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EX-DIVIDEND DATE PRICING OF U.S. CLOSED-END BOND FUNDS

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Abstract

This paper examines a sample of U.S. closed-end bond funds to test two possible explanations of ex-dividend date abnormal returns: the tax clientele hypothesis, which highlights marginal tax rates of long-term investors; and the short-term trading hypothesis, which relies on dividend capture activities of securities dealers and other short-term traders. U.S. closed-end bond funds are well suited to studying these hypotheses due to variation in the tax treatment of income distributions for the different types of bond funds and to the size and regularity of the dividend payments. The empirical results indicate that both hypotheses have a part in explaining ex-dividend date pricing for the full sample of closed-end bond funds.

I. Introduction

While ex-dividend date pricing of common stocks has received considerable attention, scant attention has been given to pricing of closed-end bond funds. Until recently, the relatively small size and number of outstanding funds has made it impractical to examine this class of securities for empirical evidence about ex-date pricing behavior. Yet, the growth in size and number of closed-end bond funds during the 1990's now makes this class of security a viable candidate for empirical study. Closed-end bond funds are of interest because these funds have characteristics that are well suited to testing the various theories that have been proposed to explain ex-dividend date pricing for stocks. In particular, most closed-end bond funds pay regular dividend income distributions (dividends), making these securities potential candidates for dividend-motivated trading. Recognizing the different tax treatment of capital gains and dividends is a key element used to explain ex-date pricing of closed-

end bond funds. Each of the three distinct groups of funds has a different tax treatment for the income distribution. In addition to increasing general knowledge about financial markets and the pricing behavior of specific securities, information about ex-date pricing performance of closed-end bond funds is useful to securities dealers seeking opportunities for employing dividend capture strategies. Empirical guidance is also given to long-term retail and institutional investors regarding the appropriate timing for purchasing specific types of closed-end bond funds.

Three distinct groups of closed-end bond funds are examined in this paper. One group of closed-end bond funds holds bonds from issuers such as corporations or the US Treasury and have dividend income distributions that are fully taxable (taxable bond funds). Another group of funds holds issues of municipal bonds from a number of states and are exempt from federal tax, but subject to state taxes (national municipal funds). The final group holds bonds from a single state (state municipal funds). For qualifying investors, state municipal bond funds are exempt from both federal and state taxes on dividend income. As such, each of these fund types may appeal to different tax clienteles. In addition, each of the fund types differs in terms of average size and trading volume, with state municipal funds typically being the smallest. It follows that there are corresponding differences in the ability to execute short-term dividend capture strategies for each fund type. Closed-end bond fund prices also tend to have less volatility than exhibited by stock prices, facilitating the execution of unhedged dividend capture strategies.

Numerous empirical studies have documented the presence of abnormal returns associated with ex-dividend date stock price behavior. The two most commonly examined hypotheses that have been advanced to explain these abnormal returns are: the tax clientele hypothesis, which highlights marginal tax rates of long-term investors; and the short-term trading hypothesis, which relies on dividend capture activities of short term traders.[1] This study investigates the empirical validity of these hypotheses using comparisons of the *price-drop-off ratio* and the *incremental ex-date return* for the different classes of closed-end bond funds. In addition, trading volumes on the cum-date and ex-date are examined as a proxy for short-term trading associated with dividend capture activity. The sample contains over 27,000 observations covering 307 funds over the period from Jan. 1988 to Dec. 2000. In the following, Section II provides an overview of prevailing theories about ex-date security price determination. Section III discusses the institutional details about closed-end bond funds. Section IV contains details about the sample and the empirical tests. Section V provides the empirical results. The paper concludes with Section VI which summarizes the important results contained in the paper.

II. *Background and Literature Review*

At least since Elton and Gruber (1970) there has been controversy about the returns for stock prices observed on the ex-date (Elton et al. 2004). Though perfect markets intuition suggests a drop in stock price from the last cum-date to the ex-date of approximately the amount of the dividend, numerous studies, using a range of time periods and countries, have demonstrated that many stock prices drop by less than the cash dividend. Elton and Gruber used tax effects to explain the observed price behavior. Under the assumptions of no transaction costs, risk neutral investors and no short-term traders, ex-date stock pricing can be theoretically accounted for using marginal tax rates of a representative long-term investor. Assuming dividends are taxed differently than capital gains, the equilibrium stock price drops only by the amount of the dividend net of taxes. In equilibrium, market prices are such that the marginal long-term investor is indifferent between selling a share on the cum-date at price P_c or on the ex-date at price P_x. This explanation is commonly referred to as the tax clientele or long-term trading hypothesis. This hypothesis implies that tax rates of marginal investors can be inferred from the ex-date price drop.

The tax clientele hypothesis can be formalized by examining the long-term investor's trading profit functions for the cum-date and ex-date. To be indifferent to trading on either date:

$$P_c - t_g(P_c - P_0) = P_x - t_g(P_x - P_0) + D(1 - t_d) \tag{1}$$

where t_d = the marginal long-term investor's effective tax rate on dividend income, t_g = the investor's effective tax rate on capital gains, D = the cash dividend paid and P_0 = the original purchase price. After rearranging, the price-drop-off ratio (*DOR*) is expected to equal the relative tax differential between dividends and capital gains while the incremental ex-date return depends on both the dividend yield and the difference in tax rates:

$$DOR = \frac{P_c - P_x}{D} = \frac{1 - t_d}{1 - t_g} \rightarrow \frac{P_x + D - P_c}{P_c} = \frac{t_d - t_g}{1 - t_g}\frac{D}{P_c} \tag{2}$$

where R is the incremental ex-date return that is earned by selling on the ex-date rather than on the prior cum-date. Based on this *DOR*, when ordinary income tax rates on dividend income exceed capital gains tax rates ($t_d > t_g$), the ex-date price drop off is less than the dividend amount and the ex-date returns must be positive in order to compensate long-term investors for the *tax penalty*. For the long-term traders of the tax clientele hypothesis, the decision to buy or sell the stock is not motivated by the dividend. Rather, the tax implications of

the dividend affect the timing of the sales and purchases.

