

# A Shift-Adjusted M2 Indicator for Monetary Policy

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**T**he Federal Reserve System influences the economy through its control of fiat money (currency and bank reserves) and the monetary aggregates. This influence is more predictable and is easier to observe when there is a stable relationship between the monetary aggregates and the public's dollar expenditure or output. The monetary aggregate M2 in particular has exhibited a long-term stable relationship with dollar output (Hetzel 1989, 1992; Ireland 1993). In the early 1990s, however, this relationship apparently disappeared. Over the three-year period 1990Q4 through 1993Q4, nominal GDP grew at an annualized rate of 5.2 percent, while M2 grew at an annualized rate of only 2.0 percent.

We first review regulatory and technological changes affecting financial intermediation that could be reducing the public's demand for M2. Specifically, we review the events that have encouraged bank depositors to place their funds in bond and stock mutual funds, which are not part of M2. We then investigate whether a version of M2 that adjusts for net flows into bond and stock mutual funds can reestablish the previous stable relationship with nominal output growth. This latter aggregate, "shift-adjusted" M2, consists of regular M2 plus cumulative net inflows from households into bond and stock mutual funds. The article concludes with a discussion of the likely future stability of money demand.

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■ The views expressed are those of the authors and not necessarily those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

## 1. MUTUAL FUNDS

From 1990Q4 through 1993Q4, total bank deposits declined by \$25.1 billion, while bond and stock mutual funds rose by \$506.7 billion. (All the figures here are for open-end mutual funds, that is, funds whose shares are continuously issued and redeemed.) A regular flow of news stories provides anecdotal evidence that individuals are taking funds out of small retail CDs, which are included in M2, and placing them in bond and stock mutual funds, which are not included in M2. For example, a story in the *American Banker* (3/22/93) states:

Banks that sell mutual funds face a major test of their marketing mettle next month when a huge batch of certificates of deposit reaches maturity. As much as \$110 billion in CDs will be up for grabs, and with interest rates at the lowest level in a generation, many customers won't be looking to roll over the investments. If recent history is any indication, depositors will pour much of that money into mutual funds. . . . [C]ustomers are becoming convinced that rates will remain low for a while and are ready to seek alternatives. . . . Now they are saying, "I've got to get some income." (P. 1)

### Money Market Mutual Funds

The recent growth of bond and stock mutual funds is reminiscent of the growth of money market mutual funds in the late 1970s. Competition from the mutual fund industry for bank deposits began in earnest with the cyclical pickup in money market rates in 1977. Prior to that time, a large rise in market rates would cause Reg Q ceilings on the rates financial institutions could pay on time and savings deposits to become binding. Holders of small deposits had difficulty fleeing to money market instruments like commercial paper because of the large denominations of those instruments. By 1977, however, the availability of money market mutual funds, which pool funds from numerous individuals for investment in short-term financial assets, allowed depositors to avoid Reg Q and still hold assets that were available in small denominations and that could be bought and sold with low transactions costs. A good example was Merrill Lynch's Cash Management Account, a checkable money market account introduced in 1977.

Money market mutual funds not only collected deposits from investors, but also bought the commercial paper of corporations. Large corporations, often with better credit ratings than banks, found raising funds in this way cheaper than borrowing from banks. Intermediation that formerly went through banks now bypassed them completely. The ability of investors to circumvent Reg Q made inevitable its elimination, beginning with the introduction of all-savers certificates in June 1978 and ending with the elimination of the ceiling on savings deposits in April 1986. The introduction of money market deposit accounts (MMDAs) in 1982Q4 allowed banks to compete directly with money

market funds. The decline in bank intermediation, however, led to a decline in the public's demand for M2 defined exclusive of money market mutual funds.

Through the early 1980s, most of the growth in mutual funds occurred in money market mutual funds. Like other M2 deposits, the shares of money market mutual funds are available in small denominations. Also, because these funds hold only short-term securities, their shares are redeemable at par. That is, they do not fluctuate in value with changes in interest rates. (The weighted-average maturity of money market mutual funds cannot be greater than 90 days.) As a consequence, including the shares of money market mutual funds in M2 was straightforward and restored the long-run stable relationship between M2 and the public's dollar expenditure and output.

### Bond and Stock Mutual Funds

Table 1 shows net inflows into bond and stock mutual funds. These funds, as opposed to money market mutual funds, first began to grow significantly in 1984. They grew fairly strongly from the middle of 1985 through the middle of 1987, grew very little from the second half of 1987 through early 1990, and then began to grow rapidly toward the middle of 1991. The growth of bond and stock mutual funds in the mid-1980s is not associated with instability in the relationship between M2 and nominal output. Most of the growth in this period occurred in bond rather than stock funds and was heavily concentrated in mortgage-backed securities and, to a lesser extent, in junk bonds. Apparently, the investors financing this growth in bond funds were drawing funds from large CDs and money market instruments not included in M2.

**Table 1 Annual Inflows**  
Fourth Quarter over Fourth Quarter

Year	Total Bank Deposits	Total Money Market Mutual Funds	Total Stock and Bond Mutual Funds
1984	228.38	39.44	20.63
1985	187.11	22.26	71.09
1986	184.70	53.11	135.54
1987	122.29	16.44	45.72
1988	177.04	19.71	-23.46
1989	97.60	91.02	3.07
1990	11.51	60.79	22.94
1991	-0.57	60.24	96.65
1992	-15.25	16.40	168.90
1993	-9.29	-18.47	241.12

Source: For data on bank deposits and money market mutual funds, the Board of Governors of the Federal Reserve System; for mutual fund data, the Investment Company Institute.

In the early 1990s, two forces combined to encourage the large-scale transfer of funds from bank deposits to bond and stock mutual funds. (See Duca [1992, 1993], Simpson and Scanlon [1993], and Reid and Small [1993].) First, the ongoing telecommunications and computer revolution continued to lower the cost to mutual funds of pooling cheaply the savings of investors. The resulting competition from mutual funds for bank deposits prompted a relaxation by regulators of the constraints imposed by Glass-Steagall, which prevents banks from underwriting securities. In the early 1990s, that relaxation allowed banks to market actively bond and stock mutual fund shares. The second force encouraging deposit outflows was the depressed state of the loan market, which prompted banks to pay low rates on their deposits, both absolutely and relatively to the returns available on stocks and bonds.

