.

velocity movements can be allowed for when the Federal Reserve establishes M1 growth targets and responds to ongoing movements in M1. To the extent that M1 velocity is not predictable, however, M1 is an unreliable monetary policy guide.

This article presents evidence supporting the view that the behavior of M1 velocity was predictable during the 1982-83 period relative to the last half of the 1970s, but not predictable relative to earlier years. In other words, during the 1982-83 period, M1 velocity conformed to the historical experience of the 1974-81 period, but deviated from norms established during the 1959-73 period. The evidence is based on an empirical examination of the M1 velocity behavior of the nation's household sector during the 1959-83 period. The first section of the article defines velocity, discusses why its predictability is important, and shows that movements in total M1 velocity are dominated by movements in household M1 velocity. The second section discusses a model of household M1 demand that was used in the empirical investigation, while the third section presents the empirical results.

Household M1 velocity

For narrowly defined money, M1, velocity measures the rate of M1 turnover for a given amount of nominal spending in the economy. M1 velocity, M1V, can be expressed as

$$(1) \quad M1V = GNP/M1,$$

where GNP corresponds to nominal gross national product.

The predictability of M1 velocity is important to the Federal Reserve in setting its M1 growth objectives. From the above expression for velocity, the growth of M1 can be related to the economy as follows:

$$(2) \quad \dot{M}1 + \dot{M1V} = \dot{GNP}.$$

That is, the growth rate of M1 plus the growth rate of velocity equals the growth rate of nominal GNP. In turn, the growth rate of nominal GNP is the sum of the growth rate of real GNP and the rate of inflation. Thus, if velocity growth is predictable, the growth rate of M1 consistent with desirable outcomes for inflation and economic growth can be determined. If velocity growth behaves erratically, however, the growth rate of M1 consistent with desired values of inflation and economic growth cannot be determined.

The behavior of aggregate M1 velocity reflects the behavior of the velocity of the two major sectors of M1 holders: businesses and households. During past episodes of velocity instability, shifts have frequently been attributed to the behavior of the business sector. In terms of the proportion of M1 balances held, however, the household sector has gained in importance in recent years, rising to 63 percent in 1983. The proportion of household M1 balances in total M1 is illustrated in Chart 1.[3] This proportion has risen fairly steadily since the early 1960s. As a result, any shifts in household M1 velocity would have been increasingly reflected in the behavior of aggregate M1 velocity.

A comparison of the historical behavior of total and household M1 velocity growth is presented in Chart 2. The unprecedented decline

[3] The source of these data is Board of Governors of the Federal Reserve System, *Flow of Funds Accounts*. Household M1 velocity in Chart 2 also is calculated using end-of-quarter data from the flow of funds accounts. Total M1 velocity is calculated using the traditional quarterly averaged data. Total M1 velocity measures computed with flow of funds data and traditional data exhibit a correlation coefficient of 0.9991, and their growth rates have a correlation coefficient of 0.9326. In the empirical work reported in subsequent sections, flow of funds data are used. Flow of funds data also are used, for example, in Stephen M. Goldfeld, "The Case of the Missing Money," *Brookings Papers on Economic Activity*, 1976:3, pp. 683-730.