The general implications of the tax clientele hypothesis are that long-term investors in high (low) income tax brackets hold low (high) dividend yield stocks since they prefer capital gains (dividend income) over dividend income (capital gains). Numerous studies using a variety of different samples have tested the long-term tax clientele hypothesis and found that ex-date stock pricing is considerably more complicated than envisioned by the tax clientele hypothesis. As Frank and Jagannathan (1998) point out, the complexity of the American tax code makes it difficult to verify whether the tax interpretation is valid since not all investors have a tax-induced preference for capital gains over dividends. Floor traders, pension funds and tax exempt institutions face the same tax rates on dividends and capital gains, whereas corporations prefer dividends over capital gains. Given that there are many different types of traders facing different types of tradeoffs between dividends and capital gains and transaction costs, it is difficult to precisely interpret the relation between the ex-date price drop and the amount of the dividend. As Eades et al. (1994) point out, characteristics of the marginal investor can vary over time especially for high dividend yield stocks. As such, any change in the relative pricing of dividends and capital gains observed in the data would reflect the changing importance of the different trading groups. In the presence of heterogeneous investors facing different tax rates and transaction costs, the interpretation of the relation between the ex-date price drop and the dividend is difficult to untangle.

The accumulation of evidence against the general applicability of the tax clientele hypothesis has led to the introduction and development of an alternative explanation of observed ex-date pricing: the short-term trading hypothesis. This hypothesis argues that, within the bounds imposed by transaction costs, securities dealers (i.e., short-term traders who face equal effective tax rates on dividends and capital gains) may profit from positive (or negative) ex-dividend day returns by executing short-term dividend capture strategies. The intuition of this approach is that if the dividend per share exceeds the expected ex-date price drop by more than the transaction costs, the short-term trader buys the stock on a prior cum-date (to receive the dividend) and sells the stock on the ex-date. For a securities dealer the profit function for the *long dividend capture* trade is:

$$(1-t_0)[D-(P_c-E[P_x])-\theta_p]>0$$

where $E[P_x]$ = the expected price on the ex-date, θ_p = the expected round trip transaction cost and t_o = the marginal tax rate on ordinary income for a short-term trader (securities dealer).

Short-term traders may also profit from negative ex-date returns using a *short dividend capture trade*. In this case, if the dividend per share is less than

the expected ex-date price drop, byallowing for transaction costs, the short-term trader can short sell the stock on the prior cum-date and buy it back on the ex-date. For a securities dealer, the profit function for this trade is:

$$(1-t_0)[(P_c - E[P_x]) - D - \theta_p] > 0$$

These two conditions provide upper and lower bounds on the expected *DOR* associated with no-expected-profit opportunities. Some rearranging gives:

$$1 - \frac{\theta_p}{D} < \frac{P_c - E[P_x]}{D} < 1 + \frac{\theta_p}{D}$$

Unlike the relationship between *DOR* and tax rates indicated by the tax clientele hypothesis, the bounds on expected *DOR* ($\{P_c - E[P_x]\}/D$) associated with the short-term trader hypothesis only indicates the range within which there are no expected profit opportunities. These bounds are inversely proportional to the dividend yield (as dividends go down, the bounds get wider). Because violation of the bounds only means that short-term trading is profitable, it follows that tax rates of the firm's stockholders cannot be inferred from the value of the expected *DOR* as predicted by the tax clientele hypothesis. Even if the sample mean of expected *DOR* is within these bounds, the marginal tax rates of the trading population still cannot be inferred, as there may have been sufficient short-term trading to move prices within the bounds.

In addition to dividend capture trading by securities dealers, short-term dividend capture by corporations is also possible. Due to different tax treatment for dividends and capital gains, corporate dividend capture trading implies different restrictions on ex-date pricing than for short-term trading by securities dealers. The 1986 Tax Reform Act reduced the inter-corporate dividend tax exemption from 85% in 1986 to 80% in 1987 and to 70% in 1988 and years thereafter. Corporate tax rates also decreased from 46% in 1986 to 40% in 1987 and 34% in 1988 which reduced the dividend preference of corporations but still left favorable dividend treatment at a significant level (Robin 1991).[2] Though somewhat reducing the potential gains, this tax treatment still provides corporations with a strong incentive to engage in dividend capture activities. For these traders, the profit bounds differ from those for securities dealers, e.g., Siddiqi (1998). There is considerable evidence that stocks with the highest dividend yields have *negative* abnormal ex-date returns, e.g., Elton and Gruber (1970), Michaely (1991), Koski and Scruggs (1998) and Naranjo et al. (2000). This result is consistent with the view that, encouraged by favorable tax treatment, corporations are attracted to dividend capture trading in the stocks with high dividend yields. In turn, the associated negative abnormal return on the ex-date produced by corporate dividend capture provides a short-term

trading profit opportunity for securities dealers to exploit with short dividend capture trades.

Empirical tests of the short-term trading hypotheses have produced a rich array of results. Unlike the tax clientele hypothesis that is somewhat more difficult to test, the short-term trading hypothesis has some readily testable implications. One approach to testing the short-term trading hypothesis is to observe the behavior of *trading volume* around the ex-date rather than examining the price behavior, e.g., Stickel (1991), Michaely and Vila (1995).[3] At least for taxable distributions, it is expected that abnormal trading activity would be negatively related to transaction costs and positively related to dividend yield. A number of studies have presented evidence consistent with the hypothesis that short-term trading is important for taxable distributions. Trading volume increases abnormally before and after the ex-date, with trading effects becoming more pronounced in the period following the introduction of negotiable commissions in 1975. For non-taxable distributions (stock splits and stock dividends), negative abnormal trading volume has also been observed around the ex-date. More recently, Koski and Scruggs (1998) examine NYSE trade audit data to identify the types of traders involved in trading high dividend yield stocks where abnormal increased volume is observed. Evidence is presented that the bulk of this trade is done by securities dealers rather than corporations.

