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ABSTRACT

This paper proposes an alternative to the traditional model for explaining the spread between taxable and tax-exempt bond yields. This alternative model is a special case of a general class of clientele models of portfolio choice and asset market equilibrium. In particular, we consider a setting with two types of investors, a taxable investor and a tax-exempt investor, who hold specialized bond portfolios. The tax-exempt investor holds only taxable bonds, and the taxable investor holds only tax-exempt bonds. Both investors hold equity, and the taxable and tax-exempt bond markets are linked through the equilibrium conditions governing equity holding and bond holding for each type of investor. In contrast to the traditional model, this alternative model has the potential to explain the small observed spread between taxable and tax-exempt yields. In addition, this model predicts that the yield spread between taxable and tax-exempt bonds should be an increasing function of the dividend yield on corporate stocks. Although the substantial changes in the tax code during the last four decades complicate the testing of this model, we find some support for the predicted relationship between the equity dividend yield and the yield spread between taxable and tax-exempt bonds.

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What determines the yield on tax-exempt municipal bonds relative to the yield on similar taxable bonds? This paper suggests that factors outside the taxable and tax-exempt bond markets, in particular the yield on common stocks, may affect this yield spread. According to the traditional model, the yields on taxable and tax-exempt bonds must adjust so that, in equilibrium, a taxable investor is indifferent between holding the two kinds of bonds. This model is the basis for most of the previous studies of yields in the tax-exempt bond market. Poterba (1989) offers one survey of this literature; Litzenberger and Nir (1995) is a recent example. In this setting, the marginal tax rate on interest income determines the ratio of the tax-exempt to taxable yield. As a result, relative yields should move with statutory tax rates. Fortune (1988), Poterba (1986), Skelton (1983), and various other studies have presented evidence that confirms this prediction.

In this paper we develop an alternative framework for analyzing the relative yields of tax-exempt and taxable bonds. We move beyond the traditional model, in which there is only one type of investor with a given tax rate, to consider a model in which there are two types of investors who face different tax rates and specialize in different kinds of bonds. The first type of investor is a tax-exempt institution which holds taxable bonds but no tax-exempt bonds. The second type of investor is a wealthy taxpayer who holds tax-exempt bonds but no taxable bonds. What links the two bond markets is that both investors hold equities. In this model, the relative pricing of taxable and tax-exempt bonds is determined by equating each bond's after-tax risk-adjusted return, for the investors who hold that type of bond, to the analogous return on corporate stock. Neither type of investor considers holding both taxable and tax-exempt bonds, so there are no investors who are indifferent between the yields on these two types of bonds.

Our model is a simple special case of a more general class of clientele models in

financial economics. In this sense, it is similar in spirit to Green's (1993) model of the term structure in the taxable and tax-exempt bond markets. Green suggests that the standard comparison between par taxable bonds and par tax-exempt bonds is inappropriate, and he emphasizes that yields on tax-exempt bonds should be compared with yields on "tax-advantaged" portfolios of taxable bonds. His empirical findings suggest that such comparisons help to explain the smaller implicit tax rate on longer-term than short-term tax-exempt bonds. Our analysis also suggests that factors beside the yield on taxable par bonds affect yields on tax-exempt bonds.

Despite some important differences from the traditional model with a single type of investor, our model nevertheless shares many of the features of this model. Both models predict that the yield spread moves with statutory tax rates. Hence, much of the evidence for the traditional model is also consistent with our alternative model. This alternative model can, in addition, potentially explain why the yield ratio seems "too small" on average to be explained by the traditional model. In 1993, for instance, the yield on high-quality long-term tax-exempt bonds was 87 percent of the yield on similar Treasury bonds. This ratio, together with the traditional model, implies a marginal tax rate of only 13 percent. By contrast, the marginal federal income tax rate for high-income households was about 40 percent at this time. Hence, the tax-exempt and taxable yields were too close together to be easily explained by the traditional view, without introducing other factors such as differences in risk between municipal and Treasury bonds. Our alternative model can resolve this puzzle because it predicts a narrower yield differential between taxable and tax-exempt yields than the traditional model.

