How Useful Is M2 Today?

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I. INTRODUCTION

The actions of the Federal Reserve System determine the nominal (dollar) expenditure of the public. A key issue for policymakers is what variable best measures the impact of monetary policy actions on nominal expenditure.[1] The press uses changes in the funds rate as an indicator of the thrust of monetary policy. Declines are labeled "easing moves," that is, changes that will augment the rate of growth of nominal expenditure, and conversely with increases. The usefulness of the funds rate as an indicator, however, is contradicted by current experience. The funds rate fell from almost 10 percent in May 1989 to 3 percent in September 1992. Over this same period, however, the trend rate of growth of nominal GDP dropped from 7 percent to around 4 percent.

This paper examines whether the monetary aggregate M2 offers useful information about the impact of monetary policy actions on nominal expenditure.[2] By definition, nominal expenditure equals the amount of dollars in circulation times the average number of times per year those dollars turn over against nominal output. That is, nominal expenditure is the quantity of money times the velocity of circulation of money. M2 is useful as a definition of money if its velocity is a simple, predictable function of a small number of variables. Equivalently, M2 is a useful definition of money if unpredictable changes in M2 velocity are small compared to changes in nominal expenditure.

Section II examines the predictability of M2 velocity. Section III discusses M2 indicator variables. Section IV examines arguments that special factors are currently making M2 velocity less predictable.

II. IS M2 VELOCITY PREDICTABLE?

This section examines the predictability of M2 velocity initially by checking whether growth rates of nominal GDP move with growth rates of M2 over long periods of time. It then examines M2 velocity more carefully by estimating an M2 demand regression equation. Table 1 shows annual growth rates of M2 and nominal GDP, with M2 lagged two years.

Table 1

Growth Rates of Nominal GDP and M2 Lagged Two Years

	GDP Growth		M2 Growth	
	annual	average	annual	average
1973	11.8		12.1	
1974	8.1		12.5	
1975	8.7		9.9	
1976	11.5	(10.8)	6.1	(10.9)
1977	11.6		9.3	
1978	13.1		13.0	
1979	11.5		12.7	
1980	8.8		8.5	
1981	11.9		8.3	
1982	3.9		8.0	
1983	8.1		9.4	
1984	10.9	(9.0)	9.3	(7.8)
1985	6.9		12.5	
1986	5.7		8.2	
1987	6.4		8.9	
1988	7.9		8.2	
1989	7.0		6.6	
1990	5.1	(5.2)	5.2	(5.0)
1991	2.9		3.9	
1992			5.3	
1993			3.2	

Notes: The numbers in parentheses show average GDP growth for the years 1973 to 1979, 1980 to 1988, and 1989 to 1991 and average M2 growth for the corresponding periods two years earlier.

[1] As shown by the accounting of the national income and product accounts, aggregate nominal expenditure for final products (aggregate nominal demand) equals aggregate nominal output (aggregate nominal supply) minus changes in business inventories. Aggregate nominal output (within a country's own borders) is the dollar value of gross domestic product (GDP). Again, as an accounting matter, aggregate nominal output equals aggregate nominal income.

[2] It is important to distinguish among instruments, indicators and targets. The usefulness of the funds rate as an instrument is not discussed here: nominal GDP is certainly higher now relative to what it would have been if the Fed had not lowered the funds rate. The use of M2 as a target is also not discussed. The issue is whether the behavior of M2 offers more useful information about aggregate nominal expenditure than the funds rate.

(The lag prevents contemporaneous inverse movements in M2 and its velocity from obscuring the longer-run relationship between growth in M2 and nominal output.) Over the three periods shown, the trend rate of growth of nominal GDP matches fairly closely the trend rate of growth of M2.

If velocity is stable, the rate of inflation will correspond over long periods of time to the excess of the rate of growth of money over output. To illustrate, over the three decades from 1960 through 1990, the excess of the annualized rate of growth of M2 (8.1 percent) over the annualized rate of growth of real GDP (3.0 percent) was 5.1 percent, while annualized inflation (measured by the implicit GDP price deflator) was 4.9 percent.

The inverse of velocity, the fraction of its income the public wants to hold in the form of money, expresses the real value of money. The remainder of the section examines the stability of M2 velocity by examining the stability of M2 demand regressions, which predict the behavior of real M2. Specifically, this section looks at the prediction errors from an updated version of a money demand regression similar to one estimated by Friedman and Schwartz (1982). (Estimation details are in the appendix.) The period of estimation is from 1915 to 1991. Using annual observations, real M2 is regressed on real output and on opportunity cost variables measuring the rate of return on financial market assets and on physical assets. The financial market opportunity cost of holding M2 is proxied for by the difference between the commercial paper rate (R) and a weighted average of the explicit rates of return paid on the components of M2 (RM2). [Hetzel (1989) describes the construction of RM2.]

Following Friedman and Schwartz (1982), the regression employs the percentage change in nominal output as a proxy for the market yield on physical assets. The market yield on physical assets (land, buildings, machinery, consumer durables, etc.) possesses two components: a real rate of return and an anticipated change in dollar value. The percentage change in nominal output also possesses two components: the rate of growth of real output and the rate of inflation. These two components of the percentage change in nominal output proxy for the two components of the market yield on physical assets.[3]

Over the entire estimation period, the fitted M2 demand function exhibits considerable stability. This stability can be observed directly by noting that M2 velocity (nominal output divided by M2) has fluctuated around a value of 1.63 since 1915; M2 (real and nominal) and output (real and nominal) would not gravitate around each other over time unless unpredictable changes in the demand for real M2 cancelled.[4] Particularly in the post-World War II period, prediction errors are relatively small. Over the period 1950 to 1991, the mean absolute errors in predicting the level of real M2 and changes in real M2 are, respectively, 2.2 and 1.0 percent. (Errors are from the regressions in Tables A1 and A2 of the appendix.) The exception to the statement that the public's M2 demand function was stable over the period 1915 to the present is that after the mid-1960s the public's demand for real M2 became less sensitive to variation in market rates.

The regression equation in first differences, shown in Table A2 of the appendix, generates errors in 1989, 1990 and 1991 that cumulate to an overprediction of real M2 of 5.3 percent. This overprediction of real M2 has continued to grow during 1992. As noted above, M2 is a useful definition of money if unpredictable changes in M2 velocity are small

[3] This proxy makes two assumptions. First, there is a positive relationship between fluctuations in real output and the economy's equilibrium real rate of interest. When economic activity strengthens, the real rate of interest must rise to achieve macroeconomic equilibrium, and conversely. The real component of changes in nominal output then can proxy for changes in the real rate of return on physical assets. Second, the behavior of inflation is such that the public extrapolates realized inflation in predicting future inflation. The nominal component of changes in nominal output then can proxy for the anticipated change in the dollar value of physical assets.

[4] Judd and Trehan (1992) contend that the long-term stability of M2 velocity is a "statistical artifact" due to the choice of a definition for M2 in 1980 designed to make M2 velocity stable. Their contention is inaccurate. Attempts to circumvent Regulation Q ceilings on interest rates that were kept low relative to market rates led in the 1970s to the appearance of new financial instruments, especially money market mutual funds and NOW accounts. These new instruments necessitated a redefinition of the monetary aggregates. The Board staff did attempt to determine the relative stability of the public's demand for money using alternative definitions of the monetary aggregates, but it was unsuccessful. At the time of the redefinition of the aggregates, the new instruments had been introduced so recently and were still issued in such small amounts that their inclusion in a particular monetary aggregate did not affect econometric analysis of money demand. For example, money market mutual funds were insignificant until 1978 and NOW accounts were not introduced nationwide until 1981. In the end, M2 was constructed a priori to include M1 and savings instruments available in small denominations and basically redeemable at par.

