TREASURY DEPOSITS AND THE MONEY SUPPLY

*By Mary Hamblin**

The narrowly defined money supply, M1, was subject to unusually wide fluctuations during 1976. Most observers recognize that short-term changes in M1—which includes privately held currency and demand deposits—are sometimes erratic. Nevertheless, the recent volatility in M1 has caused concern among those who use this measure to gauge the Federal Reserve's monetary policy intentions.

Some observers say that fluctuations in deposits held by the U.S. Treasury contribute to fluctuations in M1. They argue that an inverse relationship exists between the two series in that changes in Treasury deposits result in changes in the opposite direction in M1. When the Treasury makes payments to the public, Treasury deposits decline and private demand deposits increase. Since private demand deposits are included in M1 and Treasury deposits are excluded, the declines in Treasury deposits are accompanied by increases in M1. Similarly, payments from the public to the Treasury produce declines in M1 and increases in Treasury deposits.

Experience sometimes supports the argument that M1 and Treasury deposits are inversely related. For example, in the week of September 15, 1976, Treasury deposits fell $3.7 billion and seasonally adjusted M1 rose $4.7 billion. Furthermore, in the following week, Treasury deposits increased and M1 decreased. However, during each of the first two weeks of September, both Treasury deposits and M1 declined, suggesting that an inverse relationship does not always hold.

This article examines the relationship between changes in Treasury deposits and the narrowly defined money supply. Broader money supply measures, such as M2, are not treated. It seems reasonable that the relationship between Treasury deposits and these broader measures would be weaker than between Treasury deposits and M1. The first section of the article discusses in general terms the nature of the relationship between Treasury deposits and M1. The next section examines changes in Treasury deposits and M1 on a weekly, monthly, and quarterly basis. The article then discusses the concept of including Treasury deposits in M1 as a means of reducing the volatility of M1.

TREASURY DEPOSITS, M1, AND OPEN MARKET OPERATIONS

The Treasury's operating balance includes two types of accounts—tax and loan accounts at commercial banks and demand accounts at Federal Reserve Banks. Tax and loan accounts are maintained primarily to receive tax revenues and proceeds from Treasury security sales. These funds are transferred to the Treasury's accounts at the Federal Reserve according to a predetermined schedule. Treasury deposits at the Federal Reserve are

*J.A. Cacy, research officer, advised in the preparation of this article.

the general account of the Government from which disbursements are made. This dual system of accounts was developed to reduce the destabilizing effects of large shifts in Treasury deposits on bank reserves and to reduce the need for Federal Reserve open market operations.[1]

Changes in total Treasury deposits—reflecting changes either in deposits at the Federal Reserve or in tax and loan accounts—are normally accompanied by changes in M1 unless offset by the Federal Reserve or by other factors. Apart from offsetting factors, increases in Treasury deposits are accompanied initially by equal declines in M1, while declines in Treasury deposits are accompanied by increases in M1.[2] For example, Government payments, such as salaries, reduce the Treasury's balance at the Federal Reserve. When salary checks are deposited in private checking accounts, M1 increases by the amount of the decline in the Treasury's balance. Conversely, when the public purchases U.S. Government securities or remits taxes, and pays by drawing down private demand accounts, M1 drops and the decline is matched by an increase in Treasury tax and loan accounts.

The direct association between changes in Treasury deposits and M1 may be offset by Federal Reserve open market operations. An offset is more likely for changes in deposits at the Federal Reserve than for tax and loan accounts. That is because fluctuations in deposits at the Federal Reserve are among the "technical factors" that open market operations tend to offset. Such operations are needed to stabilize bank reserves because increases in Treasury deposits at Federal Reserve Banks are accompanied by declines in reserves, and declines in these deposits are accompanied by increases in reserves. For example, when the public deposits checks drawn on the Treasury's account at the Federal Reserve, bank reserves increase and the Treasury's account declines. Similarly, when the Treasury transfers funds from tax and loan accounts at commercial banks, reserves decline' and the Treasury's balance at the Federal Reserve increases. These changes in reserves tend to be offset by open market operations. Thus, for example, when Treasury deposits at the Federal Reserve increase and bank reserves decline, the Federal Reserve tends to buy U.S. Government securities, which increases reserves and thereby offsets the impact on reserves of the rise in Treasury deposits. Similarly, when Treasury deposits decline, the Federal Reserve tends to sell securities.