Our alternative model also predicts that the spread between taxable and tax-exempt yields will fluctuate with the dividend yield on the stock market. Because dividends and

capital appreciation are taxed differently, the dividend yield affects the relative tax burden that taxable investors face on common stocks and, therefore, their required return on tax-exempt bonds. We test this prediction using time-series data from 1955 to 1994. Although the results are not completely consistent with the model, we do find evidence that the dividend yield is related to the spread between taxable and tax-exempt bond yields. This finding supports our general suggestion that available returns on assets other than taxable bonds may affect the pricing of tax-exempt bonds.

This paper is divided into four sections. The first develops the framework for our analysis of yield spreads. The second section documents the substantial differences between top statutory marginal tax rates and implicit tax rates in the tax-exempt bond market. It also shows how our alternative model can resolve this puzzle. The third section presents empirical evidence that the yield spread between taxable and tax-exempt bonds is related to the equity dividend yield. The fourth section is a brief conclusion.

1. The Multiple-Investor Framework

This section describes the standard model of municipal market equilibrium, and then presents our alternative model. First, we consider a taxable investor with a marginal tax rate of τ. If this investor is to be indifferent between holding a par taxable bond with yield r_T and a par tax-exempt municipal bond with yield r_M, it must be the case that $(1-\tau)r_T = r_M$. This implies

$$r_T - r_M = \tau r_T \qquad (1)$$

If taxable investors hold both taxable and tax-exempt bonds, then the yield spread should be set according to this equation. Much of the literature on the municipal bond market has shown that the tax rate implied by this equation in fact moves with statutory marginal tax rates. This evidence provides some support for this model, but as we will see, it may be consistent with other models as well.

We now develop an alternative model by introducing a second class of investors: tax-exempt institutions. Because tax-exempt bonds earn a lower return than taxable bonds, no tax-exempt investor holds them. At the same time, because the spread between the yields on taxable and tax-exempt bonds is so small, no taxable investor holds taxable bonds. This model is thus related to the "preferred habitat" models of asset-market equilibrium that have been proposed in various contexts.

Consider the equilibrium conditions for each type of investor. A tax-exempt investor compares the return on stock with the return on bonds plus an equity risk premium. If d is the dividend yield, g the expected capital gain, and θ the risk premium, then the tax-exempt investor earns the same risk-adjusted return on taxable bonds and stocks when

$$r_T + \theta = d + g. \tag{2}$$

A taxable investor compares the tax-exempt bond yield with the after-tax return on stocks. If τ_{cg} is the tax rate on capital gains, then the taxable investor's equilibrium condition is

$$r_M + (1 - \tau_{cg})\theta' = (1 - \tau)d + (1 - \tau_{cg})g \tag{3}$$

where $(1- \tau_{cg})\theta'$ is the taxable investor's after-tax risk premium on equity. Note that we assume that taxable and tax-exempt investors have the same expectations regarding capital gains. In addition, we assume that the equity risk premium falls as the tax rate on capital gains rises, because the government takes on some of the risk through capital-gains taxation.

We can solve for $r_M - r_T$ using the equilibrium conditions for the taxable and tax-exempt investors. By subtracting equation (3) from equation (2), we obtain

$$r_T - r_M = [(1-\tau_{cg})\theta' - \theta] + \tau\, d + \tau_{cg}\, g. \tag{4}$$

This expression depends on g, the expected capital gain on equities, which is not observable. We can, however, rearrange equation (2) to solve for g and substitute into equation (4). We obtain

$$r_T - r_M = (1 - \tau_{cg})(\theta' - \theta) + \tau_{cg}\, r_T + (\tau - \tau_{cg})\, d. \tag{5}$$

This expression shows that the spread between taxable and tax-exempt yields should depend on both the taxable bond yield and the equity dividend yield. The coefficient on the bond yield is the capital-gains tax rate, not the interest-income tax rate. The difference between the interest and capital-gains tax rates multiplies the dividend yield.

