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Three Essays On Investments: An Examination Of The Effects Of Diversification And Taxes

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THREE ESSAYS ON INVESTMENTS: AN EXAMINATION OF THE EFFECTS OF DIVERSIFICATION AND TAXES

by

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ABSTRACT

Chapter 1 examines the effect of property-type diversification in equity real estate investment trusts (REITs) from 1995 to 2006. A strong positive relationship is documented between property-type diversification and return on assets, return on equity, and Tobin's Q. The diversification benefit comes from both the ability to select better performing property types in "hot" markets and the limited exposure to poorly performing property types in "cold" markets. Diversified REITs produce higher cash flows relative to equity as a result of a broader opportunity set; moreover, return on assets increases with the degree of diversification, which suggests significant shielding to property-type specific risk. Additionally, results indicate that diversified REITs operate and trade above their contemporaneous predicted values, which are calculated using imputed multipliers from specialized REITs. The evidence shows that the market is operating efficiently and has incorporated this information; diversified REITs Q ratios are significantly greater than specialized REITs.

Chapter 2 uses a large sample of municipal bond closed-end funds to examine how tax liability affects seasonal trading. Optimal tax trading dictates that net tax liability be calculated after all trades. Investors' net tax liability is held in a holding account of his or her choosing. This study investigates what happens when there is tax liability in excess of Safe Harbor, and tax holding accounts are liquidated to cover the payments. We find that there exists a pattern of negative returns and increased volume in the month of March that is unexplained by changes in yield.

Chapter 3 examines the ex-dividend day effect for municipal bond closed-end. The proposed explanations for this phenomenon are tax effects, short-term trading and/or market microstructure effects. In this study I use a unique set of dividend distributions to provide additional evidence that ex-dividend behavior is related to taxation as well as short-term trading. The sample I use is comprised of dividends in nontaxable closed-end funds, which ordinarily are not subject to Federal Income Tax. However, there is an occasional distribution that is subject to capital gains or ordinary income tax. This provides a unique environment in which to study the ex-dividend price behavior of a fund while eliminating the need for comparisons across funds.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: PROPERTY-TYPE DIVERSIFICATION AND REIT PERFORMANCE: AN ANALYSIS OF OPERATING PERFORMANCE AND ABNORMAL RETURNS

Introduction

Theoretical arguments have been put forth that suggest both value-adding and value-destroying effects of diversification. Diversification may increase operating efficiency, increase internal capital markets, provide for higher amounts of leverage, and decrease overall taxes. On the contrary, the costs of diversification may include increased agency costs and cross segment subsidization. The arguments originally put forth in the finance literature for (or against) diversification by operating segment, also pertain to property-type diversification by REITs. That is, property-type diversification may limit REIT exposure to the cash flow fluctuations in a given property class, but it also comes with significantly higher management costs. As is more fully detailed in the Literature Review, the consensus from the finance literature is that investors do not (and should not) want firms to diversify for them. Despite the similarities in possible costs and benefits associated with diversification among REITs, that same recommendation does not seem warranted for REITs.

The predominant early REIT strategy was to grow as big and as broad as possible. Consistent with modern portfolio theory, diversification by property type was intended to shield the investor from the violent, cyclical swings in the real estate industry by limiting exposure to the variation in any given property type. There is substantial downside protection offered by property-type diversification of equity REITs due to less than perfect correlation between property-type returns. However, the property-type diversified REIT may not be able to be fully invested in the most profitable sector at a given time, since invested capital is tied up in illiquid assets.

After the initial REIT expansion, the consensus belief among researchers and practitioners was that specialization by property type would lead to a comparative advantage due to efficiencies in management and streamlining of operational costs. This belief guided most of the growth in equity REITs after the early expansion period ended. It is not feasible that one advisor or manager could become an expert on every possible property type. Therefore, REITs that decide to diversify across property types must hire additional managers and/or accept less-than-perfect knowledge. Thus, specialized REITs are more susceptible to swings in the market but have fewer expenses than diversified REITs. This study seeks to address whether any benefits from property-type diversification outweigh the inherent costs of diversifying across property types and to determine whether there is a profitable investment strategy with regards to property-type diversification.

The effect of property-type diversification on the performance of equity REITs is investigated by focusing on three common performance ratios: Tobin's Q (1969),[1] return on average assets,[2] and return on average equity.[3] Controls are included for factors found to affect REIT performance in earlier studies. The existence of a premium or discount for property-type diversified REITs relative to their hypothetical industry-predicted values is also investigated. Furthermore, the return to investing in an equal- or value-weighted portfolio of property-type diversified REITs compared to the return to investing in a similarly constructed portfolio of property-type specialized REITs is investigated. The current study also adds to the literature by using contemporaneous industry-predicted values from property-type specialized REITs to show that property-type diversified REITs trade at a premium to these imputed values; to the authors' knowledge, this is the first application of this methodology in the real estate literature.

In addition, the study attempts to identify the source of any diversification benefit enjoyed by property-type diversified equity REITs. One possible source of a diversification benefit could be the insulation against property-type risk provided by the dilution of the asset base. Another possible source of diversification benefits could be the ability of the diversified REIT to purchase the best-performing property at a given time from a much larger opportunity set consisting of many property types; this second possible source of diversification benefit is referred to as "cherry-picking" throughout the remainder of the text. The evidence indicates that the move

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1 Computed as the ratio of market value of equity plus market value of debt divided by total assets.

2 A measure of a company's profitability, equal to a fiscal year's earnings divided by its total assets, expressed as a percentage.

3 A measure of how well a company used reinvested earnings to generate additional earnings, equal to a fiscal year's after-tax income (after preferred stock dividends but before common stock dividends) divided by book value, expressed as a percentage.

from completely specialized to some level of property-type diversification provides a tangible benefit from the broader investment opportunity set and the decreased property-type cash flow variations.

To preview some of the study's other results, the performance of property-type diversified REITs, as measured by ROA and ROE, consistently exceeds the performance of property-type specialized REITs on a raw and risk-adjusted basis. Additionally, there is a positive abnormal return on assets and return on equity above the ROA and ROE predicted using contemporaneous returns imputed from the performance of specialized REITs. The market seems to recognize this performance difference, as evidenced by significantly larger Tobin's Q ratios for property-type diversified REITs than for their specialized counterparts. In fact, the market values property-type diversified REITs approximately 7 to 11 percent higher than specialized REITs; both the cherry-picking effect and property-type risk insulation contribute to this premium. Given that the performance difference between property-type diversified and specialized REITs has already been priced by the market, which is as expected in an efficient market, there is not a profitable strategy to buying diversified REITs and selling specialized REITs.

The remainder of the paper proceeds as follows: Section II provides a brief review of the relevant prior literature, Section III describes the data and methodology, Section IV details the results obtained, Section V offers some alternative return models, and Section VI contains conclusions and directions for future research.

Literature Review

In post-World War II America, there was a flurry of merger and acquisition activity that gave rise to a large number of diversified conglomerates. Following this trend, a number of researchers investigated the performance of these conglomerates (Weston (1970); Gort and Hogarty (1970); Hogarty (1970); Weston, Smith, and Shrieves (1972)). REITs also exhibited a similar merger trend in the early 1990's, which was followed by a similar move towards specialization. Given the historical importance of diversification studies in financial economics, the question of whether property-type diversification provides measurable benefits for REITs has not been as intensively studied as one might expect. In fact, there has yet to be conclusive evidence on possible benefits to diversification by property type.

