

Sean Collins and Cheryl L. Edwards

Sean Collins and Cheryl L. Edwards are staff economists with the Board of Governors of the Federal Reserve System, Division of Monetary Affairs.

An Alternative Monetary Aggregate: M2 Plus Household Holdings of Bond and Equity Mutual Funds

STANDARD MONEY-DEMAND MODELS began to go off track in 1990, attesting to an apparent shift in the velocity of M2. This shift sparked debate about whether M2 velocity is stable, an important property for an indicator of monetary policy.¹ It also raised questions about the usefulness of money-demand models for predicting the effects of Federal Reserve policy. If velocity shifts in some unforeseeable way, how is it possible for policymakers to exploit the statistical relationship between M2 and nominal income to attain their policy goals? In mid-1993, the Federal Reserve responded to the velocity shift by formally downgrading M2 as an indicator of the state of the economy. Meanwhile, interest has been rekindled in defining "money" and searching for alternative monetary aggregates.

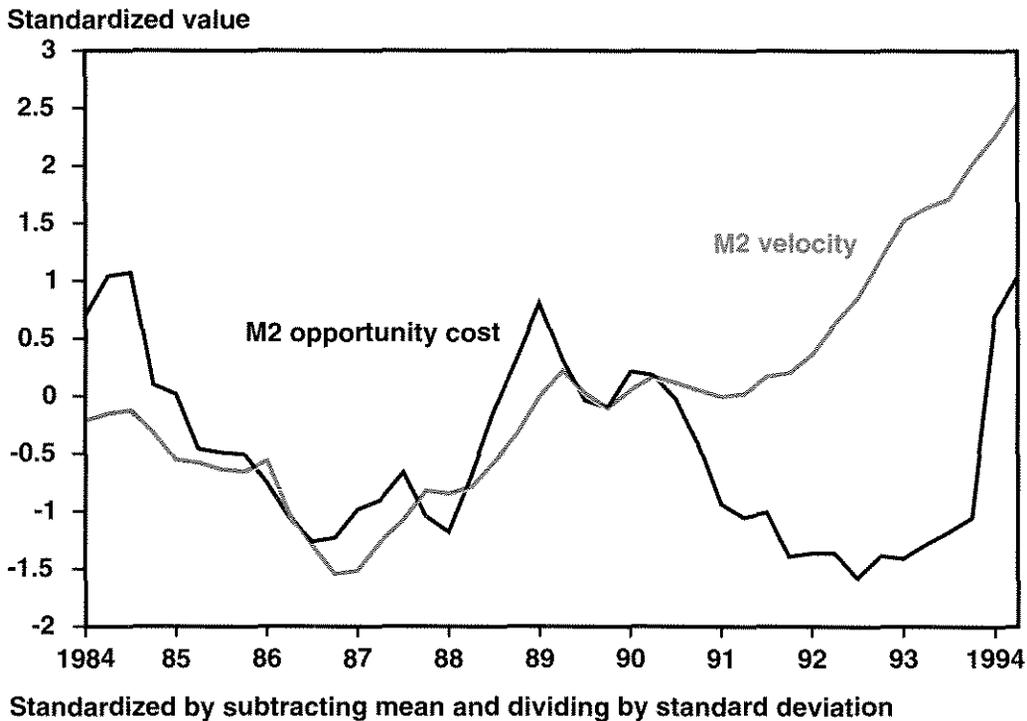
One explanation for the velocity shift is the increased importance of bond and equity mutual funds, also called long-term funds. Over the four-year period from 1990 to 1993, net purchases of bond and equity mutual funds by investors

totaled about \$655 billion, compared with about \$400 billion over the 1980s. The surge largely reflected the yield-seeking behavior of retail investors. Yields on M2-type assets fell to historically low levels in the early 1990s, while long-term market interest rates were unusually high relative to short-term rates, and equity prices were rising sharply. In this environment, investors sought higher returns by investing in bond and equity mutual funds. They may also have been attracted by the enhanced liquidity of long-term mutual fund shares. Most large mutual fund complexes upgraded their shareholder services during the late 1980s to permit investors to write checks against their bond fund balances. At the same time, banks entered the mutual fund business as regulations that once prevented banks from selling mutual funds virtually evaporated. As a result, investors could buy and sell mutual fund shares in a familiar environment: the bank lobby.

Taken together, these two developments—the recent case of missing M2 and the ascendant

¹ In this context, stable is usually taken to mean that velocity is a stationary stochastic process. For some recent evidence on the stability of velocity, see Hallmann and Anderson (1993).

Figure 1
M2 Velocity and its Opportunity Cost



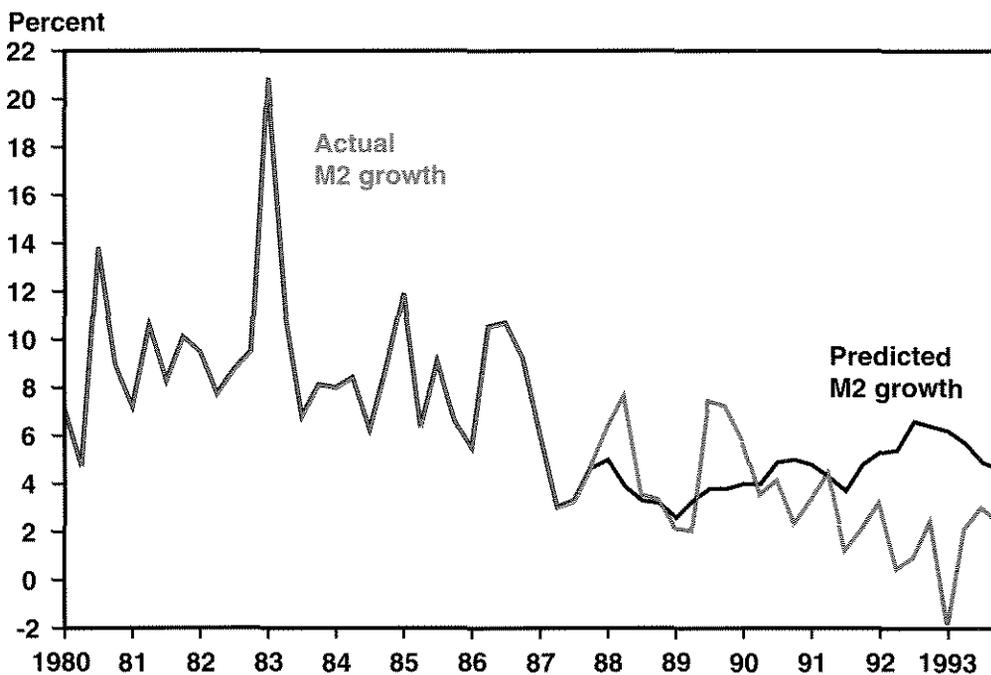
mutual fund industry—raise the issue of whether bond and equity mutual funds ought to be added to M2. This paper proposes just that, but offers some caveats. The first section reviews the recent behavior of M2 and its deterioration as a predictor of economic activity. The second section provides historical background on the mutual fund industry. The third section asks whether bond and equity mutual funds meet the tests of “moneyness” usually applied to assets considered for inclusion in a monetary aggregate. The fourth section discusses the data needed to construct a theoretically sound monetary aggregate that includes bond and equity mutual funds. The fifth section describes how we constructed such an aggregate, which we will refer to as M2+. The final section concludes by pointing out some of the drawbacks of this aggregate.

RECENT BEHAVIOR OF M2

The relationship between M2 and nominal income was fairly stable for many years before 1990. M2 velocity, which is the ratio of gross domestic product to the level of M2, fluctuated

around a constant level. Moreover, movements away from this level were strongly positively correlated with the opportunity cost of holding M2, measured as the spread between the yield on a short-term Treasury security and the weighted-average return on M2. When short-term Treasury rates rose, the opportunity cost of holding M2 increased because the rates on the components of M2 did not climb as fast as market rates. As a result, M2 growth would slow relative to the growth in income, and velocity would rise. As the rates paid on M2 completed their adjustment to the higher level of market rates, M2’s opportunity cost would narrow, M2 growth would rise relative to income growth, and velocity would return toward its trend level. This relationship meant that M2 growth could serve as a guidepost to current (but as yet unknown) income growth. In mid-1990, however, the velocity of M2 rose substantially above its long-run average, despite a very considerable drop in the opportunity cost of holding M2 (Figure 1). At the same time, conventional demand equations for M2, which are statistical representations of the relationship between money and variables such as interest

Figure 2
Actual and Predicted Growth Rates of M2



rates and income, began to go off track (Figure 2). Between the first quarter of 1990 and the fourth quarter of 1993, the Board staff's quarterly model of M2 demand overpredicted growth by an average of 2.5 percentage points per quarter—misestimates that cumulated to nearly \$380 billion by the end of 1993.²

Several alternative hypotheses have been advanced to explain the missing M2. Duca (1993a) postulated that the resolution of thrifts by the Resolution Trust Corporation (RTC) may have been a factor. In short, he argued that deposit rates were reset by depository institutions that acquired the deposits of resolved thrifts. More often than not, the new deposit rates would be lower—typically much lower—than the rates that thrift investors had enjoyed earlier. This “sticker shock” led thrift depositors to reassess their portfolios in ways not captured by conventional money-demand models. Duca's explanation is an important one for 1990

and 1991, but cannot explain the subsequent weakness in M2 because RTC funding and, thus, resolution activity dried up in 1992. Wenninger and Partlan (1992) focused on the weakness in small time deposits. They noted that the phasing out of Regulation Q (which limited the rates banks could pay on deposits) encouraged banks to think of small time deposits as managed liabilities. Consequently, banks, which faced weak credit demand, were rather unaggressive bidders for small CDs. The authors also noted that, on the demand side, consumers may have been surprised by the substantial decline in deposit rates, and they therefore sought the higher returns available on mutual fund investments. Other explanations advanced in the press and elsewhere attributed the weakness in M2 to a number of sources: the credit crunch; rising deposit insurance premiums; the imposition of new, higher capital standards for depositories; the downsizing of consumer balance sheets (which was accomplished by using M2 balances to pay off debt); the unusual

² This model is described in Moore, Porter and Small (1990).

steepness of the yield curve; and, finally, the especially strong flows into bond and equity mutual funds over the 1991-93 period.

A common thread binds these stories: They highlight some facet of household demand for money not captured in conventional money-demand models. For instance, if the demand for money by households is influenced by returns on capital market instruments, then this effect would be reflected as an error in conventional money-demand models, because such models usually depend only on the spread between the yield on a short-term Treasury security and the weighted-average rate paid on M2 balances. Similarly, to the extent that rising deposit insurance premiums were not accurately reflected in reported deposit rates, conventional models could experience significant forecast errors.

The incompleteness of conventional money-demand models sparked attempts to revamp such models. Feinman and Porter (1992) augmented the Board staff's model of the demand for M2. Rather than defining the opportunity cost of M2 as the spread between a short-term Treasury rate and the rate of return on M2 balances, they estimated the opportunity cost of holding M2 balances. Their model chose the opportunity cost by selecting among rates of return on M2-type balances and competing assets.³ In contrast to conventional models, Feinman and Porter found that yields on longer-term Treasury instruments and consumer debt were significant factors in determining money demand. A steep yield curve tended to dampen money growth and helped to explain weak M2 growth. Although the Feinman-Porter model achieved some success in predicting M2 growth out-of-sample, the model had difficulty beginning in mid-1993, when long-term interest rates fell sharply. In part, this problem may have stemmed from an asymmetric response of investors to changes in the slope of the yield curve. If the yield curve flattens because long-term interest rates have declined, investors in mutual funds may enjoy temporary capital gains, thus depressing their appetites for M2 balances. In contrast, if the yield curve flattens

because short-term rates have risen, investors would garner no capital gains (and might even confront capital losses on short-term securities), and they would see an erosion of the yield advantage of mutual funds over M2-type balances. However, the Feinman-Porter model treats the two kinds of flattening the same.