In the alternative model summarized in equation (5), the yield spread is an increasing function of the tax rate on interest income, so the previously cited evidence that tax policy affects the yield spread is consistent with the current model. The mechanism by which the interest tax rate affects the yield spread, however, is quite different than in the traditional model. In the two-investor case, the tax rate on interest affects the yield spread between taxable and tax-exempt bonds because it determines the tax burden on dividends, which is part of the return on one of the taxable alternatives to tax-exempt bonds.

Data on portfolio holdings provide some support for the notion of a clientele equilibrium in the tax-exempt bond market. At the end of 1992, the most recent period for which it is possible to disaggregate households and nonprofit institutions in the Federal Reserve Board Flow of Funds accounts, households held $581.1 billion in municipal securities directly. They also held additional tax-exempt debt through mutual funds. Nonprofits, which are tax-exempt,

held only $0.1 billion of such securities. Households held $182.8 billion of taxable Treasury securities, and another $157.3 billion in savings bonds, while nonprofits held $110.9 billion of taxable Treasuries. Both nonprofits and households report substantial holdings of corporate equities.

The notion that tax-exempt institutions compare taxable bonds and equities is fully consistent with these portfolio data. The portfolio pattern exhibited by households is more difficult to interpret. Although households hold more tax-exempt bonds than taxable bonds, they nonetheless hold substantial amounts of taxable bonds, which appears inconsistent with our stylized model. It is possible, however, that holdings of taxable debt are concentrated in tax-deferred investment vehicles such as Individual Retirement Accounts and Keogh plans. In this case, household ownership of taxable bonds is consistent with the model.

We should note that the ownership pattern of tax-exempt debt is very different today than it was twenty years ago. When Fama (1977) suggested that commercial banks were the marginal investors in all short-term municipal obligations, and that the pricing of these bonds depended on the tax rates of these banks, commercial banks were major investors in this market. Since the Tax Reform Act of 1986 limited banks' ability to invest in tax-exempt securities and borrow the principal in a tax-deductible way, the role of commercial banks in this market has declined. Households have become the largest holders of tax-exempt debt in the ten years since the 1986 act.

The changing pattern of municipal-bond ownership poses a challenge to testing models of yield determination. If details of the tax code and financial regulations determine the set of investors for whom holding tax-exempt bonds is a viable option, and if these rules change over time, then it may be problematic to find a sufficiently long time series to permit careful testing of these models. Alternatively, if shifts in marginal tax rates coincide with shifts in

the identity of investors in the municipal bond market, there may be changes in risk premia and other factors that confound econometric testing. We consider these issues further below.

2. The Implicit Tax Puzzle

Motivated by the traditional model, economists often summarize the yield differential between taxable and tax-exempt bonds by the implicit tax rate that equates the after-tax yield from a taxable and tax-exempt security. This implicit tax rate τ is $(r_T - r_M)/r_T$, where the two yields are for securities with similar characteristics.

A standard source of information on the yield curve for taxable and tax-exempt securities is Salomon Brothers' Analytical Record of Yields and Yield Spreads, which presents estimates of yield curves for par bonds on the first of each month. Like many studies of the determinants of the yield spread between taxable and tax-exempt bonds, including Buser and Hess (1986), Poterba (1986), and Kochin and Parks (1988), we focus on the spread between newly issued Treasury securities and prime-grade general obligation tax-exempt bonds. "Prime" is the least risky category of municipal bonds presented in the Salomon Brothers data, so both the taxable and tax-exempt rates are close to riskless. Chalmers (1995) examines data on pre-defeased municipal bonds and presents striking evidence that default risks do not explain the pricing of high-quality municipal and taxable bonds.

Table 1 shows annual averages of the twelve monthly implicit tax rates for 20-year bonds. We focus on yield spreads for long-term bonds, which have almost always exhibited a smaller implicit tax rate than short-term bonds. At some points in the late 1960s and early 1980s, the difference between the implicit tax rates on one- and twenty-year bonds exceeded twenty-five percentage points. The upward slope of the tax-exempt term structure has sometimes been steep enough to imply future short-term municipal rates greater than those

suggested by the taxable term structure; see Kochin and Parks (1988).