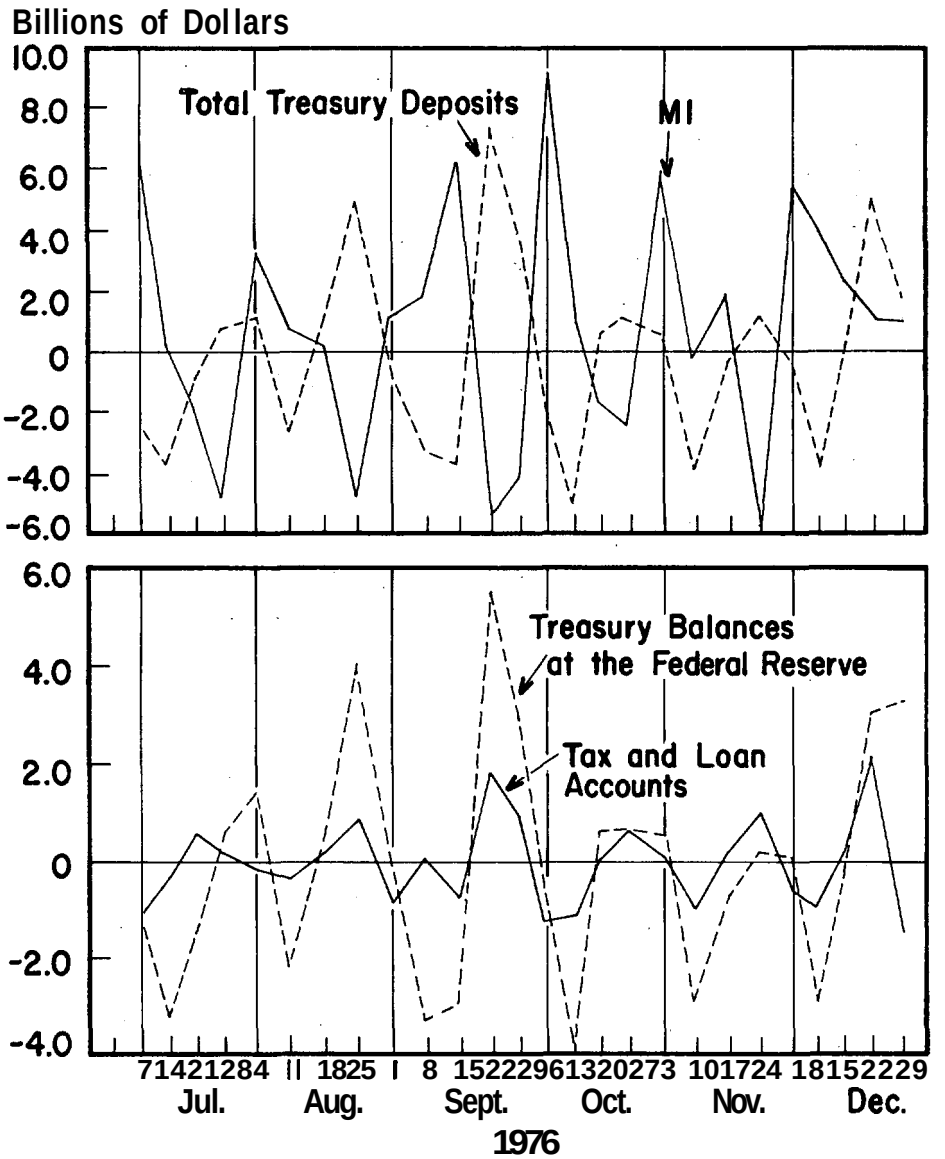
The Federal Reserve's open market operations may affect M1 as well as reserves and in this way prevent changes in Treasury deposits at Federal Reserve Banks from being accompanied by changes in M1. For example, suppose the Treasury's balance at the Federal Reserve declines and is initially accompanied by an increase in reserves and in M1. Assume though that the Federal Reserve responds to the decline in Treasury deposits by selling securities. If the public pays for the securities from private checking accounts, M1 as well as bank reserves are reduced to their previous levels. In this case, open market operations have prevented the change in Treasury deposits at the Federal Reserve from being reflected in a change in M1.

Open market operations designed to stabilize reserves may not always negate the association between Treasury deposits and M1 because the Federal Reserve has no direct control over how the public manages its funds. Thus, in the preceding example, suppose that when the Federal Reserve sells securities, the public pays

[1] Peggy Brockschmidt, "Treasury Cash Balances," *Monthly Review* (Federal Reserve Bank of Kansas City. July-August 1975).