A different approach advocated by Hendry and Ericsson (1990) for the United Kingdom, and recently employed by the Board staff, is to introduce an "error-learning" term into the conventional M2 demand equation. The error-learning term attempts to capture changes in preferences as investors "learn" about mutual funds and their potentially higher yields. Nonetheless, as suggested by Higgins (1992), if the slowdown in M2 was to some extent a permanent phenomenon related to restructuring (both regulatory and technical) in the financial industry, then error-learning models might eventually go off track as well. Indeed, this appears to be the case, as the Board's error-learning model has recently been overpredicting money growth.

The standard model has been modified by adding other variables as well. Carlson and Byrne (1992) and Duca (1993a) both included variables that accounted for the impact of thrift closings. Duca (1993b) further modified the model by changing the dependent variable to be M2 plus various measures of households' holdings of bond mutual funds. He found that both the assets of bond mutual funds and RTC activity helped explain the missing M2.

Instead of reworking conventional money-demand models, many economists have suggested abandoning M2 as an aggregate and replacing it with another, more predictable (they hope) aggregate. The search for a replacement to M2 has given rise to a cottage industry of constructing and testing alternative aggregates. Among the proposed successors to M2 are M1, M1A, liquid M2 (M2 less small time deposits), MZM (M2 less small time deposits plus assets of institution-only money market mutual funds), M2E (M2 plus assets of institution-only money funds), household M2

³ The rates of return included on M2-type balances were for other checkable deposits, savings accounts (including MMDAs), small time deposits with original maturities of six months, small time deposits with original maturities of two-and-a-half years or over, and the yield on money market mutual funds. Yields on competing instruments included those for three-month Treasury bills, five-year Treasury notes, 30-year Treasury bonds and the 48-month auto loan rate.

(M2 less demand deposits, and overnight RPs and Eurodollars), M2BF (M2 plus bond mutual funds) and, most recently, M2+ (M2 plus household holdings of bond and equity mutual funds).⁴

To date, none of these proposed aggregates has been particularly well-received because all are plagued by theoretical or empirical difficulties. With respect to M1 and M1A, recent history clearly demonstrates that they are too highly interest elastic to serve as a useful indicator of income growth. Liquid M2, considered by Wenninger and Partlan (1992), among others, seems appealing on the theoretical grounds that small CDs are neither very liquid nor transaction balances; liquid M2, however, suffers from the same interest-elasticity problem as M1. Moreover, the velocity of liquid M2 has been less predictable than that of M2 itself. Poole's proposed aggregate, MZM, is subject to the same criticism and would additionally include a component (institution-only money funds) that is extremely sensitive to money market pressures and thus is highly volatile. Institutional investors will make large adjustments in their holdings of money funds in response to very small differentials between market rates and those on money funds. This sensitivity was demonstrated in February 1994, when nearly \$16 billion flowed out of institution-only money funds following a 0.25 percentage point increase in the federal funds rate.

M2BF and M2+ are not trouble-free, either on empirical or theoretical grounds. Each attempts to internalize some of the observed substitution between M2 and long-term mutual funds. These aggregates therefore should have a more stable relationship to nominal income than M2 alone. The empirical evidence, however, suggests that these aggregates may not be much more stable than M2. For instance, Orphanides, Reid and Small (1994) point out that the velocity of M2+, although perhaps more predictable than that of M2, would have led to substantial overpredictions

of GDP growth during the past few years, just like M2 (indeed, the velocity of M2+ grew quite rapidly in early 1994). In part, these overpredictions may not stem from the definition of the augmented aggregate but rather from an inappropriate measuring of the opportunity cost variable. The authors use the slope of the yield curve as a proxy for the yield advantage of holding bond and equity funds; however, there is no necessary reason why the yield on long-term bonds should be a good proxy for the return on equities. Moreover, one can argue that if the expectations hypothesis is true, the yield on short-term Treasury securities should adequately measure the opportunity cost.⁵

Difficult issues arise on the theoretical side as well. For instance, should we add just bond funds to M2, or should equity funds be included as well? Duca (1993) focused mainly on bond funds on the grounds that equity funds carry substantial principal risk and therefore are less substitutable for M2 balances. The liquidity of equity funds, however, suggests that there may be some benefit to including these funds in an augmented aggregate. A thornier issue is the treatment of capital gains. Orphanides, Reid and Small (1994) note that excluding capital gains from net assets could lead to substantial misestimates of potential balances and introduce an element of arbitrariness into measuring the aggregates, but including capital gains may permit changes in interest rates or equity prices to introduce excessive volatility into the aggregate. As a consequence, the M2+ aggregate, although it has the advantage of internalizing portfolio shifts between mutual funds and M2, will be quite sensitive to movements in bond and equity prices. This problem poses difficulties, but the difficulties may be somewhat less severe than the problems affecting the alternative aggregates discussed earlier. Nonetheless, in order to better interpret the movements in M2+, one must track capital gains and losses.

In this paper, we focus on issues related to the construction of M2+. These issues include

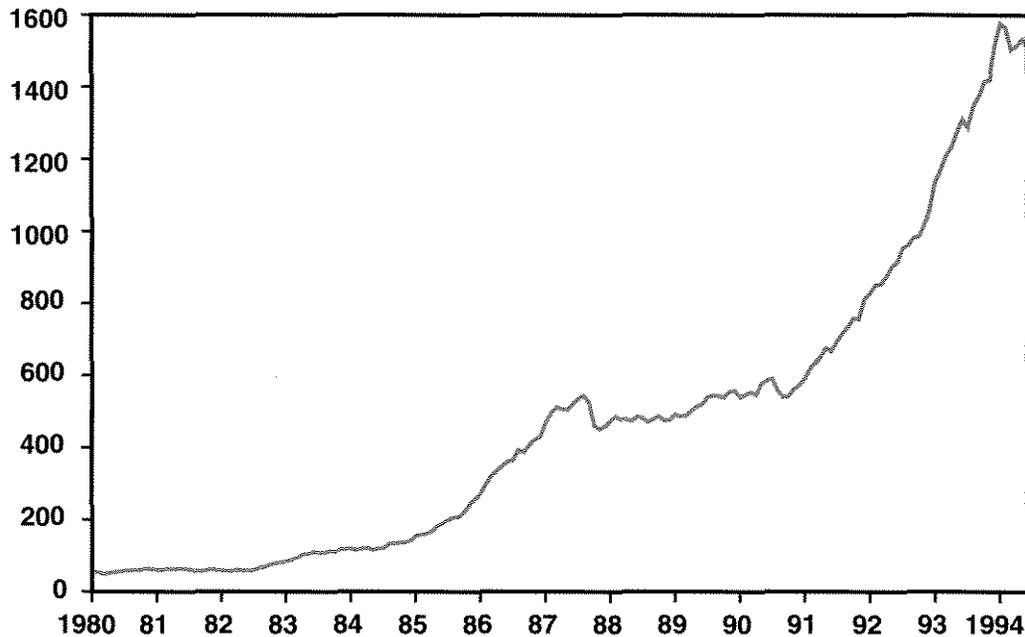
⁴ Monetary economists in other industrialized countries have grappled with similar problems as their official monetary aggregates have succumbed to financial innovation and deregulation. In Canada, McPhail (1993) proposed an M2+ aggregate consisting of M2 balances plus savings bonds and short-term Treasury securities. Arestis and others (1993) discussed the difficulties faced by the Bank of England in defining and controlling monetary aggregates during the 1980s. They concluded that "trying to target the growth rate of broad monetary aggregates in the UK...has always been problematic because of the weak and some-

times perverse relationships between the level of absolute rates and the relative rates which form the key to [money targeting]." To our knowledge, though, economists in the United States were the first to propose incorporating bond and equity mutual funds into a monetary aggregate.

⁵ This point is a matter of debate. For a contrary view, see Feinman and Porter (1992).

Figure 3
Net Assets of Bond and Equity Mutual Funds

Billions of dollars



the following: Should we exclude from M2+ the assets of mutual funds devoted to retirement accounts? Should we exclude the liquid assets held by mutual funds on the grounds that such assets are "money" and have already been counted in M2? Should we exclude the assets of international funds, whose underlying investments are denominated in currencies other than dollars and thus may not reflect purchasing power within the United States? More pragmatically, do the data exist to make such adjustments?

RECENT HISTORY OF THE MUTUAL FUND INDUSTRY

Net assets of stock and bond mutual funds were nearly \$1.5 trillion at the end of 1993, about 24 times higher than in 1980 (Figure 3). Most of this dramatic growth reflected heavy purchases of fund shares by investors, as opposed to revaluations of fund investments.

During the 1980s, net purchases of bond and equity mutual funds averaged \$54 billion per year. The upswing during the 1980s was prompted, in part, by rising stock and bond prices. With incomes and wealth rising, investors were interested in taking advantage of potential gains in equity and bond markets, and mutual funds permitted small investors to invest in a diversified portfolio at low cost.⁶ Investor interest may also have been spurred between 1982 and 1986 by the incentives to invest in individual retirement accounts (IRA) and Keogh accounts.⁷

The popularity of bond and equity mutual funds soared in the early 1990s. Two record years were reported in 1992 and 1993, when investors made net purchases of \$202 billion and \$266 billion, respectively (Figure 4). The increased pace of purchases stemmed, in large part, from the low-interest rate environment and the steepness of the yield curve. In early 1989,

⁶ A mutual fund is a type of investment company. It sells shares representing an interest in a pool of securities. The minimum initial investment for many long-term funds is around \$2,500, in contrast to, say, the \$10,000 minimum investment needed to purchase a Treasury bill. For a more

complete discussion of recent trends in the mutual fund industry, see Mack (1993).

⁷ IRAs and Keogh accounts are two types of tax-sheltered accounts that are used to save for retirement.

