

Budget Deficits and The Money Supply

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The nation's money supply is closely linked to deficit spending by the Federal government, many analysts contend. Due to the way monetary policy is conducted, these observers argue, money grows rapidly when the deficit in the Federal budget is large and grows slowly when the deficit is small or when surpluses occur. This article undertakes an analytical and empirical examination of these propositions. The first section of the article reviews the analytical relationship between budget deficits and surpluses and money, while the second section presents results of the empirical examination.

RELATIONSHIP BETWEEN DEFICITS AND SURPLUSES AND THE MONEY SUPPLY

In analyzing the relationship between Federal budget deficits and surpluses and the money supply, it is useful to distinguish direct effects from indirect effects. Budget deficits occur when government expenditures exceed revenues. A deficit will lead to a direct rise in the money supply if the U.S. Treasury finances the deficit not by borrowing but by drawing down balances it holds at commercial banks or Federal Reserve Banks. That is because government expenditures result in a shift of funds into money balances held by the public, and out of deposit balances held by the U.S. Treasury, which are not a part of the money

supply. The government revenues, though, result in a shift out of the public's money balances and into Treasury deposits. Therefore, when expenditures exceed revenues, money balances will increase and Treasury deposits will fall.¹ Similarly, when revenues exceed expenditures and the Treasury does not use the resulting surplus to repay debt held by the public, money balances will decline and Treasury deposits will rise. In practice, changes in Treasury deposits arising from deficits and surpluses may importantly affect the money supply over short periods, but are quantitatively unimportant for longer periods.

If deficits and surpluses are not accompanied by changes in Treasury deposits, they will not directly alter money balances. When a deficit is accompanied by borrowing, the increase in money due to expenditures exceeding revenues is offset by a decline in the money balances of those who purchase the obligations issued by the Treasury. When a surplus is accompanied by debt repay-

¹The financing of a deficit by drawing down Treasury balances may affect commercial bank reserves as well as the money supply. If Treasury deposits at Federal Reserve Banks rather than at commercial banks are drawn down, reserves will increase. Unless the increase is offset by the Federal Reserve System, commercial banks may use the reserves to acquire earning assets. This may lead to a rise in the money supply beyond the direct increase caused by the financing of the deficit. The Federal Reserve may, of course, offset the increase in both reserves and the money supply arising from a deficit financed by drawing down Treasury deposits.

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ment, the decline in money due to revenues exceeding expenditures is offset by an **increase** in the money balances of those who were holding redeemed securities.

Deficits and surpluses unaccompanied by changes in Treasury deposits may indirectly affect money. These indirect effects may be both quantitatively significant and long-lived and may result in a correlation between deficits and surpluses and money. To facilitate exposition, in the analysis of indirect effects and in the remainder of the article, the term "deficits and surpluses" is not used. Instead, the term "deficit," which may be positive or negative, is employed and is defined as Federal government expenditures minus revenues. In this terminology, a surplus or an excess of revenues over expenditures is referred to as a negative deficit.

A deficit not accompanied by a change in Treasury deposits may indirectly affect money because it may lead to changes in interest rates. The public, commercial banks, and the Federal Reserve System may then respond to these interest rate changes in ways that affect money. A positive deficit (expenditures exceed revenues) financed by borrowing will tend to cause interest rates to increase. The rise in interest rates will tend to reduce the demand for **M1** balances, which consists of currency plus demand deposits held by the public. When the public shifts out of **M1** and into other assets, **M1** will tend to decline.

As offering rates on time deposits increase along with other interest rates, part of the balances moving out of **M1** may be placed in time deposits. To the extent that **M1** balances are drawn down and transferred to time deposits, the required reserves of the banking system will decline and excess reserves will increase. This, along with the rise in interest rates, will encourage banks to acquire earning assets, which will tend to offset some of the initial drop in **M1** and add to the initial increase in time deposits. The net impact on money resulting from these responses by the public and commercial banks cannot be determined analytically. **M1** would probably decline but,

because **M2** consists of **M1** plus time deposits other than large negotiable **CD's**, **M2** might decline or increase. Similarly, responses by the public and commercial banks to a decline in interest rates associated with a negative deficit (that is, a surplus with revenues exceeding expenditures) accompanied by debt repayment would tend to indirectly cause **M1** to increase and the effect on **M2** would be uncertain.