III. Institutional Background on U.S. Closed-End Bond Funds

The aggregate U.S. market for closed-end funds experienced considerable growth during the 1990's, with much of this growth concentrated in domestic bond funds.[4] Closed-end funds are able to avoid direct payment of federal tax at the fund level by meeting IRS requirements regarding sources of income and levels of diversification. These requirements involve the closed-end fund distributing the bulk of income and capital gains to shareholders on an annual basis. In this fashion, the tax implications are flowed through to the shareholder where the fund distributions are treated either as dividends or capital gains. Dividend income paid by the fund to shareholders is derived from the interest or dividend income earned by the assets held in the fund. Capital gains which arise from profits associated with the sale of securities during a calendar year are typically paid annually, around the end of the calendar year. Funds retaining capital gains into the next tax year may be subject to federal tax on those gains. As an investment class, U.S. closed-end bond funds have a number of features that are attractive for empirical testing of ex-date price behavior. Unlike closed-end stock funds, which trade on-average at discounts to net asset value (NAV) which vary with the degree of market sentiment, e.g., Chopra et al. (1993), closed-end bond funds trade on-average at small and less variable

premiums to NAV, e.g., Abraham et al. (1993). More importantly, closed-end bond funds are generally purchased for the dividend income generated.

Fully taxable bond funds invest in a wide range of securities depending on a fund's investment objective which is reflected in the types of securities held by the fund. Using the *Wall Street Journal* method of classification, fully taxable U.S. closed-end bond funds can be decomposed into funds holding investment grade corporate bonds, U.S. government debt securities, high yield (below investment grade) corporate debt and mortgage backed securities. There are also domestic hybrid bond funds which hold portfolios of bonds from two or more of these generic categories. (Two additional types of closed-end bond funds are also traded on U.S. exchanges: global and foreign closed-end bond funds. These types were not considered in this study.) As indicated in Table 1, of the 101 taxable bond funds examined: 7 funds with an average end-of-sample market value of $288.3 million held U.S. government debt; 19 funds with average market value of $237.7 million held mortgage securities; 14 funds with average market value of $117.2 million held investment grade bonds; 34 funds with average market value of $185.8 million held high yield bonds; and, there were 27 hybrid bond funds with average market value of $253.3 million. Of the 101 funds, all but 21 paid monthly dividends, with all of the mortgage funds and all but one of the high yield funds paying dividends monthly throughout the sample. Except for one fund which paid semi-annual dividends and two which switched payment frequencies from quarterly to monthly or vice versa, the 18 other high dividend payout funds, primarily investment grade and hybrid funds, paid quarterly dividends. National municipal bond funds invest in a variety of municipal bonds issued across a number of different states. The average end-of-sample market capitalization for the national funds was $286.9 million. As noted, distributions from these funds are exempt from federal income tax only. Single-state municipal bond funds invest in bonds issued within only one state to obtain income that is, for qualifying investors, exempt from both state and federal taxes. The average end-of-sample market capitalization for the single state funds was $110.4 million.[5]

Though all municipal bond funds are similar in being exempt from federal tax, closed-end municipal bond funds do differ with respect to the credit worthiness of the issues which are held in a given fund. It is likely that closed-end funds exhibit credit risk variation similar to open-end municipal bond funds, e.g., Kihn (1996), though there are no studies which confirm this presumption. Inspection of the fund descriptions does indicate that these funds invest in a range of credits, from high-grade to low-grade, depending on much the same factors that impact all bond issues. The credit quality of a fund's holdings has implications for the capital gains distributions made by the funds. All municipal bond funds pay monthly dividends. Due to the favorable tax treatment, the monthly dividend yields are almost always below those of the taxable funds.

For example, while the state and national funds averaged monthly dividend (plus distributed capital gain) yields of 0.5261% and 0.575% (6.325% and 6.9% annualized), the taxable high yield and mortgage funds averaged 1.0359% and 0.7024% (12.43% and 8.43% annualized). Using national mortgage funds as an example, this translates into an average monthly dividend (plus distributed capital gain) payment of 7.09¢ on an average share price of $12.31.

Most states levy personal income taxes by following a format similar to that of the federal government.[6] State taxes are substantially lower than federal taxes and are typically progressive, though some states such as Massachusetts and Pennsylvania do charge a flat rate on personal income. Other states, such as Florida, Texas and Alaska, do not levy any state taxes at all. State income taxes are levied on income received with the exception of Rhode Island and Vermont that charge income taxes on 25.5% and 24% of the individual's federal tax liability respectively. Income taxes paid to state governments may be deducted from income before computing federal income tax. For purposes of calculating tax rates for taxable and national municipal bond funds, the range for the marginal tax rate on income across states ranges from 0.00 for the states with no income tax to 9.00% for the highest marginal state tax rate category. Capital gains distributions are paid by mutual funds from their net realized long-term capital gains. The Internal Revenue Service requires that capital gain distributions are taxed as long-term gains regardless of how long the investor has owned the shares in a mutual fund with the maximum capital gains rate applicable to mutual funds being 20%. Comparing the range of state income tax rates with the maximum capital gains tax rate, it follows that the effective state income tax rate is less than the capital gains tax rate. In what follows, the magnitude of tax rates on capital gains and ordinary income has implications on the predictions of ex-date price behavior.

IV. Sample and Methodology

Three groups of closed-end bond funds containing a total of 307 funds were identified using the *Wall Street Journal* for October 1st, 2001: 101 fully taxable bond funds; 96 national municipal funds; and, 110 single-state municipal funds. All three groups were NYSE or AMEX traded with at least one ex-date from January 1988 to December 2000. Only 5 of the state municipal funds and 5 of the national municipal funds traded for 12 years (or more) while 37 fully taxable funds did so. The number of observations in the sample is indicated by the average number of ex-dates for an individual fund by fund group: 96 for taxable funds; 95 for national municipal funds; and, 79 for state municipal funds (see Table 1). For these 307 funds, daily closing prices, dividends paid and trading volumes were collected from the Center for Research in Security Prices (CRSP) daily master files. From this data, ex-date fund prices and cum-date

Table 1
Descriptive Statistics for the Full Sample of Closed-End Bond Funds, Jan. 1988-Dec. 2000*