The first force, advances in communications and computer technology, reduced the cost of maintaining records on purchases and sales and on income and distributions. It also helped with the recordkeeping required to keep track of gains and losses for tax purposes. Vanguard Group introduced a series of U.S. government securities funds that charged a maximum annual operating fee of 15¢ per \$100 (*Business Week*, 1/18/93), compared with the 23¢ per \$100 of deposits charged for FDIC insurance alone. Also, mutual funds were offered as families of different kinds of funds, within which investors can easily switch by telephone. The increased ease in selecting mutual funds was exemplified in Charles Schwab's combined offering of almost 250 no-load mutual funds that do not charge brokers' fees. *The New York Times* (3/20/94) described this concentration of funds in one place as "a financial Wal-Mart that enables investors to trade funds as easily as stocks" (Sec. 3, p. 1).

In the last part of the 1980s, regulators, concerned about the ability of banks to compete for the public's savings, increasingly allowed banks to become involved in the marketing of mutual funds. The Glass-Steagall Act prevents banks from underwriting mutual fund shares. That is, banks cannot buy the underlying securities, repackage them in the form of mutual funds shares, and distribute those shares to the ultimate investors. By the early 1990s, however, banks or their affiliates had acquired the right to perform most of the other services needed to maintain a mutual fund. They could serve as the investment adviser. That is, they could select the particular stocks or securities specified by the fund's stated objectives. Banking organizations could also serve as transfer agent and custodian. That is, they kept records of ownership and of the collection and distribution of interest and dividend income. They also settled the accounts between buyers and sellers.

In the early 1980s, regulators allowed banks to establish a discount brokerage service not subject to the geographical limitations of the McFadden Act. In 1992, the Federal Reserve Board allowed bank holding companies to provide investment advice along with brokerage services. In 1993, the Office of the Comptroller of the Currency permitted Dean Witter and a subsidiary of

NationsBank to form a partnership to sell mutual funds and other securities in the branch offices of NationsBank. Also, in April 1993, the Federal Reserve Board allowed Mellon Bank Corporation, which had already teamed up with the mutual fund company Dreyfus, to buy The Boston Company, which provided administrative and advisory services to 84 different mutual funds.

In 1991, a fall in the rate of interest paid on bank deposits, combined with the ongoing technological and regulatory changes that were facilitating the creation of mutual funds, encouraged the large-scale transfer of funds from bank deposits to bond and stock mutual funds. Many retired investors used the income from bank CDs to support themselves. Especially with the sharp fall in short-term rates that began at the end of 1990, they moved out of CDs into bond and stock mutual funds, which promised a steadier cash flow (at the risk of capital fluctuation). *The Wall Street Journal* (2/12/93) wrote:

[The yield on] Treasury bills plunged 37% last year. "That was the great T-bill crash of 1992," says Laurence Siegel. . . . Investors usually think of stocks as very risky and bonds as moderately risky. Meanwhile, T-bills, certificates of deposit, money market funds and other short-term debt instruments are seen as virtually risk-free. That's certainly the case, if all you care about is fluctuations in price. But if your concern is getting a steady stream of income, then holding T-bills and rolling them over as they mature is much more risky than holding stocks or bonds. (P. C1)

By fall 1992, the rate paid on six-month CDs had fallen to about to 3.25 percent, where it remained until early 1994. For all of 1992, the 30-year bond rate averaged 7.67 percent, while three-month CDs averaged 3.62 percent, an unusually wide difference of four percentage points. As of February 1994, savings deposits at commercial banks and savings banks paid on average 2.43 percent (Board of Governors of the Federal Reserve System statistical release H.6, "Monthly Survey of Selected Deposits," March 24, 1994). That level of short-term rates produced a transfer of funds out of bank deposits into higher-yielding bond and stock mutual funds.

The immediate cause of the disintermediation from financial institutions was the low rates paid on deposits, which in turn reflected weakness in loan demand. In addition, the need to rebuild capital forced many financial institutions to restrict their asset growth and, indirectly, their deposit growth. Finally, the well-publicized problems of financial institutions with debt defaults, especially in real estate, beginning in 1989 altered the perception of investors with small amounts of capital that bank deposits were the primary safe form of saving apart from savings bonds and Treasury bills. Mutual funds, in contrast, experienced no such bad publicity.

A survey by the Board of Governors (1993) documented the change in emphasis in the 1990s by banks from solely attracting deposits to retail marketing of mutual funds. The Board surveyed 56 large banks nationwide. All but four of these banks marketed mutual funds to their retail customers.

Three-quarters of the banks that marketed mutual funds had sales representatives at their branches. Forty percent of the banks had sales forces with over 50 people. By 1993, customers of Wells Fargo could buy and sell mutual funds through automated teller machines (*The Economist*, 9/4/93).

## 2. SHIFT-ADJUSTED M2

Shares in bond and stock mutual funds possess many of the characteristics of the deposits in M2. They are liquid and available in small denominations, and they can be bought and sold with low transactions costs. The existence of these common characteristics suggests adding shares in bond and stock mutual funds to M2 to create a more inclusive monetary aggregate that would be unaffected by transfers between these funds and M2. Bond and stock mutual funds, however, are not complete substitutes for the time deposits in M2. Fluctuation in their capital value presents a risk not present with bank time deposits. Also, they are not suitable for regular small transactions in that each sale of a mutual fund share creates a capital gain or loss that is taxable.

Fluctuation in capital value makes bond and stock mutual funds unsuitable for inclusion in a broad monetary aggregate. Consider, for example, the anomaly that could arise if bond and stock mutual funds were added to M2 to create a new, more inclusive monetary aggregate. Assume that a rise in money growth creates an expectation of a future rise in inflation. That expectation would produce a rise in bond yields, which would depress the value of bonds. The value of an inclusive definition of money would then fall and give a misleading message about the thrust of monetary policy. Money growth would fall when nominal output growth rose.

