THE RELATIONSHIP BETWEEN MONEY AND EXPENDITURE IN 1982

Robert L. Hetzel

Introduction

The behavior of the money supply and the relationship between the money supply and the public's expenditure have recently been the subject of considerable interest. The interest in the behavior of the money supply is explained below by a discussion of the relationship between money growth and inflation. Other things equal, an increase in money growth will cause an increase in the inflation rate. The monetary acceleration that began in 1982 can then in time be expected to reverse the post-1979 trend toward a lower inflation rate. The inflationary implications of the behavior of the money supply must, however, be assessed in relation to the behavior of the public's demand for money. It has been argued that the relationship between the money supply and the public's expenditure in 1982 indicates that the public's demand for, money increased in 1982 by an abnormal extent. The high rate of growth of money that began in 1982 does not, therefore, presage higher inflation. This argument is appraised in the body of the paper through an examination of whether the recent behavior of expenditure and money is consistent with their past behavior.

Money Growth and Inflation

A standard quantity theory explanation of inflation as a monetary phenomenon is offered in this section. It is assumed that the actions of the monetary authority determine the nominal quantity of money (the number of dollars in circulation). The public, however, cares about the real quantity of money it holds (the quantity of goods and services that the nominal quantity of money will purchase). The real quantity of money can be expressed as the ratio of the nominal quantity of money to the nominal (current dollar) expenditure of the public. The public's desire to control this ratio, given the determination of the nominal quantity of money by the monetary authority, causes nominal money to be stably related to nominal expenditure.

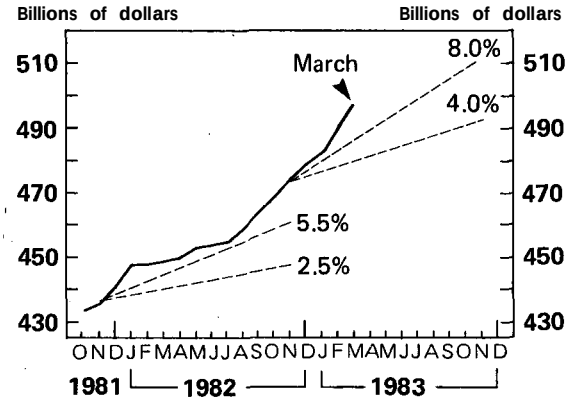
The nominal quantity of money does not affect tastes and preferences or natural resource endowments and technology. Ultimately, therefore, real expenditure is determined independently of the nominal quantity of money. Given that the nominal quantity of money determines nominal expenditure and that real expenditure is determined independently of nominal money, the nominal quantity of money determines the price level. The ratio of current dollar expenditure (determined by money) to constant dollar expenditure (determined independently of money) is a definition of the price level. The above relationships may require many years to work out, but ultimately the level of the nominal quantity of money determines the price level.

Recent Behavior of Money

The behavior of money (Ml,) in 1982 and early 1983 is displayed in Chart 1. The cones show the four quarter target ranges set by the Federal Reserve System for 1982 and 1983. The rapid growth of Ml

Chart 1

Ml GROWTH COMPARED TO TARGET RANGES 1982-1983



over this period has been watched by individuals contracting to receive nominal dollars in the future. In itself, the rapid growth of M1 suggests a future reversal of the post-1979 trend toward lower inflation. This result, however, need not pertain if an unusual increase in the public's demand for real M1 balances has occurred. In the succeeding section, evidence is examined bearing on the possibility that the ratio of M1 to expenditure desired by the public has increased.

Methodology

The ratio of M1 to expenditure did rise in 1982 relative to its trend. This rise suggests an unusual increase in the demand for real M1 balances desired by the public. The ratio of contemporaneous money to contemporaneous expenditure is, however, a misleading indicator of the public's demand for real money balances. Changes in money do not affect expenditure immediately, but rather with a long lag, the effect of which is distributed over time. In order to assess the stability of the relationship between money and expenditure, it is necessary to consider the stability of the distributed lag relationship between them. This consideration motivates the approach used below. A historical distributed-lag relationship between expenditure and money is calculated. The ability of the historical relationship to explain the recent behavior of expenditure is then examined.