Figure 4
Net Flows into Long-Term Bond and Equity Mutual Funds

Billions of dollars, 12-month sum

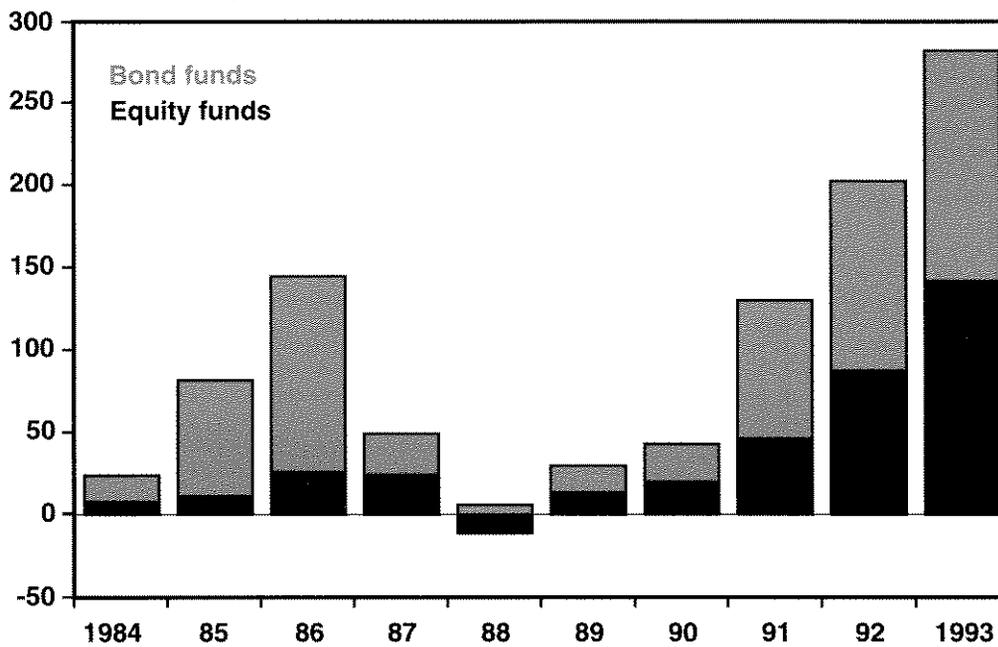


Figure 5
Yields on Treasury Bills and Bonds

Yield in percent

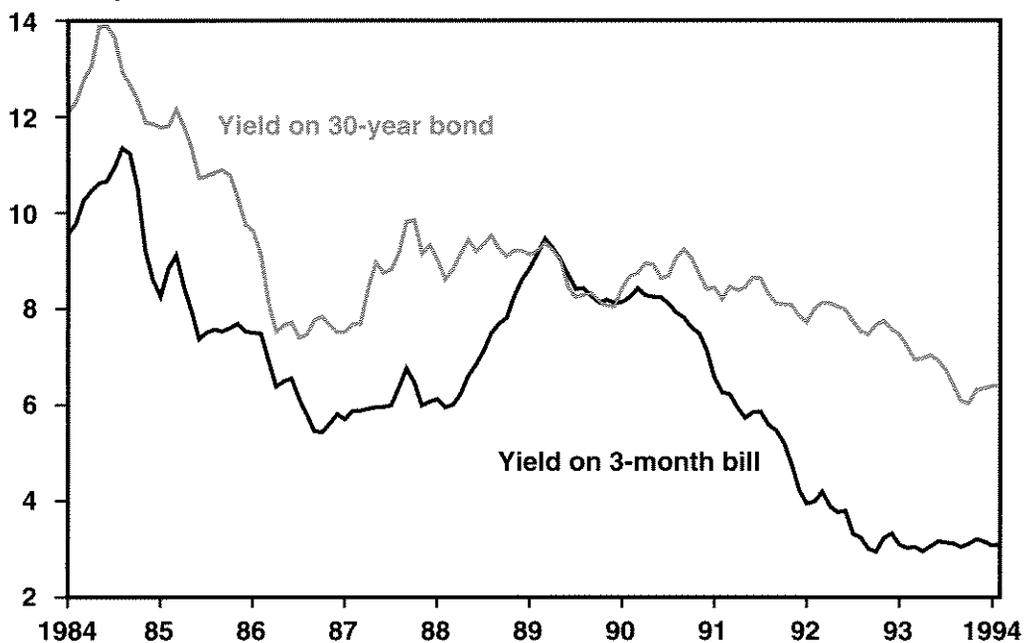


Table 1
Bond and Equity Bank-Related Mutual Funds

| Dollar Value of Assets¹ | 1989 | 1990 | 1991 | 1992 | 1993 | 1994² |
|---|-------------|-------------|-------------|-------------|-------------|-------------------------|
| Total assets of bank-related funds | 9.8 | 13.1 | 26.4 | 46.7 | 85.5 | 96.4 |
| Percent of industry assets | 1.7 | 2.3 | 3.3 | 4.4 | 5.7 | 6.3 |
| Number of funds | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| Total bank-related mutual funds | 213 | 271 | 359 | 502 | 954 | 1211 |
| Percent of all mutual funds | 9.5 | 11.5 | 13.8 | 16.8 | 26.2 | 31.1 |

Source: Lipper Analytical Services and Investment Company Institute.

¹ Billions of dollars

² Observation for 1994 is June.

the yield curve was essentially flat. Between March 1989 and December 1993, the yield on three-month Treasury bills fell by about 6 percentage points to around 3 percent, while the yield on 30-year bonds fell by 3 percentage points to about 6.25 percent (Figure 5). At the same time, equity prices were rising. Over the 24 months from January 1992 to December 1993, the stock market advanced just over 20 percent. In this rate environment, investors sought the higher returns available in long-term mutual funds. Equity funds were also apparently boosted by households substituting out of direct purchases of equities. The flow-of-funds accounts show that households' direct holdings of equities fell \$21 billion in 1993, in contrast with the \$140 billion of inflows into equity mutual funds.

Faced with a loss of deposits to mutual funds, many banks began entering the mutual fund business in the late 1980s. Since 1989, the assets of bank-related mutual funds have increased tremendously, relative to the total assets of the mutual fund industry. As shown in the top panel of Table 1, long-term bank-related mutual funds accounted for only about 2 percent of total assets of long-term funds in 1989, but this figure had more than tripled by mid-1994. As the bottom panel of Table 1 shows, the number of long-term funds offered by banks climbed even faster, experiencing more than a fivefold increase from 1989 to mid-1994. In contrast, for the industry as a whole, the number of long-term funds less than doubled over the same

period (from 2,242 funds to 3,894 funds). As a result, the banking sector created nearly 60 percent of all new long-term funds over this period. The watershed year for bank-related long-term funds was 1992, when the average number of funds sold per bank jumped sharply. In that year, Nationsbank started 55 new long-term funds, and many other banks plunged into the business as well.

ARE MUTUAL FUND SHARES MONEY?

Economists have typically asked two questions when designing monetary aggregates: Do the assets in question serve as a transaction balance or a medium of exchange, and is the asset readily convertible into a transaction balance? For our purposes, we consider to what extent shares held in long-term mutual funds may be used as payment for goods, services or other assets. We also explore whether individuals consider fund shares to be readily convertible into transaction balances.

Investments in bond and equity mutual funds cannot generally be used as a medium of exchange or as a transaction balance. Some bond funds are exceptions. Bond funds sometimes offer a check-writing option that permits investors to make purchases by writing a check directly against their bond fund assets. Thus, there is good reason to consider some portion of the assets of bond funds to be transaction balances. Indeed, check writing is nearly universal among money market mutual funds, whose assets are included in M2. On the other

hand, although both money market funds and bond funds typically impose minimum dollar amounts on checks written against them (often \$500), the check-writing feature of bond funds is usually less flexible, because they sometimes impose maximum dollar amounts (often 50 percent of an investor's total bond fund assets).⁸

Irrespective of the check-writing features they offer, mutual funds can be quite liquid. Investors can usually redeem assets by telephone and have the proceeds wired to their checking or money market fund the same day.⁹ Moreover, the vast majority of fund complexes (a group of funds managed by the same advisor) routinely offer exchange privileges at nominal cost or no cost. Exchange privileges allow investors to shift assets between long-term funds and money market funds (or other long-term funds) within their complex. Thus, a telephone call again allows fund investors to shift in and out of M2-type accounts (that is, retail money market mutual funds). Figure 6 shows the cumulative sum of net exchanges out of money market funds into long-term funds for the years 1989 to 1993. This sum rose during the 1990-93 period, when the M2 forecasting equation went off track. Although the cumulative sum is not particularly large, relative to the \$380 billion of missing M2, it does suggest that there is a quantitatively important, and technologically direct, substitution between a component of M2 and long-term mutual funds. One factor that tempers this argument is that some mutual funds charge exit fees (back-end loads). By raising transaction costs, back-end loads reduce substitutability between long-term mutual funds and M2 balances.

Another way to decide whether an asset is "money" is to look at its turnover rate, measured as total withdrawals divided by outstanding balances. Spindt (1985) argued that transaction accounts have high turnover rates; therefore, the higher the transaction balance, the greater the degree of "moneyness." Figure 7 shows turnover rates for some of the components of M2, along with turnover rates for equity and bond funds. Turnover rates for checkable deposits are quite high, reflecting their use as the primary transaction account for most households. Turnover rates on savings accounts and money market mutual funds are somewhat lower. Turnover ratios on

long-term funds are quite low, an indication that individuals regard these accounts mainly as savings vehicles, rather than transaction balances. Figure 7 lacks one important series: the turnover ratio for small time deposits. Unfortunately, the Federal Reserve does not collect this information. Staff at the Federal Reserve Board, however, have estimated that the turnover ratio for small time deposits is on the order to 1 percent to 1.5 percent at an annual rate, which is reasonably close to the estimated turnover ratio for long-term funds.

In summary, there are some reasons to think of the assets of bond and equity mutual funds as "money," or at least close substitutes for money. Although the reasons for believing mutual fund assets to be money are not overwhelmingly strong, they are about as favorable as the case for calling small time deposits money. Both small time deposits and long-term mutual fund assets are mainly savings balances, as opposed to transaction balances. Both have a high degree of substitutability (or potential substitutability) with other kinds of M2 balances. In addition, investors in these instruments may face some penalty for withdrawing their balances.

DESIRED DATA

The current monetary aggregates measure the public's holdings of money first by summing the total outstanding amounts of instruments deemed to be money and then subtracting money holdings of the U.S. government, foreign governments, depository institutions, and money market mutual funds. (Table 2 shows the construction of M2.) The current aggregates also attempt to distinguish between individual (retail) and institutional holdings of money market mutual funds. This distinction is based on the belief that individuals' holdings of money market mutual funds are more closely related to consumption and income than are institutions' holdings, which are more tightly linked to financial market conditions. In practice, however, making such a distinction is difficult because data on money funds are available only by type of fund, not by type of holder. Consequently, the distinction between retail and institutional money funds is not clear cut: Funds deemed to be institution-only funds accept investments from individuals as long as those individuals meet the sizable minimum investment

⁸ Maximums are imposed to prevent an investor from incurring an overdraft if bond prices fell sharply on the day that the check clears.

⁹ Proceeds can also be mailed by check, but this option would reduce liquidity relative to the wire transfer option.