In terms of responses by the Federal Reserve System, it is often argued that the Federal Reserve conducts monetary policy in a way that results in a correlation between the deficit and money. Some observers hold that the correlation occurs because the Federal Reserve tries to stabilize interest rates. They contend that the Federal Reserve responds to the deficit-induced upward pressure on interest rates by acquiring U.S. Government securities **and/or** providing banks with reserves in other ways, thereby encouraging commercial banks to augment their holdings of earning assets. These increases in the earning assets of the banking system are accompanied by increases in money balances, thereby resulting in a correspondence between the deficit and the behavior of money. The argument would be similar for a negative **deficit**, **which** would place downward pressure on interest rates. In trying to stabilize interest rates, the Federal Reserve would reduce bank reserves and the money supply would decline. While the Federal Reserve may at times attempt to stabilize interest rates, however, it often allows interest rates to move up or down. Thus, any argument that the conduct of policy results in a correspondence between the deficit and money should not be based on the assumption that the Federal Reserve attempts to stabilize interest rates.

An alternative hypothesis about the Federal Reserve's approach to policymaking is that it sets out to influence interest rates, but does not necessarily seek to stabilize them. The alternative would postulate that the Federal Reserve determines its interest rate policy in light of economic conditions such as unemployment and inflation. If followed, this approach to **policymaking** may tend to pro-

duce a correspondence between the deficit and the money supply.

In the latter part of a recession and the early part of an economic recovery, for example, when unemployment is high and the inflation rate is low, the Federal Reserve may allow interest rates to decline or, at least, resist upward movements in rates. At the same time, due to the sluggishness of the economy, Federal revenues are declining and transfer-payment expenditures are rising so that the deficit is large. The consequent heavy Treasury borrowing is placing upward pressure on interest rates. To prevent rates from rising, the Federal Reserve would purchase U.S. Government securities in volume and/or undertake other reserve-supplying actions, which would lead to large money supply increases. Thus, large money supply increases would accompany the large deficit and would result, in part, from the combination of the large deficit and the Federal Reserve's policy of minimizing upward movements in interest rates.

As the economy moves into the middle stage of an economic expansion, when inflationary pressures develop and unemployment falls, the Federal Reserve may allow interest rates to rise. At the same time, due to the economic recovery, the deficit is small. The consequent reduction in Treasury borrowing alleviates some of the upward pressure on interest rates. In allowing interest rates to rise, the Federal Reserve would be forced to moderate the increases in the money supply. Thus, the small increases in money would accompany the small deficit and would be brought about, in part, by the combination of the small deficit and the Federal Reserve's policy of allowing interest rates to rise.

In the latter part of a recovery and the early part of a recession, when inflationary pressures are strong and unemployment is low, the Federal Reserve may be pushing interest rates up or, at least, resisting downward movements. At the same time, due to the inflation, the deficit is negative, i.e., a surplus occurs. Consequently, the Treasury is repaying debt, and this places

strong downward pressure on interest rates. The Federal Reserve, in order to resist downward interest rate movements, would reduce the money supply. Thus, the decline in the money supply would accompany the negative deficit and would be brought about, in part, by the combination of the negative deficit in the budget and the Federal Reserve's policy of resisting downward movements in interest rates.

In summary, it is sometimes contended that the Federal Reserve may respond to deficit-induced alterations in interest rates in a way that results in large money supply increases when the deficit is large, small money supply increases when the deficit is small, and declines in money when the deficit is negative. That is, Federal Reserve responses may produce a correlation between the deficit and the money supply. It was earlier shown that responses by the public and commercial banks may also result in correspondence between the deficit and money. The remainder of the article empirically examines these propositions.