Regression Analysis

The results of regressing expenditure on a distributed lag of past values of money are presented in this section. M1 is included as a right hand variable with six lagged terms. The contemporaneous and lag one term for M1 are omitted in an attempt to reduce the correlation that does not reflect causation running from M1 to expenditure, but rather reflects, reverse or simultaneous causation.[1] Inclusion of M1 beginning with a two quarter lag corresponds to Milton Friedman's estimate that two to three quarters elapse before a change in money affects expenditure [3, p. **22].**[2]

Experimentation with alternative forms of regression equations indicates that the relationship between money and expenditure appears more clearly when an interest rate is included as a right hand variable. The interest rate is included with six contemporaneous and lagged terms. The estimated coefficient on the contemporaneous term is positive. The positive sign suggests the common influence on expenditure and the interest rate of nonmonetary forces. The sum of the estimated coefficients on the contemporaneous and lagged terms of the interest rate variable is negative, however. The negative sign on the sum of the estimated coefficients suggests that the predominant role of the interest rate term is to capture the effect of shifts in the demand for money.

The regression equation described above is not a reduced form derived from a model. Its justification is that it appears to offer a useful way of organizing a review of the data pertaining to the relationship between money and expenditure. It is offered as a superior alternative to the common practice of looking at the behavior of the ratio of contemporaneous expenditure to contemporaneous money, the contemporaneous velocity of money.

"Shift-adjusted" M1 is used. This series, constructed by the staff of the Board of Governors, is the current M1 series adjusted to account for the shifts into ATS and NOW accounts from nonmone-

[1] In a regression of quarterly percentage growth rates of GNP on a constant and a simple distributed lag of contemporaneous and past values of quarterly percentage growth rates of M1, the sum of the estimated coefficients on M1 for the three quarters of lag 0 through lag 2 is 1.22. This value is implausibly large if it is considered to reflect the causal effect of money on expenditure.

[2] Including more lagged terms does not reduce appreciably the sum of the squared residuals of the regression equations estimated here. The true distributed lag relationship between money and expenditure is summarized only approximately by the estimated relationship for many reasons. The true lags, for example, are longer than the ones shown here. Consider, say, an increase in money that causes an initial rise in real expenditure. This rise, in time, will be reversed. At this point, the fall in real expenditure appears to offset the concurrent rise in the price level, so the impact of money on nominal expenditure is negligible. Beyond this point, however, the initial increase in money will cause the price level, and thus nominal expenditure, to rise. The data appear to be too noisy to allow estimation of distributed lags long enough to describe the full working out of a change of money on the price level. (The author estimates that about four years are required for the price level to reflect fully a change in money [5].)

Another reason why the causal relationship running from money to expenditure is obscured is that the estimation does not allow for any possible consistent pattern in the way in which the monetary authority varies money in response to changes in nominal expenditure. The estimation procedure also obscures variation over time in the nature of the lag relating money to expenditure. For example, anticipated changes in money might affect nominal expenditure more rapidly than unanticipated changes.

tary assets that occurred at the time of the introduction of these accounts in 1981.[3]

Two left hand variables are considered, final sales to domestic purchasers and gross national product. As implied by the quantity theory of money discussed above, individuals vary their rate of expenditure in response to discrepancies between their actual and desired holdings of cash balances. The immediate impact of these variations in expenditure is captured by final sales to domestic purchasers. GNP is a measure of production rather than spending. (GNP minus the change in business inventories equals final sales. Final sales less net exports equals final sales to domestic purchasers.) The expenditure and M1 series are expressed in per capita form, although this form does not affect the results.

Table I displays the results of regressing annualized percentage changes in final sales to domestic purchasers on a constant and on annualized percentage changes in the commercial paper rate and M1, employing the simple distributed lag relationships discussed above. The regression employing GNP as the left hand variable is very similar, apart from a higher standard error for the estimated residuals, which reflects the volatility of inventories and net exports. The magnitude of the sum of the estimated coefficients on the interest rate term is small. The individual coefficients considered collectively are, however, statistically significant. The coefficients on M1 considered collectively are also very significant statistically.[4]

Table I

REGRESSION OF FINAL SALES TO DOMESTIC PURCHASERS ON AN INTEREST RATE AND MONEY, 1952Q1 TO 1982Q4

Lag	Constant		R		M	
0	3.41	(.45)	.021	(.0067)	—	
—1			—.011	(.0081)	—	
—2			—.014	(.0090)	.33	(.13)
—3			—.007	(.0097)	.02	(.13)
—4			—.021	(.0091)	.33	(.15)
—5			.002	(.0081)	.26	(.15)
—6					.04	(.15)
—7					—.02	(.12)
Sum			—.030	(.013)	.96	(.13)

NOB = 124 NOV = 13 RSQ = .47 SER = 3.1 DW = 1.8

Notes: Standard errors ore in parentheses. NOB is number of observations and NOV number of variables estimated. R is the 4-6 month commercial paper rats and M is per capita shift-adjusted M1 (see footnote 4). Observations represent annualized percentage changer. Simple distributed lags are used.

