Identifying Determinants of the Cost of Long Term Borrowing for U.S. Firms: Insights for Management

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Long term corporate planning and the effective pursuit of profits require, among other things, an understanding by managment of the factors that influence the cost of borrowing. This study empirically identifies key factors that influence the cost of borrowing for U.S. firms, which cost is measured in the present study by the interest rate yield on Moody's Baa-rated corporate bonds. Identification of these factors is essential knowledge in order for firm management to be able to anticipate to at least some degree both current and future trends in the cost of borrowing to finance capital formation.

I. Introduction

Corporate management faces a variety of serious challenges in the pursuit of profit-maximization and/or growth maximization [Yarrow (1975)]. One of the most difficult of these challenges is understanding factors influencing current and future changes in the cost of borrowing, especially for long-term capital formation (investment). The optimal investment decision-making process breaks down when management seriously misjudges trends in the long term cost of borrowing. In order to judge such trends, firms must of course first identify factors that influence the long term cost of borrowing.

The impact of federal government budget deficits on interest rates in the U.S. has been studied extensively [e,g., Barth, Iden and Russek (1984; 1985), Cebula (1988; 1997), Findlay (1990), Hoelscher (1983; 1986), Holloway (1988), Johnson (1992), Mascaro and Meltzer (1983), McMillin (1986), Ostrosky (1990), and Swamy, Kolluri, and Singamsetti (1990)]. These empirical studies typically are framed within the context of either IS-LM or loanable funds models or variants thereof. Many of these studies find that the federal budget deficit acts to elevate longer term rates of interest while not significantly affecting shorter term rates of interest.

This study seeks to investigate the impact not only of the U.S. federal budget deficit on the nominal Moody's Baa-rated corporate bond interest rate yield over the long run, but also the effects of such factors as expected

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inflation, the change in per capita real GDP, and *ex ante* real short term interest rate yields. The "long run" for purposes of this study begins with the first full year immediately following the end of World War II, 1946, and runs through the year 2005. The focus is on the nominal interest rate yield on long term corporate bonds rather than a short term interest rate yield. This is because, according to the conventional wisdom, it is the long term (as opposed to short term) interest rate that influences capital formation/investment decisions for both profit-maximizing and growth-maximizing firms [Hoelscher (1986), Yarrow (1975)].

Section II of this study provides the system for the empirical analysis. Section III defines the variables and also describes the actual data, including the measurement of expected inflation and the computation of the *ex ante* real short term interest rate yield. Section IV provides the empirical results, which involve IV (instrumental variables) estimation, whereas a brief summary is found in Section V.

II. The Basic Framework

In developing the framework for the empirical analysis, the following intertemporal central government budget constraint is introduced:

$$ND_{t+1} = ND_t + G_t + F_t + R_tND_t - T_t \quad [1]$$

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
R_t = average effective 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 the difference between ND_{t+1} and ND_t:

$$TD_t = ND_{t+1} - ND_t = G_t + F_t + R_tND_t - T_t \quad [2]$$

To identify the significant determinants of the nominal long term interest rate yield on corporate bonds, including the impact of the deficit on same, a framework is adopted in which the nominal long term interest rate is determined by a loanable funds equilibrium of the following form [Barth, Iden, and Russek (1985), Cebula (1992), Hoelscher (1986)]:

$$D = S + TD \quad [3]$$

where:

D = real private sector demand for long term corporate bonds
S = real private sector supply of long term corporate bonds
TD = real net borrowing by (budget deficits of) the government, as measured by the total budget deficit