There is, however, a problem in the definition of M2. M2 includes time deposits of less than $100,000. As prices rise, the real value of the cutoff falls. In order to prevent M2 velocity from rising as a consequence of the definition, the $100,000 cutoff should be indexed to the price level.

compared to changes in nominal expenditure.[5] This condition is reasonably well satisfied, despite the recent overprediction of real M2 (underprediction of M2 velocity). Money demand disturbances have not been the primary determinants of the rate of growth of nominal output in recent years. Taken alone, the M2 demand errors for 1989, 1990, and 1991 would have increased the rate of growth of nominal GDP. Instead, beginning in mid-1989, the trend rate of growth of nominal GDP fell from about 7 to 4 percent. The influence of disturbances in the demand for real M2 has been swamped by the reduction in the trend rate of growth of M2 that began in 1987.

III. An M2 Indicator Variable

This section draws on the results of Section II to construct two related measures of the impact of monetary policy actions on nominal expenditure. One, a marginal monetary indicator, measures the effect of contemporaneous policy actions on nominal expenditure. The other, an average monetary indicator, measures the cumulative effect of policy actions, contemporaneous and past, on nominal expenditure. These indicators are suggested by the quantity equation:

$$(1)\quad M \cdot V = Y,$$

where M is M2, V is M2 velocity, and Y is aggregate nominal expenditure (output or income). Equation (1) can be expressed in percentage change form (with continuous compounding) as (2):

$$(2)\quad \Delta m + \Delta v = \Delta y,$$

where Δ indicates a first difference and small letters indicate the natural logarithm of a variable (the change in the logarithm is a percentage change). Setting Δm equal to actual percentage changes in M2 and Δv equal to predicted percentage changes in M2 velocity makes (2) operational as an average monetary indicator variable, Δy^p.

A. An Average Monetary Indicator

The regression results reported in Table A2 of the appendix can give empirical content to Δv^p, predicted percentage changes in M2 velocity. Changes in velocity are a function of changes in the financial market opportunity cost, which is proxied for by the difference between the commercial paper rate (R) and the weighted average of the explicit interest rates paid on the components of M2 (RM2): (R – RM2). Changes in velocity due to changes in this opportunity cost variable are denoted by $\Delta v[\Delta(R - RM2)]$. Equation (2) then becomes

$$(3)\quad \Delta y^p = \Delta m + \Delta v[\Delta(R - RM2)].$$

A proxy for predicted velocity in (3) is constructed as a distributed lag of changes in the financial market opportunity cost variable with the estimated coefficients from the regression in the appendix Table A2 used as weights. The signs of the estimated coefficients reported in Table A2 change because the regression predicts changes in real M2 (the inverse of velocity) and the proxy predicts changes in velocity. Predicted changes in velocity due to changes in the financial market opportunity cost are proxied for by (4) before 1964.

$$(4)\quad \Delta v[\Delta(R - RM2)] = 2.47\ \Delta(R_t - RM2_t) + 2.50\ \Delta(R_{t-1} - RM2_{t-1}) + 1.65\ \Delta(R_{t-2} - RM2_{t-2})$$

Starting in 1964, (4) changes to (5) because of a reduction in the interest sensitivity of M2 demand.[6]

$$(5)\quad \Delta v[\Delta(R - RM2)] = 1.16\ \Delta(R_t - RM2_t) + 1.19\ \Delta(R_{t-1} - RM2_{t-1}) + .34\ \Delta(R_{t-2} - RM2_{t-2})$$

Figure 1 graphs actual annual percentage changes in nominal output and predicted percentage changes in nominal output, Δy^p, given by (3). In (3), Δm is annual percentage changes in M2, and Δv^p is given by (4) before 1964 and (5) thereafter. Predicted changes in nominal expenditure track actual changes in nominal output reasonably well over the period 1918 to 1991. The actual change in nominal output is underpredicted in 1991 by 1.2 percentage points.

[5] Equivalently, M2 offers useful information about the growth of nominal expenditure if unpredictable changes in the public's demand for real M2 are small relative to the sum of changes in M2 and of predictable changes in M2 velocity (real M2 demand).

[6] This reduction in interest sensitivity could reflect an increase in cyclical changes in short-term interest rates. The public began to adjust its money balances less in response to a change in interest rates because it anticipated the change would be reversed in time. Alternatively, the appearance of large negotiable CDs, which are not included in M2, could have drawn interest-sensitive balances out of M2.

The predicted series tracks the sharp fall in the rate of growth of nominal output (GDP) from 1988 to 1991.

B. A Marginal Monetary Indicator

The monetary indicator of nominal expenditure shown in Figure 1 measures the cumulative impact of Fed actions. In particular, the component of this indicator that predicts changes in M2 velocity depends upon the behavior of current and past market rates. This section proposes a monetary indicator that indicates how contemporaneous Fed actions affect the value of this cumulative measure.

The suggested marginal indicator is the difference between the rate of growth of nominal output (GDP) and the short-term rate of interest. As discussed in Section II, Friedman and Schwartz (1982) use the rate of growth of nominal output as a proxy for the market rate of return on physical assets. The short-term rate of interest is the traditional policy instrument of the Fed.[7] An unusually high value for the difference between the rate of growth of nominal output (GDP) and the short-term rate of interest, therefore, indicates that the rate of return on capital is high relative to market rates, and conversely. This proxy variable for a difference in interest rates measures a relative price, not a nominal (dollar) price. The Fed, therefore, cannot control it in a sustained way. It can, however, produce transitory increases by allowing monetary accelerations, and vice versa.

Figure 2 plots annual observations of the marginal indicator (solid line), that is, the difference between the rate of growth of nominal output and the commercial paper rate. It also plots *changes* in the average indicator Δy^P (shaded line), that is, changes in the predicted rate of growth of aggregate nominal expenditure. (The shaded line in Figure 2 shows first differences of the shaded line in Figure 1.) The positive correlation between the series shown in Figure 2 indicates that the Fed can increase temporarily the difference between the market rate of return on capital and the market rate of interest by allowing the rate of growth of aggregate nominal expenditure to increase, and conversely.[8]

Figure 3 displays quarterly observations of the two components of the marginal monetary indicator: the annualized rate of growth of nominal output and the short-term rate of interest. It also shows peaks and troughs of the business cycle. Figure 3 suggests that the Fed has raised the level of short-term rates relative to the rate of growth of nominal output over recovery phases of the business cycle until the thrust of monetary policy became restrictive. With a lag after the decline in the growth of nominal output, it then lowered the level of short-term rates until the thrust of monetary policy became expansionary.

Figure 3 shades in positive differences between the rate of growth of nominal output and the short-term interest rate. Until 1980, during periods of economic recovery, the rate of growth of nominal output exceeded the short-term interest rate. In the 1980s, the economy's underlying real rate of interest rose above its historical average. In the 1980s, therefore, a higher level of short-term rates (relative to nominal GDP growth) was required to maintain a given rate of growth of nominal expenditure.[9]

It is possible that in the 1990s the economy's real rate of interest has fallen back to its longer-run, lower level.[10] One possible explanation for the recent weakness in the growth of nominal expenditure is that a fall in the economy's real rate of interest to

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[7] The rate of interest in the money market is largely determined by the level of the funds rate, which since the early 1970s the Fed has either targeted directly or indirectly through setting the discount rate and the level of borrowed reserves. Before the 1970s, the Fed used the combination of the discount rate and free reserves (excess reserves minus borrowed reserves) to target the level of money market rates.