The estimated residuals for the regression equation displayed in Table I, plotted in Chart 2, measure the difference between the actual and predicted quarterly percentage growth rates of final sales to domestic purchasers. An examination of the estimated residuals indicates that they do not, in general, fall randomly. The relative weakness of growth rates of nominal expenditure shown in interval 1, 1953Q2 to 1954Q2, derives from an autonomous decline in the inflation rate following an earlier autonomous rise at the onset of the Korean War. (When the war began, consumers ran their cash balances down in anticipation of shortages of consumer durables. When the shortages did not materialize, they returned their holdings of cash balances to normal levels. This behavior was reflected in the behavior of expenditure and inflation,) In interval 2, the residuals appear to fall randomly.

Beginning in the early 1960s the estimated residuals display a wave-like appearance. Long periods during which the actual growth rate of expenditure persistently exceeds the predicted growth rate by a moderate amount are followed by offsetting periods

[3] The Board staff estimated that in 1980 the growth rate of M1, defined to include NOW and ATS accounts, should be lowered by about half a percentage point in order to account for transfers into these new accounts from nonmonetary sources. (This figure is the lower bound of the range given in the notes to the table "Growth Ranges and Actual Monetary Growth" in the Appendix contained in [6, p. 100]. See also [6, pp. 69 and 72] and the references in [2, p. 149].) No quarterly breakdown is given for this figure, so growth of M1 in each quarter of 1980 is lowered by .125 percent in order to arrive at the shift-adjusted series. For 1980, shift-adjusted M1 is thus derived by multiplying M1 for quarters one through four, respectively, by .99875, .99750, .99625, and .995. For 1981, the ratio of the Board staff's shift-adjusted M1 (shift-adjusted M1-B) to M1 (M1-B) is calculated (both series use the 1981 seasonal adjustment factors). These ratios for quarters one through four are respectively, .986, .978, .976, and .973. For 1981, shift-adjusted M1 is thus derived by multiplying M1 by .995 times the appropriate preceding ratio. The factor multiplying the 1981 Q4 observation is used with the M1 observations in 1982. In 1982, shift-adjusted M1 is about three percent below M1, (The Board staff's shift-adjusted M1 series for 1981 is contained in [1].)

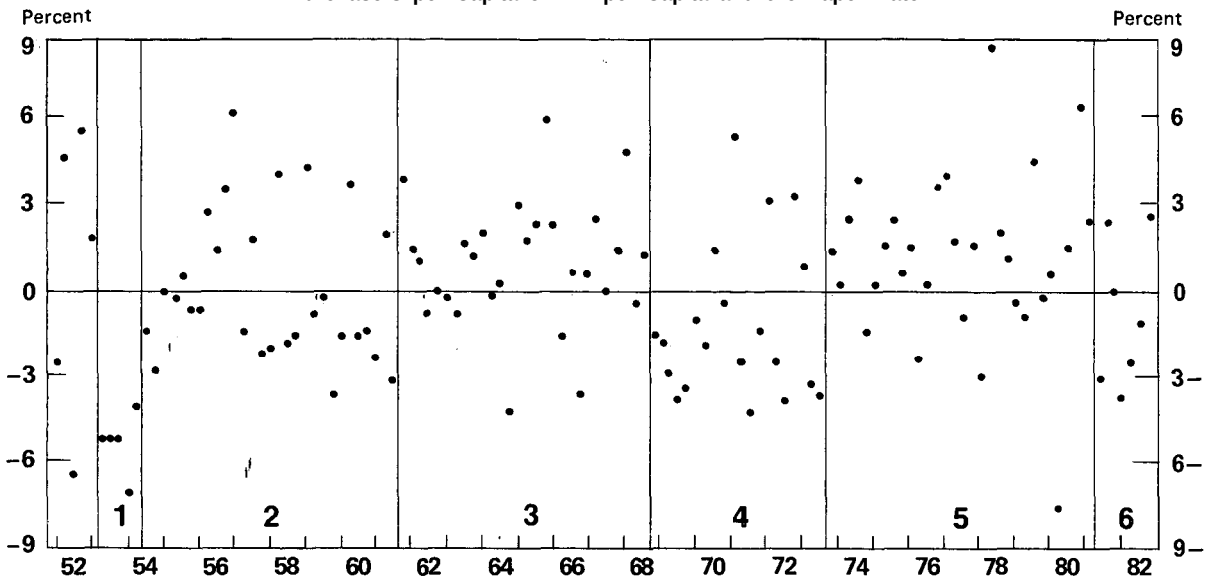
A discontinuity arises in the M1 series in 1959 due to the exclusion at this time of demand deposits of foreign commercial banks and official institutions. Post-1959 M1 was spliced with pre-1959 M1 by multiplying pre-1959 M1 by the ratio of the two series in 1959 excluding and including these, deposits (.987).