CHART 1

Proportion of household M1 balances in total M1

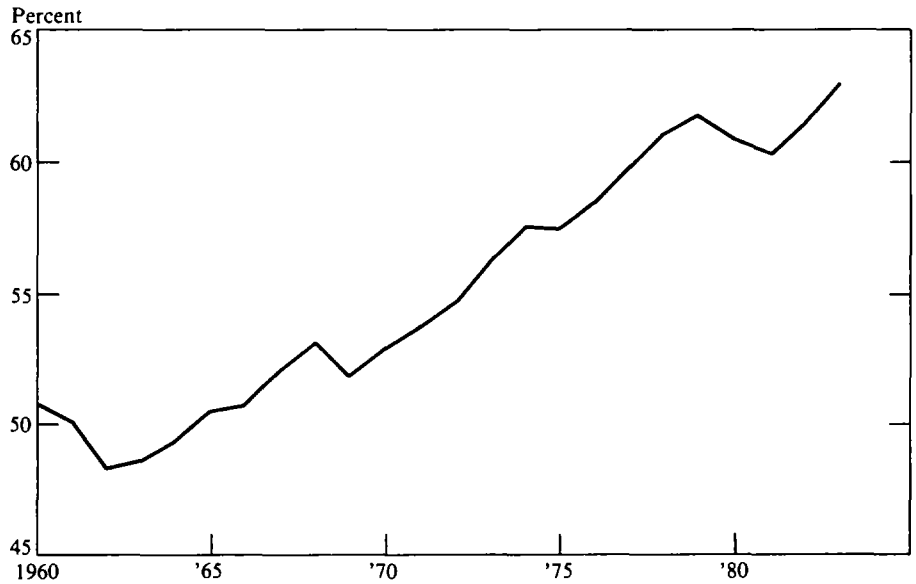
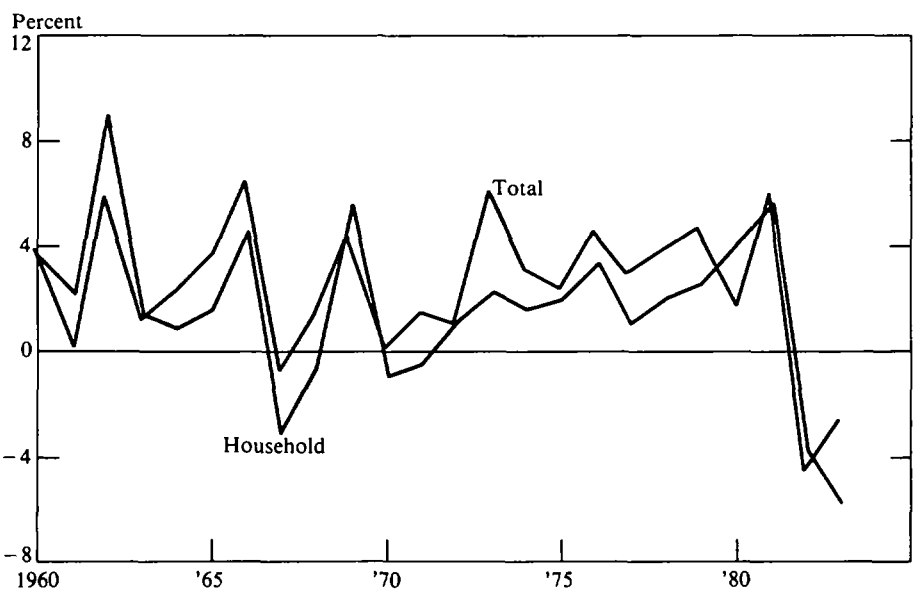


CHART 2

Household and total M1 velocity growth



in aggregate M1 velocity in 1982 and 1983 can be readily seen. The decline in 1982 is mirrored by household M1 velocity, and the performance in 1983 is again quite similar. Thus, factors affecting household M1 velocity appear to be largely responsible for the behavior of total M1 velocity growth during these years.

In previous years, the performances of household and total M1 velocity also are similar despite the attention given to the business sector in explanations of past swings in M1 velocity growth. Before 1973, the relationship appears to have been particularly close. The fluctuations of household M1 velocity growth occurring from 1960 to 1973 corresponded to those of total M1 velocity growth. From 1973 through 1979, however, total M1 velocity growth was uniformly higher than the same measure for households. In this case, the difference was due to the growth in the fraction of M1 held by households, or, equivalently, the sharp rise in velocity growth of other sectors' M1 balances. During these years, improved cash management practices by businesses causing an upward shift in velocity growth are often cited as a primary factor.[4] Changes in M1 velocity growth are nevertheless reflected quite well by the household sector's M1 velocity. As a result, to the extent that the velocity of household M1 balances was predictable over this period, as well as 1982 and 1983, a major portion of the movements in total M1 velocity can potentially be explained by movements in household M1 velocity.

