“Recent evidence on the impact of federal budget deficits on the nominal cost of long term borrowing for private enterprise in the U.S.”

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Recent evidence on the impact of federal budget deficits on the nominal cost of long term borrowing for private enterprise in the U.S.

Abstract

This study provides recent empirical evidence on the impact of the federal government budget deficit on the nominal cost of borrowing for private enterprise in the U.S., as measured by the nominal interest rate yield on Moody's Aaa-rated corporate bonds. The study is couched within an open loanable funds model that includes expected inflation, the ex ante real short-term interest rate, the M1 money supply, net international capital inflows, and the change in per capita real GDP. Using quarterly data for the period of 1973.1-2007.4, heteroskedasticity-corrected 2SLS estimations reveal that the federal budget deficit, expressed as a percent of GDP, exercised a positive and statistically significant impact on the nominal interest rate yield on these corporate issues and hence on the cost of borrowing for private enterprise.

Keywords: cost of borrowing, budget deficit, international capital flows.
JEL Classification: H62, E43.

Introduction

In the U.S., there was a brief experience with federal government budget surpluses during the 1998-2001 period. However, given the 2001 recession, sluggish economic growth since 2001, and budgetary demands involving proposed further income tax cuts on the one hand, and the "war on terrorism" in the aftermath of the terrorist attacks on the U.S. on September 11, 2001 on the other hand, the specter of the federal government budget deficits, potentially huge ones, has raised its ugly head once again. As Alan Krueger (2003) observes, budget deficits have re-emerged as a major economic concern.

The impact of deficits on interest rates has been studied extensively (Al-Saji, 1992; 1993; Barth, Iden and Russek, 1984; 1985; 1986; Barth, Iden, Russek, and Wohar, 1989; Cebula, 1997; 2003; 2005; 2009; Cukierman and Meltzer, 1989; Feldstein and Eckstein, 1970; Findlay, 1990; Hoelscher, 1986; Holloway, 1988; Johnson, 1992; Macavoy, 2003; McGrath and Toma, 2006; Ostrosky, 1990; Saltz, 1998; Swamy, Kolluri, and Singamsetti, 1990; Tanzi, 1985; Wang and Rettenmaier, 2008; and Zahid, 1988). These studies typically are couched within IS-LM or loanable funds models or variants thereof. Many of these studies find that the government budget deficit acts to raise longer term rates of interest while not significantly affecting shorter term rates of interest. Since capital formation is presumably much more affected by long term than by short term rates, the inference has often been made that budget deficits may lead to "crowding out" of private sector outlays of private enterprise firms (Carlson and Spencer, 1975; Cebula, 1985; Krueger, 2003).

This literature has most commonly focused upon the yields on U.S. Treasury bills, Treasury notes, and Treasury bonds. In recent years, however, the budget deficit impact on Moody's Aaa-rated bonds has received effectively no attention in the economics and finance literature. Accordingly, the purpose of this study is to provide current evidence as to the effect of the federal government budget deficit on Moody's Aaa-rated corporate bond issues, with this yield being interpreted as a measure of the long-term cost of borrowing for private enterprise firms. The analysis is couched within an open-economy loanable funds model.

Using seasonally adjusted quarterly data, the study investigates the period of 1973.1-2007.4. We begin with 1973.1 because this is approximately the time of the abandonment of the Bretton Woods agreement. Ending the study period with 2007.4 makes this study very current and hence very pertinent. Moreover, using 34 years of quarterly data provides a relatively longer-term perspective on the impact of the budget deficit on the nominal Moody's Baa-rated corporate bond interest rate yield.

Section 1 provides the framework for the empirical analysis. Section 2 defines the variables in the empirical model and describes the data, including the measurement of the expected inflation. Section 3 provides the basic empirical results, whereas an overview of the study findings is found in the last Section.

