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Marginal Tax Rates: Evidence from Nontaxable Corporate Bonds: A Note

JAMES ANG, DAVID PETERSON, and PAMELA PETERSON*

ABSTRACT

This study offers an alternative method of calculating marginal personal tax rates through the pairing of nontaxable (industrial development and pollution control) and taxable corporate bonds. This procedure is shown to produce matched bond pairs that are comparable. Two hundred pairs of bonds are examined from the second quarter of 1973 through the second quarter of 1983. Testing of the marginal tax rate relationships indicates that the marginal personal tax rate is less than the corporate statutory tax rate.

THE EXAMINATION OF THE relative pricing of taxable and nontaxable bonds provides an estimate of the marginal tax rates of bondholders who are indifferent between taxable and nontaxable bonds (see, for example, Gordon and Malkiel [1], Trczinka [6], and Skelton [4]). Typically, these implied marginal tax rates are calculated by comparing yield indices of taxable corporate bonds and nontaxable municipal bonds. A potential problem with this method, pointed out by Trczinka [6], is that municipal and corporate bonds may not be of the same risk, requiring some adjustment in the calculation. Another problem with this method is that the bond yield indices are computed from a sample of outstanding bonds, introducing a potential yield-to-maturity bias associated with discount bonds (Skelton [4]).

An alternative procedure for calculating implied marginal tax rates is employed in this paper which avoids the problems of differential risks and the potential yield-to-maturity bias for discount bonds. Implied tax rates are calculated from pairs of newly issued bonds, where each pair consists of one nontaxable corporate bond (a tax-exempt industrial development or pollution control bond) and one taxable corporate bond.¹ Since only newly issued bonds are used in the computations, the bias associated with capital gains and losses is avoided. This study is organized into the following sections. Section I describes the data and the collection procedure. The resultant implied marginal rates are presented in Section II. Summarizing and concluding remarks are provided in Section III.

I. Data and Empirical Design

The primary source of data is *Moody's Bond Survey*. Data on newly issued bonds are gathered from the second quarter of 1973 through the second quarter of 1983.

* All authors are from Florida State University. We wish to thank the anonymous referees for helpful suggestions and comments.

¹ The approach of examining individual bonds, rather than bond indices, has been suggested by Skelton [3] and Smith [5].

All possible pairs of bonds, made up of one taxable corporate bond and one industrial development or pollution control bond, are selected using the following criteria:

1. The two bonds are in the same rating class.²
2. Utility bonds are only matched with utility bonds; nonutility bonds are only matched with nonutility bonds.
3. The two bonds are issued on the same day.
4. The issuance price of each bond is within \$2 of \$100.
5. The bonds in a pair have maturities within five years of one another.
6. The maturity of each bond exceeds five years.
7. Each bond has a fixed coupon rate.

There are 200 pairs which satisfy these criteria, where 59 pairs are made up of utility bonds and 141 pairs are made up of nonutility bonds. For each bond, data are drawn from *Moody's* on the yield to maturity at issuance, coupon rate, maturity date, and rating.³

The calculation of the marginal tax rate of interest income, t_{pb} , requires the comparison of the yields to maturity of the two bonds in a pair. Let r_n be the yield to maturity on the nontaxable bond and let r_t be the yield to maturity on the taxable bond. The marginal personal tax rate on interest income is:

$$t_{pb} = 1 - (r_n/r_t) \quad (1)$$

II. Analysis and Results

The analysis of the marginal tax rates is presented in two parts. In the first part, the calculated tax rates are reported and compared with the statutory corporate tax rates (t_c). In the second part, a regression is performed to assess the ability of the data selection process to control for risk within pairs.

A. Marginal Tax Rates: t_{pb} vs. t_c

For the 200 pairs of bonds, the average marginal personal tax rate is 0.251 with a standard error of 0.005. The average tax rate computed from the nonutility bonds is 0.244, while the average tax rate computed from utility pairs is 0.268.

To provide further indication of the magnitude and the distribution of the implied marginal tax rates on bonds, a test of the hypothesis, $H_0: t_{pb} = t_c$ against $H_a: t_{pb} < t_c$, is performed where t_c is the statutory marginal corporate tax rate and t_{pb} is the marginal personal tax rate on interest income. The motivation behind the statutory marginal corporate tax rate as the benchmark to evaluate t_{pb} originates from two sources: (1) the model of Miller [2] where, given perfectly

² As of April 26, 1982, *Moody's* expanded their rating system by subdividing each rating category. After this date, pairs were selected which were either exact matches under the new system or were within one subclass apart (e.g., A2 and A3); 52% of these matches had exactly the same rating.