This study adds to the mainstream corporate finance literature on the existence of a diversification discount or premium and to the REIT literature on how a REIT benefits from diversification. Existing corporate finance literature has found mixed results as to the effect diversification plays when valuing a firm relative to its single segment matched counterparts. Weston (1970) argues that diversified firms create a larger and more efficient internal capital market and that a firm's allocation of scarce resources is better handled internally rather than externally. Lewellen (1971) explains that diversified conglomerates benefit from a form of coinsurance whereby imperfectly correlated earnings streams can allow a conglomerate to be more levered than a stand-alone business. A third theoretical argument for the benefit of diversification is put forth by Majd and Myers (1987), who conjecture that a multi-segment conglomerate with a loss in at least one segment will be more tax efficient than stand-alone entities. One counterpoint to the theoretical benefits of diversification is the argument by Jensen (1986) that internal capital markets allow managers to undertake value-decreasing projects.

In some of the seminal papers in the area, Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), and Comment and Jarrell (1995) all find evidence supporting the existence of a diversification discount. Lang and Stulz (1994) and Servaes (1996) show that the largest drop-off in Tobin's Q occurred between single-segment and two-segment firms. Berger and Ofek (1995) show the diversification discount increases with the number of segments in which the firm operates.

The aforementioned studies define diversification by the number of business segments the firms report to Compustat. Villalonga (2005), among others, argues that the business segment database of Compustat can introduce considerable noise and bias into the results of such tests, stemming from the way in which operations from various business segments interact and are aggregated. Furthermore, the coding of multiple segment conglomerates does not account for the co-variation between segments and possible miscoding of segments. Additionally, several authors have argued that firms choosing to operate in multiple business segments differ systematically from firms that choose to remain focused in one business segment. Specifically, Villalonga (2004) and Hyland and Diltz (2002) find that diversified firms traded at a discount prior to acquiring additional business segments.

Several authors have made counterarguments against the existence of a diversification discount. Graham, Lemmon, and Wolf (2002) find that the market reaction to a segment-increasing merger is positive, but the acquisition is usually purchased at a discount. Additionally, they argue that the value of a single segment may not be comparable to the value of a multi-segment firm operating in the same industry. This type of benchmarking is a common tool employed in the earlier diversification discount studies. Campa and Kedia (2002) and Villalonga (2004) employ Heckman's (1979) causal inference techniques of instrumental variables and two-stage regressions to control for the sample selection bias present in the Compustat database. They find that the diversification discount disappears when compared against matched firms with similar diversification propensity scores.

In real estate, numerous studies have included a property-type diversification control variable in examining scale economies in REITs (Bers and Springer (1997, 1998a, 1998b); Yang (2001); Anderson, Fok, Springer, and Webb (2002)) and in examining discounts and premia to net asset value (Capozza and Lee (1995)). The sensitivity of returns to macroeconomic variables (Allen, Madura, and Springer (2000)) and impacts on systematic risk (Gyourko and Nelling (1996)), among several other types of studies, have also included property-type diversification as a control. The aforementioned studies have samples that necessitate updating given the explosive growth in the REIT industry. From 1985 to 2005 the number of equity REITs grew from 37 to 152, and equity REIT market cap ballooned from $3.2 billion to over $300 billion. Furthermore, these older studies did not focus on diversification as a primary explanatory variable, and there is substantial anecdotal evidence suggesting that surviving diversified REIT are becoming systematically more diversified, which was emphatically not the case at the time of the earlier studies addressing this issue.

Previous studies in real estate have used controls for diversification or focused on the difference in returns between specialized and diversified REITs. Capozza and Seguin (1998) examine the impacts that geographic and property-type diversification have on REIT value using Herfindahl indices to capture the varying degrees of diversification in the asset base. Their main findings are that diversification increases borrowing costs, has a positive impact on property-level cash flows, and has an offsetting negative impact on general and administrative expenses. Capozza and Seguin state that a more diversified asset base is less transparent and more difficult to value and monitor, which likely contributes to the increased borrowing costs. They surmise that diversification ultimately reduces REIT value.

Cannon and Vogt (1995), Howe and Shilling (1990), and Capozza and Seguin (2000) all find that self-managed REITs outperform externally-managed REITs on a risk-adjusted basis. Benefield, Anderson, and Zumpano (2009), using Jensen's Alpha, Treynor Index, and Sharpe Ratios, find that diversified REITs outperform specialized REITs during the period of 1995-2000. As noted by Ro and Ziobrowski (2009), Benefield et. al. hold the specialized REITs' composition constant over the sample and fail to account for leverage. Ro and Ziobrowski (2009), after accounting for leverage and an adjusted sample population, still surmise that diversified REITs outperform specialized REITs, but that the margin is not statistically significant. Finally, Xing and Anderson (2003) use the coefficient of determination from a market model regression as the appropriate measure of firm diversification and find that significantly diversified REITs trade at a premium to their more focused counterparts, rather than at a discount.

Data and Methodology

The focus of this study is whether property-type diversification has an impact on REIT performance. The nature of this question requires that the sample be limited to equity REITs; mortgage and hybrid REITs are ignored due to the vastly different composition of their asset bases and the drastically different possible meanings of "diversification." The three measures of REIT performance are Tobin's Q (Q), return on average assets (ROA), and return on average equity (ROE). Chung and Pruitt's (1994) approximation of Q is utilized, since equity REIT valuation is reasonably straightforward. Although the estimation of Q used by Chung and Pruitt more closely resembles market-to-book value, prior research has shown that results using this estimate and more complex measures of Q are virtually indistinguishable. The two accounting measures of performance are defined as net operating income divided by average total assets (ROA) and net operating income divided by average total equity (ROE), respectively. Portfolio buy-and-hold returns are calculated as the geometric average of monthly returns on an equal- and value-weighted basis.

Data

Equity REIT β's are calculated by hand using risk-free rates (proxied using the 10-year Treasury rates with quarterly frequency) obtained from the St. Louis Federal Reserve FRED website. The data on percentage of assets in a particular property-type are obtained from the National Council of Real Estate Investment Fiduciaries (NCREIF) for the years 1995 – 2006. The accounting and market data are obtained from the SNL Financial REIT DataSource for the years 1990 – 2006. The monthly return data is obtained from the Center for Research in Security Prices (CRSP). SNL Financial REIT DataSource also provides data on whether REITs are self-managed and/or self-advised, as previous research has indicated that managerial style can impact performance.[4] Self-Managed is a binary variable that takes the value one if the REIT is self-managed; Self-Advised is similarly defined. SNL also provides data regarding the size (natural log of total assets) and leverage ratios (total debt/total assets) for the sample REITs, which is used to control for possible differences in performance due to differences in size and capital structure. Finally, occupancy rates were collected from SNL for the sample REITs to proxy for property quality.[5]

The requirement for inclusion in the sample is data availability in the combined SNL and NCREIF databases; therefore, the sample period is constrained to 1995-2006. The total sample includes 69 REITs; however, depending on the year, there are between 57 and 68 included

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4 Extant literature has shown that internal management may have a positive effect on performance.