Figure 6
Net Exchanges Into Long-Term Funds from Money Market Mutual Funds

Billions of dollars

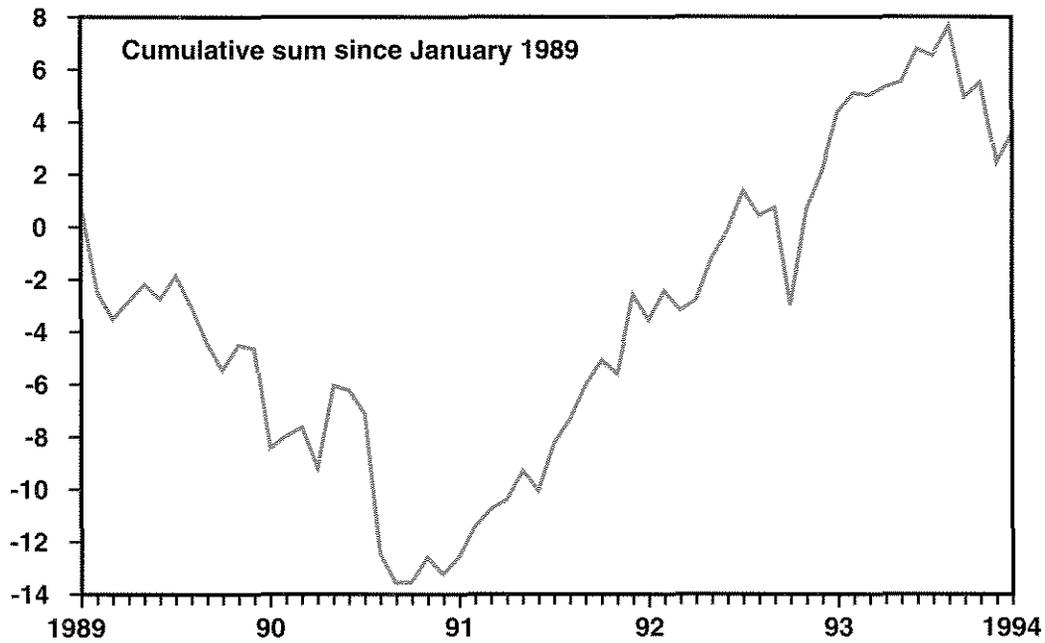
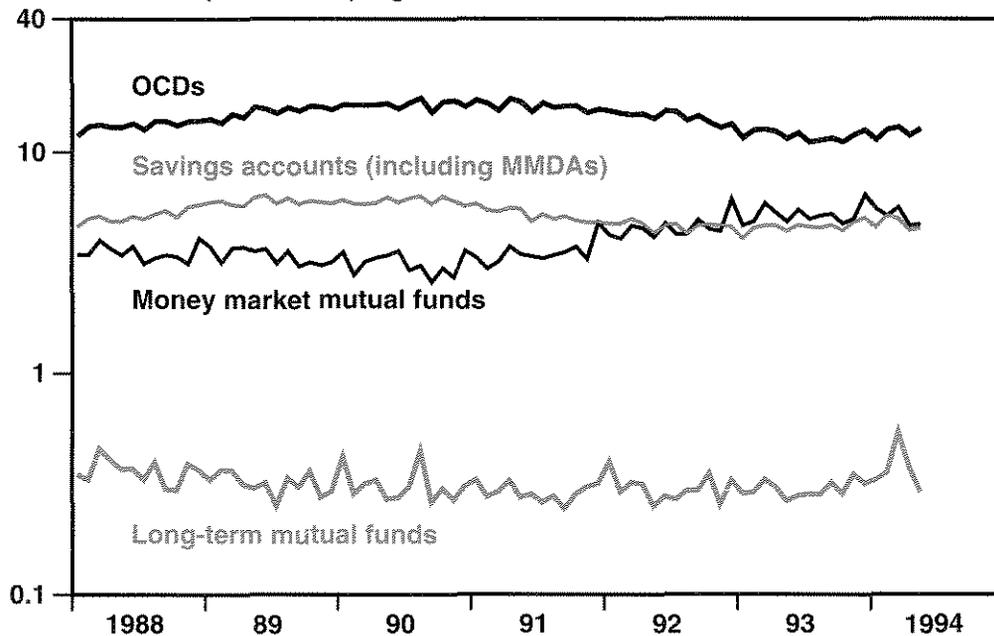


Figure 7
Turnover Ratios of Selected Financial Assets

Turnover ratio (annualized)/log scale



requirements, and institutions can invest in retail funds.¹⁰

The guiding principle we followed when constructing M2+ was to parallel the current construction of M2. The data needed to add bond and equity mutual funds to M2 are in many ways similar to those that were needed to incorporate money market mutual funds into M2. We must be able to measure the total net assets of long-term mutual funds and, for netting purposes, the monetary investments of such funds, as well as balances held by institutions or invested in retirement accounts. Table 3 summarizes the series necessary for the construction of M2+.

The first requirement for building M2+ is an accurate measure of total net assets of bond and equity mutual funds. Total net assets of a mutual fund are simply its total assets—essentially the market value of its securities portfolio—less its total liabilities, which include such items as accounts payable (for investments purchased or shares redeemed), accrued management fees, and other accrued expenses.¹¹ We included reinvested dividends and capital gains in order to treat these items like interest credited on deposits, which is included in M2.

The second requirement is to distinguish between mutual fund holdings of individual and institutional investors. In order to parallel the current treatment of money market mutual funds, we would split bond and equity mutual funds into retail and institution-only funds; we cannot do so, however, because long-term funds typically accept investments from both individual and institutional investors. Therefore, we need data on holdings of long-term mutual funds by type of investor, with individual holdings appearing in M2+.

Bond and equity mutual funds invest in instruments included in the monetary aggregates. If the total net assets of these funds were simply added to M2, the funds' holdings of monetary instruments would be counted twice because their holdings already would be included in the outstanding amounts of monetary instruments, such as overnight RPs with banks. To avoid this

Table 2
Current Definitions of the Monetary Aggregates

| | |
|------|--|
| M1 = | currency (public holdings) |
| | + travelers checks of nonbank issuers |
| | + demand deposits at all commercial banks (less cash items in the process of collection and Federal Reserve float) |
| | – demand deposits due to depository institutions, the U.S. government, foreign banks, and foreign official institutions |
| | + other checkable deposits |
| M2 = | M1 |
| | + overnight and continuing contract RPs issued by all depository institutions |
| | + overnight Eurodollars issued to U.S. residents by foreign branches of U.S. banks worldwide |
| | + savings deposits (including money market deposit accounts) |
| | + small-denomination time deposits |
| | + balances at retail money market mutual funds |
| | – U.S. commercial bank, U.S. government, foreign government, foreign commercial bank, and retail money market mutual fund holdings of all non-M1 components |
| | – IRA/Keogh balances at depository institutions and money market mutual funds |

double counting, monetary investments of long-term funds should be excluded from M2+, just as holdings of monetary instruments by money funds and depository institutions are excluded from M2. Therefore, we need data on bond and equity fund holdings of overnight Eurodollars and overnight RPs with depository institutions. Moreover, the data ideally would allow us to apportion these so-called netting items between those due to retail investors and those due to institutional investors.

Finally, paralleling the current aggregates requires us to exclude from the M2+ aggregate IRA and Keogh balances held as bond and equity

¹⁰ Institution-only money funds are funds that impose high minimum balances on shareholders. These minimums—usually \$50,000—are prohibitively high for the great majority of retail customers.

¹¹ The value of a share in a long-term fund is calculated each day by dividing the total net assets of the fund by the number of shares outstanding.

mutual fund shares. IRA/Keogh accounts are savings vehicles and typically are not used for transaction purposes. Indeed, these accounts are extremely illiquid because federal law imposes stiff penalties for withdrawals before retirement. Of course, for individuals of retirement age (59-and-a-half or older), IRA/Keogh balances are liquid. As a practical matter, though, it would be nearly impossible to estimate the percentage of IRA/Keogh balances that might be considered liquid. As a result, instead of making an arbitrary assumption about the proportion of IRA/Keogh balances that are liquid, M2 simply excludes all IRA/Keogh balances held in deposit accounts and money market funds, and we follow that approach for M2+ by removing balances held in IRA/Keogh accounts from the measure of total net assets of long-term funds.

ACTUAL CONSTRUCTION OF M2+

Not all of the desired data set forth in the previous section are available. This section therefore discusses data availability and gives the technical details on how the augmented aggregate M2+ was constructed. (Table 4 provides a summary.)

The Investment Company Institute (ICI) is a prominent source of mutual fund data. It is funded by contributions from its members, which comprise the vast majority of investment companies. On behalf of the Federal Reserve, ICI has been collecting data on money funds for over 12 years, including data on their assets, their investments and their IRA/Keogh balances. These series are used in the construction of M2, M3 and L. We have used ICI's data on long-term funds to construct M2+.

Net Asset Data

Monthly data on the total net assets of bond and equity mutual funds are drawn from ICI's *Trends in Mutual Fund Activity*. This release publishes (with a lag of about one month) data on total net assets held by long-term funds measured as of month-end. In 1993, ICI collected data from over 3,000 long-term funds. From the *Trends* releases, we compiled a monthly series on the total net assets of bond and equity mutual funds back to 1959.

We deviated from our guiding principle of constructing M2+ like M2 in only one area: net assets of global and international mutual funds. These funds invest in debt and equity instruments

Table 3

Theoretical Definition of M2+

| | |
|-------|--|
| M2+ = | current M2 |
| | + net assets of bond funds held by individual investors |
| | + net assets of equity funds held by individual investors |
| | - bond and equity fund holdings of overnight RPs attributable to individuals |
| | - bond and equity fund holdings of overnight Eurodollars attributable to individuals |
| | - IRA and Keogh holdings at bond and equity mutual funds |

denominated in foreign currencies, as well as those denominated in dollars. Although M2 excludes deposits denominated in foreign currencies, we incorporated the assets of these types of funds in M2+. This treatment seems justified by the following considerations. First, doing so permits M2+ to internalize substitutions between non-dollar-denominated and dollar-denominated funds. Second, the foreign currency deposits netted from M2 have been quite small, amounting to only a few billion dollars. Moreover, these assets are thought to be held by institutions, mainly for clearing purposes. Thus, the netting of these assets has little impact on the monetary aggregates, and doing so skirts a difficult theoretical issue: Are non-dollar-denominated assets money in the United States? This issue cannot be swept aside when considering long-term mutual funds. The assets of international mutual funds are thought to be held mainly by retail investors and are growing rapidly. Although the underlying investments of these funds are denominated in foreign currencies, these funds' net asset values (share prices) are reported in dollars and thus may be viewed by retail investors as liquid investments that are highly substitutable for assets in M2 or for other kinds of mutual funds whose underlying investments are denominated in dollars. Finally, because of data limitations, it would be very difficult to extract only the dollar-denominated holdings of these funds for inclusion in M2+.

Institutional Holdings

In order to apportion the total net assets of

Table 4

Actual Construction of M2+

| | |
|-------|---|
| M2+ = | current M2 |
| | + net assets of bond funds |
| | + net assets of equity funds |
| | - institutional holdings of bond and equity funds |
| | - IRA and Keogh assets at bond and equity funds |

long-term mutual funds between retail and institutional holdings, we made use of the ICI's survey of institutional holdings of long-term mutual funds. ICI first surveyed such holdings in 1954 and did so biennially until 1980. Since that time, its survey has been conducted annually. In the survey, mutual funds report the percent of their assets held by various institutions on the last day of the calendar year. Among the largest institutional holders are fiduciaries (bank trust departments) and retirement plans. The data are disaggregated enough to permit us to apportion institutional holdings of mutual funds between long-term funds and money market funds for survey dates back to 1974. For earlier years, we have assumed that the assets of money market mutual funds were zero; thus, any institutional holdings in these years are allocated to long-term funds.

We had to make several adjustments to the raw data in order to derive a monthly series on institutional holdings. First, we adjusted for the changes in the format of ICI's survey by making several ad hoc adjustments to remove the breaks in the series. Second, we converted the break-adjusted series into monthly observations. We did so by linearly interpolating between surveys the end-of-year ratio of institutional assets to total net assets of long-term funds. Third, we multiplied each of the resulting monthly ratios by total net assets in the corresponding month to derive the series on institutional holdings. We could then construct a series on retail holdings of long-term mutual funds by subtracting our institutional series from total net assets. The resulting series therefore may be subject to considerable month-to-month error because of the assumptions required to estimate institutional

holdings on a monthly basis. Nonetheless, analyses of the long-run behavior of M2+ likely would not be impaired much because, by construction, the interpolated series is tied to ICI's year-end observations.