³ Prior to September 1977, the issuance price and yield to maturity are not reported for the nontaxable bonds. We assume price to be 100 and, thus, set the yield equal to the coupon rate. This should be a fairly safe assumption since, after September 1977, 93% of the nontaxable bonds in the sample were issued at par.

Table I
Test of Hypotheses
 $H_0: t_{pb} = t_c$ vs. $H_a: t_{pb} < t_c$

Sample Characteristic	Pre-1979	Post-1978
Number of Pairs	100	100
Mean Marginal Tax Rate (t_{pb})	0.248	0.253
Standard Error of the Mean	0.005	0.008
Corporate Tax Rate (t_c)	0.480	0.460
t -Statistic to Test $H_0: t_{pb} = t_c$	-46.400*	-25.875*

* indicates that the mean marginal personal tax rate on interest income is significantly different from the marginal corporate tax rate at a 1% level of significance.

elastic demand curves for corporate debt, the marginal tax rate of bond income with progressive taxes for suppliers of funds is the marginal corporate tax rate, t_c , and (2) the arguments and evidence presented by Skelton [4] that banks, being the major arbitrageurs of taxable and nontaxable bonds, are the marginal bondholders and thus $t_{pb} = t_c$ (since the statutory marginal rate of tax on banks is the same as for other corporations). The analysis is performed on subsamples of the data since the corporate statutory tax rate changed in 1979 from 48% to 46%. Therefore, the sample is broken into two subsamples: bonds issued before January 1, 1979 (pre-1979 sample) and bonds issued after December 31, 1978 (post-1978 sample).⁴ Tests of the hypotheses are carried out for each subsample using $t_c = 48\%$ for the pre-1979 period and $t_c = 46\%$ for the post-1978 period. The information on these tests is provided in Table I. The null hypothesis of $H_0: t_{pb} = t_c$ is rejected at the 1% level of significance in favor of the alternative $H_a: t_{pb} < t_c$ in both periods.

Additional tests are conducted restricting the samples to bonds with further similarities. The first restriction is to include only those pairs where the two bonds have maturities within one year of each other. There are 59 pairs in the first time period and 56 pairs in the second time period which satisfy this requirement. The results of the tests of hypothesis for these restricted samples are shown in Part A of Table II. The hypothesis that the corporate tax rate is equal to the personal tax rate on interest is again rejected at a 1% level of significance in both periods. Another restriction is to include only those pairs where the two bonds have a duration within one year of each other.⁵ The results are provided in Part B of Table II. Again the evidence rejects the relationship

⁴ The tax rates on corporate income were changed by Public Law 95-600, effective for tax years beginning after December 31, 1978, from a graduated scale with a rate of 48% applied to income over \$100,000. The split of the sample resulted in two subsamples of 100 pairs each. It is possible that the market may have anticipated the change in tax rates well before the change was effective. Therefore, the benchmark t_c for the first period would be somewhere between 46% and 48%. The general conclusions with respect to the comparison of the implied marginal tax rates and the statutory tax rate are not altered if t_c is viewed as 46% (fully anticipated) in the first subsample.

⁵ The duration measures are calculated using pre-tax cash flows. Strictly speaking, duration should be calculated using after-tax cash flows. For taxable bonds, however, the marginal personal tax rate must be known before calculating duration.

Table II
Tests of Hypotheses for Bond Pairs

Sample Characteristic	Pre-1979	Post-1978
A. Pairs of Bonds With Maturities Within One Year		
Number of Pairs	59	56
Mean Marginal Tax Rate (t_{pb})	0.252	0.240
Standard Error of the Mean	0.007	0.010
Corporate Tax Rate (t_c)	0.480	0.460
t -Statistic to Test	-32.571*	-22.000*
$H_0: t_{pb} = t_c$		
B. Pairs of Bonds With Calculated Durations Within One Year		
Number of Pairs	14	26
Mean Marginal Tax Rate (t_{pb})	0.198	0.213
Standard Error of the Mean	0.015	0.017
Corporate Tax Rate (t_c)	0.480	0.460
t -Statistic to Test	-18.800*	-14.529*
$H_0: t_{pb} = t_c$		

* indicates rejection of null hypothesis at 1% level of significance.