5 The occupancy rate has a correlation of 0.21 with DIVERSIFIED (binary variable to indicate 100% concentration to be explained in next section), and is slightly higher for property-type diversified REITs on average. This may represent quality of property or management.

REITs. The sample is split relatively equally between diversified and non-diversified REITs, with no year having more than 57% diversified or less than 40% diversified. The independent variables, the previously mentioned performance variable are listed in Table 1.1. The sample returns are screened and truncated for extreme outliers.

Table 1.1 describes the characteristics of, and differences between, property-type specialized and property-type diversified REITs, as determined by a 100% specialization in any property type. Panel A of Table 1.1 provides summary statistics for the various performance measures utilized and the predicted values used to calculate the excess performance measure.[6] Panel B describes the primary test and control variables used in the regressions. There is substantial variation in the dependent variables, but there is little compositional difference between property-type specialized and property-type diversified REITs.

Methodology

The risk-adjusted performance measure is derived in a very straightforward manner. The risk-adjusted return (RAR) for REIT *i* in year *t* measured by performance measure *j*, which is either Q, ROA, or ROE, is computed as:

$RAR_{i,t,j} = r_{i,t,j} - \beta r_{index,t}$

where $r_{i,t,j}$ = raw return on REIT *i* in year *t* measured by *j*

6 The methodology used to calculate the excess performance measure is described in the methods section.

$\beta_{i,t}$ = equity β for REIT *i* against all other REITs in year *t*

$r_{index,t}$ = return on the value-weighted REIT index in year *t*

The Excess Abnormal Return (EAR) measure is computed as the difference between REIT *i*'s actual return measured by *j* and its imputed return in year *t*. The imputed return (IR) of REIT *i* is the sum of the weights of each property type multiplied by the mean return of REITs specializing in that property-type in year *t*; median returns of property-type specialized REITs are used as an alternative to mean returns to minimize concerns about influential outliers.[7,8] This is essentially the Berger and Ofek (1995) method of computing excess value to test whether diversified firms perform at a premium or discount relative to specialized firms applied in a real estate context. Thus, the abnormal return for year *t* is computed as:

$EAR_{i,t,j} = r_{i,t,j} - IR_{i,t}$

where $r_{i,t,j}$ = raw return on REIT *i* in year *t* measured by *j*

$IR_{i,t} = \Sigma(M_{p,t} * w_{p,i,t})$

where $M_{p,t}$ = the property type mean (or median) return multiplier in year *t*

$w_{p,i,t}$ = the weight of property type *p* in REIT *i* in year *t*

7 In some years there were not sufficient specialized firms to calculate a pure multiplier. In such cases the mean value for all REITs with a concentration above 0.75 is used as the multiplier.
8 There is only one REIT (Prologis) that consistently specializes in industrial. However, due to the large number of properties that they hold their performance should be representative of the industry.

In this way, market expectations regarding returns for property-type diversified REITs can be estimated. Both equal-weighted and value-weighted measures of mean returns for property-type specialized REITs are used in computing the imputed returns.

To test the accuracy of this method, the actual performance measure is regressed on the predicted performance measure; results are reported in Table 1.2. As can be seen in Table 1.2, the model is reasonably well specified for property-type specialized firms, with intercepts not significantly different from zero and slope coefficients very close to one. The intercepts and coefficients for property-type diversified firms suggest that the model does not fully capture the returns of these firms.

Since the focus of this study is the impact of property-type diversification on REIT performance, the model specified must be able to detect the influence of property-type diversification. The prior literature has not reached a consensus on the best way to measure property-type diversification; in fact, past studies have used thresholds of 50% and 75% concentration in a single property type to determine whether a REIT is "Diversified" or "Specialized." Due to the nature of the empirical investigation in this study, three measures of diversification are utilized for robustness. This also allows inferences to be made regarding the proper way to control for property-type diversification in future studies. Moreover, allowing the degree of diversification among the property-type diversified subsample to change enables conclusions to be drawn regarding the area from which the diversification benefit arises.

The first of the three measures is a binary variable, Diversification Dummy (DIVERSIFIED), which equals zero if the REIT owns all one type of property and equals one otherwise. Second, indicator variables are included to capture the particular property type that a REIT owns. APTSHR equals one if 75% or more of a REIT's assets are apartments in a particular year and equals zero otherwise; INDSHR, OFFSHR, and RETSHR are similarly defined for industrial, office, and retail property, respectively. To complete this specification, DIVER equals one if a REIT does not have at least 75% of its assets invested in any one property-type and equals zero otherwise. This specification is more restrictive; on average only 16.2% of REITs qualify as diversified with this second categorization scheme, as opposed to 40.5% under the first categorization method. Third, following Bers and Springer (1998a, 1998b) and others, we use the Herfindahl (1950) Index, also called the Hirschman (1945) Index, as another measure of property-type diversification. The Herfindahl Index is defined as:

$$\text{Degree-of-Diversification} = \Sigma\, S_p^2$$

where S_p is the proportion of a REIT's assets invested in property-type p.

Hence, if a REIT is invested in only one property-type, the value of Degree-of-Diversification (Herfindahl) is 1. As a REIT becomes more and more diversified by property-type, the value of Herfindahl decreases to a minimum of 0.25 if a REIT is equally invested in the four property categories. For the sample REITs, Herfindahl Index values actually range from 0.35 to 1.0.

Hypothesis Testing

For robustness, two models of the effect of property-type diversification on performance are estimated using ordinary least squares (substantially similar results using White's heteroskedasticity correction). The first model uses the three raw returns and the three risk-adjusted returns computed using Q, ROA, and ROE, as described above, in separate specifications. Formally, we analyze the regressions:

$$r_{i,t,j} = \alpha + \beta_1 \text{Diversification} + \beta_2 \text{TA} + \beta_3 \text{Leverage} + \beta_4 \text{Managed} + \beta_5 \text{Occupancy} + \varepsilon \quad (1.1)$$

$$RAR_{i,t,j} = \alpha + \beta_1 \text{Diversification} + \beta_2 \text{TA} + \beta_3 \text{Leverage} + \beta_4 \text{Managed} + \beta_5 \text{Occupancy} + \varepsilon \quad (1.2)$$

The Diversification placeholder in equations (1) and (2) is one of the three diversification variables described above: DIVERSIFICATION, DIVER, or Herfindahl.

The functional form for the second model is essentially the same as equations (1) and (2), with the substitution of excess abnormal return ($EAR_{i,t,j}$) for the dependent variables. Excess performance is tested on both a raw and risk-adjusted basis. Also, the second model uses the same control variables for size, leverage, management style, and occupancy rates as the first model in equations (1) and (2); these variables have previously been found to be important controls in modeling REIT returns.

It should be noted that a number of other possible models were considered. For example, self-managed and self-advised are almost perfectly correlated. Unreported results using self-advised show marginal changes in the magnitudes of the coefficients on the diversification variables, but the signs and significance levels remain unchanged. Ultimately, the reported results utilize self-managed because it has a more direct impact on property level cash flows. Additionally, models without the occupancy control were also considered, since a non-trivial number of observations are lost when this independent variable is introduced. However, the models with the occupancy control seem to fit the data better, as indicated by a higher R-squared.