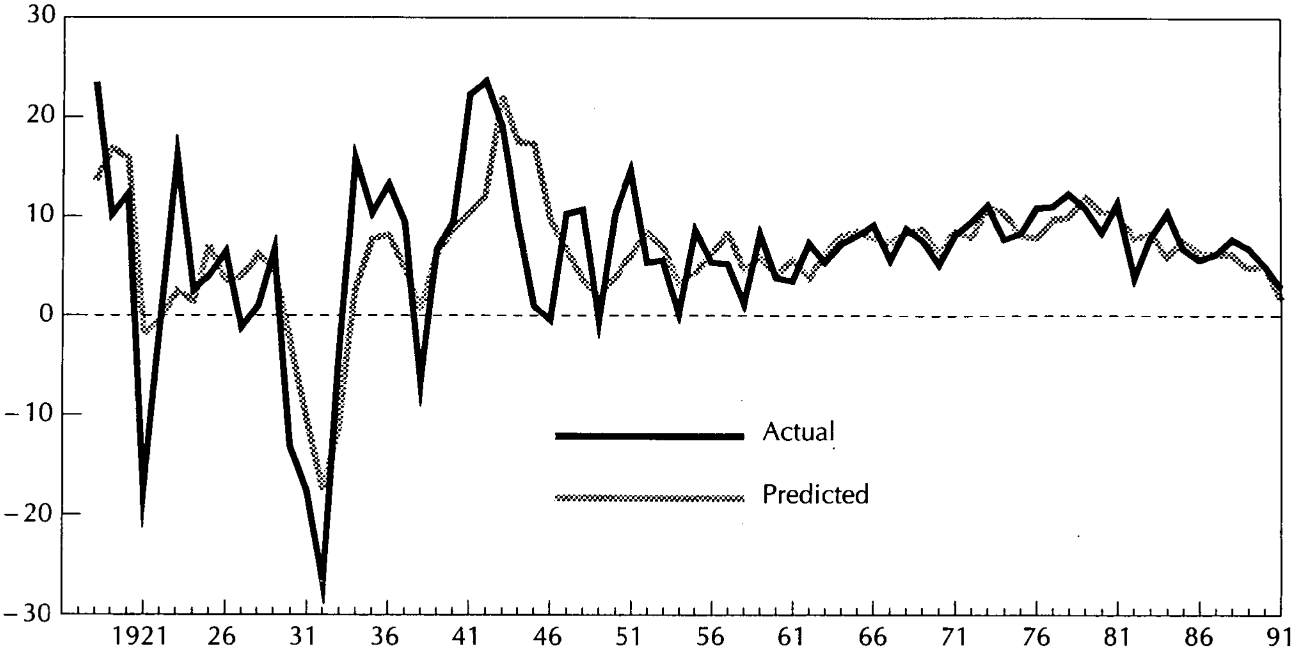
[8] For the period 1950 to 1979, there is a positive correlation like that shown in Figure 2 between the difference in the rate of growth of nominal output and the commercial paper rate and changes in the rate of growth of M1. M1 is a particularly interesting monetary aggregate over the period 1950 to 1979. Because market rates were relatively high and demand deposits could not pay explicit interest, individuals used M1 primarily as a transactions vehicle. For this reason, the interest sensitivity of real M1 demand was low. As a consequence, quantity changes in M1 served as a good proxy for the effect of monetary policy actions on the rate of growth of nominal expenditure. Unlike M2, to use M1 as an indicator for this period, it is not necessary to adjust for velocity changes due to changes in interest rates.

[9] The difference between GNP growth and the commercial paper rate was 3.3 from 1951 to 1960, 2.0 from 1961 to 1970, 2.7 from 1971 to 1980, but −1.7 from 1981 to 1990.

[10] The merchandise trade deficit provides indirect evidence. It averaged about .5 percent of GDP in the 1970s. It climbed sharply in the 1980s to a level of 3.6 percent of GDP in 1986. It began to fall after 1987 and was about 1.5 percent of GDP in 1991. The trade deficit is the mirror image of capital inflows. The high real rate of return to capital in the United States in the 1980s produced capital inflows that appeared as a trade deficit. The reduction in the trade deficit and the associated reduction in capital inflows suggests that the real rate of interest in the United States is returning to a lower, more normal level.

Figure 1

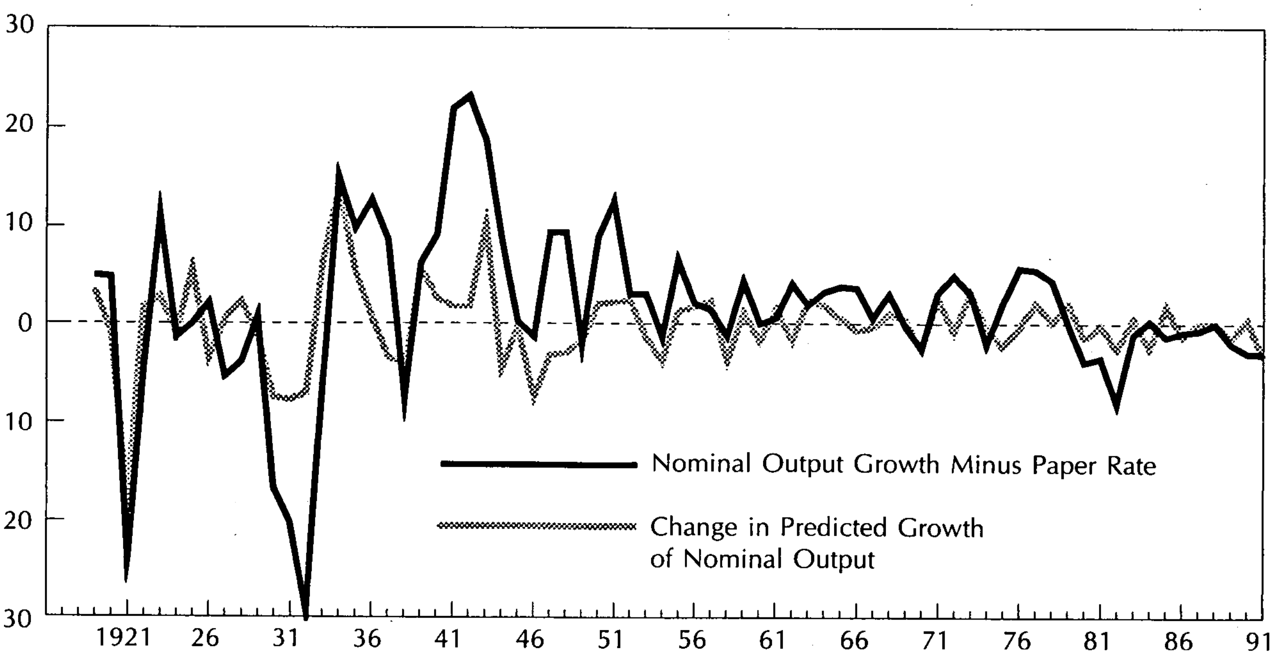
ACTUAL AND PREDICTED NOMINAL OUTPUT GROWTH



Notes: Predictions of nominal output growth are from the M2 indicator variable $\Delta m + \Delta v^p$, where Δm is the percentage growth in M2 and Δv^p is the predicted percentage growth in M2 velocity due to changes in the financial market opportunity cost of holding M2. Actual nominal output growth is the percentage change in GNP before 1959 and GDP thereafter.

