

# The Financing of Federal Deficits: An Analysis of Crowding Out

By V. Vance Roley

The large federal deficits since the 1974-75 recession have rekindled interest in the economic consequences of both the size and the method used to finance federal deficits. One of the principal reasons for this concern is the possibility that deficits crowd out a significant amount of private expenditures and perhaps generate higher inflation. When increases in government spending occur, for example, crowding out takes the form of an expanded government sector at the expense of the private sector. Moreover, interest-sensitive expenditures in the private sector are the principal targets of any crowding out. Thus, private capital formation—which is usually thought to be responsive to changes in interest rates—could be retarded if crowding out occurs. In turn, a slower rate of capital formation would have further adverse consequences on labor productivity growth by reducing the amount of productive capital available to each worker.

Most agree that in a world of unemployed resources, money-financed deficits eliminate the possibility of significant crowding out. However, considerable uncertainty exists con-

cerning the consequences of debt-financed deficits, with a common presumption among those favoring mandatory balanced budgets that debt-financed deficits may crowd out an equal amount of private expenditures. The purpose of this article is to review the analytical model often used to assess the relative qualitative impacts of money versus debt financing of federal deficits, and then to empirically analyze the crowding out question in the context of this model.

In the first section of this article, the changing composition of federal deficit financing over the last two decades is examined. The historical data reveal the greater reliance that has recently been placed on debt financing. In the second section, the issues surrounding the relative effects of money and debt financing of deficits are presented using a familiar analytical model. In the context of this model, empirical estimates are presented in the third section to assess the short-run consequences of alternative forms of deficit financing. The main conclusions of the article are summarized in the final section.

## FEDERAL DEFICIT FINANCING OVER THE LAST TWO DECADES

Federal deficits arise when federal government expenditures are larger than revenues.

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Because of automatic stabilizers built into the expenditure and revenue functions of the federal government, deficits normally occur during recessions and at least the early part of the subsequent recovery. On the expenditure side, unemployment and other forms of compensation increase during recessions resulting in larger federal expenditures. On the revenue side, the growth of personal and corporate income often slows which reduces the growth of federal income tax revenue. Moreover, special legislation, such as a tax cut, is also often put in place during recessions to expedite economic recovery. All of these factors increase the gap between federal expenditures and revenues, thereby increasing the size of the federal deficit, or reducing the size of the surplus.

As with households and businesses, whenever revenues are less than expenditures, the federal government must finance the difference by borrowing. Borrowing by the federal government is in the form of new issues of Treasury securities. In the absence of any action by the Federal Reserve, the federal deficit would be entirely debt financed. However, the Federal Reserve through its open market operations buys and sells Treasury securities in order to exert control over the monetary aggregates. Over periods of time as long as a year, for example, the Federal Reserve is normally a net purchaser of Treasury securities so as to enable the monetary aggregates to grow at rates consistent with a desirable rate of overall economic growth. In examining how the deficit is financed, therefore, it is useful to consolidate the balance sheets of the federal government and the Federal Reserve. As a result, deficit financing can be viewed as consisting mainly of the change in the amount of Treasury securities held privately—that is, the net change in the total amount of Treasury securities outstanding minus the net change in Federal Reserve holdings—plus the change in the monetary base resulting from open market purchases or sales

of Treasury securities by the Federal Reserve. For example, if the Federal Reserve purchases Treasury securities equal to the amount of the federal deficit, then the deficit is entirely money financed. That is, currency held by the public and reserves of depository institutions would increase by the same amount as the deficit, given unchanged levels of other sources of the monetary base. Thus, the money-debt composition of the federal deficit depends on the monetary policy actions taken by the Federal Reserve.

The amount and composition of federal deficit financing since 1959 are reported in Table 1. Over a given five-year period, the sum of the change in net Treasury securities outstanding plus the change in Federal Reserve holdings of Treasury securities roughly corresponds to the size of the cumulative deficits.<sup>1</sup> For example, in the 1969-74 period, the cumulative deficit—the sum of the deficits (or surpluses) which occurred in 1970, 1971, 1972, 1973, and 1974—was \$68.4 billion, while the Treasury's total debt increased by \$61.5 billion. Similarly, in the 1974-79 period, the cumulative deficit was \$212.8 billion, while total Treasury debt increased by \$290.0 billion.

The composition of the financing of the federal government's debt has varied sharply since 1959. In the 1959-64 period, net issues of Treasury securities accounted for 38.5 percent of the funding, implying that 61.5 percent or \$10.4 billion was money financed through Federal Reserve purchases of Treasury securities. In turn, the monetary base rose by \$6.8 billion, reflecting this increase in Federal Reserve holdings.<sup>2</sup> In contrast to the 1959-64

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<sup>1</sup> In a given year the federal deficit as measured in this article does not necessarily equal the change in Treasury debt outstanding because, among other reasons, the deficit as measured in the National Income Accounts is an accrual rather than a cash flow measure.