One way to offset the distortions in M2 produced by bond and stock mutual funds is to construct a shift-adjusted M2: M2 plus cumulative net inflows into bond and stock mutual fund shares not coming from institutional investors and not held in IRA/Keogh accounts. The exclusion of institutional holdings is consistent with the definition of M2, which excludes money market funds held by institutions. Similarly, the exclusion of IRA/Keogh accounts reflects the exclusion of these accounts in M2. The shift-adjusted measure also excludes reinvested dividends. The use of dollar inflows to adjust M2 avoids the problem of changes in the capital value of bonds and stocks.

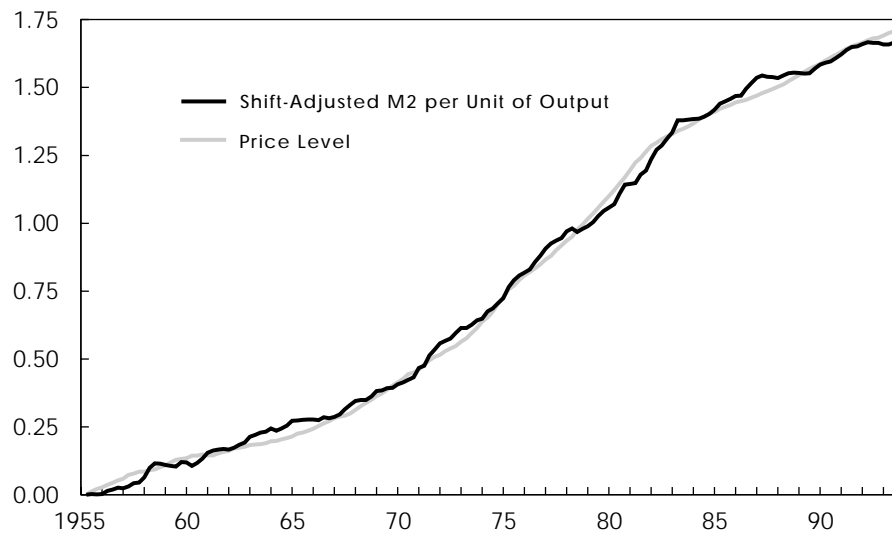
This construct should not be thought of as a conventional monetary aggregate. The divergence between its growth and M2 growth, however, suggests a measure of the extent of shifts in the public's demand for M2. By taking account of these shifts, it is possible that M2 could again be used as an indicator of the thrust of monetary policy. Shift-adjusted M2 is analogous to the shift-adjusted M1 the Fed used in 1981 (Bennett 1982). At that time, an adjustment to M1 was needed because the incorporation of interest-bearing NOW (negotiable order of withdrawal) accounts in the definition of M1 in 1980 and the introduction

of these accounts nationwide in 1981 produced an inflow of funds into M1 from deposits not formerly included in M1. Shift-adjusted M1 subtracted an estimate of these inflows. Analogously, the suggested shift-adjusted M2 adds in an estimate of outflows from M2 into bond and stock mutual funds. Table 2 lists figures for conventional M2 and shift-adjusted M2. In 1991 the difference in their growth rates was only 1.4 percent, but that figure rose to 1.9 percent in 1992 and 2.4 percent in 1993.

### 3. SHIFT-ADJUSTED M2 AS AN INDICATOR

How well does shift-adjusted M2 predict the impact of monetary policy actions? Shift-adjusted M2 predicts better than unadjusted M2; however, it does not eliminate all of the unusual reduction in the public's demand for M2. Figure 1 uses shift-adjusted M2 per unit of output to predict the price level. (M2 is shift-adjusted starting in 1991.) Assuming that M2 velocity is stable over time, that is, the ratio of dollar output to M2 fluctuates around an unchanged value, M2 divided by real output should move with the price level over long periods of time. (See Humphrey [1989] for a history of the use by quantity

**Figure 1 Money per Unit of Output as a Predictor of the Price Level**



Notes: Data are quarterly observations of shift-adjusted M2 divided by real GDP and of the implicit price deflator. Both series are logarithms of the index numbers created by dividing each series by its 1955Q1 value. Shift-adjusted M2 is M2 plus cumulative net inflows starting in 1991 from households into bond and stock mutual funds (non-IRA/Keogh accounts).

**Table 2 Growth of M2 and Shift-Adjusted M2**

Year	Month	M2 (billions)	Shift- Adjusted M2 (billions)	Monthly Annualized Growth M2	Monthly Annualized	Quarterly Annualized Growth M2	Quarterly Annualized
					Growth Shift- Adjusted M2		Growth Shift- Adjusted M2
		(1)	(2)	(3)	(4)	(5)	(6)
1991	1	3363.53	3365.40	3.85	4.54		
	2	3380.02	3384.65	6.04	7.08		
	3	3398.11	3405.88	6.62	7.79	3.89	4.47
	4	3409.00	3419.30	3.91	4.83		
	5	3418.86	3432.99	3.52	4.91		
	6	3426.64	3444.01	2.77	3.92	4.53	5.64
	7	3426.42	3447.19	-0.08	1.12		
	8	3427.40	3453.14	0.34	2.09		
	9	3427.51	3458.72	0.04	1.96	1.05	2.46
	10	3432.33	3469.06	1.70	3.65		
	11	3445.36	3486.11	4.65	6.06		
	12	3455.25	3501.98	3.50	5.60	2.02	3.84
1992	1	3464.09	3519.20	3.12	6.06		
	2	3483.61	3547.02	6.97	9.91		
	3	3486.28	3555.74	0.92	2.99	3.97	6.45
	4	3481.94	3554.52	-1.48	-0.41		
	5	3482.07	3560.23	0.04	1.94		
	6	3477.77	3562.72	-1.47	0.84	0.30	2.11
	7	3480.72	3572.35	1.02	3.29		
	8	3489.43	3587.62	3.05	5.25		
	9	3496.58	3599.00	2.49	3.87	0.96	3.09
	10	3507.46	3610.43	3.80	3.88		
	11	3510.53	3617.26	1.05	2.29		
	12	3509.04	3624.41	-0.51	2.40	2.32	3.51
1993	1	3502.78	3624.12	-2.12	-0.10		
	2	3494.21	3621.75	-2.90	-0.78		
	3	3494.83	3630.23	0.21	2.85	-1.33	0.89
	4	3497.99	3641.85	1.09	3.91		
	5	3521.86	3674.52	8.50	11.32		
	6	3528.70	3687.19	2.36	4.21	2.18	4.77
	7	3533.56	3700.11	1.66	4.29		
	8	3535.69	3712.65	0.73	4.14		
	9	3543.59	3727.09	2.71	4.77	2.46	5.05
	10	3545.09	3735.63	0.51	2.79		
	11	3556.19	3753.27	3.82	5.82		
	12	3563.11	3765.99	2.36	4.14	1.96	4.20