[4] See, for example, Jared Enzler, Lewis Johnson, and John Paulus, "Some Problems of Money Demand," *Brookings Papers on Economic Activity*, 1976:1, pp. 261-280; Stephen M. Goldfeld, "The Case of the Missing Money," *Brookings Papers on Economic Activity*, 1976:3, pp. 683-730; and Thomas D. Simpson and Richard D. Porter, "Some Issues Involving the Definition and Interpretation of the Monetary Aggregates," *Federal Reserve Bank of Boston Conference Series*, October 1980, pp. 161-234.

A model of household M1 demand

The velocity of M1 is closely related to the demand for M1. For example, an increase in the volume of M1 balances demanded per dollar of GNP causes M1 to grow more rapidly than GNP. Since M1 velocity is equal to the ratio of GNP to M1, rapid growth in M1 relative to GNP is associated with a decline in velocity. Thus, there tends to be an inverse relationship between velocity and the demand for M1: an increase in the demand for M1 is associated with a decline in the growth of velocity, while a decrease in the demand for M1 is associated with an increase in the growth of velocity.

Given the close association between M1 velocity and the demand for M1, the predictability of M1 velocity during the 1982-83 period can be investigated by examining the predictability of the demand for M1 during this period. To do the latter, a model of household M1 demand is required.

The model of household M1 demand used in this article is based mainly on the transactions demand for M1. According to this basic model, households hold M1 to purchase goods and services in the future. Moreover, the higher the opportunity cost of holding M1, as represented by the rates of return on alternative assets, the lower the amount of M1 holdings. By minimizing M1 balances, households will have more wealth and hence greater consumption in the future. Thus, the determinants of M1 demand suggested by this model are interest rates and a measure of transactions such as income or consumption expenditures.

In addition to the variables suggested by the basic transactions model, two other potential determinants of household M1 demand are considered in this article. In particular, based on portfolio motives, a wealth variable is included. It is assumed that the greater the

amount of wealth, for example, the larger the holdings of M1 as well as other assets by households. Moreover, an increase in wealth may lead to a rise in future consumption expenditures, which in turn may increase the current demand for M1.[5]

The other variable considered as a possible determinant of household M1 demand is price inflation. The role of price inflation already is implicit in many conventional transactions models. In particular, nominal interest rates are typically included in these models, and increases in expected inflation are assumed to cause nominal interest rates to rise. In addition to this channel, however, inflation may have direct effects on the demand for M1. If the primary alternative asset available to households is savings deposits, for example, the nominal interest rate implied by Regulation Q ceilings have frequently been set below inflation. In this case, standard models imply that households ignore the negative real returns realized on these deposits. As a consequence, it is implicitly assumed that they settle for fewer goods and services in the future by holding either demand or savings deposits. Alternatively, if consumers reduced M1 holdings by purchasing goods, they would not have realized negative real rates of return. Thus, if the real rate of return on M1 substitutes is negative at times, inflation may affect M1 demand directly.

Another possible determinant that has received attention recently is the rate of return on NOW accounts. Since the introduction of nationwide NOW accounts in 1981, households have been able to earn 5 1/4 percent on transactions balances. Despite the plausibility of including this variable as a determinant, the results reported in the next section are virtually unchanged when it is considered.[6]

Finally, the demand for M1 is frequently assumed to adjust only gradually to current interest rates, income, and wealth. The motivation for this partial adjustment is based on transactions costs. In converting alternative assets into M1, such costs as brokerage fees and the opportunity cost of the time taken to make the conversion are incurred. To represent partial adjustment, lagged M1 balances are included as a possible short-run determinant of M1 demand.

