Federal Government Budget Deficits and Interest Rates: A Brief Note

Cebula, Richard

Jacksonville University

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I. Introduction

In recent years, a number of studies, including Barth, Iden, and Russek [1; 2], Hoelscher [6; 7], Evans [3; 4], and Makin [9], have empirically investigated the impact of federal budget deficits upon interest rates. This note seeks to investigate further the actual impact of the deficit upon the nominal rate of interest. The analysis differs from the existing literature on a number of counts. To begin with, the analysis uses the most updated evidence available on the structural deficit [8], as well as newly available monthly data on inflationary expectations [10]. Next, unlike previous studies, the variable federal purchases of goods and services is expressly introduced into the model as an explanatory variable. In addition, since the total federal deficit is in this paper broken into its two component parts, the structural deficit (which is exogenous) and the cyclical deficit (which is not exogenous), the model expressly deals with the problem of simultaneity bias involving the cyclical deficit. Finally, the monetary policy measure, government purchases of goods and services, and the two deficit measures are not only expressed in real terms but also are divided by trend real GNP; this is because monetary policy actions, government purchases of goods and services, and the deficit must all be judged relative to the size of the economy.

II. The Model

It is commonplace in the literature to measure the deficit as simply the difference between aggregate federal outlays and receipts. That is, most of the literature fails to adjust the aggregate federal budget deficit for the effect of the business cycle.

To appreciate the relationship between the deficit and the business cycle, consider the traits of an economic downturn. As real GNP declines, government tax collections decline and government transfer payments increase. Thus, the total federal deficit increases and federal credit demands increase. However, concurrent with the increased credit demands of the Treasury will be decreased credit demands in the private sector because the downturn in real GNP will elicit diminished real private sector spending. Thus, the cyclical rise in the federal deficit is accompanied by a cyclical decline in private sector spending (and credit demand). As a result, the increased credit demands of the Treasury to finance the "cyclical" deficit are presumably going to be offset by diminished private sector credit demands during the same downturn. Accordingly, when examining the interest-rate impact of the federal deficit, it is essential to distinguish between the cyclical deficit, which is the countercyclically endogenous component of the total deficit, and the

structural deficit, which is the exogenous component of the deficit. According to conventional macroeconomic theory, the structural deficit and the cyclical deficit are both supposed to generate upward pressure on the rate of interest. Of course, since the cyclical deficit is countercyclical in nature and since interest rates are procyclical in nature, the cyclical deficit should tend to be associated with lower interest rates in absolute terms and higher interest rates in relative terms.

Given the above remarks, the *IS-LM* based model to be examined is given by:

$$NR_t = f(SD_t/Y_t, CD_t/Y_t, M_t/Y_t, G_t/Y_t, P_t, RTR_t) \tag{1}$$

where NR_t = the nominal interest rate yield on Moody's Aaa-rated corporate bonds in quarter t, expressed as a percent;

SD_t/Y_t = the ratio of the seasonally adjusted real structural deficit in quarter t to the seasonally adjusted trend real GNP in quarter t, expressed as a percent;

CD_t/Y_t = the ratio of the seasonally adjusted real cyclical deficit in quarter t to the seasonally adjusted trend real GNP in quarter t, expressed as a percent;

M_t/Y_t = the ratio of M_t, which is expressed in real terms and which is defined as the average of the current and preceding quarters' values of the seasonally adjusted net acquisition of credit market instruments by the Federal Reserve System, to the seasonally adjusted trend real GNP in quarter t, expressed as a percent;

G_t/Y_t = the ratio of seasonally adjusted real federal government purchases of goods and services in quarter t to the seasonally adjusted trend real GNP in quarter t, expressed as a percent;

P_t = the expected inflation rate during quarter t, expressed as a percent;

RTR_t = the ex ante real three-month Treasury bill rate in quarter t, expressed as a percent.

Several observations are now in order. To begin with, the analysis includes measures of both the structural deficit and the cyclical deficit. The structural deficit data are based upon a 1986 study by Holloway [8], who provides revised and updated quarterly estimates of the structural surplus for the period beginning in 1955:1. To convert these data into structural deficit data, it was necessary to multiply the series by (-1). The cyclical deficit is simply the difference between the total federal deficit and the structural deficit.

Our study period, like the structural deficit data, begins in 1955:1. The study period ends with 1984:4, so that the study period covers three full decades, a period (number of observations) more than sufficient to provide insights into the deficit-interest rate relationship. Furthermore, it should be noted that essentially the same kind of results as shown below in equations (2) and (3) are obtained for a wide variety of other periods beginning with 1955:1.