Figure 2

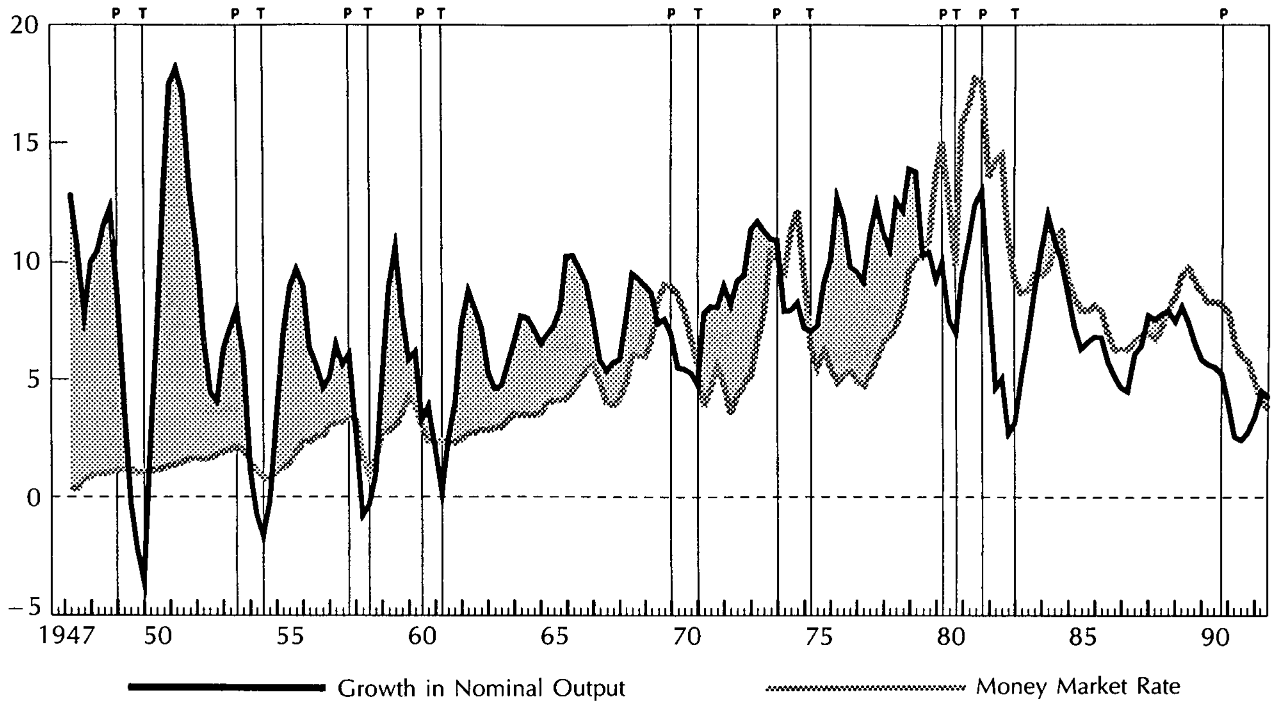
DIFFERENCE BETWEEN RATES OF RETURN ON PHYSICAL AND FINANCIAL ASSETS; CHANGES IN PREDICTED OUTPUT GROWTH



Notes: The solid line is the difference between nominal output growth (GNP before 1959 and GDP thereafter) and the four- to six-month commercial paper rate. The shaded line is the change in predicted growth of aggregate nominal output. That is, it is first differences of the sum of the percentage growth in M2 and the predicted percentage growth in velocity (first differences of the shaded line in Figure 1).

Figure 3

MONEY MARKET RATE AND NOMINAL OUTPUT GROWTH



Notes: Nominal output growth is quarterly observations of four-quarter rates of growth of nominal output (GNP before 1959 and GDP thereafter). Money market rate is the three-month Treasury bill rate for 1947-1963 and the funds rate thereafter. The graph shades in the positive differences in these two series. *Ts* mark business cycle troughs and *Ps* peaks. Heavy tick marks indicate last quarter of year.

a more normal historical level has made it difficult for the Fed to find the level of short-term market rates consistent with this rate. The funds rates in the 3 to 4 percent range that prevailed in 1991 and 1992 seemed low relative to the funds rate peak of almost 10 percent in 1989. Figure 3, however, suggests that these funds rates were low only relative to the unusually high rates of the 1980s. As shown in Figure 3, relative to the rate of growth of nominal GDP in business cycle recoveries before the 1980s, the funds rate has not been low in the current recovery.

C. Inverse Movements in M2 and M2 Velocity

M2 is not widely used as an indicator of the impact of monetary policy actions on the growth of nominal expenditure. The reason may be the low contemporaneous correlation between the rates of growth of M2 and nominal expenditure.[11] The reason for this low contemporaneous correlation is that movements in interest rates initially produce inverse movements in M2 and its velocity.

This inverse relationship is produced by the inertia in the rates paid on many of the deposits in M2 relative to money market rates. Until June 1978, with the issuance of money market certificates by S&Ls, all the deposits in M2 were either subject to Reg Q ceilings or to the outright prohibition of interest payments. Even with the complete phase-out of Reg Q in 1986, banks continue to vary the rates paid on many of the components of M2 (NOWs, MMDAs, and savings deposits) sluggishly. As a consequence, when market rates rise, the cost of holding M2 rises, and depositors move out of M2 into other financial instruments like large CDs. Although M2 growth falls, M2 velocity growth rises because M2 has become more costly to hold. As a consequence, a macroeconomic shock that causes

[11] For example, from first quarter 1965 through second quarter 1992, the correlation between quarterly growth rates of M2 and nominal GDP was .31. This correlation, however, mostly reflected a common trend. When the growth rates are differenced to remove trend, the correlation between M2 and GDP falls to .044. There is almost no contemporaneous relationship between changes in the growth rates of M2 and nominal GDP.

expenditure and market rates to rise is initially associated with a decline in M2 growth, and conversely.[12] Casual observation then suggests that M2 offers little information about the behavior of expenditure.

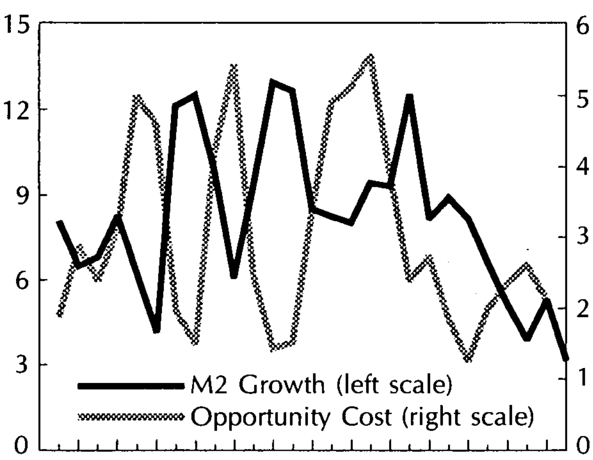
Figure 4 shows annual observations of rates of growth of M2 and the financial market opportunity cost of holding M2 (the commercial paper rate minus the own rate of return on M2). There is an inverse cyclical relationship between the rate of growth of M2 and the cost of holding M2. Consequently, there is an inverse cyclical relationship between M2 growth and M2 velocity growth. This inverse relationship means that often the contemporaneous behavior of M2 does not give good signals about the contemporaneous rate of growth of nominal output. More generally, cyclical movements in nominal expenditure are largely accounted for by cyclical movements in M2 velocity rather than in M2.

This pattern can be seen in recent years. In 1987, market rates rose absolutely and relative to the rates paid on M2 components like NOWs, savings deposits, and MMDAs; consequently, the rate of growth of M2 fell. This fall, however, was more than offset by a rise in M2 velocity produced by the increased cost of holding real M2. In 1987, therefore, the rate of growth of M2 fell, even though the rate of growth of nominal GDP rose. These inverse movements in M2 and in its velocity, however, are transitory. Sustained changes in the rate of growth of M2 ultimately produce changes in the rate of growth of nominal output. The financial market opportunity cost of holding M2 stopped rising in 1989 and began to fall. In the absence of rising velocity, low M2 growth then began to show through to weakness in the growth of nominal output.

[12] It follows that strength in economic activity is initially associated with a reduction in M2 growth and weakness in economic activity is initially associated with an increase in M2 growth. M2 targeting then would appear to conflict with lean-against-the-wind procedures that call for a rise in the funds rate when economic activity strengthens and a fall when economic activity weakens. This conflict is probably one of the reasons for the relative insignificance of M2 in popular discussions of monetary policy. A substantive target for M2 would provide for a short-term negative elasticity of supply with respect to market rates, but would eliminate long-term base drift in light of the stability of M2 velocity.

Figure 4

M2 GROWTH AND FINANCIAL MARKET OPPORTUNITY COST OF HOLDING M2



Notes: Annual observations of percentage change in M2. The financial market opportunity cost of holding M2 is the difference between the four- to six-month commercial paper rate and a weighted average of the explicit rates of return paid on the components of M2.