Type of Fund	*Number of Funds*	*Average Mkt. Cap. (millions)*	*Average# of Ex-dates*	*Average Monthly Div. Yield*
State Municipal	110	$110.356	79	0.5261%
National Municipal	96	$286.939	95	0.5750%
Fully Taxable	101	$211.182	96	0.8786%
Fully Taxable Subgroups				
–US Government	7	$288.309	111	0.7100%
–Mortgage Securities	19	$237.657	103	0.7027%
–Investment Grade	14	$117.235	75	0.7090%
–High Yield	34	$185.780	93	1.0359%
–Hybrid	27	$253.257	102	0.8877%
–Monthly Payout	80	$240.526	109	0.879%
–Quarterly Payout	21	$ 99.394	48*	2.401%*
– Gov't., Mortgage and Investment Grade	40	$204.373	95	
–High Yield and Hybrid	61	$215.647	97	
Fully Taxable, Without December	101	$211.182	8530	
December Only	101		1170	

* Market capitalization is the end-of-sample value. Monthly dividend yield also includes capital gains distributions. Funds which made dividend payments less frequently than monthly have had the dividend yield converted to a monthly basis except for the quarterly payout sample where the dividend yield is for three months, i.e., the quarterly return is for the amount actually paid (after adjusting for one fund with semi-annual payout and two funds which switched from monthly to quarterly). The average number of ex-dates is the number of monthly ex-dates for an individual fund in that fund group, except for the quarterly payout sample where it is the number of quarterly ex-dates in that sample and for the December/Without December sample where it is the total number ex-dates for all funds in the taxable fund group. The data source used is the CRSP daily master file. See also notes to Table 2.

prices for the day prior to the ex-date were extracted, together with the ex-date and cum-date trading volumes. The CRSP files were also used to obtain information about the stock exchange on which the funds traded and the number of shares outstanding. The initial sample contained 28,466 ex-dates for the 307 bond funds. From this sample, 940 ex-date observations (51 taxable, 86 national municipal and 803 state municipal) were excluded because of no trade on the ex-date or cum-date (or missing P_x and P_c prices). The final sample contains 27,506 observations.

From the CRSP daily tape, it is not possible to distinguish fund distributions that are capital gains from those which are dividend distributions. Only the amount and date of the payment is recorded. As capital gains distributions for closed-end bond funds are made almost exclusively in December, the impact of capital gains was evaluated by reworking the empirical results using a sample which excluded all December payments, prices and trading volumes. *A priori*, capital gains distributions are not expected to have a significant impact on the results, because most bond funds do not experience the significant price changes associated with stock funds. Hence, such distributions will not be large relative to capital gains distributions for closed-end stock funds. However, bond fund capital gains distributions that are paid annually can be large relative to the monthly (or quarterly) dividend distributions requiring that these cash flows receive specific attention. The average size of the capital gains distribution can be estimated by differencing the average distribution payment per share paid in December from the average monthly dividend payment for all other months, excluding December. This produces for state municipal funds (9.444¢ - 7.153¢ = 2.291¢), for national municipal funds (9.364¢ - 7.280¢ = 2.084¢) and for taxable funds (14.60¢ - 10.20¢ = 4.40¢).

The main parameters used for testing the tax clientele hypothesis is the average price drop-off ratio, *DOR*, and the average incremental ex-date return, *R*. For a given fund group, the average *DOR* is calculated by taking an equally weighted average of the *DOR*'s for each fund in the group. In turn, the *DOR* for an individual fund is calculated by taking a time average of the *DOR*'s for that fund. Hence, the average *DOR* for a fund group is calculated as the average across funds of the time averaged individual fund *DOR*'s. The average *R* is calculated in the same fashion as the average *DOR*, as averages across individual funds of the individual fund time averages. Because the aggregate *DOR* for a given fund group can be sensitive to anomalous individual fund values associated with factors such as abnormally low *D*, results using *R* are likely to produce more accurate inferences. Average *DOR* and *R* are computed for fund groups and selected sub-groups and used to test the relevant hypotheses. The statistical tests employed are t-tests, where the degrees of freedom are determined by the number of funds in the group being examined. This approach raises some statistical issues which are addressed by using a different approach for testing the December/Non-December samples (see Tables

1, 2 and 5).

In calculating the *DOR* and *R* as an average over funds of the individual time averages, it is necessary to treat each of the fund time averages as a random variable. As a consequence, the statistical tests are conducted as though there are as many random variables are there are funds in the sample. Hence, despite starting with a large number of total observations, the degrees of freedom for the statistical tests and the standard deviations are calculated as though there are substantially less. For example, though there are 9,696 total ex-dates in the fully taxable sample, the tests are conducted as though there are only 101 observations, i.e., the time averages for the individual funds (see Table 1). This is the approach used to resolve the statistical problem of variation in the number of temporal observations for each fund. An alternative approach that would take account of all the observations is to lump all the observations together without taking account of the individual fund information. Each ex-date observation is treated as an individual random variable and tests are conducted on the averages across all ex-dates. In this fashion, being based on the total number of ex-dates in the sample, the degrees of freedom in the statistical tests would be much larger. This approach was used to test the December/Non-December sample (see Tables 2 and 5).[7]

Regarding the specific form of the hypotheses being tested, let the superscripts *T, N* and *S* denote fully taxable, national municipal and single-state municipal funds respectively where t_g and t_d are the investor's effective tax rate on capital gains and ordinary income. Observing that dividends from single-state municipal bond funds are exempt from state and federal income taxes for qualifying investors, dividends are tax-exempt (i.e., $t_d^S = 0$) but capital gains are taxed at a positive rate (i.e., $t_g^S > 0$), under the tax clientele hypothesis, the *DOR* of the marginal investor is expected to be:

$$DOR^S = \frac{P_c - P_x}{D} = \frac{1-t_d}{1-t_g} = \frac{1}{1-t_g} > 1$$

Because dividends from fully taxable bond funds are subject to both federal and state income taxes with income tax rates exceeding capital gains taxes (i.e., $t_d^T > t_g^T$), for taxable funds the tax clientele hypothesis requires:

$$DOR^S = \frac{P_c - P_x}{D} = \frac{1-t_d}{1-t_g} = \frac{1}{1-t_g} < 1$$

Unlike single-state municipal funds, national municipal funds are exempt from federal income tax only. Because the tax rate on ordinary income is assumed to be less than the tax rate on capital gains, it follows that the *DOR* is greater than one for national municipal funds under the tax clientele hypothesis:

Table 2
Price Drop Off Ratio (DOR) and Incremental Ex-Date Return by Type of Closed-End Bond Fund, Jan. 1988-Dec. 2000*

Type of Fund	*State Municipal*	*National Municipal*	*Fully Taxable*
Full Sample	N = 110	N = 96	N = 101
Average *DOR*	1.109	1.118	0.977
(t value for = 1)	(2.91)	(4.20)	(-0.88)
Average Ex-Date Return	-0.047%	-0.060%	0.069%
(t value for = 0)	(-2.45)	(-3.84)	(2.957)
Number of Excluded Ex-Dates	803	86	51
December Only Sample	N = 812	N = 832	N = 1170
Average *DOR*	1.146	1.148	0.957
(t value for = 1)	(1.83)	(2.24)	(-0.87)
Average Ex-Date Return	-0.030%	-0.050%	0.136%
(t value for = 0)	(-0.76)	(-1.09)	(3.08)
Sample Excluding December	N = 7860	N = 8302	N = 8530
Average *DOR*	1.156	1.114	1.005
(t value for = 1)	(2.91)	(5.61)	(-0.31)
Average Ex-Date Return	-0.070%	-0.060%	0.016%
(t value for = 0)	(-6.43)	(-5.75)	(1.17)

* Ex-dates are excluded primarily because of no trading on that ex-date. N for the 'type of fund' samples indicates the number of funds in that group. N for the December/Non-December samples is the total number of ex-dates in the sample, i.e., averaging is over the total number of ex-dates and not over the number of funds in the group. In terms of *DOR*, the tax clientele hypothesis requires: $DOR^S > DOR^N > DOR^T$ and $DOR^S > 1$, $DOR^N > 1$ and $DOR^T < 1$. In terms of the incremental ex-date return, *R*, the tax clientele hypothesis requires: $R^S < R^N < 0 < R^T$.

$$DOR^T = \frac{P_c - P_x}{D} = \frac{1-t_d}{1-t_g} < 1$$

Combining these three results produces the additional restriction that $DOR^S > DOR^N > DOR^T$. Results are also provided for incremental ex-date returns where the associated tax clientele hypotheses are $R^S < R^N < 0 < R^T$.

The use of *DOR* may be disquieting to those familiar with studies of ex-date pricing for common stocks. Low dividend payout and substantial stock price volatility unrelated to the dividend payment can produce significant statistical problems, such as heteroskedasticity, for *DOR*'s calculated from stock prices. Due to certain characteristics specific to closed-end bond funds, such statistical problems are less likely to be as important as for common stocks. For example, unlike stock prices and dividends which have wide dispersion across time and stocks, closed-end funds tend to be issued at similar market values, with \$10-\$12 per share being most common. Actual fund values then track up or down from this value depending on fund performance and other factors.[8] On average, price volatility of bond funds is substantially less than for common stocks. In addition, bond fund dividend payments tend to be relatively constant and, on an annualized basis, much higher than for common stocks. Recognizing that using *R* avoids statistical problems that could arise with *DOR*, comparison of the *DOR* and *R* results can provide insight into the degree of heteroskedasticity in the sample. While using *R* may avoid the statistical problems associated with *DOR*, the primary advantage of using *DOR* is the intuitive superiority of this calculation for assessing the tax clientele hypothesis.

Tests of the short-term trader hypothesis are conducted by examining a measure for the volume of trading and testing for differences across the ex-date, cum-date and other trading dates. *Ceteris parabus*, short-term dividend capture trading produces an abnormal amount of ex-date and cum-date trading volume relative to other trading days. Because of the heteroskedasticity associated with unadjusted trading volume, the volume measure used in testing for abnormal ex-date and cum-date volume is the actual number of shares traded divided by the number of shares outstanding, effectively the *turnover* of shares. (Note that in Tables 4 and 5 the turnover measure is scaled, i.e., volume in the numerator is the actual number of shares traded and the denominator is the number of shares outstanding in thousands). The turnover measure is calculated for each of the fund groups, state municipal, national municipal and taxable, as well as for a number of sub-groupings of the taxable group. The most important taxable sub-grouping for testing the short-term trading hypothesis is the 21 highest dividend paying taxable funds, that is, those funds with distributions which are paid (mostly) quarterly. Paying distributions on a quarterly basis means that instead of making three monthly distributions, the three dividend payments are 2952 accumulated into one, making the actual dividend three times larger. It is expected that turnover on both the cum-date and ex-date for the quarterly-pay

fund groups will be significantly greater than for other trading days.

The turnover measure of volume is calculated for the ex-dates, cum-dates and the sums of all other trading dates (zeroes excluded). Because of concerns about the prices for a number of funds on the CRSP tape where there are days with zero volume, observations on which there was no trading were discarded. (The discarded observations are largely from the single state funds.) In practice, this means that only a few cum-date/ex-dates were discarded with most of the observations discarded being in the other trading days. Because this will increase the average volume for the other than ex-dates and cum-dates, this makes the percentage change tests being done more conservative. Again using the average across funds of the time averages for individual funds, tests for abnormal trading activity are conducted by taking percentage differences of the cum-date or ex-date turnover from turnover on all other trading days and evaluating whether this value is different from zero.[9] It is expected that short-term trading will be more significant for the high dividend payout group and, due to the capital gains distributions, for the December sample. Abnormal turnover for the state and, to a lesser extent, the national municipal funds is expected to be insignificant. This is due to the small size of the monthly dividends for other funds, the small aggregate size of funds (which impacts underlying liquidity) as well as the presumption that it is long-term investors which buy municipal bond funds.