Results

Consistent with prevailing about efficiency and specialization, REITs in the mid-1990's were becoming more specialized, as indicated by the increasing Herfindahl indices. Table 1.3 presents the average Herfindahl Indices for diversified REITs by year. Just beyond the halfway point of the sample period, Table 1.3 shows that property-type diversified REITs change course toward increasing diversification, which is evidenced by the decreasing Herfindahl Indices after that point. Although there is a drop in the number of diversified REITs from 36 in 1997 to as low as 23 in 2005, the concentration index indicates that the surviving REITs are more diversified.

The findings in Table 1.3 can be interpreted in a variety of ways. First, the findings may suggest that the industry is operating efficiently and only the successfully diversified REITs are surviving. That is, more REITs are choosing to become specialized and leaving only the most diversified of the property-type diversified REITs. However, Table 1.3 may also indicate that the number of diversified REITs in the industry is balanced given the opportunities available. The reason for the shift toward increased property-type diversification within diversified REITs can be found by analyzing the performance of diversified REITs. Additionally, the table also shows that, on average, greater than 99% of property-type diversified REIT value is in the Apartment, Industrial, Office, and Retail property-types. Thus, inclusion of other property categories seems unnecessary for the empirical investigation undertaken in this study.

Table 1.4 presents cross-sectional regressions of REIT returns using the models specified in equations (1) and (2) to determine whether, on average, property-type diversified REITs over- or under-perform relative to property-type specialized REITs. Panel A of Table 1.4 displays results from the regression of raw returns for each performance measure on each diversification variable. The model coefficients on DIVERSIFIED and DIVER are positive and significant in explaining performance and market valuation, while the model coefficients on Herfindahl are negative and significant; all coefficients are signed correctly to indicate a positive impact on each performance measure. For example, consider the coefficient for the Herfindahl Index (i.e. degree-of-diversification) in column eight, which shows that Tobin's Q is negatively related to Herfindahl. This result implies that a REIT equally divided between two property types will, on average, have a market value that is 9.5% higher than a specialized REIT with comparable asset values. In fact, the findings for Q suggest that property-type diversified REITs have a market value relative to assets that is an average of 7% greater than property-type specialized REITs. In other words, it appears that the market places a larger discount on complete specialization than on high concentration in a single property type. This is a relatively important finding for future

REIT studies that deem it necessary to control for property-type, or perhaps even geographic, diversification.

Turning to the full results from Panel A of Table 1.4, the coefficients for each diversification variable are reported separately; the findings are discussed in terms of simple averages across the DIVERSIFED and DIVER specifications. The results indicate that, on average, property-type diversified REITs have a Tobin's Q that is 0.08 greater than that of property-type specialized REITs, which means that a 1% change in property-type diversification corresponds to a 0.0018% increase in Q. Results for the second performance measure suggest that diversified REITs have an ROA that is on average 1.5% greater than specialized REITs per year, with a 1% change in diversification corresponding to a 0.04% change in ROA. Finally, the coefficients on ROE suggest that diversified REITs outperform specialized REITs by an average of 8.2% per year, with a 1% change in diversification corresponding to a 0.2% change in ROE.

It is also worth mentioning that the signs for portfolio occupancy are often different in the models of Q and ROA, as they are in Panel A of Table 1.4. While the sign on Occupancy in the Q model is not significant at standard levels, the difference in sign may be troubling to some readers at first glance. It is reasonable to assume that higher occupancy portfolios would be associated with higher net operating income, explaining the positive coefficient for ROA. Recall that the Q computation also utilizes market valuation, not solely accounting information. Thus, a negative coefficient on Tobin's Q for portfolio occupancy may signal the market's belief that the REIT has gained their high occupancy rate by agreeing to below-market rental rates in the future.

In Panel B of Table 1.4, an industry-specific β is used to adjust the REIT returns for risk. The β is computed for each REIT as the covariation in returns of REIT i with industry returns using a three-year window. Results using the risk-adjusted returns in Panel B are consistent with the results using the raw returns presented in Panel A of Table 1.4. In Panel B, the coefficients on the diversification variables in explaining ROA and ROE are significant and enter with the correct signs. Diversified REITs outperform specialized REITs by an average of 0.38%, and an increase in diversification of 1% leads to 3.4 % better performance in ROA on a risk-adjusted basis. The coefficients for ROE suggest that diversified REITs outperform specialized REITs by 6.9%, and an increase in diversification of 1% leads to 18% better performance in ROE on a risk-adjusted basis. As pointed out by Lang and Stulz (1994), Tobin's Q is the present value of all expected future cash flows in relation to the replacement cost of tangible assets; therefore, no risk adjustment is necessary for comparing Q across firms.

The results from both Panel A for raw returns and Panel B for risk-adjusted returns indicate that property-type diversified REITs trade at a premium relative to their property-type specialized counterparts. This result is consistent with Xing and Anderson (2003), who find that diversified firms trade at a premium relative to specialized firms. Furthermore, diversified REITs consistently have higher returns on assets and equity. The higher ROA may suggest that diversified REITs hold better properties with more growth opportunities, which would provide some level of protection from property-type risk. The ROE results would suggest that property-type diversified REITs are able to earn higher returns using their retained earnings than are property-type specialized REITs. The substantially larger opportunity set for diversified REITs explains this disparity; that is, the manager of a diversified REIT can selectively reinvest retained earnings in the highest returning property or property type, while their specialized counterparts can only reinvest in a limited subset of these properties. This evidence supports the cherry-picking hypothesis.[9]

Table 1.5 presents an alternative way to look at property-type diversification benefits using raw returns to estimate excess abnormal returns to diversification versus the industry-predicted value methodology described earlier. Panel A presents excess abnormal returns computed using mean returns from property-specialized REITs; Panel B presents excess abnormal returns computed using median returns. The median property-specific returns are utilized to avoid concerns about return outliers driving the results obtained. The three diversification variables are significant and appropriately signed across all three performance measure specifications using both mean property-specific returns and median property-specific returns. The results indicate that property-type diversified REITs have market values that are about 10% larger than their predicted values. When looking at either the mean or median predicted models the coefficients for Q, ROA and ROE are positive and significant for each of the three specifications of diversification. The results from Table 1.5 show that diversified firms have ROA that is approximately 1.5% (the average of the coefficients for the Diversified and DIVER models) greater than their predicted values, and have ROE that is 5-10% greater than their predicted values. This is economically significant given the average ROA and ROE for all firms in the sample are 3.9% and 9.9% respectively.

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9 Results for Table 1.4 are reproduced using White's Correction for heterskedasticity and are report in the Table 1.4.

Table 1.6 presents results very similar to those obtained in Table 1.5; however, in Table 1.6, risk-adjusted returns are used to compute excess abnormal returns versus the imputed values. The mean risk adjusted ROA and ROE for specialized firms in the sample was 0.0% and -0.5% respectively. The mean risk adjust ROA and ROE for diversified firms was 0.85% and 2.1% respectively. As mentioned earlier, Q does not require this risk adjustment; therefore, only results for ROA and ROE are provided. Using either the property-specific mean returns in Panel A or the property-specific median returns in Panel B, the impact of increased property-type diversification on ROA and ROE is positive and significant in all estimations. The results, reported in Table 1.6, show that diversified REITs outperform predicted ROA by 1.64% and ROE by 2.12%, on average. The coefficients estimates in Table 1.6 confirm the non-parametric comparison between specialized and diversified REITs.