[4] The null hypothesis that the coefficients on the interest rate term are all zero is rejected by an F-test at the .99999 confidence level. The null hypothesis that the coefficients on the money term are all zero is rejected by an F-test at the .9999 confidence level. An examination of the estimated residuals of the regression equations used in calculating the statistics for these F-tests shows them to be approximately white noise. (The calculations referred to in this footnote are for the regression shown in Table II. which differs from the one in Table I by the addition of 'three dummies to capture intercept shifts.)

Chart 2

ERRORS IN PREDICTING EXPENDITURE

Residuals from a Regression of Final Sales to Domestic Purchasers per Capita on M1 per Capita and the Paper Rate



Note: Tick marks indicate first quarter of year.

during which these positive prediction errors are offset by negative errors. In interval 3, 1961Q4 to 1968Q3, the residuals are generally positive. Chart 3, which displays quarterly growth rates of M1, shows that this interval is characterized by a monetary acceleration. Examination of interval 3 thus suggests an overshooting of expenditure in response to monetary acceleration; the rate of growth of money rose, while the rate of growth of nominal expenditure rose even more. (Friedman and Schwartz [4, p. 68] discuss one possible cause of such overshooting.) The strength in the growth of nominal expenditure appeared to a significant extent in the growth of real expenditure, rather than in the inflation rate in this interval. In interval 4, 1968Q4 to 1973Q3, the estimated residuals are generally negative. The prior overshooting of expenditure then was followed in this interval by an offsetting period of undershooting.

In interval 5, 1973Q4 to 1981Q1, the residuals are generally positive. This underprediction of nominal expenditure may have been caused by the positive impact on prices of the rise in the price of oil that occurred near the beginning and end of this interval. Interval 5 is also characterized by a monetary acceleration. The positive residuals beginning in 1977 may indicate an overshooting in expenditure as a consequence of this monetary acceleration. In interval 6, 1981Q2 to 1982Q4, the estimated residuals are generally negative. Again, the prior interval of overshooting in expenditure is followed by an offsetting period of undershooting.

The regression shown in Table II employs intercept-shift dummies in order to capture the effect of the overshooting and subsequent undershooting described above. DO, the post-Korean War dummy, is set equal to one for interval 1 and zero elsewhere. D1, the "overshooting" dummy, is set equal to one for intervals 3 and 5 and zero elsewhere. D2, the "undershooting" dummy, is set equal to one for intervals 4 and 6. Otherwise, the specification of the regression equation in Table II is identical to that of

Table II

REGRESSION OF FINAL SALES TO DOMESTIC PURCHASERS ON AN INTEREST RATE AND MONEY, 1952Q1 TO 1982Q4

$$SAL = 3.52 - 5.86\ D0 + 1.12\ D1 - 1.13\ D2 - .039\ R + .93\ M + \hat{u}$$
$$(.48) \quad (1.4) \quad (.83) \quad (1.05) \quad (.012) \quad (.17)$$