1. The loanable funds framework

In developing the underlying framework for the empirical analysis, we first consider the following intertemporal government budget constraint:

$$ND_{t+1} = ND_t + G_t + F_t + AR_tND_t - T_t, \quad (1)$$

where ND_{t+1} = the national debt in period t+1; ND_t = the national debt in period t; G_t = government purchases in period t; F_t = government non-interest transfer payments in period t; AR_t = average effec-

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tive interest rate on the national debt in period t; T_t = government tax and other revenues in period t.

The total government budget deficit in period t (TD_t) is simply the difference between ND_{t+1} and ND_t:

$$TD_t = ND_{t+1} - ND_t = G_t + F_t + AR_tND_t - T_t. \quad (2)$$

Based extensively on Hoelscher (1986), but on Barth, Iden, and Russek (1985) and Cebula (1988; 1997) as well, to explain the determination of the nominal interest rate yield on the Moody's Aaa-rated long-term corporate bonds, including the impact of the budget deficit on same, a standard loanable funds model is adopted in which the nominal long-term interest rate yield is determined by an equilibrium of the following form:

$$D + M + NCI = S + TD, \quad (3)$$

where D = real domestic demand for long term bonds; S = real domestic supply of long term bonds; TD = real net government borrowing, as measured by the federal budget deficit (as above); NCI = net international capital inflows; M = total domestic money supply.

In this framework, it is expected that:

$$D = D(EAR, EP, Y, Aaa,...), D_{EAR} < 0, D_{EP} < 0, D_Y > 0, D_{Aaa} > 0; \quad (4)$$

$$S = S(EP, Aaa,...), S_{EP} > 0, S_{Aaa} < 0; \quad (5)$$

$$NCI = NCI(3YRYld), NCI_{3YRYld} > 0. \quad (6)$$

Variable EP represents the expected future inflation rate, and EAR is the *ex ante* real short-term interest rate. The variable Aaa is the nominal annualized interest rate yield on the long-term bond, and Y is the change in per capita real GDP. It is expected that, in principle paralleling Barth, Iden, and Russek (1984; 1985), Cebula (1988; 1997), and Hoelscher (1986), the real domestic demand for long-term bonds is a decreasing function of the *ex ante* real short-term rate. In other words, as EAR increases, *ceteris paribus*, bond demanders/buyers at the margin substitute shorter-term issues for longer term issues. According to the conventional wisdom, the private demand for long-term bonds is a decreasing function of EP, whereas the private supply of long term bonds would be an increasing function of EP, *ceteris paribus* (Hoelscher, 1986; Cebula, 1988; Saltz, 1998). In addition, following Hoelscher (1986), it is argued here that the greater the change in per capita real GDP, the greater the private sector demand for bonds due to increased capacity to save. Furthermore, the demand for long-term bonds is an increasing function of their nominal interest rate yield, *ceteris paribus*, whereas the supply thereof is a decreasing function of the tax free interest rate yield, *ceteris paribus* (conventional wisdom). Finally, net financial capital inflows are treated as an increasing function of the interest rate yield on three year U.S. Treasury notes ($3YRYld$), *ceteris paribus*, because such inflows have been found to absorb domestically generated U.S. debt (Cebula and Belton, 1993; Koch, 1994).

Substituting equations (4), (5), and (6) into equation (3) and solving for Aaa yields:

$$Aaa = f(TD, M, EAR, Y, EP, NCI), \quad (7)$$

such that

$$f_{TD} > 0, f_M < 0 \, f_{EAR} > 0, f_Y > 0, f_{EP} > 0, f_{NCI} < 0.$$

The first of these expected signs is positive in order to reflect the traditional argument that when the government attempts to finance a budget deficit, it forces interest rate yields upwards as it competes with the private sector to attract funds from the financial markets, *ceteris paribus*. The expected sign on the money supply variable (M) is negative because the greater the money supply, the greater the offset to debt issues, i.e., a greater money supply presumably helps to offset the effects of budget deficits (Cebula and Belton, 1993), *ceteris paribus*. The expected signs on f_{EAR}, f_Y, f_{EP}, and F_{NCI} follow from (4), (5), and (6).