Empirical results

This section presents the results of an empirical investigation that used particular versions of a household M1 demand model. The model was employed to determine whether there was an unpredictable shift in the household demand for M1 during the 1982-83 period; that is, whether the relationship between the household demand for M1 and the determinants of that demand deviated during the 1982-83 period from historical norms. The demand for M1 relationship was first estimated for historical periods and then these estimated relationships were used to evaluate the behavior of M1 demand in the 1982-83 period.

In estimating the historical demand for M1 relationship, two historical periods were separately considered. They were the period from the third quarter of 1959 to the fourth quarter of 1973 and the period from the first quarter of 1974 through the fourth quarter of 1981. Two periods were considered because researchers have found that the demand for

[5] The effect of increases in wealth—defined similarly to the measure used here—on future consumption expenditures is examined in Robert Hall, "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis," *Journal of Political Economy*, December 1978, pp. 971-987.

[6] Estimation and simulation results of specifications including the rate of return on NOW accounts are presented in V. Vance Roley, "Money Demand Predictability," *Journal of Money, Credit, and Banking*, Part II, forthcoming.

M1 relationship shifted in 1974 so that the relationship during the 1974-81 period differed from that during the 1959-73 period.

In estimating the demand for M1 relationship for these two historical periods, the particular model used states that the quantity of M1 demanded depends on a transactions variable—either real GNP or consumption—rates of return on alternative assets, inflation, and wealth. Two versions of the model were estimated for each period. In one version, the levels of the variables representing the determinants of M1 demand were entered into the regression. In this version, M1 in the previous period was entered as an independent variable under the assumption that, during any short time span, households make only partial adjustments in their M1 holdings in response to changes in the determinants of M1 demand.[7] The other version was the first-difference version. In this version, changes in the variables are entered in the regressions, rather than levels.[8]

The results of estimating the models differ depending on time period, the version of the model, and whether real GNP or consumption was used as a transactions variable. For the 1959-73 period, the results using the levels of the variables and real GNP as the transactions variable indicate that the savings deposit rate and real income are statistically significant determinants of household M1 demand. The coefficient on lagged M1 balances also is statistically significant, but other potential determinants are not.[9] For the first-difference model using real GNP as a transactions variable, the 1959-73 estimation results show no statistically significant determinants of household M1 demand. Moreover, the estimated partial adjustment coefficient has an incorrect sign. It is, nevertheless, insignificantly different from zero.

For the 1974-81 period, the levels/real GNP model shows that the speed of adjustment is estimated to decline, and the coefficient on inflation is statistically significant.[10] The results for the first-difference/real GNP model over the 1974-81 period show that inflation is estimated to be significantly correlated with household M1 demand.[11] (See Table 1 for complete estimation results of the models for the two periods using real GNP as a transactions variable.)

[7] This model conforms to the real adjustment model, as real M1 holdings are hypothesized to adjust to desired real M1 balances. The nominal adjustment model's specification only differs from that of the real adjustment model in that an additional term equaling the change in the logarithm of the price level is included. Since this same inflation variable is included in the estimated equations, the empirical results allow for the possibility of nominal adjustment. For discussions of these models, see Stephen M. Goldfeld, "The Case of the Missing Money," *Brookings Papers on Economic Activity*, 1976:3, pp. 683-730.

[8] The data used to estimate M1 demand models motivate this first-difference specification. In particular, most economic time series have trends, and the presence of trends can cause spurious correlation to appear in estimated relationships. First differencing the data helps to eliminate these trends. Moreover, if a model is appropriately specified, it should yield similar estimated coefficients when specified as levels on first differences. See, for example, Charles I. Plosser and G. William Schwert, "Money, Income, and Sunspots: Measuring Economic Relationships and the Effects of Differencing," *Journal of Monetary Economics*, November 1978, pp. 637-660.

[9] The inflation coefficient can again be interpreted as arising from the nominal adjustment model. While the nominal adjustment model cannot be rejected under this interpretation, neither can the real adjustment model because of the lack of statistical significance of this coefficient. Because the variables are entered as natural logarithms, the estimated coefficients can be interpreted as elasticities. For real GNP, for example, the estimated coefficient implies that a 1 percent increase in real GNP causes a 0.41 percent increase in the short-run demand for real M1 balances.