$t_{pb} = t_c$. To further investigate the homogeneity of the sample, pairs are classified as either matching or nonmatching, where a pair is considered matching if it contains bonds which are similar with respect to the presence or absence of call and sinking fund features, and a pair is considered nonmatching otherwise. There are 72 matching pairs in the sample and 128 nonmatching pairs. The average implied marginal tax rate for the matching pairs is 0.260, while the average tax rate for the nonmatching pairs is 0.245.⁶

The results of these tests indicate that the marginal personal tax rate on interest is less than the statutory corporate tax rate. When the sample is further restricted to control for potential differences in risk within pairs, the relationship between the personal and corporate tax rates remains the same.⁷

B. Examining Pairs for Similarity of Risks

As suggested by Trzcinka, the risk of the nontaxable and taxable bonds may not be similar, and the nontaxable municipal bonds may have a positive risk premium. To examine the sample for possible dissimilar risks within pairs of nontaxable and taxable corporate bonds, the following regression is estimated:

$$r_{ni} = \alpha_0 + \alpha_1 r_{ti} + e_i \quad (2)$$

⁶ Tests were also performed after grouping the bond pairs by rating class and by maturity. In all cases, the results indicate rejection of the null hypothesis of equality of the marginal tax rate on interest income and the corporate tax rate.

⁷ Gordon and Malkiel [1] examine a sample of five pairs of bonds, where each pair is formed by selecting bonds which are issued on the same day by the same issuer, and where one bond is a taxable corporate bond and one is a nontaxable corporate bond. The calculated marginal tax rate for the five pairs averages 0.27. There are two pairs in the sample in this study which are identical matches similar to the five discussed by Gordon and Malkiel. The bonds are the Florida Power and Light issues on January 10, 1978 and the Toledo Edison issues on September 25, 1979; the implied marginal tax rates are 0.324 and 0.297, respectively.

Table III
Regression Results of Estimation of
Equation (2)

$$r_{ni} = \alpha_0 + \alpha_1 r_{ti} + e_i$$

Sample	α_0	α_1	R^2
Pre-1979	-1.122 (0.669)	0.879 (0.074)	0.587
Post-1978	0.202 (0.642)	0.730 (0.049)	0.694
Total	0.164 (0.252)	0.734 (0.022)	0.844

Note: Standard errors are in parentheses.

where r_{ni} is the yield to maturity on the nontaxable bond in pair i and r_{ti} is the yield to maturity on the taxable bond in pair i . If the pairs are similar, then α_0 , the bias due to risk differences, should not be statistically different from zero. Additionally, the slope should be equal to $(1 - t_c)$. The regression is estimated for the pre-1979 and post-1978 periods as well as for the entire sample period. The results are provided in Table III. The intercept for the regression using the entire sample indicates that the pairs are homogeneous with respect to risk; the intercept is not significantly different from zero. The two subsamples also confirm this finding. These results indicate that the bond pairs are similar in risk and therefore do not necessitate further adjustments. There does not appear to be any bias, in the form of a risk premium on the nontaxable corporate bond, which had concerned Trczinka.⁸ In addition, these results indicate that the marginal personal tax rate on interest is less than the marginal corporate tax rate. Testing the slopes against a hypothesized value of $(1 - t_c)$ indicates rejection of the null hypothesis at a 1% level in both periods (calculated t -statistics of 4.851 and 3.878, respectively).⁹

III. Summary and Conclusions

This study offers an alternative method of calculating marginal personal tax rates through the pairing of nontaxable (industrial development and pollution control) and taxable corporate bonds. This procedure is shown to produce matched bond pairs that do not exhibit the risk premium bias. Two hundred pairs of bonds are examined from the second quarter of 1973 through the second

⁸ Differences in liquidity between the bonds within a pair may affect the implied marginal tax rates. The taxable bonds are, in almost every pair, larger issues and may therefore be more marketable than the nontaxable counterparts. The effect of the difference in liquidity between the two bonds in a pair would be an understatement of the implied marginal tax rates. However, the results of the estimation of Equation (2) indicate that the intercept is not different from zero, which implies that differences in risk premium as well as liquidity premium are not of a significant magnitude to affect the value of the implied marginal tax rates.

⁹ The results in Table III also indicate that the calculated slopes are not significantly different from the sample means presented in Table I. These results are in agreement with those of Trczinka and Kamma [7].

quarter of 1983. Testing of the marginal tax rate relationships indicates that the marginal personal tax rate is less than the corporate statutory tax rate.

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