2. Variables and data

The first step in the analysis is to develop an appropriate empirical measurement of *expected inflation*. This determination is essential to the specification of both variables EP and EAR. One possibility is to adopt the well-known Livingston survey data. However, as observed by Swamy, Kolluri, and Singamsetti (1990, p. 1013) there may be serious problems with the Livingston series:

'Studies by some psychologists have shown that the heuristics people have available for forming expectations cannot be expected to automatically produce expectations that come anywhere close to satisfying the normative constraints on subjective probability judgments provided by the Bayesian theory… failure to obey these constraints makes Livingston… data incompatible with… stochastic law...'

Accordingly, following the lead by Swamy, Kolluri, and Singamsetti (1990), rather than using the Livingston series, the study adopts a distributed lag model on actual inflation to construct the values for the *expected inflation rate*, EP_t, for quarter t. In particular, to construct the values for EP_t, a four-quarter distributed lag model of actual inflation (as measured by the annualized percent rate of change of the CPI, 2000 = 100.00) was used.

Based on the framework expressed above, then, the following model is to be estimated:

$$Aaa_t = a_0 + a_1 EP_t + a_2 TDY_t + a_3 MY_{t-1} + a_4 EAR_{t-1} + a_5 Y_{t-1} + a_6 NCIY_t + a_7 TREND + u \quad (8)$$

where Aaa_t = the nominal average interest rate yield on *Aaa*-rated corporate bonds in quarter *t*, as a percent annum; a_0 = constant; EP_{t-1} = the expected inflation rate of the CPI in quarter *t*-1, expressed as a percent per annum and computed as above; TDY_t = the ratio of the seasonally adjusted nominal federal budget deficit in quarter t to the seasonally adjusted nominal GDP in quarter *t*, expressed as a percent; MY_{t-1} = the ratio of the seasonally adjusted nominal *M*1 money supply in quarter *t*-1 to the seasonally adjusted nominal GDP in quarter *t*-1, expressed as a percent; EAR_{t-1} = the *ex ante* real average interest rate yield on three month Treasury bills in quarter *t*-1, expressed as a percent per annum (EAR_{t-1} = the nominal average interest rate yield on three month U.S. Treasury bills in quarter *t*-1 minus the expected inflation rate in quarter *t*-1); Y_{t-1} = the change in per capita real GDP in quarter *t*-1; $NCIY_t$ = the ratio of nominal net financial capital inflows in quarter t to the nominal GDP in quarter t, expressed as a percent; *TREND* = linear trend variable; and *u* = stochastic error term.

The federal government budget deficit is scaled by the GDP level, as are the money supply and net capital inflow variables; this is because the sizes of the federal budget deficit, the money supply, and net capital inflows each should be judged relative to the size of the economy (Evans, 1985; Hoelscher, 1986; Holloway, 1986; Ostrosky, 1990; Cebula, 1997). The means and standard deviations for each of the variables shown in equation (8) are found in Table 1.

The data sources are as follows:

- Bureau of Economic Analysis (2008) www.bea.gov/national/nipaweb/ss_data/section7all_xls.xls
- Federal Reserve Bank of St. Louis (2008), 3-Month Treasury Bill: Secondary Market Rate. http://research.stlouisfed.org/fred2/data/tb3ms.txt
- Federal Reserve Bank of St. Louis (2008), Moody's Seasoned Baa Corporate Bond Yield, Yield on Three Year Treasury Notes. http://research.stlouisfed.org/fred2/data/BAA.txt
- Federal Reserve Bank of St. Louis (2008), Consumer Price Index for All Urban Consumers: All Items. http://research.stlouisfed.org/fred2/data/cpiaucns.txt
- Federal Reserve Bank of St. Louis (2008), Gross Domestic Product, 1 Decimal. http://research.stlouisfed.org/fred2/data/gdp.txt
- Federal Reserve Bank of St. Louis (2008), M1SL, M1 Money Stock, Net Capital Inflows. http://research.stlouisfed.org/fred2/data/M1SL.txt
- Federal Reserve Bank of St. Louis (2008), Net Federal Government Saving. http://research.stlouisfed.org/fred2/data/fgdef.txt