Additional information about the short-term trading hypothesis can be obtained by evaluating the *DOR* and *R* for fund groups that have been identified as having a significant amount of abnormal trading volume on the ex-date or cum-date. Under the short-term trading hypothesis, high dividend payout funds which exhibit significant abnormal volume around the ex-date and cum-date are subject to dividend capture trading. Because dividend capture trading is sensitive to transactions costs, it follows that the marginal dividend capture traders will be securities dealers that are subject to the lowest transactions costs. (This is consistent with the empirical evidence, that is, Koski and Scruggs 1998). Recognizing that securities dealers are subject to different tax rates than long-term investors because taxable dividend income and capital gain income are not differentiated for securities dealers, this implies an average *DOR* and *R* for funds subject to dividend capture that differ significantly from the *DOR* and *R* for funds that are not subject to dividend capture trading. More precisely, short-term traders would move in to establish a no-profit pricing environment that impacts the *DOR* and *R* for funds subject to dividend capture. Empirically, this is tested by comparing the *DOR* and *R* for the monthly and quarterly payout samples where it is expected that $DOR^Q < DOR^M$ and $R^Q > R^M$.

V. Empirical Results

Table 2 provides evidence in favor of the tax clientele hypothesis for

the two closed-end municipal bond fund groups. In particular, the mean *DOR's* of state municipal bond funds (1.109) and for the national municipal funds (1.117) are significantly greater than one. These results are confirmed by the negative ex-date returns for both fund groups, which are both significantly less than zero. Though the *DOR's* for both municipal bond fund groups are not significantly different from each other, both *DOR's* are significantly larger than the *DOR* for the taxable bond funds (.977). These results are comforting for the tax clientele hypothesis as a number of factors contribute to make the municipal funds prime candidates for securities where the hypothesis is expected to apply. Dividends are paid monthly, making the actual payments too small for dividend capture trading. In addition, the primary objective of the municipal funds is to capture income tax advantages and purchasers are likely to be the tax-motivated long-term investors which are the defining element used in developing the hypothesis. These empirical results beg the question: is the lack of a significant difference between the *DOR* for the two municipal fund groups consistent with the hypothesis that the marginal trader in these funds does not qualify for exemption from state taxes?

Though the difference between the state municipal and national municipal *DOR's* is insignificant, this is somewhat problematic for the tax clientele hypothesis as the absence of state taxes for state municipal funds implies a *DOR* that is greater than that for national municipal funds. While it is tempting to conclude that the results in Table 2 indicates that the marginal investor in state municipal funds is not impacted by state tax considerations, i.e., the marginal investor does not qualify for an exemption from state tax, an alternative explanation is provided by the sample which segregates December observations from those for other months (see Table 2). Recalling that December is the month when capital gains distributions are paid, and that the CRSP daily master file does not differentiate between these two types of distributions, the results for the sample which excludes December observations provides results which conform to those expected under the tax clientele hypothesis, i.e., the *DOR* for the state municipal funds is now larger and the *R* more negative than the *DOR* and *R* for the national municipal funds. Hence, instead of relying on an appeal to the type of marginal investor to explain an anomalous result, it appears more likely that the tax clientele hypothesis does apply, albeit with a qualification about the need to adjust for ex-date trading associated with capital gains distributions.

Less comforting for the tax clientele hypothesis is the evidence regarding the mean *DOR* of fully taxable bond funds (.977) which is found to be insignificantly different than one (see Table 2), seemingly contrary to the tax clientele hypothesis which predicts a value significantly less than one for this fund group, i.e., dividend income is taxed at a higher rate than capital gains, implying a *DOR* less than one. However, this result is not confirmed by the Ex-

Table 3

Price Drop Off Ratio (DOR) and Incremental Ex-Date Return by Subgroup of Taxable Closed-End Bond Fund, Jan. 1988-Dec. 2000*

Type of Taxable Fund:	*US Government*	*Mortgage Bonds*	*Investment Grade*	*High Yield*	*Hybrid*
Full Sample	N = 7	N = 19	N = 14	N = 34	N = 27
Average *DOR*	0.940	0.904	0.930	1.076	0.937
(t value for = 1)	(-0.65)	(-1.88)	(-1.60)	(1.24)	(-2.01)
Average Ex-Date Return	0.189%	0.053%	0.134%	-0.02%	0.12%
(t value for = 0)	(0.97)	(3.84)	(2.61)	(-0.47)	(2.99)
Number of Excluded Ex-Dates	0	14	23	2	12

Type of Taxable Fund:	*Monthly Dividends*	*Quarterly Dividends*
Full Sample	N = 21	N = 80
Average *DOR*	1.008	0.856
(t value for = 1)	(0.28)	(-3.50)
Average Ex-Date Return	0.008%	0.297%
(t value for = 0)	(0.48)	(4.21)

* See Notes to Tables 1 and 2. The short-term trading hypothesis requires $DOR^{Q} < DOR^{M}$ and $R^{Q} > R^{M}$.

associated test using incremental ex-date returns, where the *R* is both positive and significant, indicating support for the tax clientele hypothesis. Unlike the state municipal and national municipal funds, this quandary is not resolved by examining the Dec./Non.-Dec. results. If anything the interpretation problem is further compounded, as the sample excluding December observations has both *DOR* and ex-date returns exhibiting insignificant values, contrary to the tax clientele hypothesis. The significant/insignificant conflict between the *DOR* and ex-date return tests observed for the full sample is still being observed for the December-only sample.

