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Taxable and Tax-Free Equivalence of Interest Rates Yields: A Brief Note

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In converting the yield on tax-free municipals to an equivalent yield on a comparable taxable bond, most textbooks (Ceccchetti, 2006, pp. 159-160; Mishkin, 2010, pp. 128-129; Ross, Westerfield, and Jordan, 2010, p. 208) adopt either of the following two formulations:

$$R_{tx_k} = R_{tf_i} / (1 - mftr_j) \quad (1)$$

or

$$R_{tf_i} = R_{tx_k} \times (1 - mftr_j) \quad (2)$$

Where:

R_{tx_k} = the nominal annualized taxable interest rate yield (as a %) on bond k ;
 R_{tf_i} = the nominal annualized tax-free interest rate yield (as a %) on bond i ; and
 $mftr_j$ = the relevant marginal *federal* income tax rate (as a %) for economic agent j .

The formulations in equations (1) and (2) are a reasonable general guide by which to express either a taxable interest rate yield in terms of a tax-free equivalent yield or a tax-free municipal interest rate yield in term of a taxable equivalent yield.

Naturally, if one is a legal resident of a state (state m) that has an income tax on bond interest and endeavors to compare a tax-free yield in state m to the relevant taxable yield, the outcome might appear to be (for $i = m$) either (3) or (4):

$$R_{tx_k} = R_{tf_m} / (1 - mftr_j - mstr_{mj}) \quad (3)$$

or

$$R_{tf_m} = R_{tx_k} \times (1 - mftr_j - mstr_{mj}) \quad (4)$$

Where:

$mstr_{mj}$ = the relevant marginal *state* income tax rate (as a %) for economic agent j legally residing in state m .

This is the case of the “dual exempt” tax-free municipal, as it is usually represented. The problem with specifications (3) and (4) is the neglect of federal income deductibility of state income taxes, i.e., on Form A of Schedule 1040 of the federal individual personal income tax.

To reflect this tax deductibility, equations (3) and (4) must be rewritten as (5) and (6), respectively:

$$R_{tx_k} = R_{tf_m} / [1 - mftr_j - (1 - mftr_j) mstr_{mj}] \quad (5)$$

or

$$R_{t_m} = R_{t_k} \times [1 - m_{ftr_j} - (1 - m_{ftr_j}) m_{str_{mj}}] \quad (6)$$

Consider an example. Assume that the relevant marginal federal income tax rate is 40%, that the relevant marginal state income tax rate (in state m) is 10%, and that the municipal bond interest rate yield is 5%.

According to the formulation in (3), we would have the following:

$$R_{t_k} = 5\% / (1 - .4 - .1) = 5\% / 0.5 = 10\% \quad (7)$$

However, allowing for the federal income tax deductibility of the state income tax levied on bond interest in state m yields a lower taxable interest rate yield equivalence for the 5% tax-free yield, as follows:

$$R_{t_k} = 5\% / [1 - .4 - (.6 \times .1)] = 5\% / [1 - .44] = 9.26\% \quad (8)$$

Thus, properly allowing for federal tax deductibility of state income taxation of taxable bonds reduces the taxable equivalent yield somewhat since that very deductibility partially offsets the advantages of the tax-free municipal.

In closing, it is clear that similar adjustments would be needed for accurate conversion of “triple exempt” tax-free municipal yields to equivalent taxable yields.

References

Cecchetti, Stephen M. 2006. *Money, Banking and Financial Markets*. New York: McGraw-Hill/Irwin.

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Ross, Stephen A., Westerfield, Randolph W. and Jordan, Bradford D. 2010. *Fundamentals of Corporate Finance*. New York: McGraw-Hill/Irwin.