Table 1.7 reports results from the final series of regressions, in which the impact of marginal increases in property-type diversification on performance and valuation are examined. The results in Table 1.7 are obtained using only the subsample of property-type diversified REITs and show the effect of the Herfindahl Index and control variables on the three performance measures. Examining differences in importance of the degree-of-diversification among the diversified REIT subsample allows for examination of the source of REIT diversification benefits. The results show that Tobin's Q and ROE do not increase with diversification, but that increased diversification leads to better ROA performance. This implies that the broader the scope that a REIT operates in the better the ROA. This is consistent with the risk-insulating hypothesis.

The insignificant results for ROE suggest that the initial move from property-type specialized to property-type diversified drives the significantly higher returns on equity observed in Tables 1.4 through 6, rather than the degree of diversification. To wit, the Herfindahl measure is highly significant in the ROE estimations reported in the earlier tables using the full sample, while it is insignificant in the Table 1.7 ROE estimations using only the property-type diversified REIT subsample. This finding suggests that the benefit of property-type diversification to ROE is due more to the cherry-picking hypothesis, rather than the risk-insulating hypothesis. That is, managers can more freely choose the property type in which to reinvest retained earnings and the returns therefore benefit from the increased opportunity set.

As a further check on the implications of the findings reported in Table 1.7, in unreported tests the model was estimated separately for each year and the results are compared to the historical returns of the National Association of Real Estate Investment Trusts (NAREIT) Equity Index. The diversification explanatory variable is significant from 1998 to 2002; during which the average annual return for the NAREIT Equity Index was 4.40 percent. The average annual return, for the years in which diversification is insignificant is 28.58 percent. Moreover, the coefficient for diversification is not significantly negative in any year. Combining the results from Tables 1.4 and Table 1.7, along with the comparison to the historical returns of the NAREIT Equity Index, it would seem that the benefit to ROA from property-type diversification is due to hedging against variations in cash flows in down markets when a specific property sector is hit unusually hard.

Table 1.8 provides a numerical comparison between the simple buy-and-hold returns for holding a portfolio of property-type diversified REITs versus a portfolio of property-type specialized REITs; Figure 1.1 provides a graphical display of the same information. Each monthly return is measured as the equal-weighted or value-weighted return of holding a portfolio of all sample specialized REITs or all sample diversified REITs. The control for diversification or specialization is adjusted annually, and the portfolio is updated and rebalanced accordingly. The buy-and-hold return is calculated as the terminal return over the twelve-year sample period. Additionally, four three-year sub periods are considered. As can be seen in Table 1.8, the difference in returns from this simple buy-and-hold strategy over the entire sample period is statistically insignificant, as are the differences in returns for each of the four sub-periods.

Excess returns are calculated using the Fama-French (1992, 1993) three-factor model with the momentum factor suggested by Carhart (1997). The calendar-time portfolio method eliminates cross-sectional dependence between sample firms and reduces variance in returns. Additionally, the calendar-time portfolio method yields more robust test statistics as noted by Lyon, Barber, and Tsai (1999). The four-factor model is

$$R_{p,t} - R_{ft} = \alpha_p + \beta_p \left(R_{mt} - R_{ft} \right) + s_p SMB_t + h_p HML_t + u_p UMD_t + \varepsilon_p \qquad (1.3)$$

where the regression parameters are α_p, β_p, s_p, h_p, and u_p. The four factors are zero-investment portfolios corresponding to the excess return of the market ($R_{mt} - R_{ft}$), the difference between portfolios for small- and large-cap stocks (SMB), the difference between a portfolio of high book-to-market stocks and low book-to-market stocks (HML), and the difference between a portfolio of the highest performing stocks in the previous year less the worst performing stocks in the previous year (UMD), respectively. The estimate of the intercept term (α_p) is a test of the null hypothesis that the mean excess return for the calendar-time portfolio is not significantly different from zero. This is consistent with Ro and Ziobrowski (2009) and Lyon et. al. (1999). The equal- and value-weighted returns are analyzed separately for both property-type specialized and property-type diversified REITs.

Additionally, a similar Fama-French (1992, 1993) three-factor model, along with the Carhart (1997) momentum adjustment, is used to investigate the zero-cost portfolio of buying diversified REITs and selling specialized REITs. In order to be consistent with the earlier findings of this study, and out of concern for space limitations, Table 1.9 only reports findings from this second specification:

$$(R_{d,t} - R_{s,t}) = \alpha_p + \beta_p \;\; R_{mt} - R_{ft} \;\; + s_p SMB_t + h_p HML_t + u_p UMD_t + \varepsilon_p \tag{1.4}$$

where $R_{d,t}$ and $R_{s,t}$ are property-type diversified and property-type specialized portfolios in a given calendar month. Using the more restrictive definition of specialized REITs as those REITs that have 100% concentration in one property-type provides results that are consistent with Ro and Ziobrowski (2009). Specifically, diversified REITs slightly outperform specialized REITs, but this superior performance is not significant in either statistical or economic terms. The alpha estimated from this regression is not statistically different from zero. This finding, when combined with the earlier Tobin's Q results, suggest that the market for REIT stocks is operating efficiently. In other words, there is a financial benefit to property-type diversification, but this benefit is recognized and priced by the market; consequently, there is no discernible advantage to holding REITs that specialize or diversify by property type. It should be noted that the sample REIT data is limited, and real estate returns are notoriously cyclical in nature. Thus, it may be the case that not enough observations from a long enough period of time are available to determine if there actually is an advantageous strategy to buying diversified REITs and selling specialized REITs.

Robustness Checks

As a first robustness technique, concerns about non-normality of the residuals are addressed. With the exception of the findings for ROE, which are marginally insignificant in the re-estimated models, results withstand regression techniques with heteroskedasticity-corrected standard errors using White's correction. Additionally, all findings remain qualitatively unchanged when the data is trimmed for influential outliers that might skew returns. There is a negative correlation (-0.16) between the degree of diversification, the Herfindahl index, and REIT portfolio occupancy.[10] When the 34 observations, all specialized REITs, are dropped from the sample, the correlation coefficient drops to -0.03 and the significance of portfolio occupancy disappears in the regressions. Since this variable is only used as a control it has little impact on the intention of this study. Dropping these observations greatly reduces

10 A graphical representation is presented in Figure 1.2.

the possibility of multicolinearity in the sample. The greatest absolute value for any correlation coefficient between pairs of regressors is below 0.25.[11]

The extant literature has shown that the returns of most real estate series are not linearly independent through time. Using various criteria for determining optimal lag length, Myer and Webb (1994) show that results differ by property type and geographic region. In our tests, using Akaike's Information Criteria (AIC) a measure of relative information lost by not having a full model did not converge within 8 lags. This may indicate that a large number of lags should be used in our model but given that our principal interest in this study is the effect of diversification we chose not report these models. What we can say is that through 4 lags diversification in all three forms (DIVERSIFIED, DIVER, HERFINDAHL) maintained sign and significance at conventionally accepted levels.