Liquid Investments

The current monetary aggregates, M2 and M3, are constructed to avoid double-counting of assets. For example, the RP and Eurodollar investments of money market mutual funds are excluded from the monetary aggregates to avoid counting them twice: once in the money fund component of M2, and again in the RP and Eurodollar components of M2. To avoid double-counting when constructing M2+, we needed data on long-term mutual fund holdings of M2 instruments, such as overnight RPs and Eurodollars. Most bond and equity mutual funds hold a portion of their portfolios in liquid investments to meet investors' demands for share redemption. ICI has collected monthly data on the total liquid investments of long-term funds since 1960, with a detailed breakdown of such investments into short-term Treasury securities, short-term municipal securities, and "cash and other receivables" beginning in 1991. Nonetheless, this breakdown is still too aggregated for our purposes. Rather than arbitrarily create a series on long-term mutual funds holdings of M2-type assets, which would consist principally of overnight RPs and Eurodollars, we chose to make no adjustment at all. Our view was that these holdings would be a relatively small portion of M2+ and that any assumption we might make to remove them could well introduce greater error into M2+ than that caused by double-counting them.

IRA/Keogh Assets

Retirement account balances are thought to be too illiquid to be used as transaction balances. Consequently, the monetary aggregates exclude balances in IRA and Keogh accounts. To parallel this treatment, we used ICI's data on IRA/Keogh balances in long-term mutual funds to exclude such holdings from M2+. Month-end data on the assets of bond and equity mutual funds that are held in IRA and Keogh accounts balances begin in January 1983. Data for earlier periods are available either quarterly or annually.¹² For years prior to 1983, we constructed monthly observations on

¹² Only year-end figures on these assets are available for 1981 and 1982. Quarter-end figures are available for IRA accounts from 1975 to 1980 and from 1964 to 1980 for

Keogh accounts. Earlier data for IRA accounts are not available, but balances in these accounts were essentially nil before 1977.

IRA/Keogh balances of long-term funds by linearly interpolating the ratio of IRA/Keogh assets to total net assets of long-term funds between the quarterly or annual observations. We then multiplied this interpolated ratio by the total net assets of long-term funds for the corresponding month.¹³

Deriving Monthly Averages

ICI's long-term mutual fund data are month-end observations. M2 is a monthly average derived from either daily or weekly data, depending on the component. In order to add the mutual fund data to M2, items related to mutual funds had to be converted to a month-average basis. We approximated monthly averages for ICI's data by taking two-month moving averages of the month-end figures for total net assets, institutional holdings and IRA/Keogh balances.

Seasonal Adjustment

As Figure 8 shows, some of the components of the monetary aggregates have large seasonal regularities. Seasonality in the aggregates arises primarily from their transaction nature; for instance, currency demand is seasonally high in December because of Christmas shopping. Tax payments, other holidays and interest crediting also occur seasonally. If the monetary aggregates were not adjusted for seasonal variation, it would be hard to discern changes in money demand related to movements in interest rates and income. Because it is these latter effects that are of primary interest to policymakers, seasonal adjustment of the monetary aggregates is imperative.

As a rule, seasonality is strongest within the components of M1 and less so for those in non-M1 M2 because the components of non-M1 M2 are not used as extensively as M1 for transaction purposes (Figure 9). With respect to long-term mutual fund assets, which we have suggested may be driven less by transaction motives than by savings motives, one might expect to find weak, or nonexistent, seasonality. If so, it would obviate

the need for us to seasonally adjust such assets before adding them to M2. Figure 10 indicates that there is indeed little apparent seasonality in the assets of mutual funds.

Nevertheless, our guiding principle of paralleling the current construction of M2 dictates that mutual fund assets should be seasonally adjusted before adding them to M2. Accordingly, we used the following seasonal adjustment procedure. We constructed a not-seasonally adjusted (NSA) measure of household holdings of mutual fund assets, called the "plus" portion of M2+, as shown in Table 4. This component is the assets of bond and equity funds less institutional holdings and IRA/Keogh balances. The "plus" portion is then seasonally adjusted using Census X-11, assuming multiplicative seasonality.¹⁴ Seasonally adjusted M2+ is constructed by adding the seasonally adjusted "plus" portion to seasonally adjusted M2. A comparison of M2 and M2+ is shown in Figure 11, and Appendix 1 provides estimates of M2+ for recent years.¹⁵

CONCLUDING REMARKS

This paper has detailed construction of an alternative monetary aggregate that adds household holdings of bond and equity mutual funds to M2. This aggregate has the advantage of internalizing some of the observed substitution between long-term mutual funds and M2 balances. The empirical evidence discussed by Orphanides, Reid and Small (1994) suggests that M2+ does have some advantages over M2, in that its velocity appears to have been more "sensible" over the past few years. Consequently, the predictability of GDP is improved. A major drawback of this aggregate, however, is that it is very sensitive to movements in bond and equity prices. For example, in early 1994, the velocity of M2+ rose sharply, in large part reflecting declines in bond and equity prices, and it remains to be seen whether the velocity of M2+ will return to its trend level. In fact, the only sure test of a monetary aggregate is the test of time. If financial

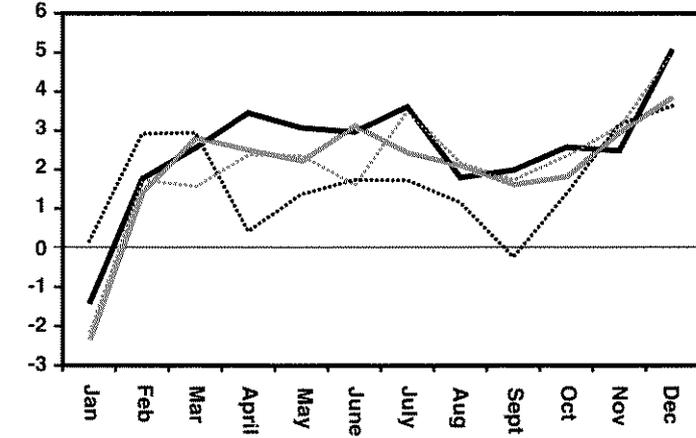
¹³ There are many other types of retirement vehicles, such as employer-sponsored retirement plans and annuities; however, only IRA/Keogh balances are subtracted from M2. The measure of M2+ that we constructed did not include balances in retirement accounts other than IRA and Keogh accounts because these accounts are included in ICI's measure of institutional holdings. Thus, subtracting institutional holdings from total net assets removes these balances from M2+. Strictly speaking, we have again deviated from our practice of paralleling the construction of M2, but we do not feel that the deviation impairs the usefulness of the M2+ aggregate.

¹⁴ This algorithm is essentially the same one used to seasonally adjust the current monetary aggregates. For a complete description of that algorithm, see Farley and O'Brien (1987).

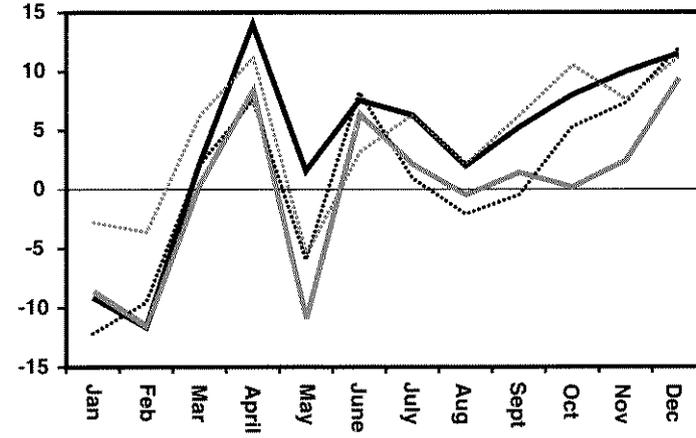
¹⁵ The reader is referred to Orphanides, Reid and Small (1994) for a discussion of the empirical properties of M2+.

Figure 8
Seasonality in Selected Components of M2 (billions of dollars)

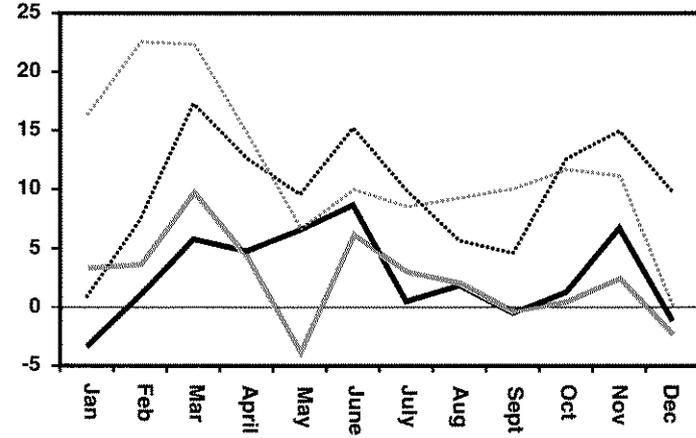
First Differences in Currency



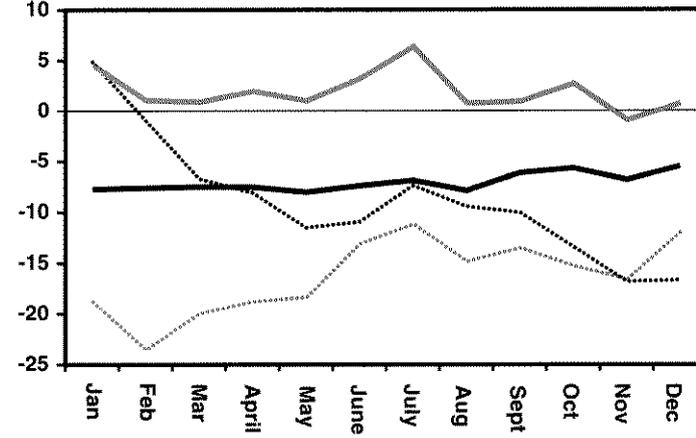
First Differences in Demand Deposits



First Differences in Savings (including MMDAs)



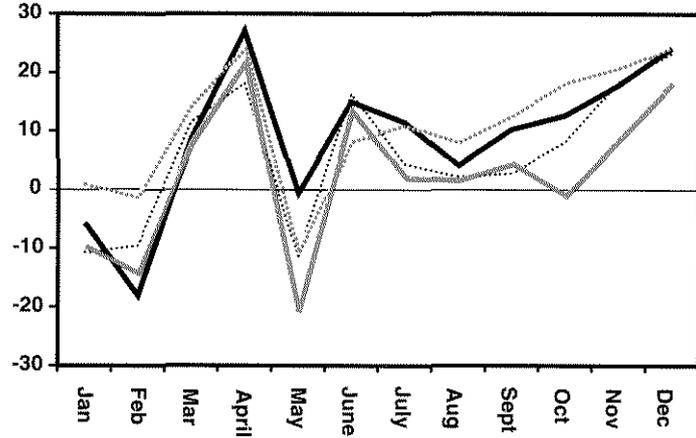
First Differences in Small Time Deposits



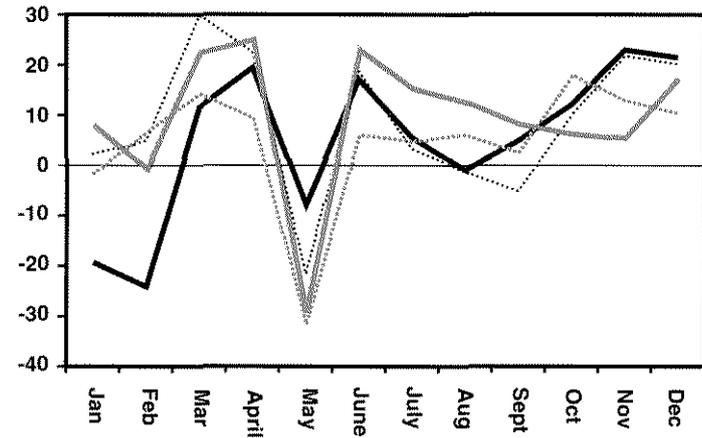
1990 ——— 1992
 1991 1993 ———

Figure 9
Seasonality in Selected Monetary Aggregates (billions of dollars)