EMPIRICAL EXAMINATION

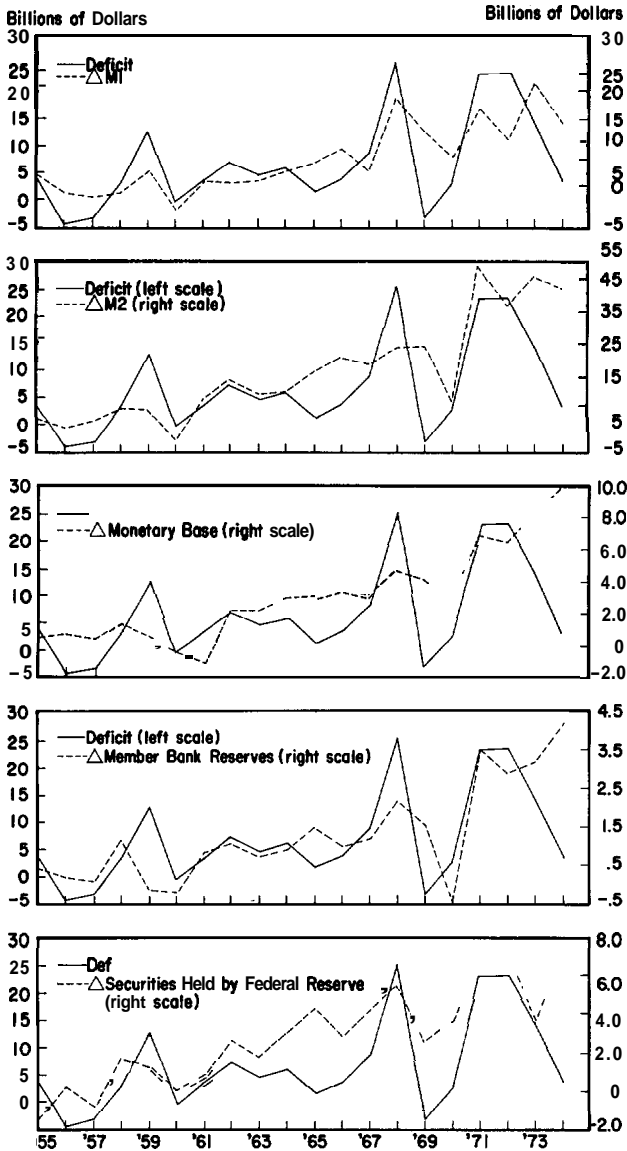
1955-74 Period

This section examines the relationship between the deficit and the money supply and certain other variables during the 1955-74 period. Yearly data on the deficit along with changes in M1 and M2 are shown in Chart 1. Also, to examine the extent to which Federal Reserve operations may be related to the deficit, Chart 1 contains yearly data on member bank reserves, U.S. Government securities held by the Federal Reserve System, and the monetary base, which consists of member bank reserves plus currency held by the public and non-member banks.

Chart 1 indicates there is very little year-to-year correspondence between movements in the deficit and movements in any of the other variables, although the other variables trended upward with the deficit in the 1955-74 period. For example, in 9 of the 20 years in the period, the change in M1 moved in the opposite direction from

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**Chart 1
THE DEFICIT, MONEY SUPPLY,
AND OTHER VARIABLES
1955-74**



the deficit. The same is true to a slightly lesser extent for M2, reserves, and the monetary base. Movements in Federal Reserve holdings of U.S.

Government securities corresponded somewhat more closely with the deficit, especially for the 1967-73 period. Also, it is true that in those years in which very sharp increases in the deficit occurred—1959, 1968, and 1971—M1 increased considerably more than in the immediately preceding years.

The absence of a year-to-year correspondence does not necessarily mean that the behavior of the money supply and other variables was unrelated to the behavior of the deficit during the 1955-74 period. For example, a deficit in any one period may have affected money not only in that period but also in one or more succeeding periods. The exploration of this possibility requires statistical analysis. However, due to the few years for which consistent data on the deficit are available, yearly data are not well suited for the type of statistical analysis required.

1970-74 Period

Monthly data for the 1970-74 period are available and provide a more fruitful subject for a statistical examination of the relationship between the deficit and the money supply. In the examination of the 1970-74 period, regression analysis was applied to monthly data to try to discover statistically significant relationships between the deficit and M1, M2, the monetary base, member bank reserves, and U.S. Government securities held by the Federal Reserve System.

The analysis hypothesized that the behavior of each variable in any month was affected by the behavior of the deficit in that month and in certain preceding months. For example, it was hypothesized that the behavior of M1 in any month, say December 1974, was affected by the behavior of the deficit in December 1974 and in certain months preceding December, say in each month from July 1973 through November 1974. The hypothesis that the behavior of money and the other variables in any month was affected by the behavior of the deficit in past months is based on the notion that time lags exist in economic behavior. Because time is required to adjust to changing conditions,

for example, a deficit may place upward pressure on interest rates for a number of months after it occurs. In addition, the public, commercial banks, and the Federal Reserve System may not respond immediately to a change in interest rates but may respond over a period of time.

The regression analysis indicates that during the 1970-74 period, M2 was related to and affected by the deficit in a statistically significant way. As shown in Table 1, for the regression measuring the impact of the deficit on M2 over a 24-month period, the adjusted R² was statistically significant and was .46. This may be interpreted to mean that on average 46 per cent of the behavior of M2 was accounted for by the behavior of the deficit. A significant relationship was also found between the deficit and M1, but it was weaker than for M2. For M1, only the 18-month regression produced a statistically significant R², and it indicates that only 28 per cent of the behavior of M1 was accounted for by the behavior of the deficit.²

While money was found to be related to the deficit, the regression analysis does not support the proposition that the Federal Reserve responded to the deficit by taking actions that affected

2/Data on the deficit were taken from the *Treasury Bulletin and Monthly Treasury Statement of Receipts and Outlays of the United States Government*. The latter publication contains information on liabilities owed and assets held by the Federal government. Liabilities minus assets, or net liabilities, may be symbolized by NL. The deficit is equal to the change in NL, that is, $D = \Delta NL$. In the statistical analysis, it was convenient to employ levels rather than changes, so that NL rather than ΔNL or D was used. Thus, the analysis examined the relationship between NL and the level of money balances rather than between D and changes in money balances. Monthly data on NL are available beginning in July 1967, so that the period from July 1967 through November 1974 was involved in the statistical analysis.