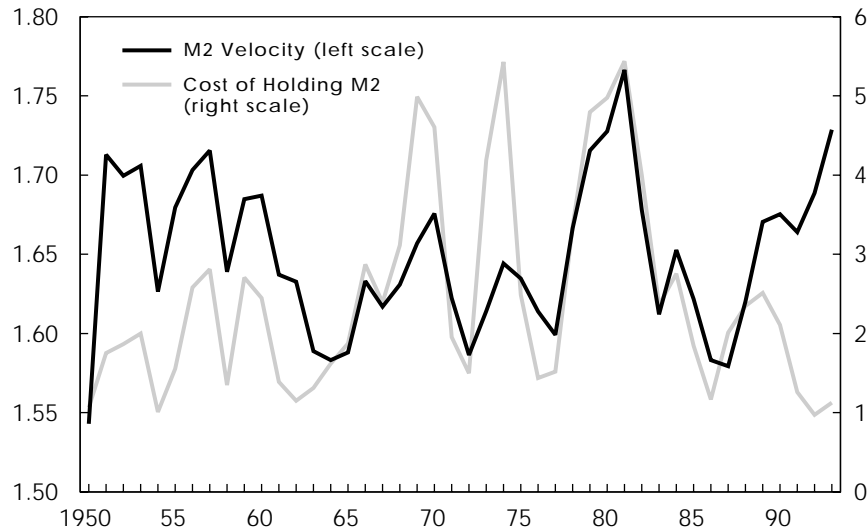


theorists of money per unit of output as a predictor of the price level.) As shown in Figure 1, M2 per unit of output and the price level do gravitate around each other. In 1992, however, M2 begins to underpredict the price level, even with the shift adjustment. By 1993Q4, the underprediction reaches 5 percent.

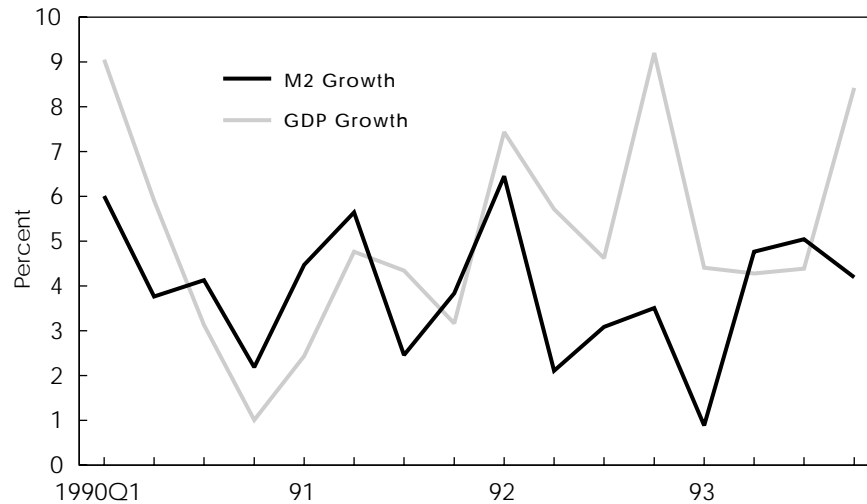
Figure 2 shows the normally positive relationship between M2 velocity and the financial market opportunity cost of holding M2. The latter variable is measured by the difference between the commercial paper rate and a weighted average of the explicit rates of return paid on the components of M2 (Hetzel 1989). An increase in the cost of holding M2 raises M2 velocity by lowering the demand for M2, and conversely. The shift-adjustment does not restore for the early 1990s the normal positive relationship between M2 velocity and the financial market opportunity cost of holding M2. Shift-adjusted M2 velocity should have fallen, but did not.

Figure 3 shows quarterly observations of quarterly rates of growth of shift-adjusted M2 and nominal output (GDP) over the recent period of instability in M2 demand. The two series exhibit some common fluctuations. The correlation between growth in nominal output and growth in M2 is .35. When M2 growth is lagged one quarter, the correlation is .41. The rise in nominal output growth

**Figure 2 The Relationship Between Shift-Adjusted M2 Velocity and the Financial Market Opportunity Cost of Holding M2**



Notes: The financial market opportunity cost of holding M2 is the difference between the rate on six-month commercial paper and a weighted average of the explicit rates of interest paid on the components of M2. Shift-adjusted M2 is M2 plus cumulative net inflows starting in 1991 from households into bond and stock mutual funds (non-IRA/Keogh accounts). Shift-adjusted M2 velocity is nominal GDP divided by shift-adjusted M2.

**Figure 3 Shift-Adjusted M2 and Nominal Output Growth**

Notes: Data are quarterly observations of quarterly annualized growth. Shift-adjusted M2 is M2 plus net household inflows into stock and bond mutual funds beginning in 1991.

during the economic recovery, however, is not matched by the usual rise in M2 growth. It appears that shift-adjusted M2 continues to contain some useful information about the effect of monetary policy actions on nominal output, but less than M2 does before 1991.

Shift-adjusted M2 appears to account for somewhat less than half of the unusual decrease in the demand for M2. Over the three-year period 1990Q4 through 1993Q4, the annualized rate of growth of nominal output was 5.2 percent, while the annualized rate of growth of M2 was only 2 percent. Over this same period, the cost of holding M2 (the financial market opportunity cost shown in Figure 2), fell about 1 percent. In the past, that decline would have produced somewhat faster growth in M2 than in nominal output (a fall in M2 velocity). Appendix B makes these figures more precise by comparing the prediction errors from a money demand regression estimated with conventionally defined M2 and with shift-adjusted M2. Using conventionally defined M2, the overprediction in the rate of growth of real M2 for the years 1991, 1992, and 1993 is 2.6, 3.2, and 4.2 percent, respectively. Using shift-adjusted M2, the overprediction in each year falls to about 2 percent.