[10] Interpreting these results in terms of the nominal adjustment model, the hypothesis of nominal adjustment cannot be rejected at low significance levels, while the real adjustment model can be rejected.

[11] In all of the models, the hypothesis of coefficient stability across periods cannot be rejected at low significance levels in Chow tests. However, these tests are weak because of the number of statistically insignificant coefficient estimates.

TABLE 1

Estimation results with GNP as the transactions variable

Sample Period	Dependent Variable	Coefficient Estimates† c	rsd	rtb	y	e	m_{-1}	Δp	Summary Statistics‡ $\bar{R}^2$	SE	DW
1959:Q3-	m	-2.548*	-0.1221*	-0.0197	0.4149*	-0.0070	0.5510*	-0.0541	0.97	.0162	1.86
1973:Q4		(0.7350)	(0.0498)	(0.120)	(0.1220)	(0.209)	(0.1283)	(0.8479)			
1959:Q3-	Δm	0.0032	-0.0597	0.0200	0.2678	0.0104	-0.1128	-0.1570	-0.06	.0182	1.90
1973:Q4		(0.0039)	(0.0872)	(0.0189)	(0.3013)	(0.0325)	(0.1527)	(0.7094)			
1974:Q1-	m	-0.8637*	-0.3455	-0.0048	0.2211*	0.0226	0.7460*	-1.7102*	0.82	.0160	2.68
1981:Q4		(0.4299)	(0.2395)	(0.0154)	(0.0864)	(0.0327)	(0.1167)	(0.7241)			
1974:Q1-	Δm	-0.0047	0.0380	0.0004	0.5768*	0.0126	-0.1515	-1.6227*	0.20	.0177	1.84
1981:Q4		(0.0036)	(0.4367)	(0.0209)	(0.2926)	(0.0353)	(0.1786)	(0.6873)			

*Significant at the 5 percent level.
**Significant at the 10 percent level.
†When Δm is the dependent variable, all right-hand-side variables also are differenced. Numbers in parentheses are standard errors of estimated coefficients.
‡ $\bar{R}^2$ is multiple correlation coefficient corrected for degrees of freedom, SE is the standard error of estimate, and DW is the Durbin-Watson statistics.

m = natural logarithm of household M1 balances divided by the GNP deflator (Board of Governors of the Federal Reserve System, *Flow of Funds Accounts*)
rsd = natural logarithm of the savings deposit rate (MPS model databank)
rtb = natural logarithm of the end-of-quarter 3-month Treasury bill yield
y = natural logarithm of real GNP
e = natural logarithm of the end-of-quarter total value of equities (Board of Governors of the Federal Reserve System, *Flow of Funds Accounts*)
p = natural logarithm of the GNP deflator
Δ = difference operator

TABLE 2

Estimation results with consumption expenditures as the transactions variable

Sample Period	Dependent Variable	Coefficient Estimates† c	rsd	rtb	ce	e	m_{-1}	Δp	Summary Statistics‡ $\bar{R}^2$	SE	DW
1959:Q3-	m	-2.420*	-0.1069*	-0.0159	0.4145*	0.0128	0.5181*	0.6597	0.98	.0161	1.86
1973:Q4		(0.6499)	(0.0441)	(0.0122)	(0.1142)	(0.0218)	(0.1312)	(1.091)			
1959:Q3-	Δm	0.0012	-0.0481	0.0168	0.5228	0.0104	-0.1130	0.4833	-0.04	.0184	1.93
1973:Q4		(0.0044)	(0.0865)	(0.0190)	(0.3682)	(0.0337)	(0.1471)	(0.9059)			
1974:Q1-	m	-1.0223*	-0.4686**	-0.0201	0.2857*	-0.0009	0.6860*	0.0300	0.79	.0166	2.68
1981:Q4		(0.4745)	(0.2800)	(0.0187)	(0.1083)	(0.0313)	(0.1508)	(1.0785)			
1974:Q1-	Δm	-0.0046	-0.0776	0.0069	0.5296	0.0584	-0.3165	0.8231	-0.02	.0195	1.84
1981:Q4		(0.0045)	(0.4813)	(0.0228)	(0.4030)	(0.0387)	(0.2070)	(1.1058)			