Monthly seasonally adjusted series on NL, M1, and the other variables were detrended using the autoregressive technique. (For a discussion of this technique, see Robert D. Auerbach and Jack L. Rutner, "Money and Income: Is There a Simple Relationship?" in the *Monthly Review*, Federal Reserve Bank of Kansas City, May 1975. See especially footnote 11.) Detrended values of M1 and the other variables were regressed on detrended values of NL. Using M1 to illustrate, the regression equations took the form:

$$M1_t = a + b_0 NL_t + b_1 NL_{t-1} + \dots + b_n NL_{t-n} + u_t$$

To test for the possibility that NL is affected by, as well as affects, money, NL was regressed on M1 and each of the other variables. These regressions took the form:

$$NL_t = a + b_0 M1_t + b_1 M1_{t-1} + \dots + b_n M1_{t-n} + u_t$$

In these regressions, none of the R²'s were statistically significant. It may be tentatively concluded, therefore, that the dominant direction of causation is from the deficit to money and that there is little or no feedback from money to the deficit.

Table 1
ADJUSTED R²S FOR REGRESSIONS
HAVING THE DEFICIT AS THE
INDEPENDENT VARIABLE

Dependent Variable	Regressions Involving:	
	18 Months	24 Months
M1	.28*	.31
M2	.40†	.46‡
Monetary base	.21	.58‡
Member bank reserves	.00	.00
U.S. Government securities held by Federal Reserve System	.01	.02
Commercial paper rate	.47†	.49‡
Federal funds rate	.00	.34

*Statistical significance at 90 per cent level of confidence.
†Statistical significance at 95 per cent level of confidence.
‡R² is significant but statistically unreliable because Durbin-Watson test indicates the existence of serial correlation.

money. The analysis indicates that, while M2 was positively related to the deficit during the 1970-74 period, M1 was negatively related.³ Prior to undertaking the analysis, it was expected that, if money was found to be significantly related to the deficit, a positive relationship would be indicated. That is, the regression analysis was expected to show that an increase in the deficit tended to result in an increase in money and a decrease in the deficit tended to result in a decrease in money. Such a relationship would exist if the Federal Reserve responded to large (small) deficits by buying large (small) quantities of U.S. Government securities and taking other actions that led to large (small) increases in the money supply.

However, since M1 was negatively related to the deficit, the Federal Reserve apparently did not respond to the deficit by taking actions that affected money. Rather, it appears that the Federal Reserve allowed the deficit to change interest rates. Instead of arising from Federal Reserve responses, the relationship between money and the deficit was due to responses by the public and

3/In addition to M1 and M2, the time deposit component of M2 was regressed on the deficit, but the R²'s were not significant. For the three variables, the sum of the regression coefficients is as follows:

	Regressions Involving:	
	18 Months	24 Months
M1	-1.847	-1.151
M2	-.193	+.749
Time deposits	+.620	+3.846

commercial banks to the interest rate changes.⁴ For example, a deficit-induced increase in interest rates, along with the accompanying rise in offering rates on time deposits, tended to reduce the demand for M1 balances. The public, therefore, tended to shift out of M1 balances and into other assets, including time deposits. This shift tended to reduce the required reserves and increase the excess reserves of commercial banks, encouraging them to acquire earning assets. The rise in earning assets tended to offset part of the initial decline in M1 balances and add to the initial increase in time deposits. On balance, these responses by the public and commercial banks to the increase in interest rates accompanying the rise in the deficit tended to result in a decline in M1 and an increase in M2. Similarly, a deficit-induced drop in interest rates tended to lead to an increase in M1 and a decline in M2.