<sup>2</sup> The monetary base not only changes due to open market purchases or sales of Treasury securities, but also with

**Table 1**  
**THE COMPOSITION OF FEDERAL DEFICIT FINANCING**

Years	Absolute Changes (In Billions of Dollars)					Ratio of Net Treasury Securities Outstanding to Total (in Percent)	Average Annual Growth Rates (in Percent)	
	Cumulative Deficit*	Net Outstandings†	Treasury Securities		Monetary Base‡		Net Treasury Securities Outstanding	Monetary Base
			Federal Reserve Holdings	Total Debt				
1959-64	8.1	6.5	10.4	16.9	6.8	38.5	0.8	2.7
1964-69	12.1	- 1.1	20.1	19.0	18.5	- 5.8	- 0.1	6.0
1969-74	68.4	38.2	23.3	61.5	30.0	62.1	4.1	7.1
1974-79	212.8	253.0	37.0	290.0	43.9	87.2	17.3	7.3
1980	61.3	83.2	3.9	87.1	10.9	95.5	18.1	7.4

\*Sum of annual federal deficits (U.S. Department of Commerce, Bureau of Economic Analysis).

†Sum of annual net issues of Treasury securities, excluding Federal Reserve purchases (Board of Governors of the Federal Reserve System, *Flow of Funds Accounts*).

‡Not adjusted for reserve requirement changes (Board of Governors of the Federal Reserve System).

period, Federal Reserve purchases of Treasury securities in the 1964-69 period were larger than the total debt accumulated by the federal government. Thus, during this five-year period, not only was the accumulated debt totally money financed, but the net debt outstanding actually declined by \$1.1 billion. During the 1970s, the composition of deficit financing once again shifted toward Treasury securities, with the ratio of net issues of Treasury securities to total Treasury security issues reaching 62.1 percent for the 1969-74 period, and then rising substantially to 87.2 percent for the 1974-79 period. This ratio increased further to 95.5 percent in 1980. Hence, there has been a marked uptrend in the proportion of the deficit that has been debt financed.

changes in member bank borrowing, Federal Reserve float, and purchases or sales of U.S. agency securities among other factors. Over periods of time as long as those in Table 1, however, changes in the monetary base primarily reflect open market purchases of Treasury securities.

The variations in the composition of deficit financing may be explained primarily by the interaction of monetary policy and the absolute size of cumulative deficits. Over the two decades exhibited in Table 1, the growth of the monetary base was fairly stable, although it increased from 2.7 percent in the 1959-64 period to 7.3 percent in 1974-79. This relatively steady growth reflected in part the Federal Reserve's desire to exert a stabilizing influence on the growth of the monetary aggregates.<sup>3</sup> Because monetary base growth was fairly stable, any fluctuations in the size of the deficit were

<sup>3</sup> While the Federal Reserve has not used the monetary base as a policy instrument to exert control over money, over long periods the growth of the monetary base is related to money growth. Monetary base growth therefore reflects to some extent the policy intentions of the Federal Reserve over periods as long as five years. For a detailed discussion of the money-base relationship, see Jerry L. Jordan, "Elements of Money Stock Determination," Federal Reserve Bank of St. Louis *Review*, October 1969, pp. 10-19.

reflected in net issues of Treasury securities. In particular, when the deficit increased in response to the recessions in the 1959-64, 1969-74, and 1974-79 periods, net Treasury securities outstanding expanded. In addition to recessions, the surge in inflation in the 1970s widened the gap between federal expenditures and revenue, although the deficit in inflation-adjusted or real terms expanded much less rapidly. Nevertheless, the rise in the deficit due to inflation was again reflected in the growth of Treasury securities.

An implication of past trends in deficit financing is that during recessionary periods with large deficits, the deficits are largely financed by debt—that is, by issuing Treasury securities to private investors. Thus, if in the short run these debt-financed deficits crowd out a significant amount of private spending, the stimulative impact of the deficit may be significantly reduced or even eliminated. This issue is examined in a simple analytical framework in the next section, and an empirical assessment is presented in the third section.

### ANALYTICAL ISSUES

In this section, a standard theoretical model of the economy, the IS-LM model, is reviewed in order to isolate the analytical issues associated with crowding out. Six different permutations of the model are examined to illustrate a range of possibilities concerning the degree of crowding out. These possibilities include cases where an increase in government spending merely replaces an equal amount of private spending—that is, complete crowding out—and other scenarios where total spending increases without any inflationary pressure.

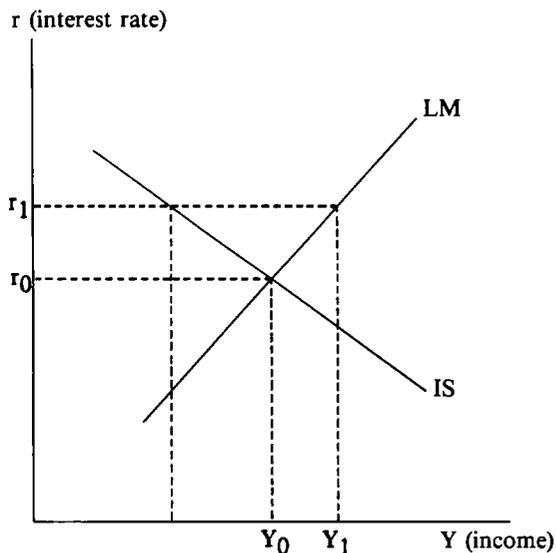
The standard IS-LM model is a general model of the economy that separately represents the commodity market—the market for goods and services—and financial markets. In the model, the IS curve represents those combinations of income and the interest rate

that satisfy equilibrium conditions in the market for goods and services. Three distinct sources of spending are usually considered in the commodity market—consumption expenditures, investment expenditures, and government expenditures. Total spending is thought to respond negatively to changes in the interest rate. For example, given a decrease in the interest rate, more potential investment projects involving purchases of structures and equipment are profitable because of an increase in the spread between the rate of return on these investment projects and the cost of financial capital, which is represented here by a single interest rate. Thus, there is a negative relationship between income and the interest rate in the commodity market as illustrated by the IS curve in Figure 1.