Note: Variables and symbols are as defined in Table 1, except for the following:

m = natural logarithm of household M1 balances divided by the consumption expenditures deflator
ce = natural logarithm of real consumption expenditures
p = natural logarithm of the consumption expenditures deflator

TABLE 3
Percentage simulation errors using pre-1974 coefficient estimates*

Period	Levels (m)		First Differences (Δm)	
	GNP	Consumption	GNP	Consumption
1974:Q1	1.43%	1.07%	0.03%	-1.06%
Q2	-1.25	-1.65	-3.02	-3.29
Q3	-1.48	-2.17	-1.75	-2.11
Q4	0.61	0.10	0.40	1.23
1975:Q1	-1.61	-2.72	-1.98	-1.83
Q2	1.33	0.05	2.30	1.86
Q3	-2.20	-3.24	-2.30	-2.43
Q4	-3.76	-4.52	-1.98	-1.94
1976:Q1	-1.74	-2.44	1.92	1.39
Q2	-1.20	-2.06	1.83	1.55
Q3	-4.01	-5.18	-1.61	-2.20
Q4	-2.64	-3.86	0.74	0.30
1977:Q1	-1.27	-2.33	2.26	1.85
Q2	-3.49	-4.13	-0.64	-0.29
Q3	-2.31	-2.84	1.08	0.97
Q4	-3.22	-4.25	-0.15	-0.64
1978:Q1	-0.88	-1.85	2.36	2.14
Q2	-2.70	-3.34	-0.80	-0.79
Q3	-4.31	-4.98	-1.46	-1.46
Q4	-3.06	-3.65	0.43	0.41
1979:Q1	-4.06	-4.75	-0.46	-0.71
Q2	-2.38	-3.11	1.46	1.32
Q3	-2.16	-3.24	0.73	0.05
Q4	-3.15	-4.95	-0.71	-1.68

*Numbers correspond to percentage errors of real M1 balances obtained in post-sample static simulations.

With one major exception, the results using consumption expenditures as the transactions variable are virtually the same as those using real GNP. The exception is evident in the 1974-81 period, where the effect of inflation is not estimated to be statistically different from zero. (See Table 2 for complete results.)

The next step was to use the estimated demand for M1 relationships to evaluate the behavior of M1 in the 1982-83 period; that is, to determine whether the demand for M1 relationship deviated from historical norms in 1982 and 1983. This was done by using the estimated relationships to simulate, or "predict," historically consistent behavior of M1 for the 1982-83 period and then determine whether the actual behavior of M1 deviated from the predicted behavior.[12] Again, the two periods were treated separately because the relationships might not have been the same during the two periods due to a possible shift in the demand for M1 in 1974. To obtain some preliminary insight into this possibility, the behavior of the demand for M1 during the 1974-81 period was evaluated. To do this, the 1959-73 relationship was simulated over the 1974-81 period to determine whether the behavior of the demand for M1 during the

[12] In all empirical equations used in the simulations, coefficients with theoretically incorrect signs are deleted and the equations are reestimated.