In this framework, it is expected that:

$$D = D(EAR, EP, LR),\ D_{EAR} < 0,\ D_{EP} < 0,\ D_{LR} > 0 \quad [4]$$

$$S = S(EP, LR, Y),\ S_{EP} > 0,\ S_{LR} < 0,\ S_{Y} > 0 \quad [5]$$

where

EAR = the *ex ante* real (short term) interest rate yield on U.S. Treasury bills

EP = expected inflation

LR = nominal interest rate yield on long term corporate bonds

Y = the change in per capita real GDP

It is expected that, in principle paralleling Barth, Iden, and Russek (1985), Cebula (1992; 1997), and Hoelscher (1986), the real private sector demand for long term corporate bonds is a decreasing function of the *ex ante* real short term rate yield on Treasury bills. In other words, as EAR increases, *ceteris paribus*, bond demanders/buyers at the margin substitute the shorter term issues for the longer term ones, *ceteris paribus*. In addition, in accord with the conventional wisdom, the real demand for long term corporate bonds is a decreasing function of expected inflation, whereas the real supply of long term corporate bonds is an increasing function of expected inflation, *ceteris paribus*. Also in accord with the conventional wisdom, the higher the nominal interest rate yield on long term corporate bonds, the greater the demand for and the smaller the supply of those issues, *ceteris paribus*. Finally, as stressed especially in Hoelscher (1986) and Cebula (1988), the greater the per capita real GDP, the greater the growth in the economy and hence the greater the propensity for firm management to float bonds so as to externally finance capital formation that can be used to increase profits and/or protect or expand market share.

Substituting equations [4] and [5] into equation [3] and solving for variable LR yields:

$$LR = R(TD, EAR, EP, Y) \quad [6]$$

such that:

$$LR_{TD} > 0,\ LR_{EAR} > 0,\ LR_{EP} > 0,\ LR_{Y} > 0 \quad [7]$$

The first of these expected signs is positive to reflect the conventional macroeconomic theory argument that, when the government attempts to finance a budget deficit, it forces interest rates upwards as it competes with the private sector to attract funds from the financial markets. The expected positive sign on the second partial reflects the competition between the yield on long term corporate bonds and the *ex ante* real short term interest rate yield, EAR. The hypothesized positive sign on LR_{EP} reflects the traditional argument that increased expected inflation leads to higher nominal interest rate yields through a decreased bond demand and an increased bond supply. Finally, the

hypothesized positive sign on LR_Y reflects the expected rise in the long term interest rate yield as increasing levels of the real per capita GDP lead to increasing economic expansion and hence an increasing supply of long term bonds.

III. Variables and Data

The analysis begins by developing a measure of expected inflation. Following the recommendations in Swamy, et al (1990), this study adopts a distributed lag model on actual inflation to construct the values for the *expected inflation rate*, EP_t, for year t. In particular, to construct the values for EP_t, a four-year distributed lag model of actual inflation (as measured by the annualized percentage rate of change of the consumer price index, 1996=100.00) was adopted. Having thusly created the expected inflation variable, constructing the *ex ante* real short term interest rate yield consists of subtracting EP_t from the nominal short interest rate yield.

Based on the framework in [6] and [7], the following model is to be estimated:

$$LR_t = a_0 + a_1 EAR_t + a_2 EP_{t-1} + a_3 Y_{t-1} + a_4 TDY_{t-1} + u \qquad [8]$$

where

a_0 = constant

LR_t = the nominal average interest rate yield in year t on Moody's Baa-rated corporate bonds, expressed as a percent per annum

EAR_t = the *ex ante* real average interest rate yield on 13 week U.S. Treasury bills in year t, expressed as a percent per annum

EP_{t-1} = the expected inflation rate of the CPI (consumer price index) in year t-1, expressed as a percent per annum

Y_{t-1} = the change in the per capita real GDP over year t-1, as expressed a percent

TDY_{t-1} = the ratio of the nominal total federal budget deficit in year t-1 to the nominal GDP in year t-1, as a percent

u = stochastic error term

The data are all annual and cover the period 1946-2005. The total budget deficit is scaled by the GDP level because the size of the budget deficit should be judged relative to the size of the economy [Hoelscher (1986), Cebula (1988; 1997), Ostrosky (1990)]. The data source is The Council of Economic Advisors (2006, Tables B-1, B-73, B-64, B-4, B-79, B-34, B-2).