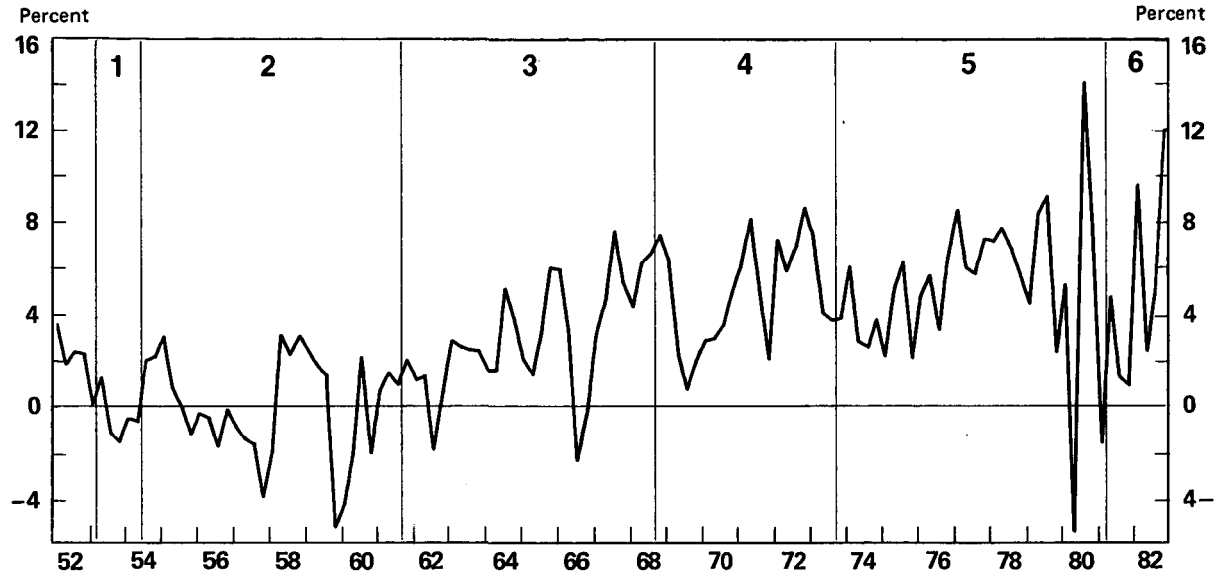
$$NOB = 124 \quad NOV = 16 \quad RSQ = .60 \quad SER = 2.8 \quad DW = 2.2$$

Notes: SAL is final sales to domestic purchasers per capita. Coefficients on the R and M terms are the sum of the coefficients estimated with the simple distributed lags shown in Table I. D0 is one from 1953Q2 to 1954Q2 and zero elsewhere. D1 is one from 1961Q4 to 1968Q3 and 1973Q4 to 1981Q1 and zero elsewhere. D2 is one from 1968Q4 to 1973Q3 and 1981Q2 to 1982Q4 and zero elsewhere. Otherwise, see notes to Table I.

Chart 3

M1 GROWTH

Quarterly Annualized Percentage Growth Rates
Continuously Compounded in Per Capita M1



Note: Tick marks indicate first quarter of year.

Table I. (Again, the use of GNP as the left hand variable results in a regression equation similar to the one shown in Table II.)

The. presence of the intercept-shift terms, which capture successive periods of underprediction and overprediction of expenditure, indicates that the relationship between money and nominal expenditure may require a period of time as long as a decade in order to work out fully. The importance of this phenomenon of overshooting should not be exaggerated, however. The magnitude of the estimated coefficients on these intercept-shift terms is about one percentage point. This number is small relative to the magnitude of the variation in percentage growth rates in money and in nominal expenditure. The variation in quarterly growth rates of nominal expenditure is significantly affected by nonmonetary forces, as indicated by the size of the standard error of the estimated regression residuals shown in Table II, 2.8 percent. This variation in quarterly growth rates is perhaps also affected by shifts in the demand for money, as suggested by the negative sign on the estimated sum of coefficients on the interest rate variable. The magnitude of the estimated sum of coefficients on the money variable, about one, is, nevertheless, consistent with the quantity theory proposition that, over long periods of time, the major determinant of nominal expenditure is the money supply.

Simulation

Results of predicting final sales to domestic purchasers and GNP out of sample are presented in this section. Regression equations, specified as shown in Table II, are estimated over the interval 1952Q1 to 1973Q3. The end date was chosen in order to incorporate a complete cycle of overshooting and undershooting in expenditure. For purposes of simulation, it was considered desirable that a one percentage point change in the rate of growth of money generate a one percentage point change in the rate of growth of expenditure. For this reason, the estimated coefficients on M1 are constrained to sum to one. The estimation results are shown in Tables III and IV.

The results of predicting final sales to domestic purchasers and GNP in the out-of-sample period are shown in Charts 4 and 5, respectively. The percentage error in the level of the actual, relative to the predicted, series is shown. Because the phenomenon of overshooting is not accounted for by intercept-shift dummies, the level of the actual series rises, in each

Table III

REGRESSION OF FINAL SALES TO DOMESTIC PURCHASERS ON AN INTEREST RATE AND MONEY, 1952Q1 TO 1973Q3

Constant	D0	D1	D2
3.56 (.45)	—6.26 (1.28)	.86 (.66)	—1.50 (.72)

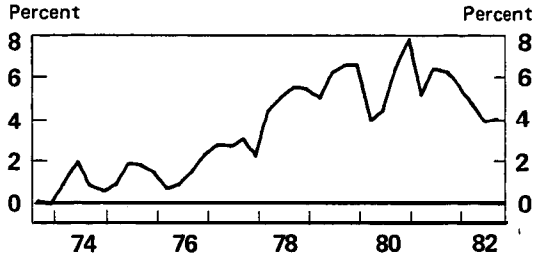
Lag	R	M
0	.010 (.007)	—
—1	—.011 (.008)	—
—2	—.004 (.010)	.21 (.17)
—3	—.013 (.010)	.20 (.19)
—4	—.022 (.009)	.05 (.20)
—5	—.006 (.008)	.34 (.20)
—6		—.01 (.19)
—7		.21 (.15)
Sum	—.046	1.0

NOB = 87 NOV = 15 RSQ = .60 SER = 2.5 DW = 2.2

Notes: See Tables I and II.