It should be noted that the IS curve describes commodity market equilibrium for a given level of government spending. Any increase in government expenditures or reduction in autonomous tax receipts, or any combination that increases the government deficit, shifts the entire IS curve to the right. In the case of increased government spending, aggregate demand will rise and result in higher income levels at any given interest rate. In the case of reduced autonomous tax receipts, the disposable income of households will increase and again result in higher levels of aggregate demand and, hence, income at any given interest rate. The impact of an increase in the federal deficit is illustrated in Figure 2 by a shift in the IS curve from  $IS_0$  to  $IS_1$ .

Also in Figure 1, the LM curve is shown to represent those combinations of income and the interest rate consistent with financial market equilibrium. In the most basic version of this model, it is assumed that all financial assets are grouped into two broad aggregates labeled “money” and “bonds.” Because of this aggregation, distinctions between Treasury securities and private securities—such as cor-

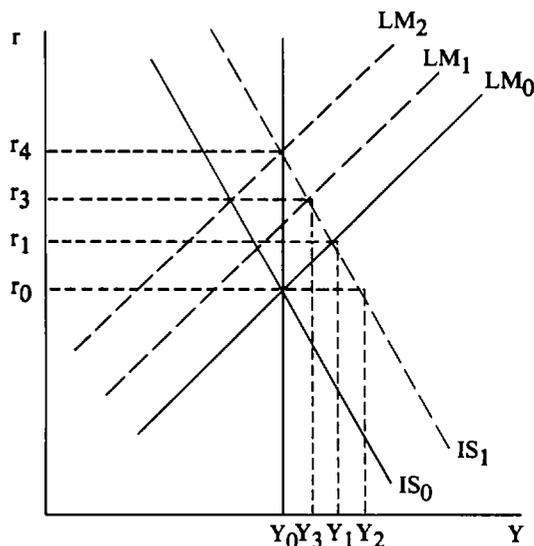
**Figure 1**  
**THE IS-LM MODEL**



porate bonds, equities (stocks), and mortgages—are not made. In this two-asset version of the model, only one of the financial markets has to be examined. In particular, for a given amount of investors' investable wealth, if the demand for money is known, then the demand for bonds simply equals the remaining amount of wealth, and vice versa. The usual convention of considering the money market, the supply of and demand for money, is followed here.

As implied by the positive slope of the LM curve in Figure 1, higher interest rates are associated with higher levels of income for equilibrium to occur in financial markets, and vice versa. For any increase in income, for example from  $Y_0$  to  $Y_1$ , the demand for transactions balances increases at the initial level of the interest rate,  $r_0$ . Under the assumption that the Federal Reserve sets the supply of money at a given level, individuals attempt to sell part of their bond holdings to satisfy their increased

**Figure 2**  
**CROWDING OUT IN THE IS-LM MODEL**



demand for money, thereby causing the interest rate to rise to  $r_1$ .<sup>4</sup>

The demand for money may also depend on wealth—defined here as consisting of the monetary base, equities, and privately held Treasury securities.<sup>5</sup> An increase in wealth is

<sup>4</sup> In the remainder of this article a distinction will not be made between money and the monetary base. Given a constant money multiplier, for example, the money market may be equivalently expressed in terms of the base or money.

<sup>5</sup> See, for example, Milton Friedman, "The Demand for Money: Some Theoretical and Empirical Results," *Journal of Political Economy*, August 1959, pp. 327-51. The definition of wealth used here follows from the consolidation of the nonfinancial business, financial business, and individuals into a single private sector. Other types of financial assets—such as nongovernment deposits at commercial banks and corporate bonds—are not included in measured wealth because they cancel out when the private sector is aggregated. For example, corporate bonds are liabilities of businesses and assets of the remainder of the nonbank public.

often presumed to increase the demand for money at any combination of the interest rate and income because some portion of the increase may be desired to be held in money. At a given level of income, individuals respond to an increase in wealth by attempting to sell bonds to bolster their money holdings. As before, the result is that the rate will increase until individuals are content to hold the existing amount of money. An increase in wealth, therefore, shifts the LM curve to the left from  $LM_0$  to  $LM_1$  in Figure 2. That is, at the current level of income,  $Y_0$ , money market equilibrium is obtained at a higher interest rate.

By combining the LM and IS curves, the overall equilibrium of the economy may be determined. In Figure 1, this equilibrium is represented by the combination, income and interest rate  $Y_0$  and  $r_0$ , which occurs at the intersection of the LM and IS curves. If the economy is initially operating at a point not at the intersection of these curves, excess supply or demand in the money market will cause the interest rate to move in the direction that equilibrates the economy.