IV. Empirical Analysis

The Augmented Dickey Fuller (ADF) and Phillips-Perron (P-P)tests for a unit root both reveal that the variables EAR, EP, Y, and TDY are all stationary in first differences, whereas the variable LR is stationary in levels with a linear trend. Therefore, in the estimate provided below, the variables EAR, EP, Y, and TDY are all expressed in first differences form. In addition, LR is expressed in levels while a linear trend variable (TREND) is included in the estimation.

Next, it is observed that the variables LR_t and EAR_t are contemporaneous. This circumstance creates a possible simultaneity problem. Accordingly, equation [8] is estimated using an instrumental variables (IV) approach, with the instrument being the two year lag of the Federal Reserve discount rate, DR_{t-2}. This instrument was chosen because it was highly correlated with EAR_t while not being correlated with the error terms in the system. Finally, the Newey-West procedure to correct for heteroskedasticity was adopted.

The IV estimation of equation [8] is given by equation [9] below:

$$LR_t = -0.19 + 0.45\ qEAR_t + 0.29\ qEP_{t-1} + 19.9\ qY_{t-1} + 0.14\ qTDY_{t-1}$$
$$(+9.01) \qquad (+6.90) \qquad (+3.45) \qquad (+8.33)$$
$$+0.88\ TREND,\ DW = 2.04,\ Rho = -0.06,\ F = 38.69 \qquad [9]$$
$$(+7.65)$$

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

As shown in equation [9], all four of the estimated coefficients are positive (as expected) and statistically significant at beyond the one percent level. In addition, the DW = 2.04 and the Rho = -0.06, so that there are no concerns about autocorrelation. Finally, the F-ratio is statistically significant at beyond the one percent level, attesting to the overall strength of the model.

The findings indicate, among other things, that, over the long run (1946-2005, in this case), the nominal interest rate yield on Moody's Baa-rated corporate bonds is an increasing function of the *ex ante* real short term interest rate yield on 13 week U.S. Treasury bills, expected inflation, and the change in per capita real GDP. In addition, the federal budget deficit acts to significantly increase the nominal Moody's Baa-rated corporate bond interest rate yield.

V. Summary

A knowledge of factors that influence the cost of borrowing for firms is critical to management's successful pursuit of long term profits and/or growth maximization [Yarrow (1975, p. 580)]. The present study seeks to provide insights into the determination of an interest rate of critical interest to U.S. corporations, namely, the nominal interest rate yield on Moody's Baa-rated corporate bonds.

Among other things, the conventional wisdom argues that, *ceteris paribus*, a nation's central government budget deficit acts to elevate the nominal long interest term rate yield. To investigate the impact of the budget deficit, as well as the impacts of a number of other easily calculable factors, on the Moody's Baa-rated corporate bond interest rate yield, this analysis adopts a loanable funds model that includes expected inflation, the *ex ante* real short term interest rate yield, the change in per capita real GDP, *and* the total federal budget deficit (expressed as a percent of GDP). The study period runs from 1946 through 2005, thus making the study both current and inclusive of a sufficiently lengthy time period so as to qualify as a long term study of any budget deficit/Moody's Baa-rated corporate bond interest rate relationship.

The study finds that the nominal Moody's Baa-rated corporate bond interest rate yield is in fact an increasing function of the federal budget deficit, as well as the change in per capita real GDP, expected inflation, and the *ex ante* real short term interest rate. Thus, among other things, there appears to be good reason to conjecture that federal budget deficits in the U.S. (including those associated with financing the War in Iraq), by raising the Moody's Baa-rated corporate bond interest rate yield above what it otherwise would be, may lead to at least partial crowding out of management's commitment to investment (capital formation), as suggested in Carlson and Spencer (1975) and Cebula (1985). In turn, over the long run, such deficits are likely to negatively impact the U.S. corporate sector's ability to compete in international markets and hence are likely to result in reduced economic growth in the U.S. along with increasing degrees of job outsourcing decisions by the management of U.S, corporations.

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