IV. Arguments That M2 Demand Will Be Unstable

In the 1950s, as in the present, many economists argued that the growing importance of nonbank financial intermediation would make money demand unstable. Similar predictions of instability in the demand for money were made in the early 1960s with the appearance of credit cards, in the late 1960s with the emergence of the Eurodollar market, in the mid-1970s with new cash management techniques, and in the 1980s with securitization. The long-term stability of M2 velocity has contradicted these predictions. At present, however, the overprediction of real M2 pointed out in Section II has revived such fears. This section examines five arguments made recently suggesting that M2 demand will be unstable in the future.

A. Bond Funds

The current weakness in real M2 growth is often attributed to a shift of deposits out of M2 into bond funds prompted by a sharply rising yield curve. It is uncertain, however, whether the magnitude of such transfers is sufficient to explain much of the weakness in real M2. It is true that in 1992 the yield curve has been unusually steep. Weakness in real M2 growth, however, developed before the appearance of a yield spread large by the standards of the

1980s.[13] Also, the 5 percentage point change in the yield spread from a −2 in the early 1980s to a +3 in 1985 did not destabilize M2 demand. More generally, over the post-World War II period, the demand for real M2 has not been significantly affected by the shape of the yield curve.

Also, the previous experience with strong growth in bond funds did not weaken real M2 demand. Bond funds increased about $250 billion from 1985 to early 1987. (A strong rally in the bond market made bonds attractive during this period. The 30-year bond rate fell from 11.4 percent in July 1984 to 7.4 percent in September 1986, a decline of 4 percentage points.) In 1985 and 1986, however, M2 grew rapidly at about an 8 percent annualized rate.

If all of the assets of bond funds were included in M2, this augmented monetary aggregate would still have grown only moderately recently. For example, from fourth quarter 1990 through fourth quarter 1991, M2 grew at 2.9 percent while M2 plus bond funds grew at 5.6 percent. It is, however, unlikely that all of the growth in bond funds came at the expense of M2 deposits. It is not plausible that individuals view the deposits in M2 as highly substitutable with bond funds. The value of assets in M2 is not subject to fluctuation as market rates change, while the value of bond funds is. Furthermore, those bond funds that could be defended as substitutes for M2, namely, short-term bond funds, have hardly grown. The amount of money in bond funds with bonds of maturity five years or less, about $20 billion at the end of 1991, is small compared to the amount of M2, $3,438.9 billion in December 1991.[14]

B. Unwinding Debt with M2

Some economists have argued that weakness in real M2 growth is due to the repayment of consumer debt. They argue that individuals experienced an adverse wealth shock in the late 1980s that has made them want to hold less debt. The ratio of consumer debt to household net worth rose from about 15 percent in the 1970s to a peak of 21 percent in 1991. (Consumer debt comprises primarily installment credit and mortgages. Household net worth is the difference between the assets and liabilities of households.) According to the argument, consumers are now reducing their debt by drawing down deposits in M2.

Figure 5 shows real household net worth (household net worth deflated by the CPI). Although by this measure the increase in the public's wealth slowed in the late 1980s, previous recessions also exhibited such slowdowns. The recent behavior of wealth does not suggest anything unusual about the last recession. Some commentators have referred to a decline in the value of the housing stock. As measured by the index constructed by the National Association of Realtors (median sales price of existing single-family homes), the sales price of existing homes did fall in 1990, after having risen in 1988 and 1989 at a rate of about 5 percent. In 1991, however, home prices rose at about an 8 percent rate.

Figure 6 shows the behavior of household debt over recent business cycles (Schreft and Owens, 1991). Household debt (deflated by the CPI) is put into the form of a cycle-relative index for each business cycle by dividing quarterly debt figures by the value of debt six quarters preceding the cycle peak. Figure 6 shows that in the recent cycle consumer debt did rise prior to the cycle peak. At least as of first quarter 1992, however, it has not fallen since the cycle peak as predicted by the debt-unwinding hypothesis. (In the recession that began in fourth quarter 1973, real household debt did fall, but the demand for M2 was not rendered unpredictable.)

The appeal of the debt-unwinding hypothesis may derive in part from a natural tendency to generalize about collective behavior on the basis of individual behavior. An individual who lowers his debt will draw on savings and reduce consumption. It therefore appears plausible to explain both the current weakness in real M2 growth and in real expenditure by an excessive debt level. However, what is true for the individual is not necessarily true for individuals collectively. One person's debt is another person's asset. If debts are high, so are assets. In the aggregate, the level of debt does not affect the level of wealth. Economic theory says that consumers will proportion their holdings of M2 to their total financial wealth, which in the aggregate is not affected by debt creation. The ratio of household net financial

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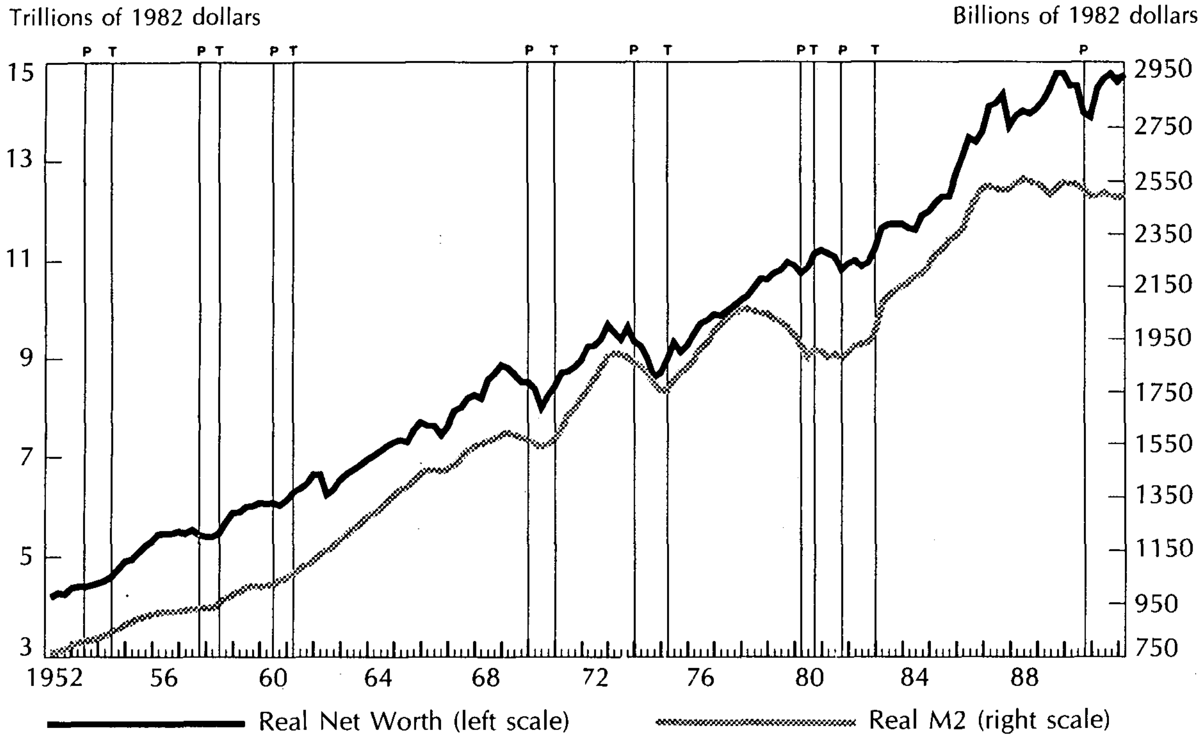
[13] As measured by the difference between the 30-year Treasury bond rate and the six-month commercial paper rate, the yield spread averaged about 2 percentage points from first quarter 1983 to second quarter 1988. After becoming relatively flat in 1989, it began to rise again and reached 2 percentage points again in the middle of 1991. It then rose to about 4 percentage points in third quarter 1992.

[14] The figures on bond funds are from the Investment Company Institute. The figures on short-term bond funds were kindly assembled by Anne Schafer at the Investment Company Institute from individual fund data from Lipper Analytical Securities.