Further exploration of the results for the fully taxable funds reveals considerable variation in the *DOR* and *R* across sub-groups with the *DOR*'s and *R*'s for all the sub-groups except high yield bonds being consistent in size, if not in statistical significance, with the tax clientele hypothesis (see Table 3). The *DOR*'s for the mortgage funds (0.904), U.S. government funds (0.940), investment grade funds (0.930) and hybrid bond funds (0.937) all are less than one, as predicted by the tax clientele hypothesis. Though only the hybrid bond funds had a t-value greater than two, the insignificance could be attributed to the small number of observations in the other groups. Results using ex-date returns for these fund sub-groups are statistically stronger and, again with the exception of the high yield group, all as predicted by the tax clientele hypothesis. The high yield bond funds had a *DOR* greater than one (1.076), though this value and the associated ex-date return value are both statistically insignificant. When the taxable bond funds are decomposed according to the frequency of dividend payment instead of by type of securities held, the funds which paid dividends monthly had a *DOR* which was insignificantly different from one (1.008) while the funds with quarterly dividend payments had a *DOR* of 0.856, significantly less than one. These results are supported by the results for *R*. Recognizing from Table 1 that the quarterly dividend payments are significantly larger on average than the monthly payments, it appears that there is a significant relationship between dividend payment size and the validity of the tax clientele hypothesis. This is possibly due to market microstructure effects such as the bid/offer spread, e.g., Bali (2001).

Evidence on the short-term trading hypothesis is evaluated by testing for abnormal trading volume on the ex-date and cum-date (see Tables 4 and 5). The presence of abnormal trading volume is tested by determining whether the percentage difference in the turnover statistic is greater than zero, where the percentage difference is calculated by taking the difference between the ex-date (cum-date) turnover and the average of turnover on the other than cum-and-ex-dates and dividing this value by the ex-date (cum-date) turnover. The results in Table 4 are as expected for the state municipal funds, though not for the national municipal funds. For both these fund groups, it was expected that the ex-date and cum-date percentage differences would be insignificantly different from

Table 4
Ex-Date Turnover and Percentage Change in Cum-Date and Ex-Date Turnover by Type of Closed-End Bond Fund, Jan. 1988-Dec. 2000*

Type of Fund:	*State Municipal*	*National Municipal*	*Fully Taxable*
Full Sample	N = 110	N = 96	N = 101
Ex-Date Turnover	1.461	1.527	1.802
Cum-Date Turnover	1.448	1.548	1.920
% Change in Ex-Date Turnover	-0.026%	0.013%	0.041%
(t value for = 0)	(-1.82)	(1.09)	(2.90)
% Change in Cum-Date Turnover	0.0003%	0.024%	0.090%
(t value for = 0)	(0.29)	(2.36)	(6.68)
Number of Excluded:			
Ex-Dates	803	86	51
Other than Ex- or Cum-Dates	9438	912	1351

Type of Taxable Fund:	*Monthly Dividend*	*Quarterly Dividend*
Full Sample	N = 80	N = 21
Ex-Date Turnover	1.950	1.239
Cum-Date Turnover	2.103	1.220
% Change in Ex-Date Turnover	0.011%	0.156%
(t value for = 0)	(1.23)	(2.94)
% Change in Cum-Date Turnover	0.085%	0.106%
(t value for = 0)	(7.06)	(2.31)
Number of Excluded:		
Ex-Dates	35	16
Other than Ex- or Cum-Dates	364	987

* Ex-date and cum-date turnover is the actual number of shares traded divided by the number of shares outstanding in thousands. N is the number of funds in the group. The % change in ex-date and cum-date turnover is the difference between the ex-date (cum-date) turnover and the average of turnover on the other than cum-and-ex-dates, divided by the ex-date (cum-date) turnover . Values for the % change in ex-date and cum-date turnover that are significantly greater than zero are consistent with the short-term trading hypothesis.

Table 5
Ex-Date Turnover and Percentage Change in Cum-Date and Ex-Date Turnover for December and Non-December Trades, Jan. 1988-Dec. 2000*

Type of Fund	*State Municipal*	*National Municipal*	*Fully Taxable*
December Only Sample	N = 812	N = 832	N = 1170
Ex-Date Turnover	2.105	2.383	2.214
Cum-Date Turnover	1.943	2.129	2.292
% Change in Ex-Date Turnover	0.278%	0.256%	0.121%
(t value for = 0)	(7.62)	(9.43)	(5.05)
% Change in Cum-Date Turnover	0.194%	0.139%	0.153%
(t value for = 0)	(5.36)	(6.99)	(7.42)
Sample Excluding December	N = 7860	N = 8302	N = 8530
Ex-Date Turnover	1.188	1.354	1.734
Cum-Date Turnover	1.243	1.413	1.884
% Change in Ex-Date Turnover	-0.032%	0.038%	0.055%
(t value for = 0)	(-2.87)	(4.90)	(6.77)
% Change in Cum-Date Turnover	0.062%	0.073%	0.129%
(t value for = 0)	(5.84)	(9.43)	(12.0)

* Percentage change in ex-date and cum-date turnover for December observations use the non-cum- date and non-ex-date trading days from December. Percentage change in ex-date and cum-date turnover for non-December observations use the non-cum-date and non-ex-date trading days from non-December months. See also notes to Table 4.

zero for both the cum-date and ex-date. This would be consistent with evidence from a number of studies, e.g., Karpoff and Walking (1988), where low dividend yield securities were found to attract no discernable short-term dividend capture trading. In addition, the low liquidity in some of the state funds would indicate wider effective bid/offer spreads, again acting as a deterrent to dividend capture trading. An anomalous result appears for trading in national municipal funds on the cum-date where the significant coefficient provides evidence of trading activity aimed at capturing the dividend. However, there is no correspondingly significant trade on the ex-date undermining the presumption that the cum-date trading is being done to achieve short-term dividend capture.

In contrast to the results for municipal funds, the evidence in Table 4 for the taxable funds provides substantive evidence of short-term dividend capture trading. This evidence can be buttressed by the observation that the method of testing the short-term trading hypothesis is conservative. Presumably, short-term traders would be executing the long dividend capture trade and be seeking to buy on the cum-date and sell on the ex-date. Yet, there is evidence that purchases and sales are not always conducted on these two dates, e.g., Lakonishok and Vermaelen (1986), Michaely and Vila (1995) and Koski and Scruggs (1998). Hence, a test which examines only the cum-date and ex-date will be conservative. With this in mind, results for the monthly/quarterly payout sample confirm the significance of the short-term trading hypothesis for the sub-sample of taxable funds where dividend capture trading is most likely to be found, i.e., funds with quarterly dividend payments. However, the monthly payout sub-sample produces the same result that was observed for the national municipal funds: significantly abnormal trading volume is found on the cum-date but not the ex-date. This result is consistent with timing of fund purchases to receive the dividend where the purchase is motivated by a long-term investment decision and not for dividend capture trading.