The data in Table 1 show that the implicit tax rate on these bonds has historically been low, and that it declined substantially during the 1980s. In 1980, the implicit tax rate was 32.4 percent. Since individual investors could face marginal tax rates as high as 70 percent on taxable interest income, the implicit tax rate was well below the top tax rate. The implicit tax rate on twenty-year bonds declined to 20.0 percent in 1990, and subsequently fell to an average value of 13.0 percent in 1993. The top federal marginal tax rate on individual investors in 1993 was 39.6 percent, again much higher than the implicit tax rate.

Our alternative model also allows the computation of an implicit tax rate, although such a computation requires more assumptions. In particular, suppose that the two investors place the same risk premium on equity ($\theta = \theta'$) and that capital gains are not taxed ($\tau_{cg} = 0$). Then the implicit tax rate τ is $(r_T - r_M)/d$. We call this the alternative implicit tax rate. For a given yield spread, the alternative model implies a much larger implicit tax rate, because the dividend yield is normally much below the taxable bond yield. Conversely, for any given tax rate, the alternative model predicts a much smaller spread $r_T - r_M$.

Table 1 also presents the time series of the alternative implicit tax rate. This alternative implicit tax rate is consistently higher than the traditional implicit tax rate and, therefore, closer to statutory tax rates. In the years since the Tax Reform Act of 1986, the alternative implicit tax rate has ranged between 29.4 percent (1993) and almost 60 percent (1987). In some cases, both in this period and before, the alternative implicit tax rate is greater than the highest statutory marginal tax rate on interest and dividend income. This finding may reflect our extreme assumption that the effective capital-gains tax rate is zero. More generally, our computed value for the alternative implicit tax rate, $(r_T - r_M)/d$, should equal $\tau + (r_T/d - 1)\tau_{cg}$, which is greater than the tax rate on dividends τ. Like the implicit tax

rate computed under the standard model, the alternative implicit tax rate declines during the 1980s, but the level of the alternative implicit tax rate does not fall substantially below statutory marginal tax rates.

Our discussion of the alternative implicit tax rate is not designed to supplant the use of the traditional implicit tax rate. The traditional implicit tax rate measures the tax rate at which an individual investor would be indifferent between holding a taxable and tax-exempt bond, and this is often a useful construct. However, under our assumption that taxable investors who hold tax-exempt bonds are not investing at the margin in taxable bonds, this calculation does not convey information on the marginal tax rates of the investors who are setting prices in the tax-exempt bond market.

3. Regression Evidence

To compare the traditional model and our alternative model of municipal bond yields, it seems natural to regress the yield spread $r_T - r_M$ on the taxable bond yield r_M and the equity dividend yield d. That is, we consider regression models of the form:

$$r_T - r_M = \delta + \alpha * r_T + \beta * d + e \qquad (6)$$

Note that this regression nests the traditional model (equation 1) and our alternative model (equation 5) if tax rates and risk premia are held constant. For any given set of tax rates, the two models give precise predictions about the magnitude of the coefficients in this regression. According to the traditional model, $\alpha = \tau$ and $\beta = 0$, where τ is a marginal tax rate on interest income. According to the alternative model, $\alpha = \tau_{cg}$ and $\beta = \tau - \tau_{cg}$, where τ_{cg} is the effective marginal tax rate on capital gains. The theory developed above suggests that $\delta = (1-\tau_{cg})(\theta' - \theta)$, the difference in the after-tax risk premia that taxable and tax-exempt investors demand for holding equities.

As we noted above, estimation of such a regression would convey the most information if it were conducted during a period when the regulations affecting who could profitably own tax-exempt bonds were stable, but when interest rates and dividend yields varied substantially. Such a data sample is not available. Nonetheless, to get a rough gauge of the validity of the two models, we try estimating this regression for the sample periods that are available, even though they span tax reforms and other changes in the tax-exempt bond market.

An important issue concerns the interpretation of the error term ϵ in the regression. Within the model we are examining, this error term arises if there are differential changes in the risk premia on equity or if there are changes in tax rates. The key question for identification is whether this error is correlated with either the taxable bond yield or the dividend yield.