The sample period covers almost a full real estate cycle, although the down period in the cycle was relatively mild. Therefore, as a second robustness test, models are estimated that include time effects; the results are robust to the inclusion of these time controls. In addition to controlling for trends related to the general real estate cycle, the inclusion of time controls also negates the "hot property type" effect, in which one or more property types perform substantially better for some period of time. In fact, after the introduction of the time controls, the coefficients and t-statistics for each of the three diversification variables actually increase.

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11 A correlation matrix is presented in Table 1.11

The third robustness check involves estimating the same models using fixed effects in an effort to control for any unseen REIT-specific effects, such as founding date or date of conversion to umbrella partnership status that may affect the profitability ratios. A complication with using fixed effects for this panel of data arises because the variable of interest, diversification, can be time-invariant for 100% specialized REITs. The main complication introduced when using a time-invariant binary indicator variable is that this variable may itself proxy for unseen firm-specific characteristics. Nonetheless, there is evidence supporting the finding that diversification has a positive impact on ROA and ROE in both the simple cross-sectional regressions and the regressions using the premium of property-type diversified REITs above industry-predicted values. Using the fixed effects model, results are robust when diversification is proxied using either the 75% threshold or the Herfindahl index. Results from the fixed effects model remain consistent when time controls are included and when individual effects are controlled for, to address the concerns above regarding time-invariant binary variables in fixed effects modeling. These robustness results suggest that REITs cross over the 75% threshold, or adjust concentration levels through time, but do not frequently move from 100% specialized to diversified or vice versa.

Finally, we attempt to use Heckman's selection technique to determine the maximum likelihood estimates that a REIT will choose to be diversified, which are termed diversification propensity scores. Exhaustive testing of variables likely to affect the decision to diversify shows surprisingly little relationship between the diversity variables (DIVERSIFIED, DIVER, and Herfindahl) and likely explanatory variables. The independence of the diversity variables is supported by a lack of significance when looking at two-stage least squares instrumental variable regressions. Given the lack of significant predictors of the diversification decision, results from the 2SLS models and from models utilizing the Heckman correction for selection bias are not provided, as they are virtually identical to the reported results.[12]

Conclusion

Motivated by the abundance of prior research on diversification, this study investigates the relationship between property-type diversification and performance. A strong positive relationship between property-type diversification and return on assets, return on equity, and Tobin's Q is documented. Evidence suggests that the positive impact of diversification on return on assets is due to significant shielding against property-type specific risk. Evidence further suggests that the benefit to return on equity from diversification is due to the availability of a larger investment opportunity set that allows managers of diversified REITs to choose the most highly performing properties. Additionally, results indicate that diversified REITs operate and trade at a premium to their contemporaneous predicted values, which are calculated using imputed multipliers from specialized REITs. Finally, using buy-and-hold portfolios of diversified and specialized REITs and zero-cost portfolios that are long diversified and short specialized REITs, evidence is provided that the market is operating efficiently and has

12 A final robustness test related to potential survivorship bias would be useful; however, data limitations regarding actual portfolio allocations to specific property types precludes such an undertaking.

recognized the benefit to property-type diversification. Therefore, despite the superior performance of property-type diversified REITs, there does not seem to be a profitable strategy to buying diversified REITs versus specialized REITs.

Tables and Figures

Table 1.1 - Summary Statistics

Panel A: Return measures and excess return measures

	Specialized			Diversified			Diversified - Specialized	
Variable	N	Mean	Std. Dev.	N	Mean	Std. Dev.	Coefficient	T-Stat
Q	357	0.82	0.25	317	0.87	0.31	0.056	(2.61)
Excess Q	357	0.002	0.3	317	0.0834	0.39	0.082	(4.05)
ROA	380	3.5	2.59	352	4.26	3.68	0.76	(3.26)
Excess ROA	380	-0.025	2.47	352	0.79	3.74	0.81	(3.49)
ROE	379	8.89	8.34	343	11.18	28.24	2.29	(1.51)
Excess ROE	379	-0.06	8.15	343	2.56	28.2	2.62	(1.73)

Panel B: Independent variables

	Specialized			Diversified			Diversified - Specialized	
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Coefficient	T-Stat
Ln (TA)	384	14.06	1.27	354	13.79	1.45	-0.27	(-2.78)
Leverage Ratio	384	0.5	0.16	354	0.49	0.16	-0.006	(-0.53)
Self-Managed	384	0.85	0.36	354	0.82	0.38	-0.03	(-1.05)
Self-Advised	384	0.92	0.28	354	0.88	0.32	0.97	(-1.45)
Portfolio Occupancy	269	90.53	8.74	184	93.67	3.36	3.14	-4.65
Beta	384	0.972	0.25	354	0.949	0.36	(-0.025)	(-1.11)

Table 1.2 - Regression Specification

Model: $r_{Q,ROA,ROE} = \alpha + \beta IR_{Q,ROA,ROE}$										
$IR_{Q,ROA,ROE} = \Sigma(M_{p,t} * w_{p,i,t})$										
	Specialized					Diversified				
Dependent Variable	α	t(α)	β	t(β)	P(β=1)	α	t(α)	β	t(β)	P(β=1)
median Q	0.015	0.16	1.02	8.87	0.84	0.25	2.16	0.81	5.41	0.21
median ROA	0.55	0.85	0.91	4.68	0.63	4.92	4.63	-0.19	-0.64	0.0001
median ROE	0.16	0.07	0.96	3.76	0.88	-5.45	-0.6	1.92	1.84	0.3775
mean Q	0.01	0.1	0.99	10.16	0.93	0.31	2.70	0.71	4.95	0.046
mean ROA	-0.23	-0.39	1.06	6.36	0.72	4.83	4.25	-0.17	-0.51	0.0004
mean ROE	-0.38	-0.21	1.03	5.37	0.85	4.58	0.62	0.77	0.91	0.620

Regressions of the actual return (r) on Imputed Return (IR) 1995 to 2006. The dependent variables are Tobin's Q (Q), Return on Assets (ROA), and Return on Equity (ROE).[a] Alpha is the intercept and Beta is the slope.

[a] Q is calculated as the market value of equity plus the market value of debt divided by total assets at period end. ROA is calculated as net income divided by average assets (annualized). ROE is calculated as net income divided by average equity (annualized). $M_{p,t}$ is the property type mean (median) multiplier in year *i*. $w_{p,i,t}$ is the property type weight in year *i*.

Table 1.3 – Industry Concentration by Year

Year	Obs	Herfindahl	Apartment	Industrial	Office	Retail
1995	30	0.69	0.24	0.15	0.24	0.37
1996	32	0.72	0.18	0.16	0.26	0.39
1997	37	0.72	0.17	0.15	0.30	0.37
1998	36	0.74	0.18	0.13	0.33	0.36
1999	34	0.74	0.15	0.15	0.30	0.40
2000	31	0.73	0.16	0.16	0.31	0.37
2001	31	0.75	0.15	0.17	0.28	0.40
2002	29	0.74	0.13	0.18	0.29	0.40
2003	26	0.70	0.08	0.20	0.34	0.38
2004	26	0.69	0.08	0.20	0.33	0.38
2005	23	0.67	0.10	0.22	0.36	0.31
2006	24	0.67	0.10	0.22	0.38	0.30

Herfindahl(year) = ΣS_p^2

Table 1.3 presents the average degree of diversification and holdings by property-type and year for the diversified REIT subsample. The Degree-of-Diversification (Herfindahl) represents the concentration of the REITs' holdings, with a value of 1.0 indicating a perfectly specialized REIT. The value under each property-type heading represents the average weight held by diversified REITs in a given year.