Chart 4

ERRORS IN PREDICTING FINAL SALES TO DOMESTIC PURCHASERS



Note: Percentage error in the level of actual, relative to predicted, final sales to domestic purchasers 1973Q4 to 1982Q4. Predictions from regression equation estimated from 1952Q1 to 1973Q3.

case, relative to the level of the predicted series through 1981Q1, where the underprediction of the actual series is about eight percent. This underprediction then lessens during the subsequent period of undershooting of expenditure until by 1982Q4 the level of final sales to domestic purchasers and GNP are underpredicted by 4.1 and 2.8 percent, respectively.

Money Demand in 1982

M1 has grown from its average value for the four weeks ending August 25, 1982, to its average value for the four weeks ending May 25, 1983, at an annualized rate of 14.4 percent. It has been asserted that the observed relationship between M1 and expenditure in 1982 indicates a rightward shift in the public's demand for M1. Consequently, it is concluded, the current high rate of growth of M1 will not be inflationary. This assertion can be evaluated with the aid of the simulations reported in the previous section,

First, a benchmark is required as to how well money can be expected to predict expenditure over a four-quarter period. This benchmark was derived as follows. The regression equation in Table I, with final sales to domestic purchasers as the left hand variable, was estimated over the interval 1952Q1 to 1981Q4. This estimation produces predictions of percentage growth rates of expenditure over the four quarter intervals ending in the fourth quarter of each year from 1952 through 1981. Errors in predicting

Table IV

REGRESSION OF GNP ON AN INTEREST RATE AND MONEY, 1952Q1 TO 1973Q3

Constant	D0	D1	D2
3.41 (.55)	—6.42 (1.56)	.86 (.80)	—1.31 (.88)

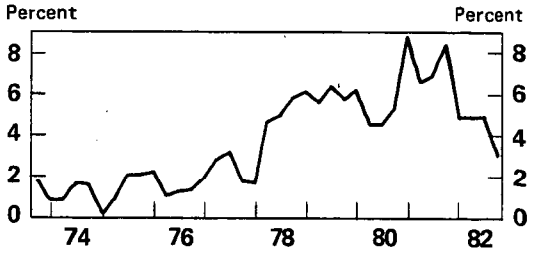
Lag	R	M
0	.034 (.008)	—
—1	—.035 (.010)	—
—2	—.001 (.012)	.20 (.21)
—3	—.013 (.012)	.20 (.24)
—4	—.037 (.011)	.33 (.24)
—5	.008 (.010)	.05 (.24)
—6		.17 (.24)
—7		.05 (.18)
Sum	—.044	1.0

NOB = 87 NOV = 15 RSQ = .61 SER = 3.1 DW = 1.9

Notes: See Tables I and II.

Chart 5

ERRORS IN PREDICTING GNP



Note: Percentage error in the level of actual, relative to predicted, GNP 1973Q4 to 1982Q4. Predictions from regression equation estimated from 1952Q1 to 1973Q3.

calendar year percentage growth rates of expenditure are then calculated as the actual percentage growth rates of expenditure over the four quarter intervals ending in the fourth quarter of each year minus the corresponding predicted growth rates. Finally, the root-mean-squared value of these yearly errors is calculated. This number measures how well in an average sense money can be expected to predict expenditure over a calendar year. Its value is 1.5 percentage points.

The regression in Table III, estimated from 1952 to 1973, was used to predict the percentage growth rate in 1982 of final sales to domestic purchasers. (This prediction corresponds to the simulation reported in Chart 4.) The predicted growth rate was 7.0 percent, compared to an actual growth rate of 5.0 percent, continuously compounded, an error of two percentage points.[5] The magnitude of this error, 2.0 percentage points, is only slightly larger than the value of the benchmark error, 1.5 percentage points. It is concluded that expenditure in 1982 is predicted about as well as in other calendar years. The evidence necessary to support the hypothesis that a significant rightward shift in the public's demand for M1 occurred in 1982, that is, the existence of an unusually large overprediction of the growth rate of expenditure, appears to be lacking.