[2] As discussed in the following paragraph, the increase in Treasury deposits, unless offset by the Federal Reserve, will cause bank reserves as well as M1 to decline. The decline in reserves, in turn, would result in a decline in M1 beyond the initial amount.

Chart 1
WEEKLY CHANGES IN TREASURY DEPOSITS AND M1
(Not Seasonally Adjusted)



for the securities by drawing down time or savings accounts rather than demand accounts. In this case, M1 is not reduced to its previous level and the change in Treasury deposits is reflected in a change in M1.

In brief, the direct association between changes in Treasury deposits may or may not be offset by Federal Reserve open market operations. Of course, the association could be offset or obscured by any of the many factors

other than open market operations that affect M1. For example, one such factor would be shifts by the public out of demand deposits and into time deposits. If offsetting factors do not completely obscure the association, however, a statistical correlation between the two variables would exist.

EMPIRICAL RELATIONSHIP BETWEEN TREASURY DEPOSITS AND M1

Not Seasonally Adjusted Data

An examination of the behavior of Treasury deposits and M1 indicates that changes in the two series are statistically correlated to some extent. This is true at least for weekly not seasonally adjusted data. As shown in Chart 1, weekly changes in not seasonally adjusted Treasury balances tend to be inversely related to weekly changes in not seasonally adjusted M1. The existence of such a correlation appears to be associated with a strong seasonal pattern displayed by both Treasury deposits and M1. Treasury deposits tend to decline in the first part of each month due in part to payment of Government salaries and retirement benefits. In the last part of the month, Treasury deposits rise as revenues are received. M1, in contrast, increases in the first part of the month as salaries and pensions are deposited, then falls as funds are paid out.

These seasonal patterns in Treasury deposits and M1 result in a statistically significant, although weak, correlation between the two series. In a regression using weekly changes in M1 and changes in total Treasury deposits for the period 1971 through 1976, the coefficient of determination, R^2, is .23. (See Table 1.) That is, in a statistical sense, the change in Treasury deposits during any week explains 23 per cent of the change in M1 during the same week.[3]

Table 1
R^2'S FOR REGRESSIONS OF TREASURY DEPOSITS AND M1
(Not Seasonally Adjusted)
1971-76

	Weekly Changes	Monthly Changes	Quarterly Changes
Total Treasury deposits	.23	.07	.06
Treasury deposits at the Federal Reserve	.17	.13	.10
Tax and loan accounts	.12	.00	.00

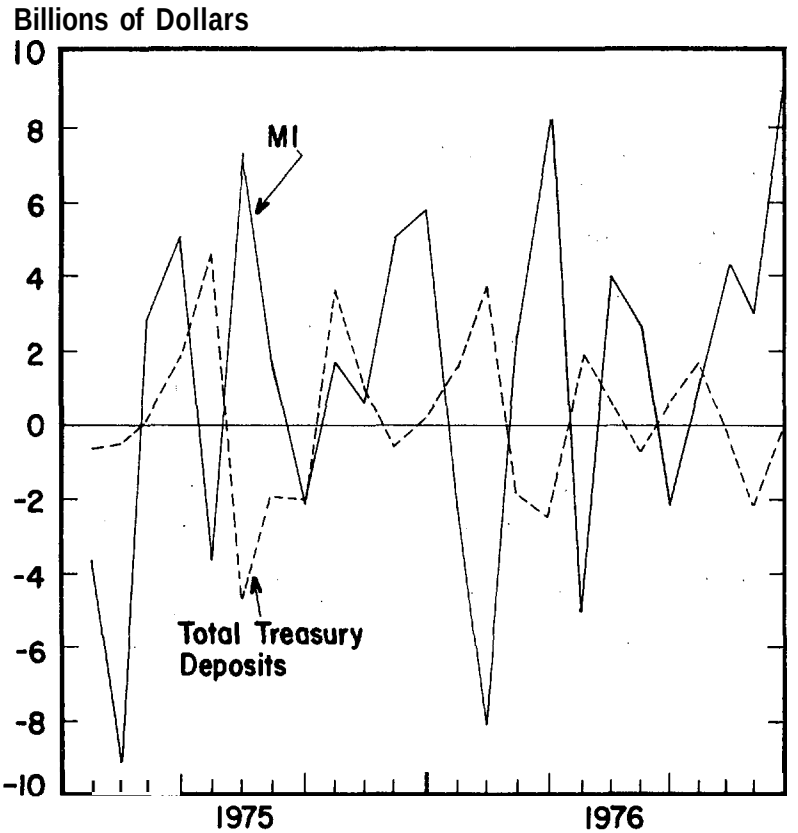
However, this does not necessarily mean that weekly changes in M1 are the result of fluctuations in Treasury deposits. Weekly variations in both series reflect basic seasonal patterns and M1 would retain its seasonal pattern in the absence of movements in Treasury deposits.