It is possible that there is an explanation for the leftward shift in M2 demand that does not focus on the desire of the public to shift its savings from the deposits of financial institutions to capital market instruments. The explanations offered, however, have not proven satisfactory. One explanation offered was that the closing of thrifts by the Resolution Trust Corporation

extinguished thrift deposits that had been included in M2. The Resolution Thrift Corporation, however, stopped closing insolvent thrifts after March 1992 because of lack of funds. Despite this fact, M2 continued to grow slowly relative to nominal output. The other explanation offered was that the public was using M2 balances to reduce its debt. Consumer installment credit, however, began to grow strongly in 1992Q3. Adding home equity loans to consumer installment credit results in a typical growth in consumer credit for a period of economic recovery. This growth implies that the public no longer considered its debt level excessive. M2 growth, however, did not subsequently revive.

It appears that the leftward shift in M2 demand derives from the public's increased desire to save with capital market instruments rather than bank deposits. This change in behavior is driven by the reduction in the transactions cost of buying and selling capital market instruments and by the availability of these instruments in small denominations made possible by the pooling of investors' savings in mutual funds. The failure of the shift-adjustment to account fully for the leftward shift in M2 demand evidently arises from a failure to account fully for the outflows of M2 deposits to other sources. Indirect confirmation of this conjecture comes from the Board of Governors' Surveys of Consumer Finances (Kennickell and Starr-McCluer 1993, p. 3). Between the 1989 and 1992 surveys, bank deposits as a fraction of households' financial assets fell from 31.9 to 26.1 percent, or 5.8 percentage points. Mutual fund holdings, however, rose only 3.2 percentage points, from 14.6 to 17.8 percent. The direct purchase of stocks and bonds apparently accounted for the remainder of the decline. Duca (1993) also points out that in 1992 sales of U.S. savings bonds held for under five years surged when money market rates fell below the floor of 4.16 percent paid on these instruments. It is likely that much of the inflows into these savings bonds came from M2 deposits.

Finally, shift-adjusted M2 does not account for the increase in the use of tax-sheltered forms of savings in the early 1990s. Governor Lindsey (1994) reports that in 1993 tax-sheltered forms of income, particularly pension fund and life insurance reserves, accounted for 70 percent of the net acquisition of financial assets. This tax shifting was probably undertaken in response to the increase in marginal tax rates in 1991 and 1993. Because the shift-adjustment made here to M2 does not include deposit inflows to IRA/Keogh accounts or deposit inflows from institutional investors, it does not capture the decline in M2 that occurs when an individual withdraws funds from a time deposit included in M2 and places them in a tax-sheltered investment. The increased importance of tax-sheltered savings can be seen by comparing mutual fund inflows in the mid-1980s and in the early 1990s. Over the three years 1985 to 1987, 43 percent of the inflows into bond and stock mutual funds went either into accounts held by institutional investors like life insurance companies or into IRA/Keogh accounts. This figure rose to 61 percent over the three-year period 1991 to 1993 (see Table 3 in Appendix A).

#### 4. WILL M2 DEMAND BECOME STABLE AGAIN?

Will the behavior of the public's demand for M2 become predictable again? In particular, will the Fed again be able to set targets for M2 growth that can be reliably related to the desired rate of growth of the public's dollar expenditure? The admittedly equivocal answer is, "It could." The distressed condition of banks in the early 1990s and the associated low rates of interest on bank deposits are not likely to recur. After the completion of the current rechanneling of saving from the indirect intermediation provided by banks in favor of the direct intermediation of Wall Street, it is possible that mutual funds will grow steadily enough to avoid destabilizing M2 demand.

A somewhat different question is whether the Fed will be able to use M2 again as an indicator of the impact of its policy actions on the behavior of the public's dollar expenditure. Even if the public continues to shift funds between bank deposits and bond and stock mutual funds, a shift-adjusted M2, by offsetting the resulting fluctuations in M2 demand, could become a useful measure of the impact of monetary policy. Assuming that a primary reason that shift-adjusted M2 does not fully account for the leftward shift in M2 demand is the move toward tax-sheltered savings instruments, then, in the absence of major future changes in the tax code, shift-adjusted M2 should become a useful monetary indicator. It could become particularly useful in the event of a financial disturbance causing a large, sudden outflow from mutual funds. In that event, the resulting large changes in conventional M2 would be primarily noise.

The future usefulness of the monetary aggregates as targets or indicators also depends upon the tax and regulatory environment that banks will face. The computer technology that made mutual funds possible also makes it possible for banks to take deposits off their books in ways that can make it difficult to measure money accurately. Banks will have an incentive to pursue this technology as long as they face tax and regulatory obstacles to collecting deposits that are not incurred by other organizations competing for the public's savings. Two major handicaps that banks suffer in competing for the public's savings are the prohibition of payment of interest on demand deposits and the imposition of a tax in the form of noninterest-bearing reserve requirements. (Goodfriend and Hargraves [1983] discuss the role that reserve requirements have played as a tax.) These two institutional features create incentives for banks to lower the amount of demand deposits and other checkable deposits on their balance sheets in ways that distort measurement of the monetary aggregates.

In particular, sweep accounts allow banks to avoid the prohibition of the payment of explicit interest on demand deposits and the tax imposed by noninterest-bearing reserve requirements. For example, on March 21, 1994, a large bank advertised in *The Wall Street Journal* for an account that "automatically sweeps your excess cash into preselected investments daily." In one

version, the bank sweeps balances from a NOW account above a specified amount into an MMDA account. Whenever the NOW account falls below a specified minimum level, the bank transfers funds from the MMDA back into the NOW account. (All funds are transferred back in with the sixth transfer to avoid exceeding the legal limit of six automatic transfers per month from an MMDA account.) Reid and Small (1993) state that “about a quarter of the banks selling mutual funds provide retail sweep accounts whereby funds in a depositor’s account in excess of a predetermined amount are automatically invested in a money market mutual fund or some other uninsured investment vehicle” (p. 12).