The percentage growth rate of GNP in 1982, measured from fourth quarter to fourth quarter, was 2.5 percentage points less than the corresponding growth rate of final sales to domestic purchasers. The smaller growth in output than in final sales to domestic purchasers derives from the adverse movements in the change in business inventories series primarily, and in the net exports series secondarily. These last two series are highly volatile and their own movements cancel out over time. Their behavior is little susceptible to control by monetary policy.

It is concluded that the relationship between money and the public's expenditure in 1982, while not tight, is consistent with the relationship that existed prior to 1982. The assertion that a rightward shift occurred in the public's M1 demand function generally derives from the observation that the ratio of contemporaneous M1 to contemporaneous output (GNP) was high relative to trend in 1982. This ratio offers misleading evidence for three reasons.

First, it fails to take account of the lag with which money acts on expenditure. The simulation results of the previous section indicate that the major factor in the decline in the growth rate of expenditure in 1982 was the monetary deceleration of 1981. (From 1980 to 1981 the percentage growth rate of shift-adjusted M1, continuously compounded and measured from fourth quarter to fourth quarter, fell from 6.5 to 2.3 percent.) The sharp deceleration of M1 in 1981 depressed expenditure, and thus output, in 1982. The denominator of the ratio of contemporaneous M1 to contemporaneous output therefore fell in 1982 relative to trend. The sharp acceleration in 1982 of M1 raised the numerator of this ratio relative to trend. Consequently, the high value of the ratio of contemporaneous M1 to contemporaneous output in 1982 represents, to a significant degree, a statistical artifact.

Second, converting nominal M1 to a real M1 series by use of the ratio of M1 to GNP introduces noise into the real M1 series because of the volatility in changes in business inventories and net exports. The ratio of M1 to final sales to domestic purchasers does not possess this source of noise. In particular, in 1982, sharp declines in the change in business inventories and net exports series caused growth of GNP to be weak relative to growth of final sales to domestic purchasers.

Third, in accounting for the lagged effect of M1 on expenditure, it is necessary to account for the introduction of ATS and NOW accounts in 1980 and 1981. Shifts of funds from nontransactions sources like time deposits into these new accounts distorted the meaning of M1 by causing actual growth of M1 to appear more expansionary than it was in reality. It is for this reason that the Federal Reserve System targeted the shift-adjusted M1 series used in this paper.

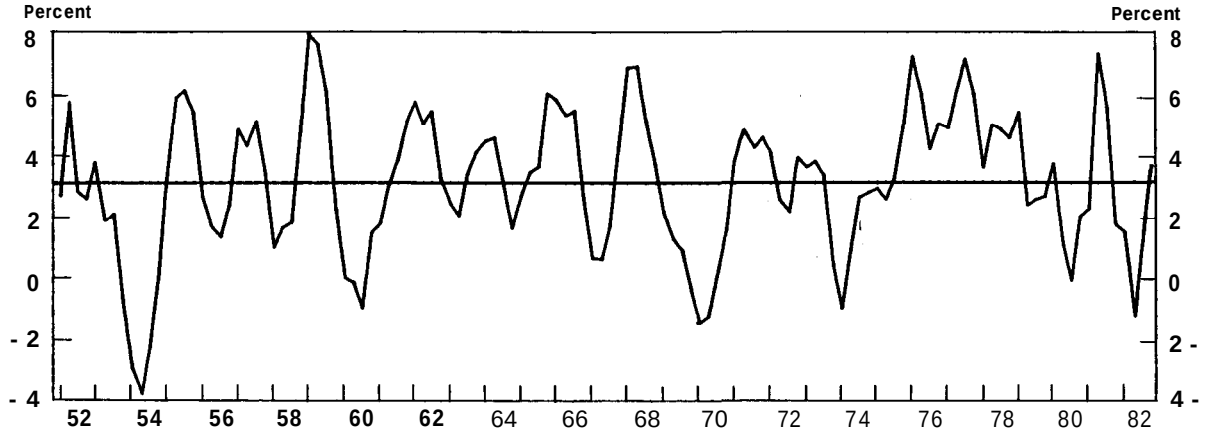
The importance of these factors is illustrated in Chart 6. Quarterly observations of four-quarter percentage changes in velocity are displayed in Chart 6. Velocity is defined as the ratio of contemporaneous final sales to domestic purchasers to M1 (shift-adjusted) four quarters in the past. The expenditure series is divided by M1 lagged four quarters because four quarters is the approximate mean lag associated with the distributed lag of expenditure on M1 estimated in the regression shown in Table II. The solid line shown in Chart 6 is the average value of quarterly percentage changes in the velocity series from 1952Q1 to 1982Q4. An examination of the velocity series shown in Chart 6 does not suggest that the behavior of velocity in 1982 was unusual.