Various case applications of this basic model are described below to examine the consequences of debt-financed federal deficits.<sup>6</sup> The controversy over the relative impact of money versus debt financing of deficits centers especially on the impact of debt-financing, as there is little debate on the stimulative impact of increases in money. In particular, it is

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<sup>6</sup> The labels attached to these various cases are chosen merely for convenience, and all economists may not agree with the implied characterizations. In addition, the analysis presented below is in terms of the traditional static effects associated with the IS-LM framework. For dynamic analyses, see Alan S. Blinder and Robert M. Solow, "Does Fiscal Policy Matter?" *Journal of Public Economics*, November 1973, pp. 319-37; and James Tobin and Willem Buiter, "Long-Run Effects of Fiscal and Monetary Policy on Aggregate Demand," in Stein, ed., *Monetarism*, North-Holland, 1976, pp. 273-309.

generally agreed that when the money supply is increased, the level of income increases beyond  $Y_0$  in Figure 1 in the absence of fully utilized resources. This result follows because the increase in the supply of money causes the interest rate to fall at any given level of income, as individuals attempt to reduce excess money holdings by purchasing bonds, thereby shifting the LM curve to the right. Thus, in this case, equilibrium income will be greater than the initial level of income.<sup>7</sup>

### Full Resource Utilization

When all factors of production are fully employed, fiscal stimulus unambiguously leads to crowding out.<sup>8</sup> A rise in the federal deficit resulting from an increase in government spending or a reduction in taxes initially influences the economy by increasing aggregate demand—that is, the IS curve shifts from  $IS_0$  to  $IS_1$  in Figure 2. If the economy is already fully employing all available resources in producing output equal to  $Y_0$ , however, the additional fiscal stimulus raises aggregate demand,  $Y_1$ , above aggregate supply,  $Y_0$ , generating pressure on prices. In the most simple case in which wealth does not affect the demand for

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<sup>7</sup> Given the presence of wealth in the money demand function, part of the rightward shift of the LM curve is offset by a leftward shift due to the higher level of wealth. However, it is unlikely that this leftward shift is greater than the rightward shift implying that on balance the LM curve shifts to the right.

<sup>8</sup> At one time, supply constraints appeared to be a rationale advanced by some monetarists to justify their belief that bond-financed fiscal stimulus is ineffective. See, for example, Milton Friedman, "A Theoretical Framework for Monetary Analysis," *Journal of Political Economy*, March/April 1970, pp. 193-238. The crowding-out debate does not, however, currently center on this case, as most economists would probably agree that binding supply constraints eliminate the effectiveness of expansionary fiscal policy. Nevertheless, fiscal policy directed toward increasing aggregate supply itself—as recently advocated—may promote output growth in the intermediate to long run.

money or aggregate spending, the rise in the price level reduces real, or inflation-adjusted, money holdings if the deficit is bond financed.<sup>9</sup> To restore real money balances to their previous level, individuals try to sell bonds which cause the interest rate to rise—that is, the LM curve shifts to the left until a new equilibrium is obtained at  $Y_0$  and  $r_4$ . At this new equilibrium, aggregate demand and supply are again equal, but the interest rate has risen to  $r_4$  due to the smaller amount of real money balances in the economy. The impact of money financed deficits is the same in this case, despite the initial rightward shift in the LM curve.

If the fiscal stimulus takes the form of increased government spending, an equal amount of real private spending is crowded out. Because total real spending is the same as before at the new equilibrium and real government spending has increased, this result necessarily follows. The amount of private spending that has been crowded out is equal to  $Y_2 - Y_0$ , where  $Y_2$  represents the amount of total spending that would have resulted in the absence of any change in the interest rate. Thus, the increase in the interest rate to  $r_4$  has crowded out some interest-sensitive private spending.

If the fiscal stimulus takes the form of a bond-financed decrease in taxes with real government spending constant, the shares of the government and private sector spending remain unchanged. Nevertheless, the rise in the interest rate results in a larger share of noninterest-sensitive private spending and a smaller share of interest-sensitive spending. To the extent that this represents a movement from

investment spending toward consumption spending, the growth of productive capacity is adversely affected.

### Ultrarationality

Another case that implies complete crowding out of private expenditures in response to bond-financed increases in government spending invokes strong assumptions about the “rationality” of private sector participants.<sup>10</sup> In particular, individuals are assumed to view bond-financed deficits and private investment expenditures as perfect substitutes. The implication of this assumption is that the private sector precisely matches any increase in a bond-financed deficit by a reduction in investment spending. This response negates the effect of an expansionary fiscal policy, implying that aggregate spending and therefore the IS curve remains at its original position.

Similarly, even if wealth affects the demand for money, the ultrarationality assumption implies that Treasury securities merely replace an equal amount of private capital, thereby leaving total wealth unchanged. From this result, it follows that a bond-financed increase in the federal deficit does not affect total wealth. Thus, the LM curve also remains at its original position, implying that bond-financed deficits do not move the economy away from its equilibrium at  $Y_0$  and  $r_0$  in Figure 2.

Increased government spending, therefore, crowds out an equal amount of private spending, and a tax reduction has no effect on aggregate private spending as in the previous case.

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<sup>9</sup> To simplify the analysis, it is assumed throughout this article that changes in wealth do not affect aggregate demand. For an analysis of crowding out that includes these effects, see Alan S. Blinder and Robert M. Solow, “Does Fiscal Policy Matter?” *Journal of Public Economics*, November 1973, pp. 319-37.