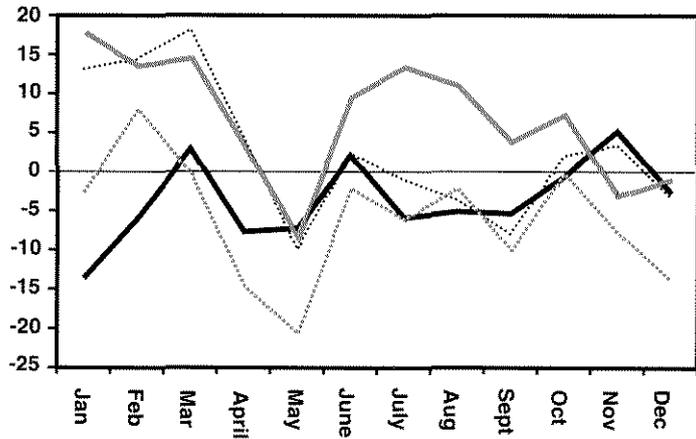
First Differences in M1



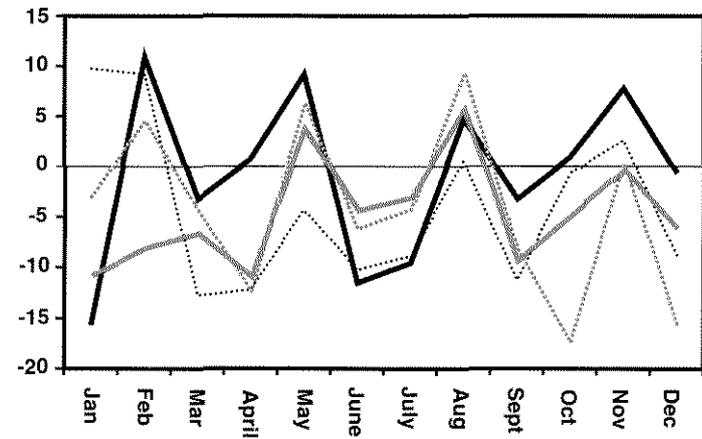
First Differences in M2



First Differences in Non-M1 M2



First Differences in Non-M2 M3



1990 1992
 1991 1993 ———

Figure 10
Seasonality in Assets of Long-Term Mutual Funds
 Growth rate of assets of bond and equity mutual funds (annualized)

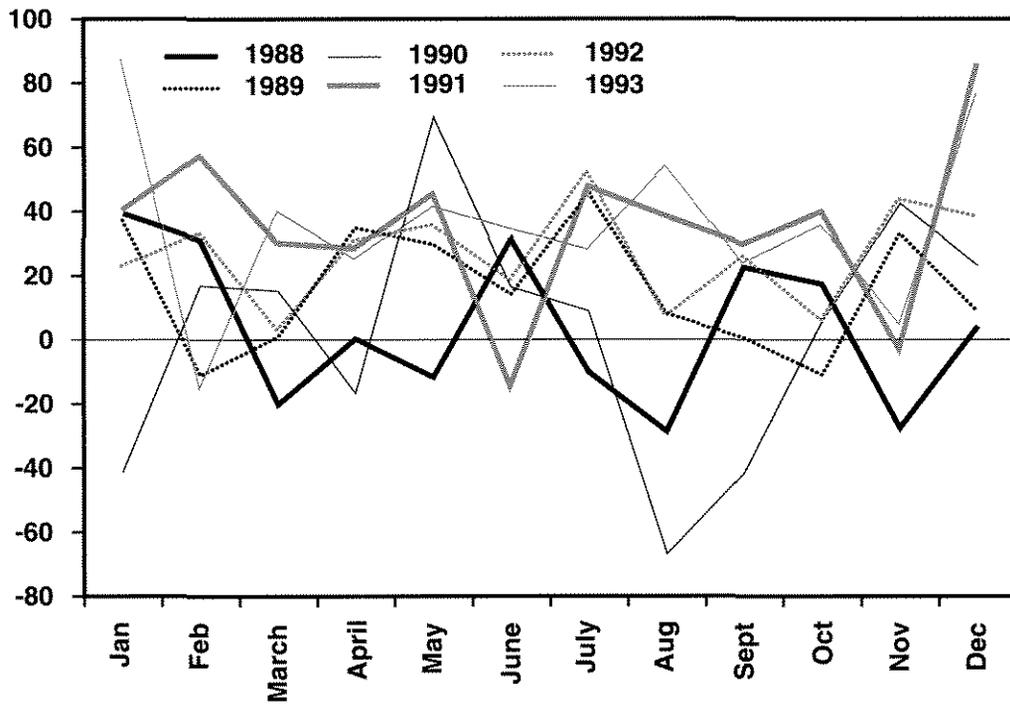
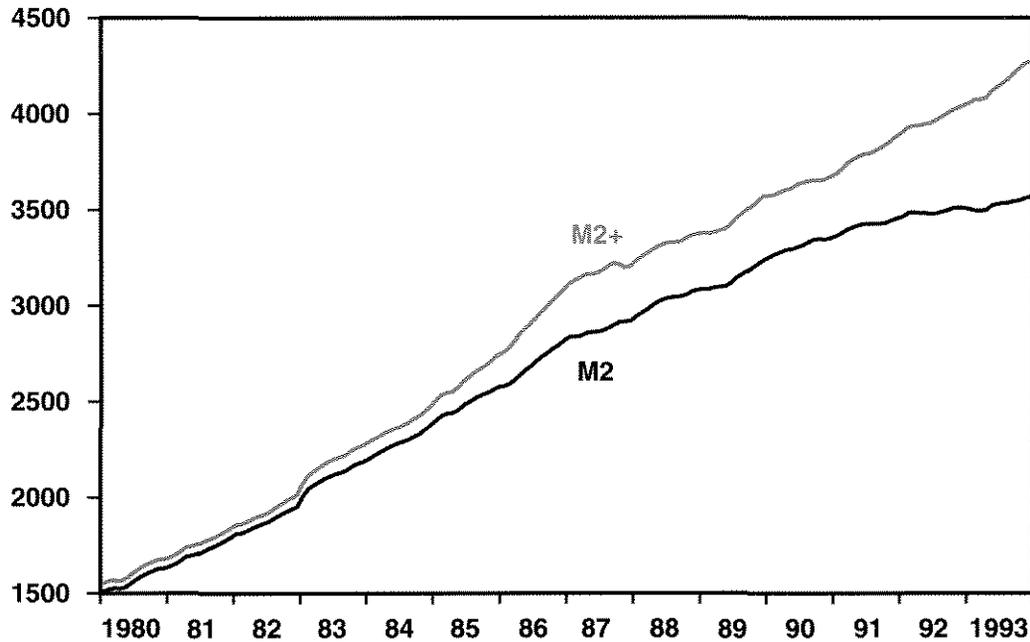


Figure 11
M2, and M2 Plus Household Holdings of Bond and Equity Mutual Funds
 Billions of dollars



innovation continues at a rapid pace in the 1990s and depositories continue to lose their share of credit intermediation, then the usefulness of M2+ as an indicator of economic activity may grow as intermediation continues to shift to mutual funds.

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Appendix 1

M2 and M2 Plus Bond and Stock Mutual Funds (M2+)¹

| | | Levels (billions of \$) | | Growth rates | | |
|-----------------------|----|----------------------------|------------|--------------|------------|-----------------------|
| | | M2 (1) | M2+ (2) | M2 (3) | M2+ (4) | Difference (4)-(3) |
| Monthly | | | | | | |
| 1993 | 1 | \$ 3502.8 | \$ 4046.7 | -2.1 | 3.5 | -5.6 |
| 1993 | 2 | 3494.2 | 4063.6 | -2.9 | 5.0 | -7.9 |
| 1993 | 3 | 3494.8 | 4066.2 | .2 | .7 | -5.5 |
| 1993 | 4 | 3498 | 4072.8 | 1.0 | 1.9 | -.8 |
| 1993 | 5 | 3521.9 | 4108.1 | 8.1 | 10.4 | -2.2 |
| 1993 | 6 | 3528.7 | 4128.5 | 2.3 | 5.9 | -3.6 |
| 1993 | 7 | 3533.7 | 4148.3 | 1.6 | 5.7 | -4.0 |
| 1993 | 8 | 3536 | 4169.2 | .7 | 6.0 | -5.2 |
| 1993 | 9 | 3544.2 | 4201.8 | 2.7 | 9.3 | -6.6 |
| 1993 | 10 | 3547.8 | 4225.6 | 1.2 | 6.8 | -5.5 |
| 1993 | 11 | 3560.1 | 4252.3 | 4.1 | 7.5 | -3.4 |
| 1993 | 12 | 3567.6 | 4265.1 | 2.5 | 3.6 | -1.0 |
| 1994 | 1 | 3572.8 | 4278.9 | 1.7 | 3.8 | -2.1 |
| 1994 | 2 | 3568.9 | 4280 | -1.2 | .3 | -1.6 |
| 1994 | 3 | 3582.9 | 4276.7 | 4.6 | -.9 | 5.6 |
| 1994 | 4 | 3589.9 | 4277.1 | 2.3 | .1 | 2.2 |
| 1994 | 5 | 3590.9 | 4278 | .3 | .2 | .0 |
| 1994 | 6 | 3581.3 | 4263.8 | -3.1 | -3.9 | .7 |
| Quarterly | | | | | | |
| 1991 | 1 | 3380.6 | 3702.5 | 3.8 | 5.5 | -1.7 |
| 1991 | 2 | 3418.2 | 3765.8 | 4.4 | 6.8 | -2.3 |
| 1991 | 3 | 3427.1 | 3796.3 | 1.0 | 3.2 | -2.1 |
| 1991 | 4 | 3444.3 | 3851.2 | 2.0 | 5.7 | -3.7 |
| 1992 | 1 | 3478 | 3912.6 | 3.9 | 6.3 | -2.4 |
| 1992 | 2 | 3480.6 | 3935.7 | .2 | 2.3 | -2.0 |
| 1992 | 3 | 3488.9 | 3974 | .9 | 3.8 | -2.9 |
| 1992 | 4 | 3509 | 4022 | 2.3 | 4.8 | -2.5 |
| 1993 | 1 | 3497.3 | 4058.8 | 1.3 | 3.6 | -5.0 |
| 1993 | 2 | 3516.2 | 4103.1 | 2.1 | 4.3 | -2.2 |
| 1993 | 3 | 3538 | 4173.1 | 2.4 | 6.8 | -4.3 |
| 1993 | 4 | 3558.5 | 4247.7 | 2.3 | 7.1 | -4.8 |
| 1994 | 1 | 3574.9 | 4278.5 | 1.8 | 2.9 | -1.0 |
| 1994 | 2 | 3587.4 | 4273 | 1.3 | -.5 | 1.9 |
| Annual (Q4/Q4) | | | | | | |
| 1987 | | 2916.6 | 3197.4 | 4.3 | 4.9 | -.6 |
| 1988 | | 3070.6 | 3353.9 | 5.2 | 4.8 | .3 |
| 1989 | | 3219.2 | 3535.3 | 4.8 | 5.4 | -.5 |
| 1990 | | 3348.5 | 3651.6 | 4.0 | 3.2 | .7 |
| 1991 | | 3444.3 | 3851.2 | 2.8 | 5.4 | -2.6 |
| 1992 | | 3509 | 4022 | 1.8 | 4.4 | -2.5 |
| 1993 | | 3558.5 | 4247.7 | 1.4 | 5.6 | -4.2 |

¹ The market value of mutual funds balances added to M2 excludes balances in IRA/Keogh accounts and institutional holdings of long-term mutual funds. Data are seasonally adjusted.