The conclusion that the Federal Reserve responded to the deficit by allowing it to result in interest rate changes is further supported by the results of regression analysis directly testing the relationship between the deficit and interest rates. This analysis provides some evidence that, during the 1970-74 period, interest rates were related to and affected by the deficit in a statistically significant way. To illustrate, for the regression measuring the impact of the deficit on the commercial paper rate over an 18-month period, the adjusted R² was statistically significant and was .47. In addition, the relationship was positive, indicating that a large (small) deficit led to a large (small) increase in the commercial paper rate.⁵

The analysis did not uncover any statistically significant relationships between the deficit and the monetary base, member bank reserves, or U.S. Government securities held by the Federal Re-

⁴The conclusion that public and commercial bank responses produced the relationship between money and the deficit is based on the finding that the sums of the coefficients are negative in the two M1 regressions (see footnote 3). The conclusion that M2 is positively related to the deficit is based on the finding that, in the M2 regression having the largest number of lags (24), the sum of the coefficient is positive. Note that the sums of the coefficients in the time deposits regressions are positive. This is consistent with the conclusion that a deficit-induced increase in interest rates, accompanied by a rise in offering rates on time deposits, resulted in a shift out of M1 balances and into time deposits.

serve. Table 1 shows that, for regressions involving these variables, the R²'s were either not significant or significant but not statistically reliable.⁶ Thus, the evidence does not support the proposition that the Federal Reserve tends to respond to deficit spending in a systematic way by acquiring U.S. Government securities or by supplying reserves or by expanding the monetary base so that commercial banks can buy U.S. Government securities. These results are consistent with the finding that the relationship between the deficit and money in the 1970-74 period was due to responses by the public and commercial banks rather than to Federal Reserve responses.

SUMMARY

The nation's money supply is closely linked to deficit spending by the Federal government, many analysts contend. According to these observers, the association is due to efforts by the Federal Reserve System to stabilize interest rates. This leads the System to respond to deficits by buying U.S. Government securities and/or taking other actions that result in increases in the money supply. However, the deficit and money may be related for reasons other than or in addition to the behavior of the Federal Reserve. The public and commercial banks, as well as the Federal Reserve System, may respond to deficit-induced alterations in interest rates in ways that affect money.

Empirical analysis undertaken in this article suggests that the deficit and money are related. While an examination of yearly data for the 1955-74 period reveals little or no year-to-year association, regression analysis applied to monthly data

⁵For the commercial paper and Federal funds regressions, the sums of the coefficients are as follows:

	Regressions 18 Months	Involving: 24 Months
Commercial paper	+ .405	+ 2.776
Federal fund;	+ .803	+22.106

⁶For the 24-month monetary base regression, the significant R² may indicate some relationship, even though the R² is not reliable due to the existence of serial correlation. For this regression, the sum of the coefficients is -2.673, indicating a negative relationship between the monetary base and the deficit. It may be that a deficit-induced rise in interest rates reduces the public's demand for currency, which is a large portion of the base. If this occurs, and if the Federal Reserve does not respond to the deficit by increasing the base, a negative relationship between the base and the deficit would be expected.

for the 1970-74 period indicates that both **M1** and **M2** were related to and affected by the deficit in a statistically significant way. However, the analysis does not support the proposition that the Federal Reserve responded to the deficit by taking actions that affected money. Rather, it appears that the Federal Reserve allowed the deficit to affect interest rates. Instead of arising from Federal Reserve responses, the relationship between the deficit and money was due to responses on the part of the public and commercial banks.

These conclusions are supported by several findings. One is that, while **M2** was positively related to the deficit, **M1** was negatively related. That is, a deficit was associated with an increase in **M2** and a decline in **M1**. It appears therefore that a deficit led to a rise in interest rates, causing the public to shift out of **M1** balances into other assets. As the offering rates on time deposits increased along with the increase in interest rates, part of the balances moving out of **M1** were transferred into the time deposit component of **M2**, offsetting part of the effect on **M2** of the drop in **M1**. The decline in **M1** and the rise in time deposits increased the excess reserves of banks which, along with the

increases in interest rates, led banks to acquire assets. Some of the prior decline in **M1** was thereby offset and the rise in time deposits was augmented. On balance, these responses by the public and commercial banks to a deficit-induced rise in interest rates resulted in a decline in **M1** and an increase in **M2**.

The conclusion that the Federal Reserve responded to the deficit by allowing it to result in interest rate changes is further supported by the results of regression analysis testing the relationship between the deficit and interest rates. These results provided some direct evidence that, during the 1970-74 period, interest rates were related to and affected by the deficit. Finally, the empirical investigation undertaken in this article did not uncover any statistically significant relationships during the 1970-74 period between the deficit and Federal Reserve operations, as measured by the monetary base, member bank reserves, and U.S. Government securities held by the System. This is consistent with the conclusion that the relationships between the deficit and money were due to responses by the public and commercial banks rather than to Federal Reserve responses.