Table 1. Descriptive statistics for variables in equation (8)

Variable	Mean	Standard deviation
Aaa	8.7	2.311
EP	4.6	2.975
TDY	2.282	1.731
MY	14.0	2.125
EAR	4.855	2.479
Y	0.455	0.796
NCIY	2.137	2.05

3. Empirical analysis

In equation (8), the private sector interest rate variable (Aaa_t) is contemporaneous with both the federal budget deficit variable, TDY_t, and the net financial capital flows variable, $NCIY_t$. In order to avoid simultaneity bias, the analysis undertakes a 2*SLS* (two stage least squares) estimation. As suggested by results (for an earlier period) in Cebula (1988), the instrumental variable for TDY_t is the two-quarter lag of the unemployment rate of the civilian labor force, UR_{t-2}, and, as suggested by results in Cebula and Belton (1993) and Koch (1994), the instrumental variable for $NCIY_t$ is the three-quarter lag of the average annual interest rate on three year U.S. Treasury notes, $3YRYld_{t-3}$. The choice of these instruments is based on the findings that UR_{t-2} is highly correlated with TDY_t, while not being correlated with the error terms in the system, whereas $3YRYld_{t-3}$ is highly correlated with $NCIY_t$ while also not being correlated with the error terms in the system.

Furthermore, the Augmented Dickey-Fuller (*ADF*) and Phillips-Perron (*P-P*) unit root tests reveal that all of the variables in the model except for Y_{t-1} and EP_{t-1} fail to be stationary in levels, with EP_{t-1} being stationary in levels with a linear trend (*TREND*) and Y_{t-1} being stationary in levels.

Given the above, the 2*SLS* estimate of equation (8) for the 1973.1-2007.4 study period is provided in equation (9), where the Newey-West heteroskedasticity correction has been adopted:

$$\Delta Aaa_t = -0.05 + 0.04\ EP_{t-1} + 0.0046\ \Delta TDY_t - 0.033\ \Delta MY_{t-1}$$
$$(+5.38) \qquad (+3.40) \qquad (-2.26)$$

$$+ 0.007\ \Delta EAR_{t-1} + 0.01\ Y_{t-1} - 0.0013\ \Delta NCIY_t + 0.00032\ TREND,$$
$$(+2.67) \qquad (+2.14) \qquad (-2.04) \qquad (+2.31)$$

$$F = 8.89,\ DW = 1.84,\ Rho = 0.07, \qquad (9)$$

where terms in parentheses are *t*-values and "Δ" is the first-differences operator.

In equation (9), all six of the estimated coefficients exhibit the expected signs and are statistically significant at the five percent level or beyond. Based on the *DW* and *Rho* values, there is no indication of an autocorrelation problem. Finally, the F-statistic is significant at beyond the one percent level, attesting to the overall strength of the model.

The estimated coefficient on the expected inflation variable is positive, as expected, and statistically significant at the one percent level, implying that the higher the expected inflation rate, the higher the nominal interest rate yield on the *Aaa*-rated corporate bond yield. This finding conforms to the conventional wisdom. The estimated coefficient on the money supply variable is negative and statistically significant at the three percent level, implying that the greater the money supply relative to GDP, the lower the nominal interest rate yield Aaa-rated corporate bonds. The coefficient on the *EAR* variable is positive and statistically significant at the one percent level, implying that the higher the *ex ante* real short-term interest rate, the higher the yield on *Aaa*-rated bonds, presumably as a reflection of the competition between long-term and short-term bond markets. The estimated coefficient on the per capita GDP variable is also positive, as hypothesized, and statistically significant at the four percent level, implying that the higher the per capita real GDP, the higher the yield on *Aaa*-rated bonds. Next, the estimated coefficient on the net financial capital inflows variable is negative and statistically significant at the five percent level, implying that such flows do act, whether directly or indirectly, to offset part of the nominal interest rate impact of budget deficits, as suggested by Cebula and Belton (1993) and Koch (1994).