A group that helps banks design sweep accounts reports the benefits of offering sweep accounts (Treasury Strategies 1994, pp. 24 and 26):

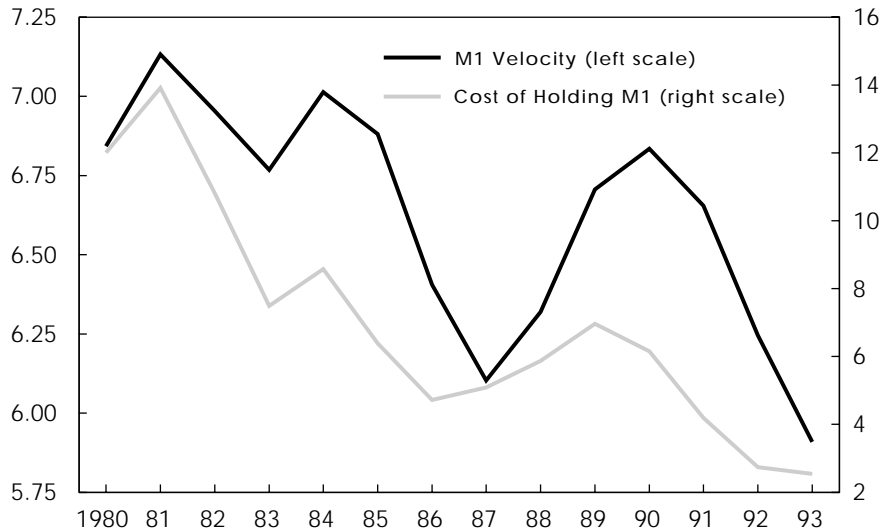
Reduced Reserves—Money market funds and trust sweeps move customer funds off balance sheet. Reserves of those deposits are eliminated and the amount of assets available for investment is increased.

Reduced FDIC premiums—Again, by moving funds out of insured depository accounts, FDIC premiums are eliminated. This .23% savings is also a benefit in which both the customer and bank can share.

Banks interested in encouraging fee payment for services and/or removing demand balances from their balance sheets set target balances and minimum sweep amounts at zero.

If a bank sweeps funds above a target balance into an MMDA, it does not affect the behavior of M2, but it does reduce measured M1. M1 has not been useful as a measure of money in the 1980s because of its high degree of sensitivity to changes in market interest rates (Hetzel and Mehra 1989). In the absence of a good measure of the interest sensitivity of the public’s demand for M1 balances, when interest rates have changed, it has been hard to estimate how M1 was changing relative to the public’s demand for it. The additional observations made possible by the passage of time could make this econometric problem manageable in the absence of sweep accounts. As Figure 4 shows, the variations in M1 velocity are related to the cost of holding it. In time, it might be possible to estimate again a reliable M1 demand function. In the future, with a high degree of substitutability between shares in bond and stock mutual funds and the time deposits in M2, a narrow aggregate like M1 could well be more stably related to the public’s expenditure than M2.

Computer technology is making it easier to avoid the tax imposed by noninterest-bearing reserve requirements. In principle, the Fed could solve the problem by paying interest on required reserves. Such proposals were advanced in discussions of the 1980 Monetary Control Act, but they were politically unacceptable. Alternatively, the Board of Governors could reduce reserve requirements. It is, however, limited by the legal minimum reserve requirement of 8 percent.

**Figure 4 Annual M1 Velocity and the Opportunity Cost of Holding M1**

Notes: M1 velocity is nominal GDP divided by M1. The opportunity cost of holding M1 is the six-month commercial paper rate minus a weighted average of the rates paid on the components of M1 (zero for currency and demand deposits).

Depending upon where “swept” funds are placed, sweep accounts can reduce measured M1 or M2. To an extent, the kind of shift-adjustment proposed here could reduce the resulting mismeasurement of the monetary aggregates. However, the data necessary to make such adjustments are never likely to be complete and are available only with a lag. Bank intermediation bears the burden of a large variety of regulations not imposed on other forms of financial intermediation. It seems likely that in the future the ability to define monetary aggregates that are useful for monetary policy will depend upon whether banks have a continuing incentive to adapt to special taxes and regulations.

## 5. SUMMARY

The growth of mutual funds that began in earnest in 1978 has increasingly directed financial intermediation away from banks and directly into the money and capital markets. Initially, growth occurred in money market mutual funds. Because shares in these funds are redeemable at par, they could be included in the definition of M2. Redefined to include money market mutual funds, M2 retained its long-run stable relationship with nominal output. Beginning in the mid-1980s, growth in mutual funds has been concentrated in bond and stock mutual funds. Because shares in these funds exhibit fluctuation in capital value, they cannot be included in an expanded definition of M2 in a satisfactory way.

In the early 1990s, the combination of (1) low rates of return on bank deposits relative to capital market instruments and (2) the decreased cost of operating bond and stock mutual funds diminished the public's demand for saving in the form of bank deposits. M2 velocity rose as depositors redirected savings from time deposits to bond and stock mutual funds. In principle, a shift-adjusted M2, defined as M2 plus cumulative dollar inflows into bond and stock mutual funds, could maintain the same relationship to the public's dollar expenditure as conventional M2. The shift-adjustment, however, accounts for only about half of the unusual rise in M2 velocity that began in 1991. The remainder to the rise in M2 velocity is probably caused by the use of bank time deposits to purchase stocks and bonds directly and to make tax-sheltered investments.

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## APPENDIX A

### CONSTRUCTION OF SHIFT-ADJUSTED M2

Tables 3, 4, and 5 detail the construction of shift-adjusted M2 from the Investment Company Institute (ICI) data contained in the monthly release "Trends in Mutual Fund Activity." As shown in Table 3, the first step is to subtract redemptions (including exchanges out of bond and stock mutual funds) from sales (including exchanges into bond and stock mutual funds but excluding reinvested dividends) of mutual funds to derive total net inflows. Subtracting net inflows due to institutions and net inflows into IRA/Keogh accounts then yields the net inflows due to households that are assumed to be coming out of deposits in M2. These net inflows are cumulated and added to conventionally defined M2 to derive shift-adjusted M2. Unfortunately, there are no direct measures of net inflows due to institutions or of net inflows into IRA/Keogh accounts. Tables 4 and 5 explain the derivation of these two series.