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<sup>10</sup> See, for example, Paul A. David and John L. Scadding, “Private Savings: Ultrarationality, Aggregation, and ‘Denison’s Law,’” *Journal of Political Economy*, March/April 1974, pp. 225-49. Despite interpretations to the contrary, Milton Friedman also appears to rely on the ultrarationality assumption in describing the ineffectiveness of bond-financed fiscal policy in “Comments on the Critics,” *Journal of Political Economy*, September/October 1972, pp. 906-50.

In contrast to the previous case, however, these policy actions do not cause the interest rate to rise. Nevertheless, investment spending is reduced by an amount equal to the rise in government spending, and a reduction in taxes shifts private spending toward consumption and away from investment.

### Strong Monetarist Position

The impact of debt-financed deficits in this and the subsequent three cases depends on assumptions about the proper theoretical representation of financial markets—that is, the LM curve.<sup>11</sup> Of these cases, the one that unambiguously implies complete crowding out from a rise in bond-financed government spending is labeled here as the “strong monetarist position,” although it would be more appropriate to call it the “straw-man monetarist position,” as the underlying assumption has been widely disavowed.

The key assumption in this case is that the demand for money is totally insensitive to changes in the interest rate. In the absence of any wealth effects, the demand for money then becomes entirely dependent on the level of income—that is, the LM curve is vertical. Because of this interest insensitivity, the supply of money effectively limits the amount of real spending in the economy, implying that the level of income is determined in the money market, as represented by the vertical line at  $Y_0$  in Figure 2.

The impact of bond-financed deficits on real private spending is the same in this case as that in the “full resource utilization” case con-

sidered previously. However, instead of a rise in both prices and the interest rate, only the interest rate increases in the strong monetarist case. For a stimulative fiscal action, aggregate demand initially increases as before, shifting the IS curve from  $IS_0$  to  $IS_1$  in Figure 2. However, because the supply of money limits the amount of transactions in the economy, the interest rate must rise to equate aggregate demand in the commodity market to that determined in the money market. Thus, the interest rate rises until it reaches  $r_4$  in Figure 2, the point at which enough interest-sensitive private spending is crowded out to enable the initial level of income,  $Y_0$ , to be obtained.

### Weak Monetarist Position

With more conventional assumptions about the demand for money, the monetarist position of substantial if not complete crowding out of private spending is an open question. However, a general representation of money demand including both interest sensitivity and wealth effects does have a special case that leads to monetarist results.<sup>12</sup> Moreover, the “strong monetarist position” can also be viewed as a special case of this general representation of money demand.

The most straightforward manner to illustrate this position is to consider the impact of bond-financed deficits in steps. First, with some interest responsiveness in the demand for money, the IS and LM curves are as exhibited in Figure 1. Fiscal stimulus causes the IS curve to shift from  $IS_0$  to  $IS_1$  in Figure 2, which implies that income rises from  $Y_0$  to  $Y_1$ , and the interest rate increases from  $r_0$  to  $r_1$  in response to the higher demand for transactions balances. Notice that at this point some interest-sensitive private spending is crowded out—in particular,

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<sup>11</sup> The analysis in the remainder of this section draws heavily on a recent article by Benjamin Friedman. However, Friedman did not present empirical estimates analogous to those presented below in the third section. See Benjamin M. Friedman, “Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits,” *Brookings Papers on Economic Activity*, No. 3, 1978, pp. 593-641.

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<sup>12</sup> For a further analysis of this case, see footnote 6.

an amount equal to  $Y_2 - Y_1$ , where  $Y_2$  equals the level of income that would have occurred had the interest rate remained unchanged. Because this crowding out arises from the increased transactions demand for money, this amount may be conveniently labeled *transactions crowding out*.

Next, with wealth in the demand for money due to the additional role money could play as an asset in investors' portfolios, the bond-financed deficit also increases the demand for money. As mentioned previously, such wealth-induced increases cause the interest rate to rise as investors attempt to sell bonds to increase their money holdings. Thus, the LM curve shifts to the left from  $LM_0$ . This additional rise in the interest rate to  $r_3$  crowds out an additional amount of private spending equal to  $Y_1 - Y_3$ . Because portfolio motives for holding money are responsible for the interest rate rise, this amount may be labeled *portfolio crowding out*. If the portfolio crowding out effect is large enough so that it raises the interest rate to  $r_4$ , bond-financed fiscal stimulus has the same crowding out effect as the previous case. However, if portfolio crowding out is small, then total crowding out, which is equal to transactions plus portfolio crowding out, or  $Y_2 - Y_3$ , will not be of sufficient magnitude to prevent a rise in total income. Thus, the impact of bond-financed deficits in this case is an empirical question that centers on the magnitude of the portfolio crowding-out effect.

### Strong Nonmonetarist Position

The nonmonetarist position that bond-financed fiscal stimulus leads to a rise in income unambiguously follows from the IS-LM framework if two conditions are met. First, the demand for money and therefore the LM curve is interest sensitive, as in Figure 1. Second, the portfolio motive for holding money is not relevant, implying that wealth is not a determinant of money demand.<sup>13</sup>

The analysis associated with this case is precisely that of the first step used to illustrate the "weak monetarist position." In particular, bond financed deficits cause both income and the interest rate to rise, although some interest-sensitive private spending is effected through transactions crowding out. However, in this case the portfolio crowding-out effect is assumed to be zero thereby ensuring no leftward movement in the LM curve.