TABLE 3 (continued)

Period	Levels (m)		First Differences (Δm)	
	GNP	Consumption	GNP	Consumption
1980:Q1	-3.65	-5.57	-1.38	-1.66
Q2	-5.59	-7.11	-2.11	-1.51
Q3	-2.24	-4.52	1.39	0.69
Q4	-8.81	-11.34	-6.16	-6.10
1981:Q1	-5.11	-6.86	0.96	1.27
Q2	-7.38	-9.39	-0.91	-1.18
Q3	-8.63	-10.44	-1.99	-1.80
Q4	-5.19	-6.72	2.51	3.03
1982:Q1	-4.85	-7.52	1.57	0.72
Q2	-6.90	-9.62	-1.37	-1.27
Q3	-6.39	-9.21	0.84	-0.04
Q4	-3.68	-7.05	2.83	2.25
1983:Q1	-0.45	-3.47	4.34	4.93
Q2	-0.63	-3.88	2.94	2.04
Q3	-4.98	-7.85	-2.00	-1.95
Q4	-5.34	-8.25	-1.09	-1.26
%ME(1974-81) =	-3.00%	-4.13%	-0.28%	-0.46%
RMSE(1974-81) =	$5.46b	$7.12b	$2.72b	$2.74b
%ME(1982-83) =	-4.15%	-7.11%	-1.01%	0.68%
RMSE(1982-83) =	$6.95b	$11.055b	$3.64b	$3.50b
%CE(1983:Q4) =	-9.28%	-14.95%	8.06%	5.42%

%ME = mean percentage simulation error
RMSE = root-mean-square error, in $1972b
%CE = cumulative percentage error

1974-81 period deviated from its behavior in the 1959-73 period.

These simulation results for the 1974-81 period are reported in Table 3. The reported values correspond to percentage errors in predicting real household M1 balances.[13] From the levels/real GNP model, for example, the results indicate that actual household real M1 balances in the first quarter of 1974 were 1.43 percent higher than those predicted by the model. The table shows that, starting in the third quarter of 1975, forecast errors for the levels model using either real GNP or real consumption expenditures were uniformly negative. As a consequence, for the 1974-81 period as a whole, the mean percentage forecast errors are -3.00 and -4.13 percent, respectively. Thus, the results using the levels model indicate that household M1 demand shifted downward over this period.

Forecasts from first-difference models are reported in the last two columns of Table 3. In contrast to the results of the levels models, the

[13] The forecasts were computed using static simulations. With this approach, the forecast in each period depends only on the values of the M1 demand determinants in the period. That is, historical values of the determinants, including lagged real M1 balances, are used to forecast current real M1 balances. This approach allows the magnitude of shifts in the empirical M1 demand relationship to be identified. For a discussion of the relative merits of the static and dynamic simulation methodologies, see Scott E. Hein, "Dynamic Forecasting and the Demand for Money," *Review*, Federal Reserve Bank of St. Louis, June/July 1980, pp. 13-23.

first-difference specifications do not exhibit large systematic errors. For the 1974-81 period as a whole, the mean percentage forecast errors using real GNP and real consumption expenditures were only -0.28 and -0.46 percent, respectively. Moreover, the root-mean-square errors—another measure of forecasting accuracy—were less than half those of the other models. These first-difference models, however, would not be expected to exhibit systematic negative simulation errors in response to permanent downward shifts in the level of M1 demand. Instead, permanent shifts would be indicated by the presence of a single large prediction error followed by a series of errors approximately summing to zero. In the first-difference model using real GNP as the transactions variable, for example, the 14 errors following the 3.02 percent decline in the second quarter of 1974 sum to 0.12. Thus, the downward shift in this quarter was not offset during these subsequent quarters. If household M1 demand equations in the pre-1974 period differ from those in the post-1974 period only by the presence of a permanent level shift, however, the pre-1974 models might explain the 1982-83 period.

Simulations over 1982-83 involving all four models estimated over the pre-1974 period are examined next. These results are reported in Table 3. The results for the models specified in levels form suggest that the earlier downward shift in household M1 demand persisted, as reflected by the negative percentage errors. The forecast errors using the first-difference models again are smaller than those of the other models.

To examine further whether the relationships estimated over the 1959-73 period were consistent with recent experience, cumulative percentage errors, %CE, over the 1982-83 period were calculated. The starting date in the corresponding simulations was the first quarter of 1982. The cumulative errors reported in Table 3 for the fourth quarter of 1983 are quite sizable. For the levels specifications, the smallest error is -9.28 percent. The cumulative errors for the first-differences specifications are 8.06 and 5.42 percent. As a whole, the magnitude of even the smallest of these cumulative errors casts doubt on the applicability of the pre-1974 models for the 1982-83 period.