Figure 5

REAL M2 AND REAL HOUSEHOLD NET WORTH



Notes: M2 and household net worth are deflated by the CPI and are in 1982 dollars. Household net worth is from the Federal Reserve Board of Governors, Flow of Funds Accounts, "Balance Sheets for the U.S. Economy." *Ts* mark business cycle troughs and *Ps* peaks. Heavy tick marks indicate last quarter of year.

wealth to disposable personal income has grown moderately ever since the mid-1970s.[15] It has not exhibited any drops over the last several years that could have caused a reduction in the public's demand for M2.

Similarly, it does not follow that aggregate expenditure will fall when an individual consumes less to reduce his debt. Nothing has changed to cause that individual to work less; he may even work harder. He will save more. In the aggregate, consumption will fall, but saving and investment will increase. The increase in investment will maintain the level of aggregate expenditure.

The behavior of the savings rate contradicts the implication of the debt-unwinding hypothesis that the savings rate should be unusually high. As measured by the National Income and Product Accounts, the savings rate has not risen but has remained around a relatively low level of 5 percent.

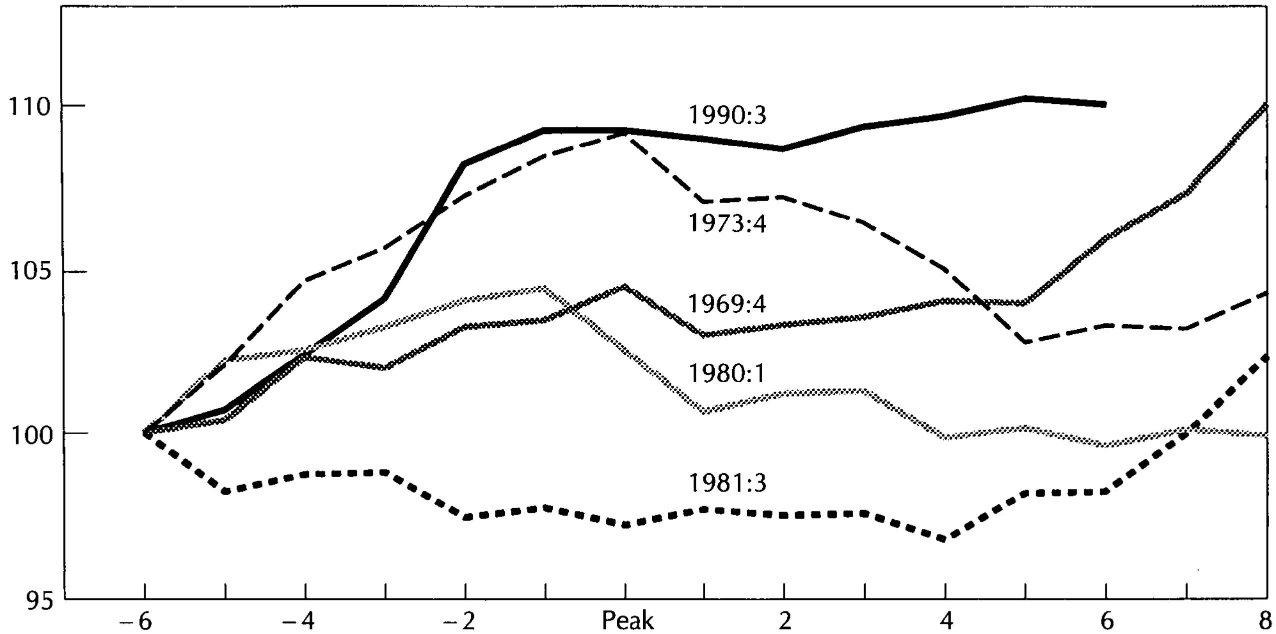
If individuals have experienced an adverse wealth shock, they would want to rebuild their wealth by saving more. Their demand for M2, which is a component of wealth, should increase, not decrease. It has, however, been argued that consumers are using M2 balances to draw down consumer installment debt because the return paid on M2 balances has fallen relative to the cost of installment credit. In particular, the rate paid on a three-month bank CD has fallen from a peak of somewhat more than 10 percent in March 1989 to 3.3 percent in August 1992, while the cost of using a credit card has often remained around 18 percent. This argument, however, assumes that the same individuals hold bank CDs and credit cards. Even when CD rates were at their peak, it is hard to understand why the same individual would borrow at 18 percent while lending at 10 percent.[16]

[15] Household net financial wealth is the difference between "Total Financial Assets" and "Total Liabilities" for households in the table "Financial Assets and Liabilities, Outstandings," from the Federal Reserve Board of Governors Flow of Funds Accounts. Disposable personal income is from the National Income and Product Accounts.

[16] Robert Laurent made this point in personal correspondence.

Figure 6

THE CYCLICAL BEHAVIOR OF REAL HOUSEHOLD DEBT



Notes: Credit market debt owed by households is deflated by the CPI. Debt is put into cycle-relative form by dividing by the value of debt six quarters prior to the cycle peak. Dates by lines indicate the particular business cycle peak. Household debt is from the table "Credit Market Debt Owed by Nonfinancial Sectors, Households," from Federal Reserve Board of Governors, Flow of Funds Accounts, "Financial Assets and Liabilities, Outstandings."

C. The Shrinking Thrift Industry

Some economists have argued that closings of thrifts by the Resolution Trust Corporation (RTC) begun in 1989 have produced slow real M2 growth (Duca, 1992; Kasriel, 1991). Actually, the ratio of thrift deposits to total M2 declined more sharply over the period 1979 through 1982 (about 7.5 percentage points) than over the period 1989 through 1992 (about 5.5 percentage points). The earlier runoff in thrift deposits was not, however, associated with an unpredictable reduction in the public's demand for real M2.

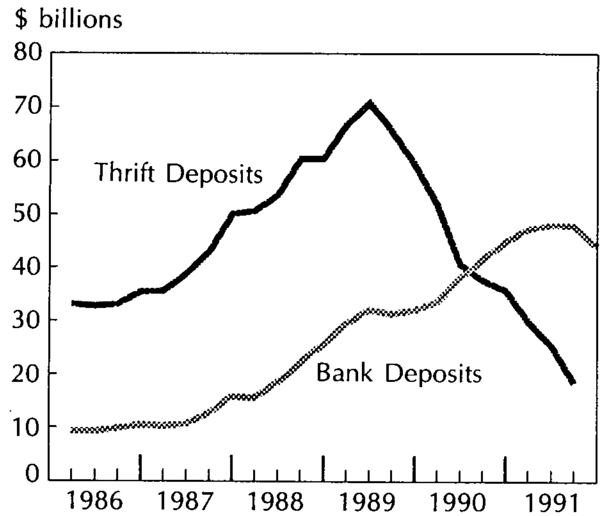
Closing a thrift does not directly affect the money stock. At an aggregate level, closing an insolvent thrift involves replacing a bad asset (a real estate loan in default) on the books of financial intermediaries with a good asset (a Treasury bill). This transaction involves a wealth transfer from taxpayers to thrift depositors. It does not, however, reduce the total assets of financial intermediaries and, therefore, need not affect total deposits.

There may, however, be an indirect effect on the money stock. Because the NOW accounts of a failed thrift are simply transferred to the acquiring institution, these deposits are not lost to M2. When the RTC closes a thrift, however, it may retain some of the thrift's assets. It will fund these assets with government debt, rather than with the high-yielding brokered deposits formerly used by the thrift. The former holders of these brokered deposits may then move into government debt. In this case, the decline in brokered deposits measures the decline in M2.

Figure 7 shows the brokered deposits of thrifts and commercial banks included in M2. Over the period of RTC closures, the decrease in brokered deposits at thrifts minus the increase in these deposits at banks gives a rough estimate of the reduction in M2 that could have arisen from RTC actions. From second quarter 1989, which marked the peak in brokered deposits held by thrifts, to the fourth quarter of 1991, the combined holdings of thrifts and banks fell by $40.3 billion. This figure is small relative to M2. As of fourth quarter 1991, $40.3 billion was only 1.2 percent of M2. Finally, because of a lack of funds, the RTC stopped closing insolvent thrifts after March 1992. The absence of thrift closures, however, did not produce any revival in M2 growth.