Appendix 2

Levels of the Augmented Aggregate M2+

The table presents levels for the augmented aggregate, M2+, as well as M2. M2+ was constructed using the formulas in Table 4 and seasonally adjusted as described in the text.

| Month | M2+ | M2 | Month | M2+ | M2 | Month | M2+ | M2 | | | |
|-------|-----|-------|-------|------|----|-------|-------|------|----|-------|-------|
| 1959 | 1 | 299.3 | 286.6 | 1964 | 1 | 419.2 | 395.4 | 1969 | 1 | 615.5 | 569.3 |
| 1959 | 2 | 300.5 | 287.7 | 1964 | 2 | 421.6 | 397.6 | 1969 | 2 | 617.2 | 571.5 |
| 1959 | 3 | 302.0 | 289.0 | 1964 | 3 | 424.0 | 399.5 | 1969 | 3 | 618.9 | 573.9 |
| 1959 | 4 | 303.4 | 290.1 | 1964 | 4 | 426.3 | 401.7 | 1969 | 4 | 621.0 | 575.9 |
| 1959 | 5 | 305.9 | 292.2 | 1964 | 5 | 429.0 | 404.2 | 1969 | 5 | 622.2 | 576.5 |
| 1959 | 6 | 307.8 | 293.9 | 1964 | 6 | 432.2 | 406.8 | 1969 | 6 | 623.3 | 578.4 |
| 1959 | 7 | 309.6 | 295.3 | 1964 | 7 | 436.4 | 410.1 | 1969 | 7 | 623.2 | 579.8 |
| 1959 | 8 | 310.8 | 296.4 | 1964 | 8 | 439.7 | 413.3 | 1969 | 8 | 623.5 | 580.5 |
| 1959 | 9 | 310.7 | 296.4 | 1964 | 9 | 443.1 | 416.5 | 1969 | 9 | 625.5 | 582.2 |
| 1959 | 10 | 310.9 | 296.5 | 1964 | 10 | 446.1 | 419.2 | 1969 | 10 | 627.8 | 583.8 |
| 1959 | 11 | 311.5 | 297.1 | 1964 | 11 | 448.9 | 422.2 | 1969 | 11 | 630.8 | 586.9 |
| 1959 | 12 | 312.1 | 297.7 | 1964 | 12 | 451.4 | 424.7 | 1969 | 12 | 631.9 | 589.5 |
| 1960 | 1 | 312.4 | 298.2 | 1965 | 1 | 454.7 | 427.8 | 1970 | 1 | 631.1 | 591.1 |
| 1960 | 2 | 312.4 | 298.5 | 1965 | 2 | 457.8 | 430.4 | 1970 | 2 | 628.8 | 588.5 |
| 1960 | 3 | 313.2 | 299.2 | 1965 | 3 | 460.5 | 433.0 | 1970 | 3 | 630.9 | 589.3 |
| 1960 | 4 | 314.1 | 300.0 | 1965 | 4 | 463.1 | 435.5 | 1970 | 4 | 629.0 | 590.4 |
| 1960 | 5 | 315.2 | 300.9 | 1965 | 5 | 465.0 | 437.0 | 1970 | 5 | 628.8 | 593.5 |
| 1960 | 6 | 316.9 | 302.1 | 1965 | 6 | 467.5 | 439.8 | 1970 | 6 | 631.0 | 597.1 |
| 1960 | 7 | 319.2 | 304.2 | 1965 | 7 | 470.7 | 442.8 | 1970 | 7 | 635.8 | 600.4 |
| 1960 | 8 | 321.9 | 306.8 | 1965 | 8 | 474.3 | 445.6 | 1970 | 8 | 643.0 | 606.1 |
| 1960 | 9 | 323.3 | 308.2 | 1965 | 9 | 478.6 | 449.1 | 1970 | 9 | 650.2 | 612.4 |
| 1960 | 10 | 324.6 | 309.5 | 1965 | 10 | 483.1 | 452.7 | 1970 | 10 | 656.0 | 617.6 |
| 1960 | 11 | 326.1 | 311.0 | 1965 | 11 | 486.8 | 455.9 | 1970 | 11 | 660.8 | 622.3 |
| 1960 | 12 | 327.7 | 312.3 | 1965 | 12 | 490.7 | 459.3 | 1970 | 12 | 668.1 | 628.1 |
| 1961 | 1 | 330.3 | 314.1 | 1966 | 1 | 494.2 | 462.3 | 1971 | 1 | 675.5 | 634.0 |
| 1961 | 2 | 333.5 | 316.6 | 1966 | 2 | 496.6 | 464.5 | 1971 | 2 | 685.8 | 642.6 |
| 1961 | 3 | 335.6 | 318.1 | 1966 | 3 | 499.1 | 466.9 | 1971 | 3 | 695.9 | 651.2 |
| 1961 | 4 | 337.9 | 319.9 | 1966 | 4 | 501.5 | 469.3 | 1971 | 4 | 706.5 | 660.5 |
| 1961 | 5 | 340.8 | 322.2 | 1966 | 5 | 501.7 | 469.9 | 1971 | 5 | 715.1 | 668.7 |
| 1961 | 6 | 342.9 | 324.1 | 1966 | 6 | 502.4 | 470.9 | 1971 | 6 | 720.8 | 674.8 |
| 1961 | 7 | 344.7 | 325.6 | 1966 | 7 | 502.8 | 470.8 | 1971 | 7 | 727.6 | 681.3 |
| 1961 | 8 | 347.1 | 327.5 | 1966 | 8 | 503.2 | 472.6 | 1971 | 8 | 733.5 | 687.4 |
| 1961 | 9 | 349.1 | 329.3 | 1966 | 9 | 504.4 | 475.2 | 1971 | 9 | 740.5 | 694.4 |
| 1961 | 10 | 351.5 | 331.2 | 1966 | 10 | 505.4 | 476.0 | 1971 | 10 | 745.6 | 700.4 |
| 1961 | 11 | 354.3 | 333.4 | 1966 | 11 | 507.6 | 477.4 | 1971 | 11 | 750.7 | 706.9 |
| 1961 | 12 | 356.4 | 335.4 | 1966 | 12 | 510.6 | 479.9 | 1971 | 12 | 757.9 | 712.6 |

| Month | M2+ | M2 | Month | M2+ | M2 | Month | M2+ | M2 | | | |
|-------|-----|-------|-------|------|----|--------|--------|------|----|--------|--------|
| 1972 | 1 | 766.3 | 719.6 | 1975 | 1 | 940.1 | 912.2 | 1978 | 1 | 1328 | 1296.2 |
| 1972 | 2 | 776.1 | 728.1 | 1975 | 2 | 949.6 | 920.1 | 1978 | 2 | 1332.2 | 1301.3 |
| 1972 | 3 | 784.6 | 735.8 | 1975 | 3 | 962.0 | 931.3 | 1978 | 3 | 1341.4 | 1308.6 |
| 1972 | 4 | 789.8 | 741.2 | 1975 | 4 | 973.4 | 941.5 | 1978 | 4 | 1350.7 | 1317.1 |
| 1972 | 5 | 795.3 | 745.9 | 1975 | 5 | 987.4 | 954.1 | 1978 | 5 | 1360.7 | 1326 |
| 1972 | 6 | 801.9 | 752.6 | 1975 | 6 | 1003.5 | 969.2 | 1978 | 6 | 1367.6 | 1333.3 |
| 1972 | 7 | 811.3 | 762.3 | 1975 | 7 | 1015.1 | 981.0 | 1978 | 7 | 1376.3 | 1341.8 |
| 1972 | 8 | 820.9 | 771.8 | 1975 | 8 | 1023 | 989.7 | 1978 | 8 | 1385.5 | 1350 |
| 1972 | 9 | 829.4 | 780.9 | 1975 | 9 | 1030.6 | 998.5 | 1978 | 9 | 1399 | 1363.3 |
| 1972 | 10 | 838.3 | 789.5 | 1975 | 10 | 1037.5 | 1004.7 | 1978 | 10 | 1407.2 | 1372.6 |
| 1972 | 11 | 846.2 | 796.6 | 1975 | 11 | 1048.3 | 1014.8 | 1978 | 11 | 1412.7 | 1379.5 |
| 1972 | 12 | 855.7 | 805.1 | 1975 | 12 | 1056.5 | 1023.2 | 1978 | 12 | 1421.8 | 1388.6 |
| 1973 | 1 | 861.7 | 813.5 | 1976 | 1 | 1068.2 | 1033.9 | 1979 | 1 | 1429 | 1395.2 |
| 1973 | 2 | 863.1 | 817.8 | 1976 | 2 | 1083.2 | 1047.8 | 1979 | 2 | 1435.7 | 1401.8 |
| 1973 | 3 | 862.3 | 818.7 | 1976 | 3 | 1092.6 | 1057 | 1979 | 3 | 1446.3 | 1412.2 |
| 1973 | 4 | 865.1 | 823.2 | 1976 | 4 | 1103.6 | 1068.4 | 1979 | 4 | 1460.6 | 1426.5 |
| 1973 | 5 | 870.6 | 830.3 | 1976 | 5 | 1116.3 | 1081.8 | 1979 | 5 | 1467.8 | 1434 |
| 1973 | 6 | 876.7 | 837.2 | 1976 | 6 | 1120.9 | 1086.2 | 1979 | 6 | 1482.2 | 1448.4 |
| 1973 | 7 | 882.0 | 841.0 | 1976 | 7 | 1129.4 | 1095.2 | 1979 | 7 | 1495.1 | 1460.9 |
| 1973 | 8 | 885.5 | 843.6 | 1976 | 8 | 1143 | 1109 | 1979 | 8 | 1505.9 | 1471 |
| 1973 | 9 | 886.6 | 844.6 | 1976 | 9 | 1155.6 | 1120.9 | 1979 | 9 | 1517.7 | 1482.8 |
| 1973 | 10 | 892.1 | 848.5 | 1976 | 10 | 1171.4 | 1136 | 1979 | 10 | 1522.4 | 1488.4 |
| 1973 | 11 | 894.9 | 854.4 | 1976 | 11 | 1183.8 | 1148.7 | 1979 | 11 | 1523.9 | 1490.5 |
| 1973 | 12 | 899.0 | 860.9 | 1976 | 12 | 1199.4 | 1163.6 | 1979 | 12 | 1530.7 | 1497 |
| 1974 | 1 | 902.7 | 865.4 | 1977 | 1 | 1212.6 | 1177.1 | 1980 | 1 | 1542.3 | 1507.8 |
| 1974 | 2 | 906.6 | 870.3 | 1977 | 2 | 1222.5 | 1188.3 | 1980 | | 1555.8 | 1520.7 |
| 1974 | 3 | 911.9 | 876.5 | 1977 | 3 | 1233.3 | 1199.4 | 1980 | 3 | 1559.8 | 1527.3 |
| 1974 | 4 | 913.2 | 879.1 | 1977 | 4 | 1244.7 | 1211.2 | 1980 | 4 | 1554.9 | 1524.1 |
| 1974 | 5 | 914.1 | 881.2 | 1977 | 5 | 1254.9 | 1221.5 | 1980 | 5 | 1565.2 | 1532.7 |
| 1974 | 6 | 916.2 | 884.6 | 1977 | 6 | 1263.9 | 1230.1 | 1980 | 6 | 1586.6 | 1552.5 |
| 1974 | 7 | 918.5 | 888.0 | 1977 | 7 | 1275 | 1240.9 | 1980 | 7 | 1609.2 | 1573.6 |
| 1974 | 8 | 919.8 | 891.1 | 1977 | 8 | 1284.1 | 1250.3 | 1980 | 8 | 1627.9 | 1590.3 |
| 1974 | 9 | 921.2 | 895.1 | 1977 | 9 | 1293.9 | 1260.3 | 1980 | 9 | 1642.4 | 1604.5 |
| 1974 | 10 | 927.3 | 900.2 | 1977 | 10 | 1302.8 | 1269.9 | 1980 | 10 | 1654.9 | 1616.8 |
| 1974 | 11 | 933.7 | 905.4 | 1977 | 11 | 1311.2 | 1278.2 | 1980 | 11 | 1667 | 1628.9 |
| 1974 | 12 | 935.9 | 908.4 | 1977 | 12 | 1320.8 | 1286.5 | 1980 | 12 | 1667.6 | 1629.3 |