The statistical correlation between weekly changes in M1 and total Treasury deposits is higher than between M1 and changes in either of the two Treasury deposit components—deposits at the Federal Reserve and tax and loan account balances. The R^2 for changes in M1 and deposits at the Federal Reserve is .17, while it is only .12 for tax and loan accounts. As may be seen from the bottom panel of Chart 1, both component series display the same general seasonal pattern over a month as total Treasury deposits. Since the bulk of the Treasury's funds is held in its account at the Federal Reserve, these deposits decline and increase according to the Treasury's receipt and payment pattern. Tax and loan accounts behave in much the same manner because they are transferred to the account of the Federal Reserve according to a predetermined schedule.

The lower correlation for weekly data between M1 and the components than between M1 and total Treasury deposits is not surprising. It is due in part to the fact that

[3] The correlation between weekly changes in total Treasury deposits and not seasonally adjusted M1 is higher for recent years than for the earlier years of the 1971-76 period. In the 1974-76 period, for example, the R^2 is .29, compared with .13 in the 1971-73 period.

Chart 2
MONTHLY CWANQES IN TREASURY DEPOSITS AND M1
(Not Seasonally Adjusted)



some changes in the components offset each other. Such offsetting changes tend not to be associated with changes in M1. Thus, when the Treasury transfers funds from tax and loan accounts to deposits at Federal Reserve Banks, both components change but there is no associated change in M1.

The statistical correlation between changes in Treasury deposits and M1 weakens as the time period is lengthened. Monthly changes in the two series generally move inversely to each other over a period of a year, but the pattern is not as clear-cut as it is on a weekly basis. (See Chart 2.) Using monthly changes for the 1971-76 period, the R^2 between the two series is only .07, compared with .23 for weekly changes. The R^2 for monthly changes in deposits at the Federal Reserve in this case exceeded that of total Treasury balances. (See Table 1.) The R^2 for monthly changes in tax and loan accounts and M1 is zero. On a quarterly basis, the R^2 between M1 and total Treasury deposits is .06.

Treasury Deposits and Seasonally Adjusted M1

A major finding of the examination of unadjusted data is that a statistically significant correlation exists between weekly changes in M1 and Treasury deposits. The seasonally

adjusted M1 series, however, is the one most often used by the public. For this reason, the relationship between seasonally adjusted M1 and Treasury deposits is examined. Since the correlation between not seasonally adjusted M1 and not seasonally adjusted Treasury deposits reflects the common seasonal patterns in the two series and because seasonal patterns should not appear in seasonally adjusted M1, the statistical correlation between seasonally adjusted M1 and not seasonally adjusted Treasury deposits would be expected to be quite low. This expectation is supported by the data, as the R^2 for the 1971-76 period between weekly changes in seasonally adjusted M1 and Treasury deposits is only .08. The R^2 for monthly changes is .01 and the R^2 for quarterly changes is zero.

While seasonally adjusted M1 and Treasury deposits are not closely correlated during the 1971-76 period, a fairly high statistical correlation for weekly data does exist for the year 1976 alone. Thus, the R^2 between weekly changes in seasonally adjusted M1 and Treasury deposits for 1976 was .22. This compares with R^2's ranging between zero and .04 for the years from 1971 through 1975. (See Table 2.)

The higher correlation for 1976 than for previous years is due in part to problems in properly accounting for seasonal factors in current data. In other words, some seasonal factors will remain in the seasonally adjusted data for 1976 until a revised set of seasonals are computed using data for 1976. The existence of seasonal influences in the 1976 seasonally adjusted M1 series is indicated by the fairly high R^2 for 1976 compared with earlier years between weekly changes in seasonally adjusted M1 and not seasonally adjusted M1. The R^2 for 1976 was .55 compared with R^2's ranging from zero to .19 for the years from 1971 through 1975. (See Table 2.)