### Weak Nonmonetarist Position

Similar to the "weak monetarist position," the "weak nonmonetarist position" is associated here with a general model that may lead to either monetarist or nonmonetarist conclusions depending on the extent of portfolio crowding out. This model, in fact, includes all of those cases considered previously, except ultrarationality, as special cases and therefore offers the most fruitful framework for empirical analysis. The analysis associated with this case differs from those of the "strong nonmonetarist" and "weak monetarist positions" in that instead of either no change or a leftward shift in the LM curve, debt financed deficits may actually cause portfolio crowding in—that is, the LM curve may shift to the right and offset some portion of transactions crowding out. Such a shift further implies that a debt-financed fiscal action leads unambiguously to an expansion of economic activity in the absence of full resource utilization, and even less total crowding out than associated with the "strong

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<sup>13</sup> See, for example, Albert Ando and Karl Shell, "Appendix: Demand for Money in a General Portfolio Model in the Presence of an Asset that Dominates Money," in Fromm and Klein, eds., *The Brookings Model: Perspective and Recent Developments*, North-Holland, 1975, pp. 560-63. An even stronger nonmonetarist position would have no interest sensitivity in the commodity market thereby implying that monetary policy has no effect. In all of the cases examined here, however, it is assumed that the commodity market exhibits interest sensitivity as illustrated in Figure 1.

nonmonetarist position." All previous cases excluded portfolio crowding in as a logical possibility.

The "weak nonmonetarist" model differs from those considered previously in that the simple money-bond distinction is generalized to include four financial assets. The four assets considered are money, short-term Treasury securities, long-term Treasury securities, and equities. In this expanded model, the deficit may be financed by increasing money or either of two different maturities of Treasury securities. In the two-asset model, the broad asset category labeled "bonds" consisted of both maturities of Treasury securities and equities.

The representation of the commodity market remains identical to that of the previous version of the model. However, in the expanded model there are three categories of interest-bearing securities, implying that three different interest rates are determined. It is therefore no longer valid to describe the analytical results in terms of "the interest rate." Instead, the link between financial markets and commodity markets must be specified in terms of one or more of the three interest rates determined in the model. In this respect, the yield on equity is often thought to be an important determinant of business fixed investment expenditures, implying that the relevant interest rate in the IS-LM curve diagram is the equity yield.<sup>14</sup> Thus, the consequences of

debt financed deficits center on the impact of debt financing on the equilibrium value of the equity yield.

As in the two-asset model, one of the financial markets may be eliminated from the analysis because it merely supplies extraneous information. In particular, as long as the demands for any three financial assets are known, it necessarily follows that the fourth equals the remaining amount of investable wealth. To facilitate the comparison between the two-asset and four-asset models, the equity market is eliminated and the equity yield is represented as being determined in the money market. Because the level of commodity market activity is dependent on the equity yield, the derivation of the IS and LM curves proceed exactly as before, with the joint equilibrium of the commodity and financial markets determined at the intersection of the IS and LM curves.

With the presence of two additional assets, the demand for money depends not only on income and wealth but also on the interest rates on short-term Treasury securities,  $r_S$ , and long-term Treasury securities,  $r_B$ . The demand for money is assumed to be negatively related to these two interest rates as well as the equity yield,  $r_E$ .<sup>15</sup> As before, an increase in wealth increases the demand for money at any given combination of the equity yield and income, implying that the LM curve shifts to the left toward  $LM_1$  in Figure 2. However, increases in either of the Treasury security yields,  $r_S$  or  $r_B$ , reduce the demand for money at any given combination of the equity yield and income which results in a rightward shift in the LM

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<sup>14</sup> See, for example, James Tobin, "An Essay on Principles of Debt Management," in *Fiscal and Debt Management Policies*, Commission on Money and Credit, Prentice-Hall, 1963, pp. 143-218; and James Tobin, "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit, and Banking*, February 1969, pp. 15-29. By including corporate bonds in the model, the relevant cost of capital may be represented by a weighted average of the bond yield and the equity yield. For an example of the use of such a variable in an empirical analysis of business fixed investment, see Peter K. Clark, "Investment in the 1970s: Theory, Performance, and Prediction," *Brookings Papers on Economic Activity*, No. 1, 1979, pp. 73-113.

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<sup>15</sup> The assumed relationships between interest rates and the demand for money are broadly consistent with empirical studies examining the determinants of money demand. See, for example, Stephen M. Goldfeld, "The Demand for Money Revisited," *Brookings Papers on Economic Activity*, No. 3, 1973, pp. 577-638; and Michael J. Hamburger, "Behavior of the Money Stock: Is There a Puzzle?" *Journal of Monetary Economics*, July 1977, pp. 265-88.

curve.<sup>16</sup> If the short-term interest rate rises, for example, individuals are induced to transfer a portion of their noninterest-bearing money balances into short-term securities.