Table 1.4 – Regression of Returns on Diversification

Panel A: Raw Returns

MODEL: $r_{i,t} = \alpha + \beta_1 Diversification + \beta_2 TA + \beta_3 Leverage + \beta_4 Managed + \beta_5 Occupancy$

	DIVERSIFIED			DIVER			Herfindahl Index		
	Q	ROA	ROE	Q	ROA	ROE	Q	ROA	ROE
Diversification	0.08	1.29	5.87	0.06	1.80	10.58	-0.19	-4.19	-20.42
	(3.18)	(5.07)	(2.41)	(2.02)	(5.55)	(3.28)	(-3.06)	(-6.52)	(-3.24)
Ln (TA)	-0.07	-0.19	-1.81	-0.06	-0.12	-1.48	-0.06	-0.12	-1.52
	(-6.08)	(-1.69)	(-1.70)	(-5.72)	(-1.04)	(-1.40)	(-5.70)	(-1.08)	(-1.45)
Leverage	0.72	-4.87	21.87	0.69	-5.25	21.85	0.71	-4.79	23.56
	(8.94)	(-5.95)	(2.61)	(8.61)	(-6.53)	(2.66)	(8.89)	(-5.98)	(2.83)
Self-Managed	-0.05	0.48	-0.42	-0.06	0.19	-1.89	-0.05	0.33	-1.09
	(-0.91)	(0.94)	(-0.08)	(-1.09)	(0.37)	(-0.39)	(-0.96)	(0.65)	(-0.23)
Occupancy	-0.00	0.04	0.14	-0.00	0.06	0.21	-0.00	0.05	0.16
	(-1.92)	(2.06)	(0.70)	(-1.41)	(2.97)	(1.09)	(-1.75)	(2.35)	(0.79)
R-Squared	0.23	0.17	0.03	0.22	.18	.04	0.23	.20	.04
Observations	432	450	444	432	450	444	432	450	444

Panel B: Risk-Adjusted Returns

MODEL: $r_{i,t} - \beta r_{index,t} = \alpha + \beta_1 Diversification + \beta_2 TA + \beta_3 Leverage + \beta_4 Managed + \beta_5 Occupancy$

	DIVERSIFIED		DIVER		Herfindahl Index	
	RA ROA	RA ROE	RA ROA	RA ROE	RA ROA	RA ROE
Diversification	1.17	5.54	1.55	9.96	-3.49	-18.20
	(4.60)	(2.27)	(4.78)	(3.16)	(-5.37)	(-2.88)
Ln (TA)	-0.68	-3.25	-0.61	-2.93	-0.62	-2.99
	(-6.06)	(-3.06)	(-5.47)	(-2.78)	(-5.56)	(-2.84)
Leverage	4.35	22.43	-4.63	22.97	-4.34	23.69
	(5.31)	(2.68)	(-5.72)	(2.78)	(5.35)	(2.84)
Self-Managed	.775	0.25	0.51	-1.15	0.63	-0.41
	(1.50)	(0.05)	(0.98)	(-0.24)	(1.23)	(-0.08)
Occupancy	0.04	0.16	0.06	0.22	0.05	0.18
	(2.06)	(0.78)	(2.88)	(1.14)	(2.38)	(0.90)
R-Squared	0.18	0.05	0.19	0.05	0.20	0.05
Observations	450	444	450	444	450	444

Table 1.4 presents the regression results of the actual return (r) and risk-adjusted return (RAR) measures Q, ROA, and ROE on measures of diversification. DIVERSIFIED takes a value of one if the REIT does not have 100% concentration in any given property-type and zero otherwise. DIVER takes a value of one if the REIT does not have 75% or greater concentration in any given property-type and zero otherwise. The Herfindahl Index, or Degree-of-Diversification, is equal to ΣS_p^2. The values in parentheses are t-statistics.

Table 1.5 – Regression of Excess Performance on Diversification

MODEL: $EAR_{i,t,j} = \alpha + \beta_1 Diversification + \beta_2 TA + \beta_3 Leverage + \beta_4 Managed + \beta_5 Occupancy$

$EAR_{i,t,j} = r_{Q,ROA,ROE} - IR_{i,t}$ $\quad IR_{i,t} = \Sigma(M_{p,t} * w_{p,i,t})$

	DIVERSIFIED			DIVER			Herfindahl Index		
Panel A: Mean	Q	ROA	ROE	Q	ROA	ROE	Q	ROA	ROE
Diversification	0.10	1.34	5.99	0.09	1.84	10.61	-0.26	-4.30	-20.42
	(4.61)	(5.30)	(2.47)	(3.02)	(5.74)	(3.39)	(4.51)	(-6.77)	(-3.26)
Ln (TA)	-0.08	-0.16	-1.85	-0.07	-0.08	-1.52	-0.07	-0.08	-1.57
	(-7.46)	(-1.42)	(1.76)	(-6.91)	(-0.74)	(-1.45)	(-6.91)	(-0.77)	(-1.50)
Leverage	0.63	-5.13	19.56	0.59	-5.53	19.47	0.62	-5.06	21.16
	(8.45)	(-6.34)	(2.35)	(7.91)	(-6.94)	(2.39)	(8.37)	(-6.38)	(2.55)
Self-Managed	-0.03	0.92	0.35	-0.05	0.61	-1.14	-0.04	0.76	-0.35
	(-0.63)	(1.80)	(0.07)	(-0.89)	(1.21)	(-0.24)	(-0.70)	(1.52)	(-0.07)
Occupancy	-0.00	0.03	0.14	-2.0E-03	0.05	0.21	-3.0E-03	0.04	0.15
	(-1.58)	(1.64)	(0.69)	(-0.83)	(2.58)	(1.09)	(-1.34)	(1.93)	(0.78)
R-Squared	0.25	0.18	0.03	0.23	0.19	0.04	0.25	0.21	0.04
Observations	432	450	444	432	450	444	432	450	444
Panel B: Median	DIVERSIFIED			DIVER			Herfindahl Index		
	Q	ROA	ROE	Q	ROA	ROE	Q	ROA	ROE
Diversification	0.10	1.21	6.10	0.08	1.71	10.84	-0.25	-4.01	-20.96
	(4.16)	(4.66)	(2.52)	(2.76)	(5.17)	(3.46)	(-4.22)	(-6.11)	(-3.34)
Ln (TA)	-0.07	-0.14	-1.89	-0.07	-0.07	-1.55	-0.06	-0.07	-1.60
	(-6.74)	(-1.19)	(-1.79)	(-6.25)	(-5.85)	(-1.48)	(-6.24)	(-0.61)	(-1.52)
Leverage	0.63	4.45	19.59	0.59	-4.80	19.51	0.62	-4.36	21.26
	(8.22)	(-5.33)	(2.35)	(7.76)	(-5.85)	(2.39)	(8.19)	(-5.33)	(2.57)
Self-Managed	-0.03	0.76	0.11	-0.40	0.48	-1.42	-0.03	0.61	-0.60
	(-0.59)	(1.44)	(0.02)	(-0.83)	(0.92)	(-0.29)	(-0.65)	(1.19)	(-0.12)
Occupancy	-0.00	.03	.14	-2.0E-03	0.04	0.22	-0.00	0.03	0.16
	(-1.62)	(1.28)	(0.71)	(0.96)	(2.10)	(1.12)	(-1.43)	(1.51)	(0.81)
R-Squared	0.23	0.14	0.03	0.21	0.15	0.04	0.23	0.17	0.04
Observations	432	450	444	432	450	444	432	450	444