There are at least three ways in which such correlation might emerge. First, if changes in the dividend yield are correlated with changes in the required risk premia on corporate equity, then the coefficient on d will reflect more than simply the difference between the tax rates on dividend income and capital gains. The net effect of this bias is not clear, for it depends on correlation of the dividend yield with the difference in risk premia between the two investor types.

A second source of potential bias arises from the effect of changes in d on the marginal tax rates of investing households. If fluctuations in the dividend yield are attributable to changes in dividend payments, and an increase in aggregate dividends raises the taxable income of some investing households enough to increase their marginal tax rates, then increases in d will raise the yield spread by more than the asset-market equilibrium conditions imply. This will lead the coefficient on d to overstate the actual differential in marginal tax

rates. This effect is unlikely to be large, however. If the taxable investors who are holding both corporate equities and tax-exempt bonds face the top marginal tax bracket, then this effect does not operate. Moreover, because most of the variation in d is attributable to fluctuations in share prices, not changes in dividends, a relatively small share of the variation in d is likely to be associated with changes in investor marginal tax rates.

A third effect that warrants consideration is a relationship between marginal tax rates and dividend payout. Poterba (1987) presents some evidence from the U.S. time series, and cites other studies, suggesting that when the differential between the tax rate on dividends and that on capital gains rises, firms reduce their payout ratios. This would suggest that an increase in r which raises the yield spread between taxable and tax-exempt bonds would also reduce d, thereby leading to a negative bias in the estimate of β.

Although these concerns suggest some caution in interpreting the regression evidence, we nonetheless proceed in estimating the equation (6) as a first step in evaluating the alternative model. We use monthly data for the period 1955:1-1994:12. The results are shown in Table 2. The first three rows present estimates for the full sample period, while the last three rows correspond to the period 1982:1-1994:12, the period after the top marginal tax rate on unearned income was reduced from 70 to 50 percent in the Economic Recovery Tax Act of 1981.

In bivariate regressions that include either the taxable bond yield or the dividend-price ratio, each of these variables has a positive and statistically significant correlation with the yield spread. The explanatory power of the equation that includes the dividend yield is smaller than that of the equation with the taxable yield. If we exclude the 1950s from our sample period, the explanatory power of the two equations is roughly equal, and for some sample periods, the yield spread is more strongly correlated with the dividend yield than with the

taxable bond yield.

When both the taxable bond yield (r_T) and the dividend yield (d) are included in the estimation equation, as in equation (6), each variable has a statistically significant effect on the yield spread ($r_T - r_M$). Recall that the traditional model of municipal bond pricing predicts a coefficient of zero on the equity dividend yield. The data decisively reject that restriction.

The resulting estimates can be used to compute the implied values of the dividend tax rate, τ, and the effective capital-gains tax rate, τ_{cg}, under the assumption our alternative model is correct. The implied value of τ is 48.6 percent, while the implied value of τ_{cg} is 17.0 percent. Keep in mind that these are not estimates of the tax rate under any particular tax code, but rather estimates based on forty years of data that span several tax regimes. Viewed in this light, the estimates seem reasonable. The effective capital-gains tax rate has long been recognized to fall well below the statutory tax rate; Feldstein and Summers (1979) divided the statutory rate by four to allow for the effects of deferral of realization, and basis step-up at death. The estimated dividend tax rate of nearly fifty percent is somewhat higher than the top statutory marginal tax rate in the post-1986 period, but is well within the range of marginal tax rates in earlier years.

The last three rows of Table 2 present estimates of the same equation for the 1982:1-1994:12 time period. Because marginal tax rates vary less in this period than between this period and earlier years, we thought that the regression might work better for these years alone. This conjecture, however, was not confirmed. The regression results suggest that the coefficients are not stable over time. When we relate the yield spread to either the taxable bond yield or the dividend yield in a bivariate regression, the coefficient estimates continue to be positive and statistically significant. When both variables are included together, however, the coefficient estimate on the taxable bond yield is positive and that on the

dividend yield is negative (and statistically significant).