Table 5 provides the final set of empirical results on tests of the short-term trading hypothesis for the Dec./Non.-Dec sample. These results are interesting, if only to illustrate Lindley's paradox: conventional hypothesis tests, such as the t-test, have /N in the numerator of the test (where N is the number of observations in the sample). Hence, as the sample size grows, it becomes more likely that a given deviation from the null hypothesis will get rejected. In the limit, even very small deviations from the null will be rejected. The often recommended resolution of this problem is to adjust the critical values of the test to account for sample size. In other words, testing at the " = 5% level with a sample of 20 is a substantively different test than testing at the same " level with 2000 observations. Table 5 provides an illustration of this statistical conundrum. Every coefficient in the table is highly significant at the conventional " = 5% level. Given this, examination of the ex-date and cum-date turnover values for the two sub-samples does reveal a substantially higher level

of trading in December relative to other months. The upshot is that short-term trading activity for closed-end bond funds is likely to extend to capture of short-term capital gains payouts.

VI. Conclusion

This paper examines the pricing of U.S. closed-end bond funds around the ex-dividend date to test two hypotheses that have been proposed to explain ex-date pricing of common stocks. These hypotheses are the tax clientele hypothesis and the short-term trading hypothesis. The empirical results for the municipal bond funds provide some evidence for the tax clientele hypothesis. Tests for abnormal volume of transactions on the ex-date and cum-date also provided evidence of short-term dividend capture trading for a small number of high dividend payout fully taxable bond funds. (These funds typically paid quarterly dividends as opposed to the monthly dividend payments for other funds.) No evidence was found for short-term trading of closed-end funds with monthly payouts, which compose the bulk of closed-end bond funds, including all of the municipal bond funds. As such, it is concluded that both the tax clientele and short-term trading hypotheses have a part in explaining the ex-date pricing behavior for the full sample of closed-end bond funds.

Endnotes

** The corresponding author. * This author gratefully acknowledges the financial support from the Faculty of Business Administration, Simon Fraser University.

[1] Another important type of hypothesis which is not directly examined here is the market microstructure hypothesis which argues that both the tax clientele and short-term trading hypotheses ignore biases in determining ex-date returns such as discreteness in price quotes and selling pressure on the prior cum-date and buying pressure on the ex-date. Though not directly examined, microstructure biases could be critical the sample being examined. As reported in Section II, the average dividend size is just over 7 cents while, during most of the sample, the minimum tick size was 1/8th, implying that the minimum tick size is comparable to the size of the dividend. Bali and Hite (1998) and Bali (2001) are recent studies that examine the microstructure implications, arguing that discreteness in price quotes favors the short-term trading hypothesis. Goldstein and Kavajecz (2000) examines the implications for changes in price quote discreteness on market liquidity.

[2]The actual trading mechanics required for corporations to access this tax treatment are discussed in Koski and Scruggs (1998, p.63). In addition, under the Tax Reform Act, the marginal tax rates on dividend income and capital gains for ordinary investors became the same, eliminating the preferential tax treatment of long term capital gains.

[3] One of the first studies to use this approach was Lakonishok and Vermaelen (1986).

Using a sample including the daily trading volume of 2300 NYSE and AMEX companies from 1970 until 1981, Lakonishok and Vermaelen test whether short-term traders have a major impact on ex-date pricing by testing for a net increase in trading volume around the ex-date.

[4] The Investment Company Institute reports that, at year-end 1990, the four general classes of closed-end funds had market values (in billions) of $9.6 for domestic equity funds, $28 for domestic bond funds, $5.5 for international and global equity funds and $9.3 for international and global bond funds. By year-end 2000, these values were domestic equity $23.6, domestic bond $89.3, global equity $12.9 and global bond $8.7, respectively. Closed-end funds are traded in much the same fashion as common stocks, with most issues being traded on the NYSE or AMEX. Unlike open-end funds, closed-end funds do not continuously offer their shares for sale. A fixed number of shares are sold at one time (in the initial public offering), after which the shares trade on a secondary market, such as the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX). The price of closed-end bond fund shares that trade on a secondary market after their initial public offering is determined by the market and may be greater or less than the shares' net asset value. Akhigbe and Madura (2001) examine the performance of seasoned offerings of closed-end funds. For tax purposes, the closed-end fund issues Form 1099-DIV to shareholders.

[5] Though intuition suggests that most of these funds would be targeted at investors in higher tax states, this is not clear in the data.. In particular, of the 110 single state municipal funds in the sample, more than half were from three higher tax states: 29 for California, 20 for New York and 8 for New Jersey. There were also one or two single state municipal bond funds for higher tax states such as Colorado, North Carolina, Missouri, Arizona, and Georgia. Yet, the state which ranked third in the most funds on offer (12) was Florida, a state with no state income tax. There was also a fund for Texas, another locale with no state income tax. This suggests that a range of factors, not just state tax levels, determine the availability of single state municipal bond funds.

[6] Information about state taxes can be obtained from the Federation of Tax Administrators (FTA) at website *www.taxadmin.org*. The FTA was organized in 1937 with the mission to improve the quality of state tax administration by providing appropriate services, such as research, training and coordination activities, to state tax authorities and administrators.

[7] Observe that this change will impact the weighting for an individual observation. In summing across fund averages, each observation will be weighted by (1/# of funds in the group)(1/# of observations in the individual fund time average). This value will not be equal to (1/# of ex-dates), except when the number of observations in the time averages are the same for every fund.

[8] Similarity of the yields across funds makes it impractical to test the predicted correlation between dividend yield and *DOR*, a common test used in empirical studies of the tax clientele hypothesis.

[9] More precisely, the percentage change in ex-date (cum-date) turnover is the difference of the ex-date (cum-date) turnover from turnover on all other trading days divided by the turnover on all other trading days.

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