ICI publishes figures on the dollar values of institutional and IRA/Keogh accounts. Dollar inflows into these accounts can be calculated by subtracting capital gains from the changes in their dollar value. The capital gains (losses) for these accounts are assumed proportional to the capital gains (losses) for all types of mutual fund accounts. Figures on the level of mutual fund assets held in IRA/Keogh accounts are available monthly, while the figures for institutional accounts are only available for December of each year. Therefore, it is necessary to interpolate monthly asset levels for institutional accounts from year-end figures.

**Table 3 Calculation of Household Net Inflows to Mutual Funds**

Billions of dollars

Year	Qtr.	Sales of Mutual Funds (excludes reinvested dividends)	Redemptions	Total Net Inflow (1)–(2)	Net Inflow Due to Institutions	Net Inflow into IRA/ Keogh Accounts	Net Inflow Due to Households (3)–(4)–(5)	Annual Totals
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1984	1	15.49	9.61	5.88	1.39	1.11	3.38	
	2	13.84	9.12	4.72	1.74	1.00	1.97	
	3	16.05	8.91	7.14	2.19	1.22	3.72	
	4	15.69	11.54	4.15	1.20	0.69	2.26	11.33
1985	1	24.35	12.48	11.87	2.01	2.03	7.84	
	2	32.36	13.41	18.95	3.64	3.29	12.02	
	3	35.22	15.86	19.36	4.58	1.69	13.09	
	4	44.11	16.17	27.94	8.07	2.74	17.13	50.08
1986	1	58.92	22.51	36.41	11.06	5.53	19.82	
	2	66.67	31.67	35.00	11.85	5.83	17.32	
	3	68.40	37.13	31.26	11.00	2.89	17.38	
	4	74.54	39.18	35.36	13.03	2.67	19.66	74.18
1987	1	94.17	46.57	47.60	10.66	7.10	29.84	
	2	76.20	68.37	7.83	0.35	7.31	0.16	
	3	61.88	63.99	-2.11	-2.99	0.63	0.25	
	4	48.03	69.61	-21.58	-8.16	-1.29	-12.13	18.12



1988	1	42.03	44.65	-2.62	-1.12	0.87	-2.37	
	2	41.28	44.83	-3.55	-1.33	0.43	-2.64	
	3	30.87	40.02	-9.14	-2.78	0.82	-7.19	
	4	33.23	41.09	-7.86	-2.41	0.49	-5.94	-18.13
1989	1	37.06	42.27	-5.21	-1.36	-0.52	-3.34	
	2	41.99	39.52	2.47	0.79	1.24	0.44	
	3	44.48	39.98	4.50	1.58	1.81	1.11	
	4	49.10	41.96	7.14	2.22	1.96	2.96	1.17
1990	1	52.58	45.73	6.85	4.63	4.36	-2.14	
	2	51.98	40.77	11.21	5.88	3.15	2.18	
	3	45.77	46.96	-1.19	1.64	0.44	-3.27	
	4	44.80	40.34	4.46	2.87	-0.46	2.04	-1.17
1991	1	61.82	45.87	15.95	5.87	1.95	8.13	
	2	71.68	48.53	23.16	9.41	4.83	8.92	
	3	77.92	46.27	31.65	10.42	4.72	16.51	
	4	94.14	58.12	36.01	12.75	6.84	16.42	49.98
1992	1	115.06	70.03	45.02	19.17	5.38	20.47	
	2	106.57	62.33	44.25	18.00	10.30	15.95	
	3	113.12	69.04	44.07	17.54	9.49	17.04	
	4	119.03	79.17	39.85	15.08	10.32	14.46	67.92
1993	1	148.38	87.61	60.77	27.15	12.90	20.73	
	2	150.13	88.99	61.14	28.35	12.58	20.21	
	3	161.92	98.02	63.90	30.02	7.26	26.62	
	4	171.71	114.01	57.70	29.41	8.42	19.87	87.43

Notes: All data are from the Investment Company Institute. Sales include exchanges into stock and bond mutual funds; redemptions include exchanges out of stock and bond mutual funds. Quarterly data are sums of monthly figures. Annual totals are sums of quarterly data from the previous column.

**Table 4 Aggressive-Growth Stock Funds**  
**Net Inflows into IRA/Keogh Accounts, 1991**  
Millions of dollars

Year	Month	All accounts, including IRA/Keogh				IRA/Keogh accounts			
		Total	Monthly Change	Net Inflow	Capital Gain (Loss) (2)–(3)	Total	Monthly Change	Capital Gain (Loss) [(5)÷(1)]×(4)	Net Inflow (6)–(7)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1991	December	63287.3		2180.7		18528.3			
1992	January	65474.8	2187.5	1555.3	632.2	19425.1	896.8	187.6	709.2
	February	68050.4	2575.6	1872.0	703.6	19426.0	0.9	200.9	–200.0
	March	66136.0	–1914.4	1050.4	–2964.8	19691.8	265.8	–882.8	1148.6
	April	65941.1	–194.9	1075.0	–1269.9	19547.4	–144.4	–376.4	232.0
	May	67847.9	1906.8	951.1	955.7	19844.0	296.6	279.5	17.1
	June	66295.1	–1552.8	430.2	–1983.0	19292.7	–551.3	–577.1	25.8
	July	69545.6	3250.5	812.1	2438.4	20205.9	913.2	708.5	204.7
	August	67472.7	–2072.9	–214.7	–1858.2	19507.6	–698.3	–537.2	–161.1
	September	68160.4	687.7	414.7	273.0	19608.1	100.5	78.5	22.0
	October	72134.5	3974.1	543.3	3430.8	20769.8	1161.7	987.8	173.9
	November	78842.4	6707.9	2753.9	3954.0	22596.5	1826.7	1133.2	693.5
	December	83365.3	4522.9	2276.0	2246.9	23893.3	1296.8	644.0	652.8

Table 4 illustrates the estimation of net inflows into IRA/Keogh accounts for aggressive-growth stock mutual funds. We repeat these calculations for the other 18 categories of bond and stock mutual funds in order to arrive at aggregate data. Column (1) of Table 4 lists monthly figures for the dollar value of all aggressive-growth funds, and column (2) shows changes in column (1). Column (3) shows monthly net inflows into aggressive-growth funds. Capital gains (4) are the difference between the change in dollar value in column (2) and net inflows in column (3). Column (5) lists the monthly dollar values of aggressive-growth funds held in IRA/Keogh accounts, and column (6) shows changes in (5). Column (7) shows estimated monthly capital gains of IRA/Keogh accounts. It is derived by multiplying capital gains for all aggressive-growth funds from column (4) by the percentage of all assets held in IRA/Keogh accounts, which is column (5) divided by column (1). The resulting capital gain for IRA/Keogh accounts (7) is then subtracted from the change in the dollar value of IRA/Keogh accounts in column (6) to derive a monthly figure for the net inflow into aggressive-growth funds held in IRA/Keogh accounts, which is shown in column (8). Summing these figures across all types of mutual funds yields the figure in column (5), Table 3.