The subsample instability in Table 2 calls attention to our aggregation of data from many different tax regimes. Therefore, we next consider specifications that allow for variation in tax rates over time. In particular, we estimate

$$r_T - r_M = \delta' + \alpha' * \tau_{cg} * r_T + \beta' * (\tau - \tau_{cg}) * d + e'. \quad (7)$$

If our alternative model is correct and if we use the correct marginal tax rates for the investors who are determining prices in these asset markets, then the alternative model predicts coefficient estimates of $\alpha' = \beta' = 1$.

To estimate this equation, we construct variables based on the marginal tax rates facing highest-income individuals. We use two measures of the effective capital-gains tax rate: the statutory rate and one quarter of the statutory rate. As we noted earlier, the latter approach is used by Feldstein and Summers (1979) to allow for the effects of deferral of realization and basis step-up at death. We then construct synthetic variables by multiplying these tax parameters by the return on taxable bonds and the dividend yields. We use these synthetic variables in the above regression.

The results are in Table 3. In some ways, the results are supportive of the model. In all cases, the coefficients are statistically significant and of the correct sign. For the entire sample, the fit is better than for the comparable regression in Table 2, which implicitly assumes constant tax rates. Moreover, the results are more robust over subsamples. On the other hand, the coefficients are not always of the right magnitude. In particular, the coefficient on the dividend-yield variable, although always positive and significant, is less than the value of unity predicted by the alternative theory.

4. Conclusion

Traditional analyses of how taxes affect the yield spread between taxable and tax-exempt bonds have assumed that a single class of taxable investors is indifferent between holding these two securities. This paper has proposed and examined an alternative model of the pricing of municipal bonds, in which there is heterogeneity in investor type and segmentation in the bond market. Taxable investors hold tax-exempt bonds, while tax-exempt investors hold taxable bonds. What links the investors, and the two bond markets, is that both investors hold equities. The model generates the novel prediction that the spread between taxable and tax-exempt bond yields depends on the dividend yield paid by equities, as well as on the taxable interest rate and on the marginal tax rates for dividends and capital gains. The time-series data gives some support to this prediction, although the results are not completely consistent with the simple model presented here.

One natural extension of the model developed here would allow for investors who can hold assets in both taxable and tax-exempt form. Individual investors with access to Individual Retirement Accounts, Keogh plans, 401(k) accounts, or similar investment vehicles can reduce their tax burden by allocating assets among accounts according to their tax characteristics. Such a model can potentially explain some of the anomalous results reported here. In Table 3, for example, we reported that the equity dividend yield, adjusted by the tax rate, has a significant impact on the spread between taxable and tax-exempt bond yields, but that the size of the effect is smaller than the model predicts. Perhaps the explanation is that individuals hold low-dividend stocks in their taxable account and high-dividend stocks in their tax-exempt account. Such behavior would lower the effective tax rate on dividends and, as a result, reduce the impact of the dividend yield on the spread between bond yields.

The general lesson from our analysis is the importance of considering assets other than

taxable bonds when modelling the yield on municipal bonds. In this sense, we have built on the analysis of Green (1993), who considers a model with various kinds of taxable bonds, some selling at par and others selling below par. In his model, tax-exempt bonds are arbitraged to yield returns comparable to those on favorably-taxed taxable bonds, not par bonds. Our analysis shares the insight that explaining the pricing of tax-favored securities may be easier if one expands the set of assets that investors are able to hold. Yet it also suggests that for analyzing the yield spread between taxable and tax-exempt bonds, it may be important to consider developments in equity as well as fixed-income markets.