As for the non-deficit variables, the analysis includes variable M_t, which is used to reflect monetary policy. Following Barth, Iden and Russek [2] and Hoelscher [6], M_t is computed by averaging the seasonally adjusted current quarter and preceeding quarter values of the net acquisition of credit market instruments by the Federal Reserve System. This two-quarter moving average is adopted in order to allow adequate time for changes in the monetary base to influence banking system liquidity and hence the supply of loanable funds in the economy. Unlike other studies, the analysis here includes (in accordance with the *IS-LM* paradigm) the variable G_t, which consists strictly of federal government purchases of goods and services; G_t does not include transfer payments. This particular variable, as defined, is not found elsewhere in this literature, despite its central place in conventional macroeconomic analysis. Next, the inflationary expectations vari-

able is based upon the recent study by Thies [10], who derives inflationary expectations data on a monthly basis. These data are potentially more useful than the Livingston survey data which, while otherwise similar to the data in Thies [10], are either semi-annual or annual in nature and thus are less neatly adapted to a quarterly framework. Next, the variable RTR_t is defined as the nominal interest rate yield on three-month Treasury bills minus the expected inflation rate. Following Hoelscher [7], this variable is included in the analysis to allow for substitutability between the short-term bond market and our longer-term bond market. Finally, in principle following Holloway [8], Hoelscher [6], and Evans [3; 4], the variables SD_t, CD_t, M_t, and G_t are all divided by trend GNP because the deficit, open market operations, and government purchases of goods and services should all be judged relative to the size of the economy.

On the basis of our earlier general remarks regarding the deficit and the nominal rate of interest, it is expected that the nominal Moody's Aaa-rated corporate bond rate is an increasing function of both the structural deficit and the cyclical deficit. In the case of the structural deficit, this expectation derives directly from conventional macroeconomic theory. Of course, given the countercyclical nature of the cyclical deficit, it will tend to be associated with lower rates of interest in the absolute sense; however, according to conventional macroeconomic theory, these lower rates of interest are nevertheless relatively higher than they would have been in the absence of a cyclical deficit.

III. Empirical Results

With the cyclical deficit included in the analysis, there arises the possibility of simultaneous equation bias. This is because the cyclical deficit, by its very nature, is not exogenous. Accordingly, the linear form of equation (1) is estimated using an instrumental variables technique (as well as the Cochrane-Orcutt technique due to the presence of first order serial correlation), with the instrument being the quarterly unemployment rate of the civilian labor force (lagged one quarter). The choice of instrument is based upon the fact that the lagged unemployment rate of the civilian labor force systematically explains the cyclical deficit, whereas the contemporaneous error terms in the system are not correlated with the lagged unemployment rate. The results of the estimation are provided in equation (2):

$$\begin{aligned} NR_t = {} & 6.59 + \underset{(+7.64)}{0.45SD_t/Y_t} + \underset{(+5.00)}{0.65CD_t/Y_t} \\ & + \underset{(+1.01)}{0.64M_t/Y_t} - \underset{(-1.49)}{0.38G_t/Y_t} \\ & + \underset{(+7.49)}{0.60P_t} + \underset{(+15.57)}{0.64RTR_t}, \qquad D\text{-}W = 1.64 \end{aligned} \tag{2}$$

where terms in parentheses are t-values.

As shown in equation (2), the coefficients on the two deficit variables are positive and statistically significant at the one percent level. Thus, it appears that the federal budget deficit does in fact exercise a positive and significant impact upon the nominal Moody's Aaa-rated corporate bond rate.

Due to multicollinearity problems associated with the government-purchases variable, we

re-estimate the system in precisely the same fashion as above while dropping this variable from the analysis. The results are given by:

$$NR_t = 2.42 + \underset{(+7.60)}{0.48SD_t/Y_t} + \underset{(+7.28)}{0.89CD_t/Y_t} - \underset{(-1.73)}{0.49M_t/Y_t} + \underset{(+13.74)}{0.82P_t}$$

$$+ \underset{(+14.63)}{0.65RTR_t}, \qquad D\text{-}W = 1.70 \tag{3}$$

In this case, the coefficients on the two deficit variables are once again positive and statistically significant at far beyond the one percent level.[1]

In conclusion, then, as shown in equations (2) and (3), the federal budget deficit exercises a positive and significant impact upon the nominal Moody's Aaa-rated corporate bond rate. This finding is at odds with most of the related literature, including Evans [3; 4], Makin [9], and Hoelscher [6]. However, these findings are consistent with Barth, Iden, and Russek [1; 2], the recent study by Hoelscher [7], and Feldstein and Eckstein [5]. In any event, the empirical results presented in this note imply the actual existence of a mechanism for the transmission of crowding out. Moreover, the empirical results shown here provide at least some degree of renewed confidence in some of our standard macro-models, such as the *IS-LM* paradigm and the loanable funds model.

Richard J. Cebula
Emory University
Atlanta, Georgia

1. The results of this estimation before the Cochrane-Orcutt adjustment are:

$$NR_t = 2.02 + \underset{(+10.63)}{0.57SD_t/Y_t} + \underset{(+11.99)}{0.93CD_t/Y_t} - \underset{(-0.03)}{0.02M_t/Y_t} + \underset{(+23.37)}{0.78P_t}$$

$$+ \underset{(+22.99)}{0.79RTR_t}, \qquad D\text{-}W = 0.73$$

In this case, the coefficients on the deficit variables are also positive and statistically significant at far beyond the one percent level.

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