Figure 7

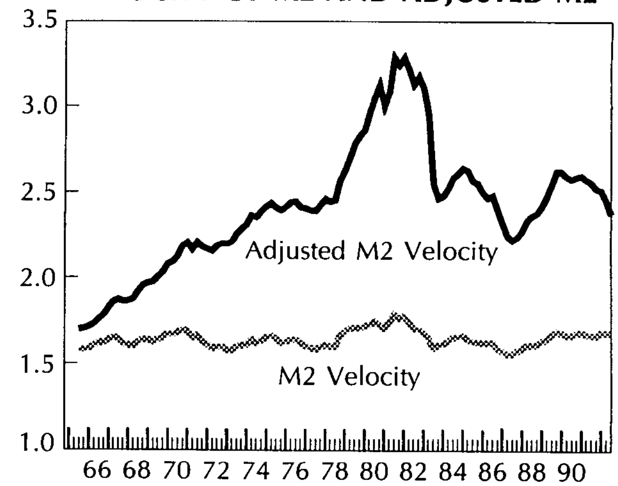
BROKERED DEPOSITS IN M2



Notes: The solid line is brokered deposits included in M2 held by S&Ls and SAIF-insured mutual savings banks. The shaded line is brokered deposits held by commercial banks and FDIC-insured mutual savings banks. Data are from call reports. Heavy tick marks indicate last quarter of year.

Figure 8

VELOCITY OF M2 AND ADJUSTED M2



Notes: Velocity is gross domestic product divided by M2. Adjusted M2 is M2 minus CDs of less than $100,000. Heavy tick marks indicate last quarter of year.

D. The Runoff in Small CDs

Much of the weakness in real M2 growth has been associated with the runoff of small retail CDs (CDs less than $100,000). Some economists have argued that small CDs are "a source of instability in the supply and demand for M2" (Wenninger and Partlan, 1992, p. 34; Citibank, 1992). The concentration of weakness in M2 growth in small CDs, however, does not in itself imply that the public's demand for M2 demand has declined. It is also consistent with a change in M2 from the supply side.

Assume, for example, that the central bank has kept the market rate of interest above the economy's equilibrium rate, so that banks are reducing their assets. As they reduce their assets, they will reduce their deposit liabilities in the least-cost way. Banks buy and sell CDs (large and small) in a spot market. In contrast, their other deposits generally involve a long-term customer relationship. The least-cost way for banks to reduce their liabilities is to let CDs run off by lowering the rate they pay on them.

Figure 8 shows velocity for M2, as well as for a revised M2 defined as M2 less small CDs. Velocity fluctuates less with the current definition of M2 than with a definition excluding small CDs. Money demand regressions using M2 minus small CDs also exhibit a significantly poorer fit than regressions using the current definition of M2.

E. Divergent Growth in M1 and M2

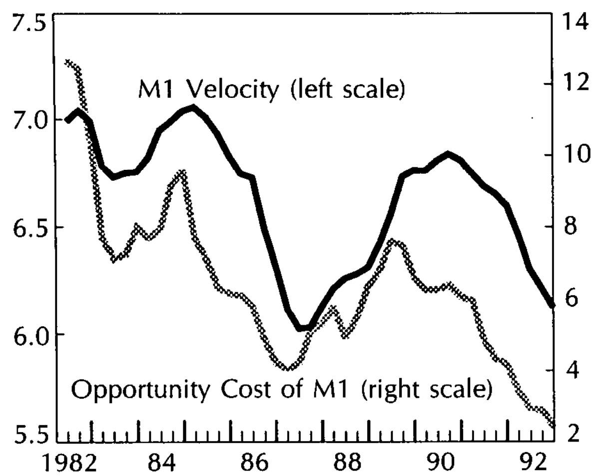
Over the two-year period August 1990 through August 1992, the annualized growth rates of M1 and M2 were, respectively, 9.2 percent and 2.3 percent. Some have argued that this divergence in growth rates indicates instability in the M2 demand function. There is, however, a ready explanation for this divergence. With the nationwide introduction of NOW accounts in 1981, real M1 demand became sensitive to market rates (Hetzel and Mehra, 1989). The recent strength in M1 growth reflects a fall in market rates that has decreased the cost of holding real M1 and increased its demand.

Figure 9 shows M1 velocity and the financial market opportunity cost of holding M1 (the difference between the commercial paper rate and a weighted average of the explicit rates of return paid on the components of M1). The graph starts in 1982 to avoid the distorting effects of the nationwide introduction of NOWs in 1981. As shown, M1 velocity is sensitive to interest rates. Over the 1980s, the fall in the cost of holding M1 has been associated with a fall in M1 velocity (a rise in real M1 demand). During the two periods when the cost of holding M1 rose, 1984 and 1987-1989, M1 velocity ceased falling.

Because banks reduce the rates paid on NOW accounts only with a lag as market rates fall, reductions in market rates make holding NOW accounts more attractive. Also, when market rates fall, corporations

Figure 9

M1 VELOCITY AND THE FINANCIAL MARKET OPPORTUNITY COST OF HOLDING M1



Notes: The financial market opportunity cost of holding M1 is the difference between the rate on four- to six-month commercial paper and a weighted average of the explicit rates of interest paid on the components of M1. Heavy tick marks indicate last quarter of year.

hold a higher level of demand deposits as compensating balancces to reimburse banks for various services. Reductions in market rates then increase the demand for M1. When market rates fell beginning in the summer of 1984, M1 growth surged. M1 growth reached 12 percent and 16 percent in 1985 and 1986, respectively. These rates of growth of M1 did not raise the inflation rate because they accommodated an increased demand for M1. Similarly, at present, high M1 growth rates are accommodating an increased demand for M1 produced by the fall in market rates.

Increased M1 growth in turn leads to an increased demand for reserves because of the 10 percent reserve requirement imposed on demand deposits and NOW accounts. At the prevailing funds rate, the Fed accommodates the increased demand for reserves and the rate of growth of bank reserves and the monetary base increases. Higher growth rates of bank reserves and the base, however, do not in themselves indicate that monetary policy actions are expansionary.

V. Concluding Comment

Forecasters have had more than the usual problems in recent years. For example, in its lead-off section entitled "End of Recession Has Arrived on Schedule," the July 10, 1991, *Blue Chip Economic Indicators* (1991) reported consensus forecasts for third and fourth quarter 1991 growth in real GNP of 2.7 percent and 2.9 percent, respectively. The actual growth rates, however, were significantly lower (1.0 and .4 percent, respectively). The forecasters who contributed to these consensus forecasts also ranked as the second most important factor in promoting economic growth "easier monetary policy resulting from more accommodative action by the Federal Reserve," that is, reductions in the funds rate. It now appears that most forecasters were again too optimistic in the spring of 1992 in forecasting growth over the last part of 1992. This article suggests that forecasters would have done better by using the information contained in the behavior of M2.

This article has proposed two related indicators of the impact of monetary policy actions on growth of aggregate nominal expenditure. One, an average indicator, measures the combined impact of the rate of growth of M2 and the rate of growth of M2 velocity produced by contemporaneous and past changes in the cost of holding M2. The other, a marginal indicator, measures the impact of contemporaneous policy actions on this average indicator. The marginal indicator is the difference between the rate of growth of nominal output (a proxy for the rate of return on physical assets) and a short-term interest rate. A large value for this indicator is associated with increases in the rate of growth of aggregate nominal expenditure predicted by the average indicator, and conversely.