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TABLE 1:
IMPLICIT TAX RATES FROM TAXABLE AND TAX-EXEMPT BOND MARKETS

Year	$(r_T - r_M)/r_T$	$(r_T - r_M)/d$
1955	25.8%	18.0%
1956	23.0	17.3
1957	15.9	12.6
1958	19.9	17.6
1959	23.3	29.8
1960	23.8	28.6
1961	20.0	26.2
1962	26.9	32.6
1963	27.5	35.0
1964	27.8	38.9
1965	27.7	39.2
1966	23.9	33.5
1967	25.1	38.6
1968	23.7	41.7
1969	13.9	27.3
1970	10.6	20.1
1971	13.7	27.6
1972	16.1	35.9
1973	29.6	74.6
1974	29.6	59.7
1975	22.8	46.4
1976	29.0	60.2
1977	33.8	56.1
1978	36.4	58.2
1979	37.3	62.9
1980	32.4	69.0
1981	24.1	64.2
1982	16.1	36.0
1983	21.6	55.7
1984	23.3	63.2
1985	20.6	53.3
1986	15.6	36.5
1987	19.9	59.3
1988	16.3	40.8
1989	18.6	46.2
1990	20.0	48.2
1991	18.4	45.9
1992	14.7	38.7
1993	13.0	29.4
1994	16.8	42.5

Source: Authors' calculations based on data from Salomon Brothers' Analytical Record of Yields and Yield Spreads, and dividend yield information from Standard and Poor's. The entries in the first column correspond to the marginal interest income tax rate of the investor who is indifferent between taxable and tax-exempt bonds under the assumptions of the traditional model; the entries in the second are the marginal tax rates on interest and dividend income of the marginal taxable investor who is indifferent between equity and tax-exempt bonds, assuming a zero capital-gains tax rate. See text for further discussion.

TABLE 2:
DETERMINANTS OF THE YIELD SPREAD BETWEEN TAXABLE AND TAX-EXEMPT BONDS

Dependent Variable: $(r_T - r_M)$

Sample	Constant	r_T	d	Adj. R^2	SER
55-94	-0.058 (0.147)	0.223 (0.026)		.598	.527
55-94	-0.868 (0.401)		0.639 (0.118)	.432	.626
55-94	-0.863 (0.448)	0.170 (0.026)	0.316 (0.137)	.669	.478
82-94	-0.679 (0.364)	0.251 (0.044)		.727	.324
82-94	-0.143 (0.509)		0.479 (0.150)	.447	.461
82-94	-0.567 (0.205)	0.435 (0.049)	-0.490 (0.117)	.801	.276

Notes: Estimation results using monthly data from the beginning of the first calendar year indicated, through December 1994. Standard errors shown in parentheses are estimated using the Newey-West (1994) algorithm to preserve consistency under autocorrelation and heteroscedasticity. The dependent variable is the yield spread between the 20-year taxable bond yield (r_T) and the 20-year tax-exempt bond yield (r_M) as reported in Salomon Brothers' Analytical Record of Yields and Yield Spreads. d is the dividend yield on the S&P 500 for the Wednesday closest to the first of each month.

TABLE 3:
DETERMINANTS OF THE YIELD SPREAD BETWEEN TAXABLE AND TAX-EXEMPT BONDS

Dependent Variable: $(r_T - r_M)$

Sample	Constant	$\tau_{cg} * r_T$	$(\tau - \tau_{cg}) * d$	Adj. R^2	SER
Using Top Capital Gains Rate					
55-94	-1.016	1.021	0.402	.724	.436
	(0.243)	(0.092)	(0.074)		
82-94	-1.033	1.011	0.604	.671	.355
	(0.485)	(0.200)	(0.162)		
Using 1/4 Top Capital Gains Rate					
55-94	-1.000	3.748	0.329	.714	.444
	(0.252)	(0.337)	(0.067)		
82-94	-1.116	3.578	0.557	.637	.373
	(0.530)	(0.707)	(0.170)		

Notes: Estimation results using monthly data from the beginning of the first calendar year indicated, through December 1994. Standard errors shown in parentheses are estimated using the Newey-West (1994) algorithm to preserve consistency under autocorrelation and heteroscedasticity. The dependent variable is the yield spread between the 20-year taxable bond yield (r_T) and the 20-year tax-exempt bond yield (r_M) as reported in Salomon Brothers' Analytical Record of Yields and Yield Spreads. d is the dividend yield on the S&P 500 for the Wednesday closest to the first of each month.