Simulation results for models estimated over the 1974-81 period are presented in Table 4. In contrast to the results of the previous table, the simulations of all the models register about the same predictive ability. Specifications employing real consumption expenditures, however, have slightly higher mean percentage errors.

The cumulative percentage errors reported for the four models in Table 4 also are smaller than those of their counterparts in Table 3. For the levels specifications, cumulative errors in the fourth quarter of 1983 in simulations starting in the first quarter of 1982 are 2.35 and 3.26 percent for models using real GNP and real consumption expenditures, respectively. These errors are about one-fourth the absolute values of those reported for similar specifications in Table 3. The cumulative percentage errors in the fourth quarter 1983 for the first-differences specifications also are noticeably smaller. These results therefore suggest that models estimated over the 1974-81 period better reflect current household M1 demand than those estimated over the 1959-73 period.[14] That is, the behavior of household M1 demand

[14] Several factors account for this result. In the levels specifications, one factor is of course the smaller absolute value of the constant term in post-1974 models. This difference, however, does not account for all of the improvement. Other factors include the increased role of inflation in the levels specification with real GNP, the larger estimated coefficient on lagged M1 in both levels specifications, and the lower estimated coefficients on either real GNP or real consumption expenditures. In the first-differences specification, factors include the larger effect of wealth in both models and the increased effect of inflation in the model using real GNP.

TABLE 4
Percentage simulation errors using post-1974 coefficient estimates*

Period	Levels (m)		First Differences (Δm)	
	GNP	Consumption	GNP	Consumption
1982:Q1	-0.17%	0.42%	0.13%	1.17%
Q2	-0.86	-0.51	-0.85	-1.04
Q3	-0.78	-0.35	0.00	-0.48
Q4	1.55	1.65	2.86	1.66
1983:Q1	4.50	4.47	4.77	4.64
Q2	3.34	3.68	1.24	1.63
Q3	-1.07	-0.49	-2.43	-1.92
Q4	-0.85	-0.41	-1.28	-1.12
%ME(1982-83) =	0.58%	0.93%	0.55%	0.57%
RMSE(1982-83) =	$3.42b	$3.45b	$3.44b	$3.21b
%CE(1982:Q4) =	2.35%	3.26%	4.44%	4.54%

*See the notes in Table 3.

and M1 velocity was predictable over 1982-83 given the recorded values of real GNP, inflation, and real consumption expenditures. This result is particularly true for the behavior of M1 demand in 1982.

Conclusions

The reliability of the narrowly defined money supply, M1, as a monetary policy guide has been questioned following the events of 1982 and 1983. During that period, M1 grew rapidly and the turnover or velocity of M1 underwent an unprecedented decline. Some observers argue that this drop in velocity was caused by an unpredictable shift in the M1 velocity function during the 1982-83 period.

This article presents evidence supporting the view that, during the 1982-83 period, the behavior of M1 velocity was predictable relative to the last half of the 1970s, but not predictable relative to earlier years. In other words, during the 1982-83 period, M1 velocity conformed to the historical experience of the 1974-81 period, but deviated from norms established during the 1959-73 period. The evidence is based on an empirical examination of the M1 velocity behavior of the nation's household sector during the 1959-83 period.

While the results suggest that the behavior of M1 velocity in 1982 and 1983 conformed with M1 velocity behavior since 1974, the use of M1 as a policy guide merits caution. One reason is that the results indicate that the behavior of M1 relative to the economy changed in the mid-1970s, and further changes could occur in the future. Another is that the empirical results for the period after the mid-1970s may not exhibit the necessary precision or robustness to adhere strictly to M1 as a monetary policy guide. The results, nevertheless, suggest that M1 is a useful monetary policy guide if used with caution.

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