Table 5 illustrates the estimation of net inflows into institutional accounts. Part 1 shows year-end figures for the dollar value of total and institutional aggressive-growth funds. Column (c) shows the percentage held in institutional accounts. In Part 2, column (1) shows the dollar value of total aggressive-growth funds. The dollar amount held in institutional accounts, column (3), is estimated as the product of column (1) and the fraction held in institutional accounts, column (2), interpolated from the figures shown in column (c), Part 1. Column (4) shows monthly changes in these figures. Column (5), which is copied from column (4) of Table 4, shows capital gains for all bond funds. Capital gains for institutional accounts, column (6), is estimated by multiplying capital gains for all accounts, column (5), by the percentage of assets in institutional accounts, column (2). Net inflows into institutional accounts, column (7),

**Table 5 Aggressive-Growth Stock Funds, Institutional Accounts—  
Part 1**  
Millions of dollars

Year	Month	All	Institutional	Percentage in
		Accounts	Accounts	Institutional Accounts
		(a)	(b)	(c)
1991	December	63287.3	21035.0	33.2%
1992	December	83365.3	24283.3	29.1%

**Table 5 Aggressive-Growth Stock Funds, Institutional Accounts—Part 2**

Millions of dollars

<b>Year</b>	<b>Month</b>	<b>All Accounts</b>	<b>Interpolated Fraction Institutional Accounts</b>	<b>Institutional Accounts (1)×(2)</b>	<b>Change in Institutional Accounts</b>	<b>Capital Gain (Loss) All Accounts</b>	<b>Capital Gain (Loss) Institutional Accounts (2)×(5)</b>	<b>Net Inflows Institutional Accounts (4)–(6)</b>
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1991	December	63287.3	33.2%	21035.0				
1992	January	65474.8	32.9%	21537.9	502.9	632.2	208.0	294.9
	February	68050.4	32.6%	22152.1	614.3	703.6	229.0	385.2
	March	66136.0	32.2%	21302.5	–849.6	–2964.8	–955.0	105.3
	April	65941.1	31.9%	21014.0	–288.5	–1269.9	–404.7	116.1
	May	67847.9	31.5%	21389.3	375.4	955.7	301.3	74.1
	June	66295.1	31.2%	20672.8	–716.5	–1983.0	–618.4	–98.1
	July	69545.6	30.8%	21448.3	775.5	2438.4	752.0	23.5
	August	67472.7	30.5%	20578.0	–870.3	–1858.2	–566.7	–303.6
	September	68160.4	30.2%	20554.4	–23.6	273.0	82.3	–106.0
	October	72134.5	29.8%	21505.8	951.5	3430.8	1022.8	–71.4
	November	78842.4	29.5%	23235.8	1729.9	3954.0	1165.3	564.6
	December	83365.3	29.1%	24283.3	1047.5	2246.9	654.5	393.0

is the difference between the change in the dollar amount in column (4) and capital gains for institutional accounts, column (6). Summing across all types of mutual funds yields the aggregate net inflow figure used in column (4), Table 3.

Because mutual fund data are end-of-month figures while M2 data are daily-average figures, the end-of-month figures are averaged to derive the monthly mutual fund data series.

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## APPENDIX B

### AN ESTIMATED M2 DEMAND REGRESSION

The estimated M2 demand regression below uses shift-adjusted M2 for the years 1991, 1992, and 1993. It is a regression of percentage changes in real M2 on a dummy for the Korean War, percentage changes in real GDP, a contemporaneous and lagged value of changes in the financial market opportunity cost of holding M2, and second differences of percentage changes in nominal output. The last term is an estimate of the nominal rate of return on physical assets, which is used by Friedman and Schwartz in their money demand regressions. See Friedman and Schwartz (1982, Sec. 6.6.3) and Hetzel (1992). Estimation of the following regression using shift-adjusted M2 rather than conventionally defined M2 results in a reduction of the overprediction of real M2 of 23 percent in 1991, 55 percent in 1992, and 47 percent in 1993.

#### M2 Demand Regression, 1950 to 1993

$$\Delta \ln rM2_t = -3.0 * Korea + .93 \Delta \ln rGDP_t - 1.1 \Delta(R_t - RM2_t)$$

$$(2.9) \qquad (11.9) \qquad (4.8)$$

$$-1.2 \Delta(R_{t-1} - RM2_{t-1}) - .51 \Delta^2 \ln GDP_t + \hat{\epsilon}_t$$

$$(4.5) \qquad (6.3)$$

$$CRSQ = .64 \quad SEE = 1.6 \quad DW = 1.4 \quad DF = 39$$

Notes: Observations are annual averages. M2 is shift-adjusted for the years 1991, 1992, and 1993.  $rM2$  is per-capita M2 deflated by the implicit GDP deflator.  $rGDP$  is real per-capita gross domestic product.  $R$  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. Korea is a shift dummy with a value of one in 1951, 1952, and 1953 and zero otherwise. Before 1959, M2 is M4 in Table 1 of Friedman and Schwartz (1970). From 1991 on, M2 includes inflows from households into non-IRA/Keogh bond and stock mutual funds.  $\ln$  is the natural logarithm and  $\Delta$  the first-difference operator. CRSQ is the corrected R-squared; SEE the standard error of estimate; DW the Durbin-Watson statistic; and DF degrees of freedom. Absolute value of t-statistics are in parentheses. Estimation is by ordinary least squares.

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