Finally, the estimated coefficient on the budget deficit variable is positive and statistically significant at beyond the one percent level. Thus, it appears that after allowing for a variety of other factors, including monetary policy, the higher the federal budget deficit, the higher the nominal interest rate yield on Aaa-rated corporate bonds. This finding is consistent with a variety of empirical studies of earlier periods, including Al-Saji (1992; 1993), Barth, Iden and Russek (1984; 1985; 1988), Barth, Iden, Russek, and Wohar(1989), Cebula (1988; 1997), Cebula and Belton (1993), Findlay (1990), Gissey (1999), Hoelscher (1986), Johnson (1992), Koch (1994), Saltz (1998), Tanzi (1985), and Zahid (1988).

Conclusion

The conventional wisdom argues that, *ceteris paribus*, the federal budget deficit acts to elevate the nominal long-term rate of interest (cost of borrowing). Despite the existence and high visibility of Ricardian Equivalence arguments and studies based thereupon, a number of studies in recent years have provided empirical support for the conventional wisdom.

The present study adopts an open-economy loanable funds model and finds that the nominal cost of borrowing to private enterprise firms (as represented by the nominal interest rate yield on Aaa-rated corporate bonds, *Aaa*) is an increasing function of expected inflation, the *ex ante* real short-term interest rate, and real GDP per capita, while being a decreasing function of the ratio of the money supply to the GDP level and the ratio of net capital inflows to the GDP level. In addition, in contrast to the arguments in Ricardian Equivalence, it also is found that the greater the federal budget deficit (relative to the GDP level), the higher nominal cost of long-term borrowing to private enterprise (the higher the value of *Aaa*).

Interestingly, results very similar to those in equation (9) can be generated using OLS and adopting the Newey-West heteroskedasticity correction. All that need be done to the specification to obtain these results is to lag the budget deficit and net capital inflows variables one quarter. The Newey-West corrected *t*-values results are as follows:

$$\Delta Aaa_t = -0.04 + \underset{(+4.25)}{0.036}\, EP_{t-1} + \underset{(+3.19)}{0.005}\, \Delta TDY_{t-1} - \underset{(-2.06)}{0.033}\, \Delta MY_{t-1}$$

$$+ \underset{(+2.44)}{0.012}\, \Delta EAR_{t-1} + \underset{(+2.41)}{0.011}\, Y_{t-1} - \underset{(-2.01)}{0.0012}\, \Delta NCIY_{t-1} + \underset{(+2.50)}{0.0004}\, TREND,$$

$$F = 7.15,\ DW = 1.80,\ Rho = 0.09. \qquad (10)$$

The results shown in equation (10) are entirely consistent with those in equation (9). Indeed, the *t*-value on the deficit variable remains statistically significant at far beyond the one percent level, adding greater credibility to the 2*SLS* finding shown above.

In conclusion, it appears that factors elevating the federal budget deficit also act to raise the cost of private enterprise borrowing, presumably through increasing the competition for loanable funds. This confirms the validity of Alan Krueger's (2003)

statement that federal budget deficits cause interest rates to rise. Clearly, then, U.S. federal government policies that elevate the budget deficit cannot be viewed in a vacuum. This is because budget deficits can be expected to impact profoundly and adversely upon the finances and decision-making process of private enterprise and, among other things, to retard the paces of both real investment (capital formation) by the private sector and hence the overall real economic growth and living standard of the nation.

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