The economic consequences of short-term or long-term debt financed deficits depend on the extent that the wealth effect associated with the larger amount of Treasury securities is offset by increases in short-term and long-term Treasury security yields. It is entirely possible that the wealth effect is more than fully offset, resulting in portfolio crowding in—that is, the LM curve may actually shift to the right. Such a shift would imply that the total crowding-out effect is even less than that associated with transactions crowding out. Differences could also emerge due to differential impacts of short-term and long-term interest rates on the demand for money. Because the ultimate impact on the LM curve and therefore the extent of portfolio crowding out can be determined only by assigning relative magnitudes to the impacts associated with the movements of wealth, short-term interest rates, and long-term interest rates, empirical estimates are presented below to assess the key magnitudes involved.

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<sup>16</sup> As indicated in the text, the LM curve represents only conditional money market equilibrium, and not complete financial market equilibrium. Thus, whenever supply or demand conditions in the short- and long-term Treasury security markets cause the respective yields to change, the demand for money is affected thereby causing the LM curve to shift. For further discussion of this methodology, see Benjamin M. Friedman, "Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits," *Brookings Papers on Economic Activity*, No. 3, 1978, pp. 593-641. An alternative framework which replaces the LM curve as represented here with a curve representing equilibrium in all financial markets may be found, for example, in Darrel Cohen and J. Stuart McMnamin, "The Role of Fiscal Policy in a Financially Disaggregated Macroeconomic Model," *Journal of Money, Credit, and Banking*, August 1978, pp. 322-36. The overall effects are identical in both frameworks as they merely represent the same model somewhat differently.

## EMPIRICAL RESULTS

In this section, empirical evidence is provided to determine the impacts of money and debt financing of deficits. The evidence is obtained from an empirical model of the financial sector of the economy corresponding to the "weak nonmonetarist" model discussed above. To determine the impacts, the procedure employed is to estimate a four-equation model consisting of the demands for money, short-term Treasury securities, long-term Treasury securities, and equity. Then experiments are performed to find the direction of change in the equity yield corresponding to increases in the supplies of money and the two maturities of Treasury securities.<sup>17</sup> If these experiments indicate that increases in money-financed and debt-financed deficits cause the equity yield to fall, the implication is that the LM curve has shifted to the right—for example, from  $LM_0$  in Figure 1. This result further implies that portfolio crowding in is prevalent, with the total crowding-out effect being smaller than that implied by transactions crowding out. In such a case, stimulative fiscal policy actions will increase aggregate demand in the economy. On the other hand, if the equity yield rises in the experiments, the LM curve has shifted to the left due to portfolio crowding out—for example, from  $LM_0$  to  $LM_2$  in Figure 2. With this result, the total crowding-out effect may be substantial and even leave aggregate demand unchanged in response to stimulative fiscal policy actions.

The model underlying the empirical analysis is represented in linear form as:

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<sup>17</sup> The results reported in this section are qualitative—that is, they concern the direction of change and not the actual magnitude of the change. To derive quantitative results, the nonfinancial sector of the economy must also be modeled. The main controversy surrounding crowding out, however, involves shifts in the LM curve, which may be examined qualitatively.

$$\begin{aligned}
 M^D &= m_0 + m_1 r_S + m_2 r_B + m_3 r_E + \\
 &\quad M_4 W + m_5 Y \\
 S^D &= s_0 + s_1 r_S + s_2 r_B + s_3 r_E + \\
 &\quad s_4 W + s_5 Y \\
 (1) \quad B^D &= b_0 + b_1 r_S + b_2 r_B + s_3 r_E + \\
 &\quad b_4 W + b_5 Y \\
 E^D &= e_0 + e_1 r_S + e_2 r_B + e_3 r_E + \\
 &\quad e_4 W + e_5 Y
 \end{aligned}$$

where  $M^D$ ,  $S^D$ ,  $B^D$ , and  $E^D$  are the demands for money, short-term Treasury securities, long-term Treasury securities (bonds), and equities. The lower case letters—for example,  $m_0$ ,  $m_1$ ,  $m_2$ ,  $m_3$ ,  $m_4$ , and  $m_5$ —represent coefficients to be estimated. The demands for the four types of securities are constrained by the total amount of wealth, which is represented as:

$$(2) \quad W = M^D + S^D + B^D + E^D.$$

This implies that any three of the asset demands may be estimated and the fourth may be derived from the wealth constraint represented by equation (2). Assuming that the supplies of the different assets are given and that markets clear, any three of the above asset demands may be used to solve for the three yields determined by the model.

The coefficient estimates of the linearized asset demands are derived from a disaggregated structural model of the Treasury and equity markets described in detail elsewhere.<sup>18</sup> Equations are separately estimated for short-term Treasury securities, long-term Treasury securities, and equities over the sample period beginning in 1960:I and ending in 1975:IV, and the money demand equation is determined from the wealth identity.<sup>19</sup> The estimated coefficients for the linear version of the model cor-

responding to the asset demands in equation (1) are presented in Table 2.<sup>20</sup> The coefficients associated with changes in income were not derived because they are not needed to determine the qualitative impact of debt and money financing of deficits—that is, shifts of the LM curve.

The short-run consequences of money and debt financing of deficits are determined by setting the demands in equation (1) equal to the given supplies of the assets, and then solving for the values of the three endogenous yields— $r_S$ ,  $r_B$ , and  $r_E$ —that equate the demands with the supplies. The impacts associated with money and debt financing of deficits are determined by separately increasing the supplies of short-term Treasury securities, long-term Treasury securities, and money, and then solving for the new values of the yields. As indicated in Table 3, an increase in the supply of money causes a reduction in all of the interest rates. This is the standard result which implies that the LM curve in Figure 2 shifts to the right offsetting some portion of transactions crowding out,  $Y_2 - Y_1$ .