[5] The behavior of the interest rate is such that it exerts practically no net effect on predicted expenditure in 1982.

Chart 6

THE BEHAVIOR OF VELOCITY
1952Q1 To 1982Q4

Quarterly Observations of Four-Quarter Percentage Changes in Velocity. Velocity is the Ratio of Contemporaneous Final Sales to Domestic Purchasers to M1 Shift Adjusted Four Quarters in the Past.



Note: Tick marks indicate first quarter of year.

Conclusions

The simulation results indicate that the reduction in the growth rate of expenditure in 1982 was caused primarily by the reduction in the growth rate of M1 in 1981. The reduction in the growth rate of M1 from 1980 to 1981 (4.2 percentage points using the shift-adjusted series) has been offset by the increase in the growth rate of M1 from 1981 to 1982 (5.9 percentage points using the shift-adjusted series). Given that this offset has already, occurred, further stimulus of expenditure does not require high rates of growth of M1 in 1983.

The evidence examined here does not support the assertion that the public's M1 demand function shifted rightward in 1982. This evidence does not take account of the effect of the introduction of the new deposit accounts in late 1982 and early 1983. The distorting effect on M1 associated with the introduction of these new accounts, however, appears to be small.[6]

M1 affects expenditure with a long lag, and it affects inflation with an even longer lag. Also, the relationship between M1 and expenditure over one, or even four, quarter periods is loose. For these reasons, it is tempting to ignore its behavior. The evidence examined in this paper, however, reveals no reason to believe that high rates of growth of M1 will not be inflationary. A key prediction of the regression analysis in this paper is that the public's expenditure will increase dramatically in the third quarter of 1983. If this increase does not occur, it can be concluded that the public's M1 demand function did shift rightward in 1982. If the increase does occur, then it can be concluded that the public's M1 demand function has remained stable and that M1 remains a good predictor of the inflation rate.

[6] Money market deposit accounts (MMDAs) were introduced in December 1982 and Super NOWs in January 1983. MMDAs can be used to a limited extent to effect transactions. To the extent that the growth of MMDAs has come out of transactions accounts in M1, this growth causes the actual growth of M1 to understate the effect of monetary policy on expenditure. Super NOWs, on the other hand, pay a market rate of interest. To the extent that the growth of Super NOWs has come out of nontransactions accounts, this growth causes the actual growth of M1 to overstate the effect of monetary policy on expenditure.

The growth of MMDAs increases the level of a shift; adjusted M1 series relative to the actual series. Given the significant amount of MMDAs now outstanding ($360.3 billion on May 25, 1983), and the meager amount of Super NOWs ($30.3 billion on May 25, 1983), it seems unlikely that actual M1 growth is understating the impact of monetary policy. Many observers believe that the biases currently distorting the meaning of M1 are washing out, so that the introduction of the new deposit accounts has not significantly affected the usefulness of actual M1 as an indicator of the stance of monetary policy.

References

1. Bennett, Barbara A. "'Shift-Adjustments' to the Monetary Aggregates." *Economic Review*, Federal Reserve Bank of San Francisco (Spring 1982).

2. Board of Governors of the Federal Reserve System. *67th Annual Report.* "Record of Policy Actions for Meeting Held on October 21, 1980." Washington, 1980.

3. Friedman, Milton. "The Counter-Revolution in Monetary Theory." Institute of, Economic Affairs Occasional Paper 33. Great Britain, 1970.

4. Friedman, Milton and Anna J. Schwartz. Monetary *Trends in the United States and the United Kingdom*. Chicago: University of Chicago Press, 1982.

5. Hetzel, Robert L. "The Behavior of the Demand for Money in the 1960s and 1970s." Unpublished paper in process, Federal Reserve Bank of Richmond, April 1983.

6. Monetary Policy Report to Congress. In *Federal Reserve's First Monetary Policy Report for 1981.* U. S. Congress. Senate. Committee on Banking, Housing, and Urban Affairs. Hearings. 97 Cong. 1 Sess. Washington : Government Printing Office, Feb. 25 and March 4, 1981.

7. Simpson, Thomas D. and John R. Williams. "Recent Revisions in the Money Stock." Federal *Reserve Bulletin,* 67 (July 1981), 539-542.