Over the last two years, the rates of growth of M2 and nominal GDP have corresponded fairly closely. From second quarter 1990 through second quarter 1992, nominal GDP and M2, respectively, grew at annualized rates of 3.3 percent and 2.7 percent. Given the reduction in the cost of holding M2 due to the fall in interest rates over this period, however, the rate of growth of M2 should have exceeded the rate of growth of nominal GDP. In this sense, the public's demand for real M2 has been unpredictable. Whether M2 conveys useful information about the nominal expenditure of the public, however, depends on the magnitude of unpredictable changes in the demand for real M2 relative to the magnitude of changes in the other determinants of nominal expenditure—changes in nominal M2 and predictable changes in M2 velocity. The regression analysis of Section II indicates that recent unpredictable changes in the public's demand for real M2 have been small relative to these other determinants. In particular, the reduction in the growth rate of nominal expenditure reflects the reduction in the growth rate of M2 rather than an unpredictable increase in M2 velocity.

The relationship between money and nominal output is predictable only over fairly long periods of time. Consequently, inferences about the contemporaneous behavior of money demand are always problematic. For this reason, Section IV examined the plausibility of various reasons advanced for believing that M2 demand is behaving unpredictably at present. Section IV examined the effects on real M2 demand of bond funds, variability in the public's demand for debt, the reduction in the size of the thrift industry, the reduction in bank holdings of small CDs, and divergent growth rates of M1 and M2. None of these phenomena will clearly destabilize real M2 demand. It appears likely that the behavior of M2 will continue to offer useful information about the public's nominal expenditure and output.

APPENDIX

One way to appraise the stability of the public's demand for real M2 is to observe the size of the errors of an M2 demand regression. The regression used here (1) is similar to the one in Friedman and Schwartz (1982). It is also interesting in the present context because its use of percentage changes in nominal output as a regressor measuring the market rate of return on physical assets lends credence to the use of this variable as a component of the marginal indicator variable advanced in Section III.

$$(1)\quad \ln (M2/P)_t = c_0 + c_1 \ln (GDP/P)_t - c_2(R_t - RM2_t) - c_3 \Delta \ln GDP_t + e_t,$$

where M2 is per capita M2; P is the implicit price deflator for GDP (GNP before 1959); GDP is per capita gross domestic product (GNP before 1959); R is the four- to six-month commercial paper rate and RM2 is a weighted average of the own rates of return paid on components of M2. The error term is e. The natural logarithm of a number is indicated by ln and Δ indicates first differences.

An examination of observations of M2 velocity and (R – RM2), the financial market opportunity cost of holding real M2, suggests a reduction in the interest elasticity of real M2 demand after 1963. The large cycles in the cost of holding M2 that began in the mid-1960s induced relatively moderate changes in M2 velocity relative to the earlier period. For this reason, (1) was estimated with a shift dummy on the financial market opportunity cost variable, with the dummy assuming the value one from 1964 through 1991 and zero otherwise.

Tables A1 and A2 exhibit regression equation (1) estimated using annual observations, respectively, in levels and first differences over the period 1915 to 1991. The specification differs from that of Friedman and Schwartz (1982) in two respects. They assume that M2 pays a market rate of return apart from the fraction held in the form of noninterest-bearing base money, H. As a consequence, they use as their opportunity cost variable, R(1 – H/M2). That is, they assume that banks have evaded completely both the prohibition of payment of interest on demand deposits and Regulation Q ceilings. Equation (1) employs instead (R – RM2), which incorporates the assumption that these restrictions were binding. Second, equation (1) omits the dummy variables Friedman and Schwartz use to capture money demand shifts during the Depression and World War II and after World Wars I and II. It adds, however, a shift dummy to capture a reduction in the interest elasticity of real M2 demand beginning in the mid-1960s.

Friedman and Schwartz (1982) use data averaged over phases (contraction or expansion) of the business cycle, while the regressions here are estimated with annual data. Their first observation is for the years 1867 to 1869, while the first observation used here is for the year 1915. The data necessary to estimate the own rate on M2 (RM2), which are used to construct the financial market opportunity cost variable, only become available in 1915. It is necessary to use annual observations because this variable can be constructed quarterly only beginning in the first quarter of 1946.

The parameter values yielded by estimation in level form and in first-differenced form are comparable. Granger and Newbold (1974) point out that regression equations like the one in Table A1 that possess a nonstationary dependent variable and serially correlated errors (as evidenced by a low Durbin-Watson statistic) can yield misleading inferences. After their work, money demand regressions were generally estimated in first-differenced form. First differencing, however, results in a loss of information in the data. For these reasons, recent work has used error-correction models that combine estimation in levels and first differences. [See Engle and Granger (1987),

Table A1

M2 Demand Regression, 1915 to 1991

$$\ln rM2_t = \underset{(.2)}{4.6} + \underset{(46.0)}{.95} \ln rGDP_t - \underset{(12.7)}{7.4} (R_t - RM2_t) - \underset{(7.0)}{.54} \Delta \ln GDP_t + \hat{e}_t$$

Dummy on $(R_t - RM2_t)$ = 5.1 (7.2)

CRSQ = .98 SEE = 5.5 DW = .98 DF = 72

Notes: rM2 is per capita M2 deflated by the implicit GNP deflator before 1959 and by the GDP deflator thereafter; rGDP is real per capita gross national product before 1959 and real per capita gross domestic product thereafter; R is the four- to six-month commercial paper rate expressed as a decimal; RM2 is a weighted average of the own rates of return paid on components of M2; and GDP is nominal gross national product before 1959 and gross domestic product thereafter. ln is the natural logarithm and Δ the first-difference operator. The zero-one multiplicative shift dummy on $(R_t - RM2_t)$ is one from 1964 to 1991 and zero otherwise.

CRSQ is the corrected R-squared; SEE the standard error of estimate; DW the Durbin-Watson statistic; and DF degrees of freedom. Absolute values of t-statistics are in parentheses. Estimation is by OLS. Before 1959, M2 is M4 in Table 1 of Friedman and Schwartz (1970). From 1915 to 1929, GNP is from Balke and Gordon (1989).

Table A2

M2 Demand Regression, First Differences, 1918 to 1991

$$\Delta \ln rM2_t = 1.0 \, \Delta \ln rGDP_t - \underset{(6.9)}{6.6} \, \Delta(R_t - RM2_t) - \underset{(11.3)}{.95} \, \Delta^2 \ln GDP_t + \hat{\epsilon}_t$$

Dummy on $(R_t - RM2_t)$ = 3.9 (3.6)

CRSQ = .79 SEE = 2.4 DW = 1.4 DF = 66

Notes: Δ^2 is the second-difference operator. The sum of the estimated coefficients (and absolute value of its t-statistic) is shown. Sum of coefficients on rGDP constrained to sum to one. Estimated coefficients on the contemporaneous and lagged terms (absolute value of t-statistics in parentheses) are as follows:

lag	$\Delta \ln rGDP_t$	$\Delta(R_t - RM2_t)$	$\Delta^2 \ln GDP_t$
0	.83 (13.0)	−2.47 (6.2)	−.46 (8.2)
1	.17 (2.7)	−2.50 (5.9)	−.36 (9.4)
2		−1.65 (3.9)	−.13 (3.6)

The estimated coefficient on the multiplicative shift dummy on $\Delta(R_t - RM2_t)$ was constrained to assume the same value at each lag. Otherwise, see notes to Table A1.

Hendry and Ericsson (1991) and Mehra (1991).] The similarity of the parameter estimates of the regressions shown in Tables A1 and A2, which employ data respectively in levels and first differences, indicates on the one hand that use of nonstationary data is not biasing parameter estimates and on the other hand that differencing is not producing a significant loss of information.

The point estimate of the elasticity of demand for real M2 with respect to real income is .95 using data in levels. The estimate using differenced data was constrained to equal one in order to make the regression analysis conformable to the average indicator, where a 1 percent change in money is associated with a 1 percent change in nominal output. The point estimates of the semi-log slope of demand with respect to the financial market opportunity cost variable are, respectively, −7.4 and −6.6. (This parameter gives the percentage change in real M2 associated with a 1 percentage point change in the cost of holding real M2.) From 1964 on, this parameter is, respectively, estimated at −2.3 and −2.7. Finally, the point estimates of the elasticity of real M2 demand with respect to the market rate of return on physical assets are, respectively, −.54 and −.95.

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