<sup>19</sup> It is unnecessary to solve the money demand explicitly. The three estimated demands are sufficient to determine the three endogenous yields. However, as is often suggested in the literature, the plausibility of the residual equation should always be examined. See William C. Brainard and James Tobin, "Pitfalls in Financial Model Building," *American Economic Review*, March 1968, pp. 99-122.

<sup>20</sup> The coefficient estimates are derived from the impact elasticities implied by the model using the actual values of  $S^D$ ,  $B^D$ ,  $E^D$ ,  $r_S$ ,  $r_B$ ,  $r_E$ , and  $W$  that occurred in 1975:IV. The impact elasticities for the interest rates were obtained by separately increasing the three interest rates by 1 percent, and then solving for the percentage change in the corresponding market demands. This procedure was followed for each quarterly period beginning in 1960:I and ending in 1975:IV, with the sample averages used in the computations. Wealth elasticities were computed in a similar manner. In the case of wealth elasticities, however, the 1 percent increase in wealth was allocated to the various categories of investors in the model according to their respective percentage holdings of the total amount of financial assets in the economy.

<sup>18</sup> See V. Vance Roley, "A Disaggregated Structural Model of the Treasury Securities, Corporate Bond, and Equity Markets: Estimation and Simulation Results," working paper RWP 80-11, Federal Reserve Bank of Kansas City, 1980.

For debt-financed deficits, the qualitative impacts in Table 3 indicate that portfolio crowding in occurs even though both short-term and long-term interest rates on Treasury securities increase. In each case the rise in short-term and long-term interest rates is sufficient to reduce the demand for money more than the increase in wealth increases the demand for money. The net effect is that the LM curve in Figure 2 shifts to the right causing the equilibrium in both commodity and money markets to occur at a higher level of income and a lower interest rate than indicated by  $r_1$  and  $Y_1$ . Thus, the empirical results indicate that the total crowding-out effect is reduced from that represented by  $Y_2 - Y_1$  in Figure 2—that is, in the short run the magnitude of transactions crowding out overstates the actual amount of total crowding out.<sup>21</sup> As discussed above, this result further indicates that either an increase in federal spending or a reduction in federal taxes will increase aggregate demand in the economy.

**Table 2**  
**EMPIRICAL ESTIMATES OF THE**  
**LINEARIZED DEMAND EQUATIONS**

(Sample Period: 1960:I—1975:IV)

Asset	Coefficient Estimates			
	$r_S$	$r_B$	$r_E$	W
$M^D$	-1.986	-0.988	-1.955	0.847
$S^D$	2.392	-0.451	-0.676	-0.013
$B^D$	-0.406	1.439	0.111	0.015
$E^D$	0	0	2.520	0.151

$r_S$  = yield on 3- to 5-year Treasury securities

$r_B$  = yield on 10-year and over Treasury securities

$r_E$  = Standard and Poor's dividend/price ratio

S = short-term Treasury securities

B = long-term Treasury securities

E = equities

M = money

W = M + S + B + E

**Table 3**  
**THE QUALITATIVE IMPACTS OF**  
**MONEY AND DEBT FINANCING**  
**OF DEFICITS**

Increase in the Supply of:	Increase (+) or Decrease (-) in the Level of Interest Rate:			Portfolio Crowding Out (+) or Crowding In (-)
	$r_S$	$r_B$	$r_E$	
M	-	-	-	-
S	+	+	-	-
B	+	+	-	-

## CONCLUSIONS

During recessionary periods, federal deficits often occur as economic stimulus is provided to a sagging economy. Because of the reliance often placed on debt-financed deficits during these periods, it is important to assess the associated economic effects of debt financing. For example, it is possible that a significant portion of debt-financed deficits simply crowd out private spending, which would negate some of the expansionary impact of the deficit.

A theoretical model often used to analyze the economy, the IS-LM model, implies that debt financing could have substantial offsetting effects on the amount of economic stimulus provided by increased deficits. However, by expanding the basic two-asset (money-bond) version of this model to include four

<sup>21</sup> Similar qualitative results have been discussed as possibilities based on explicit assumptions concerning asset substitutability. See, for example, James Tobin, "Money, Capital, and Other Stores of Value," *American Economic Review*, May 1961, pp. 26-37; and James Tobin, "An Essay on the Principles of Debt Management," in *Fiscal and Debt Management Policies*, Commission on Money and Credit, Prentice-Hall, 1963, pp. 143-218.

assets—money, short-term Treasury securities, long-term Treasury securities, and equities—the economic consequences of debt-financed deficits become much more uncertain. In the context of this four-asset model, empirical estimates indicate that the total crowding-out effect may in fact be relatively small, implying that stimulative fiscal policy actions will increase aggregate demand in the economy. The empirical results should only be

interpreted as being suggestive, however, because the inclusion of four assets in the model still only accounts for a fraction of the total financial assets existing in the economy. The crowding-out question should be analyzed by including as many assets as possible and by also explicitly taking into account the distinct channels of financial intermediation that may further affect the overall level of economic activity.

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