| Month | M2+ | M2 | Month | M2+ | M2 | Month | M2+ | M2 | | | |
|-------|-----|--------|--------|------|----|--------|--------|------|----|--------|--------|
| 1981 | 1 | 1677.6 | 1640 | 1984 | 1 | 2278.5 | 2202.4 | 1987 | 1 | 3105.7 | 2836.8 |
| 1981 | 2 | 1689.8 | 1652 | 1984 | 2 | 2296.6 | 2221.2 | 1987 | 2 | 3121.6 | 2837 |
| 1981 | 3 | 1709.7 | 1670.8 | 1984 | 3 | 2311.4 | 2236.8 | 1987 | 3 | 3136.3 | 2841.4 |
| 1981 | 4 | 1730.5 | 1691.7 | 1984 | 4 | 2327.9 | 2252.8 | 1987 | 4 | 3152.7 | 2855.8 |
| 1981 | 5 | 1736.3 | 1697 | 1984 | 5 | 2341.4 | 2267.7 | 1987 | 5 | 3155.2 | 2860.7 |
| 1981 | 6 | 1745.4 | 1705.5 | 1984 | 6 | 2352.9 | 2279.8 | 1987 | 6 | 3159.6 | 2862.6 |
| 1981 | 7 | 1757.9 | 1718.7 | 1984 | 7 | 2364.7 | 2290.3 | 1987 | 7 | 3173.8 | 2868.8 |
| 1981 | 8 | 1773.1 | 1734.9 | 1984 | 8 | 2378.8 | 2299.9 | 1987 | 8 | 3195.2 | 2882.7 |
| 1981 | 9 | 1782 | 1745.8 | 1984 | 9 | 2399.7 | 2316.3 | 1987 | 9 | 3211.9 | 2898 |
| 1981 | 10 | 1797.1 | 1760.5 | 1984 | 10 | 2413.6 | 2328.7 | 1987 | 10 | 3207.4 | 2913.8 |
| 1981 | 11 | 1814.7 | 1776.8 | 1984 | 11 | 2438.1 | 2353.1 | 1987 | 11 | 3189.5 | 2915.8 |
| 1981 | 12 | 1831.4 | 1793.3 | 1984 | 12 | 2464.1 | 2377.8 | 1987 | 12 | 3195.4 | 2920.1 |
| 1982 | 1 | 1850.3 | 1812.6 | 1985 | 1 | 2495.5 | 2403.5 | 1988 | 1 | 3223.4 | 2944.6 |
| 1982 | 2 | 1853.2 | 1815.9 | 1985 | 2 | 2524.4 | 2427.2 | 1988 | 2 | 3245 | 2963.3 |
| 1982 | 3 | 1865.4 | 1828.5 | 1985 | 3 | 2536.6 | 2438.7 | 1988 | 3 | 3262.3 | 2981.1 |
| 1982 | 4 | 1879.8 | 1842.6 | 1985 | 4 | 2541.8 | 2442.2 | 1988 | 4 | 3282.5 | 3003.7 |
| 1982 | 5 | 1892.2 | 1854.4 | 1985 | 5 | 2564.4 | 2457.8 | 1988 | 5 | 3299.4 | 3021.5 |
| 1982 | 6 | 1902.6 | 1865.3 | 1985 | 6 | 2597.9 | 2484.2 | 1988 | 6 | 3312.3 | 3033.9 |
| 1982 | 7 | 1914.4 | 1877.1 | 1985 | 7 | 2619.8 | 2500.4 | 1988 | 7 | 3319.9 | 3041.2 |
| 1982 | 8 | 1936.2 | 1895.8 | 1985 | 8 | 2643.1 | 2518 | 1988 | 8 | 3319.2 | 3044.6 |
| 1982 | 9 | 1954.2 | 1910.7 | 1985 | 9 | 2661.9 | 2533.3 | 1988 | 9 | 3325.7 | 3047.6 |
| 1982 | 10 | 1972.8 | 1926 | 1985 | 10 | 2678.9 | 2543.8 | 1988 | 10 | 3341.5 | 3056.9 |
| 1982 | 11 | 1988.7 | 1939.2 | 1985 | 11 | 2702.6 | 2557.2 | 1988 | 11 | 3356.7 | 3073.6 |
| 1982 | 12 | 2004.3 | 1953.2 | 1985 | 12 | 2731.3 | 2575 | 1988 | 12 | 3363.5 | 3081.4 |
| 1983 | 1 | 2062.6 | 2009 | 1986 | 1 | 2744.3 | 2580 | 1989 | 1 | 3368.4 | 3085.5 |
| 1983 | 2 | 2103.9 | 2046.8 | 1986 | 2 | 2764.1 | 2590 | 1989 | 2 | 3365.6 | 3085.4 |
| 1983 | 3 | 2126.2 | 2066.1 | 1986 | 3 | 2798.2 | 2611.2 | 1989 | 3 | 3371.7 | 3093 |
| 1983 | 4 | 2146 | 2082.4 | 1986 | 4 | 2833.7 | 2637.6 | 1989 | 4 | 3380.3 | 3097.1 |
| 1983 | 5 | 2166.9 | 2099.6 | 1986 | 5 | 2868 | 2663.7 | 1989 | 5 | 3388.7 | 3099 |
| 1983 | 6 | 2181.4 | 2111.2 | 1986 | 6 | 2895.4 | 2684.5 | 1989 | 6 | 3409.5 | 3116.3 |
| 1983 | 7 | 2194.8 | 2123.6 | 1986 | 7 | 2926.6 | 2711.7 | 1989 | 7 | 3441.9 | 3143.4 |
| 1983 | 8 | 2203.1 | 2132.1 | 1986 | 8 | 2959 | 2734 | 1989 | 8 | 3466 | 3161.4 |
| 1983 | 9 | 2216.7 | 2144.2 | 1986 | 9 | 2987.4 | 2753.5 | 1989 | 9 | 3488.7 | 3178.9 |
| 1983 | 10 | 2238.9 | 2165.2 | 1986 | 10 | 3017.6 | 2777 | 1989 | 10 | 3509.5 | 3199 |
| 1983 | 11 | 2250.8 | 2177.1 | 1986 | 11 | 3043.6 | 2793 | 1989 | 11 | 3534.5 | 3218.9 |
| 1983 | 12 | 2263 | 2187.6 | 1986 | 12 | 3075.5 | 2818.2 | 1989 | 12 | 3561.9 | 3239.8 |

| Month | M2+ | M2 | Month | M2+ | M2 | | |
|-------|-----|--------|--------|------|----|--------|--------|
| 1990 | 1 | 3563.4 | 3252.9 | 1993 | 1 | 4046.7 | 3502.8 |
| 1990 | 2 | 3567.3 | 3267.3 | 1993 | 2 | 4063.6 | 3494.2 |
| 1990 | 3 | 3582.7 | 3279.5 | 1993 | 3 | 4066.2 | 3494.8 |
| 1990 | 4 | 3594.4 | 3291.1 | 1993 | 4 | 4072.8 | 3498 |
| 1990 | 5 | 3600.4 | 3294 | 1993 | 5 | 4108.1 | 3521.9 |
| 1990 | 6 | 3619.8 | 3305.5 | 1993 | 6 | 4128.5 | 3528.7 |
| 1990 | 7 | 3631.5 | 3315.3 | 1993 | 7 | 4148.3 | 3533.7 |
| 1990 | 8 | 3640 | 3330.9 | 1993 | 8 | 4169.2 | 3536 |
| 1990 | 9 | 3644.6 | 3345 | 1993 | 9 | 4201.8 | 3544.2 |
| 1990 | 10 | 3644.1 | 3347.3 | 1993 | 10 | 4225.6 | 3547.8 |
| 1990 | 11 | 3648 | 3345.1 | 1993 | 11 | 4252.3 | 3560.1 |
| 1990 | 12 | 3662.8 | 3353 | 1993 | 12 | 4265.1 | 3567.6 |
| 1991 | 1 | 3676.6 | 3363.5 | 1994 | 1 | 4278.9 | 3572.8 |
| 1991 | 2 | 3700.7 | 3380 | 1994 | 2 | 4280 | 3568.9 |
| 1991 | 3 | 3730.3 | 3398.1 | 1994 | 3 | 4276.7 | 3582.9 |
| 1991 | 4 | 3750.9 | 3409 | 1994 | 4 | 4277.1 | 3589.9 |
| 1991 | 5 | 3767.6 | 3418.9 | 1994 | 5 | 4278 | 3590.9 |
| 1991 | 6 | 3778.8 | 3426.6 | 1994 | 6 | 4263.8 | 3581.3 |
| 1991 | 7 | 3783.3 | 3426.4 | | | | |
| 1991 | 8 | 3794.8 | 3427.4 | | | | |
| 1991 | 9 | 3810.7 | 3427.5 | | | | |
| 1991 | 10 | 3828.9 | 3432.3 | | | | |
| 1991 | 11 | 3850.8 | 3445.4 | | | | |
| 1991 | 12 | 3873.9 | 3455.3 | | | | |
| 1992 | 1 | 3892.4 | 3464.1 | | | | |
| 1992 | 2 | 3918 | 3483.6 | | | | |
| 1992 | 3 | 3927.4 | 3486.3 | | | | |
| 1992 | 4 | 3929.8 | 3481.9 | | | | |
| 1992 | 5 | 3936.3 | 3482.1 | | | | |
| 1992 | 6 | 3941.1 | 3477.8 | | | | |
| 1992 | 7 | 3956.8 | 3480.7 | | | | |
| 1992 | 8 | 3973.7 | 3489.4 | | | | |
| 1992 | 9 | 3991.7 | 3496.6 | | | | |
| 1992 | 10 | 4008.7 | 3507.5 | | | | |
| 1992 | 11 | 4022.5 | 3510.5 | | | | |
| 1992 | 12 | 4034.8 | 3509 | | | | |