When the revised seasonally adjusted weekly M1 data become available in early 1977, the correlation between the revised series and Treasury deposits will probably be significantly less than reported in this article. However, the correlation may yet exceed that of earlier years, as the correlation between not seasonally adjusted M1 and Treasury deposits is somewhat higher for 1976 than for earlier years.[4]

Table 2
R^2'S FOR WEEKLY REGRESSIONS: TREASURY DEPOSITS AND SEASONALLY ADJUSTED M1, NOT SEASONALLY ADJUSTED M1 AND SEASONALLY ADJUSTED M1
4994-96

	Treasury Deposits and Seasonally Adjusted M1	Not Seasonally Adjusted M1 and Seasonally Adjusted M1
1971	.00	.00
1972	.00	.19
1973	.01	.00
1974	.04	.01
1975	.00	.10
1976	.22	.55
1971-76	.08	.18

INCLUDING TREASUWY DEPOSITS IN THE MONEY SUPPLY

Several economists have argued that Treasury deposits should be included in the narrowly defined money supply.[5] Some of the reasons for including Treasury deposits are that such deposits are closely related to GNP and

[4] The R^2 for 1976 between weekly changes in total Treasury deposits and not seasonally adjusted M1 is .32, compared with the .23 for the 1971-76 period. (See Table 1.)

[5] Boris P. Pesek and Thomas R. Saving, *The Foundations of Money and Banking* (New York: Macmillan Co.. 1968); Paul S. Anderson and Frank E. Morris, "Defining the Money Supply: The Case of Government Deposits," *New England Economic Review* (Federal Reserve Bank of Boston, March-April 1969); and "Banking Developments," *Business Conditions* (Federal Reserve Bank of Chicago. July 1973).

Table 3
STANDARD DEVIATIONS OF WEEKLY CHANGES IN M1 AND TREASURY DEPOSITS (In Billions of Dollars)

	M1 (NSA)	M1 + Treasury Deposits (NSA)	M1 (SA)*	M1 + Treasury Deposits (SA)*
1971	2.3	2.4	1.3	1.5
1972	2.6	2.5	1.2	1.4
1973	2.9	2.9	1.7	2.0
1974	3.3	2.9	1.4	1.5
1975	3.3	2.8	1.2	1.3
1976	4.0	3.4	2.0	2.0
1971-76	3.1	2.8	1.5	1.6

*Both M1 and M1 + Treasury deposits were seasonally adjusted using the FARRSEAS seasonal adjustment program. Standard deviations for the Board of Governors' official seasonally adjusted M1 series were somewhat lower than those of the series used in this table.

they function identically to deposits held by the private sector. Arguments against including Treasury deposits are that such deposits do not represent money held by the public and they have little influence on the expenditures of the Federal government.

Another possible reason for including Treasury deposits in the money supply is that including them may reduce the volatility of M1. For not seasonally adjusted data, it appears that including Treasury deposits in M1 would reduce M1's volatility. Thus, the standard deviation--one measure of volatility—of M1 plus Treasury deposits is less than that of M1. For the 1971-76 period, the standard deviation of weekly changes in M1 plus Treasury deposits was $2.8 billion compared with $3.1 billion for M1. (See Table 3.) Furthermore, in most years of the 1971-76 period, M1 plus Treasury deposits had a lower standard deviation than M1. The difference between the standard deviations appears to be growing and was rather large, $0.6 billion, in 1976.

For seasonally adjusted data, the results of this study do not support the conclusion that including Treasury deposits in M1 would reduce the volatility of M1. In fact, in most years the standard deviation of seasonally adjusted M1 plus Treasury deposits was slightly more than for seasonally adjusted M1. (See Table 3.)

CONCLUSION

This study found that there is a statistically significant, although weak, correlation between weekly changes in Treasury deposits and changes in not seasonally adjusted M1. This relationship, however, disappeared when monthly or quarterly changes were examined. It was also found that weekly changes in seasonally adjusted M1 are not correlated with Treasury deposits, except in 1976.

The relatively high correlation for 1976 between Treasury deposits and seasonally adjusted M1 is due in part to problems in removing seasonal influences from current data. Due to these problems, weekly changes in Treasury deposits and seasonally adjusted M1 may be correlated until revised M1 data are available. For this reason, in analyzing current weekly seasonally adjusted money supply data, users should take into consideration weekly movements in Treasury deposits. On the other hand, because of the problems in deriving seasonal factors for current year data, as well as for other reasons, observers should be very careful when using weekly M1 data to help gauge the intentions of monetary policymakers.