Table 1.5 presents the regression results of the raw excess abnormal return (EAR) measures Q, ROA, and ROE on measures of diversification. DIVERSIFIED takes a value of one if the REIT does not have 100% concentration in any given property-type and zero otherwise. DIVER takes a value of one if the REIT does not have 75% or greater concentration in any given property-type and zero otherwise. The Herfindahl Index, or Degree-of-Diversification, is equal to ΣS_p^2. The excess return is calculated as the difference between actual and imputed returns for each firm in a given year. The values in parentheses are t-statistics.

Table 1.6 - Regression of Excess Performance on Diversification

MODEL: $EAR_{i,t,j} = \alpha + \beta_1 Diversification + \beta_2 TA + \beta_3 Leverage + \beta_4 Managed + \beta_5 Occupancy$

$EAR_{i,t,j} = r_{ROA,ROE} - IR_{i,t}$ $\quad IR_{i,t} = \Sigma(M_{p,t} * w_{p,i,t})$

Panel A: Mean

	DIVERSIFIED		DIVER		Herfindahl Index	
	ROA	ROE	ROA	ROE	ROA	ROE
Diversification	1.26	1.64	1.71	2.12	-4.26	-5.5
	(4.84)	(5.14)	(5.17)	(5.10)	(-6.46)	(-6.75)
Ln (TA)	-0.15	-0.14	-0.08	-0.06	-0.08	-0.07
	(-1.35)	(-1.06)	(-0.72)	(-0.46)	(-0.75)	(-0.51)
Leverage	-4.83	-8.71	-5.13	-8.97	-4.73	-8.31
	(-5.76)	(-7.93)	(-6.19)	(-8.24)	(-5.76)	(-7.71)
Self-Managed	0.8	1.77	0.51	1.29	0.65	1.58
	(-1.51)	(-2.76)	(-0.96)	(-2.16)	(-1.26)	(-2.52)
Occupancy	0.03	0.02	0.05	0.04	0.03	0.02
	(-1.39)	(-0.51)	(-2.23)	(-1.41)	(-1.62)	(-0.72)
R-Squared	0.15	0.23	0.16	0.22	0.18	0.26
Observations	450	444	450	444	450	444

Panel B: Median

	DIVERSIFIED		DIVER		Herfindahl Index	
	ROA	ROE	ROA	ROE	ROA	ROE
Diversification	1.26	1.64	1.72	2.12	-4.26	-5.5
	(4.84)	(5.14)	(5.17)	(5.10)	(-6.46)	(-6.75)
Ln (TA)	-0.16	-0.14	-0.08	-0.06	-0.08	-0.07
	(-1.35)	(-1.06)	(-0.72)	(-0.46)	(-0.75)	(-0.51)
Leverage	-4.83	-8.71	-5.13	-8.97	-4.73	-8.31
	(-5.76)	(-7.93)	(-6.19)	(-8.24)	(-5.76)	(-7.71)
Self-Managed	0.79	1.77	0.51	1.29	0.65	1.58
	(-1.51)	(-2.76)	(-0.96)	(-2.16)	(-1.26)	(-2.52)
Occupancy	0.03	0.02	0.05	0.04	0.03	0.02
	(-1.39)	(-0.51)	(-2.23)	(-1.41)	(-1.62)	(-0.72)
R-Squared	0.15	0.23	0.16	0.22	0.18	0.26
Observations	450	444	450	444	450	444

Table 1.6 presents the regression results of the risk-adjusted excess abnormal return (EAR) measures ROA and ROE on measures of diversification. DIVERSIFIED takes a value of one if the REIT does not have 100% concentration in any given property-type and zero otherwise. DIVER takes a value of one if the REIT does not have 75% or greater concentration in any given property-type and zero otherwise. The Herfindahl Index, or Degree-of-Diversification, is equal to ΣS_p^2. The excess performance is calculated as the difference between the actual and imputed values for each firm in a given year. The values in parentheses are t-statistics.

Table 1.7 – Regression of Performance on Degree of Diversification

MODEL: $EAR_{i,t,j} = \alpha + \beta_1 Herfindahl + \beta_2 TA + \beta_3 Leverage + \beta_4 Managed + \beta_5 Occupancy$

$EAR_{i,t,j} = r_{Q,ROA,ROE} - IR_{i,t}$ $\quad IR_{i,t} = \Sigma(M_{p,t} * w_{p,i,t})$

	Q	ROA	ROE
Raw	-0.03 (-0.30)	-3.12 (-2.65)	-19.60 (-1.41)
Median EAR	-0.11 (-1.26)	-3.09 (-2.53)	-19.92 (-1.44)
Mean EAR	-0.10 (-1.16)	-3.23 (-2.73)	-19.17 (-1.38)
Risk-adjusted		-2.14 (-1.83)	-16.44 (-1.18)
RA Median EAR		-3.34 (-2.78)	4.49 (3.18)
RA Mean EAR		-3.34 (-2.78)	4.49 (3.18)

Table 1.7 presents the regression results of the performance measures and excess performance (Q, ROA, ROE) on the diversified sub-sample to determine how the degree of diversification affects performance. The Herfindahl Index, or Degree-of-Diversification, is equal to ΣS_p^2. The excess performance is calculated as the difference between the actual and imputed values for each firm in a given year. The values in parentheses are t-statistics.

Table 1.8 – Returns by Period

EW RETURN	1995-2006	1995-1997	1998-2000	2001-2003	2004-2006
Diversified	6.84	0.93	0.16	0.92	0.96
Specialized	6.87	0.92	0.16	0.86	0.96
	(0.71)	(0.76)	(0.39)	(0.81)	(0.72)

VW RETURN	1995-2006	1995-1997	1998-2000	2001-2003	2004-2006
Diversified	7.45	0.91	0.17	0.77	1.21
Specialized	7.45	0.94	0.17	0.74	1.12
	(0.63)	(0.60)	(0.94)	(0.93)	(0.53)

Table 1.8 presents the equal weighted and value weighted return for the sample period and four three-year sub- periods. The values in parentheses are p-values for the difference in returns of Diversified REITs compared to Specialized REITs.

Table 1.9 – Fama French Three Factor Regression Results

$$(R_{d.t} - R_{s.t}) = \alpha_v + \beta_v \ R_{mt} - R_{ft} \ + s_v SMB_t + h_v HML_t + u_v UMD_t + \varepsilon_v$$

Panel A: Value-Weighted Portfolio Return				
	Coefficients	Standard Error	t Stat	P-value
alpha	0.090	0.166	0.541	0.589
R_m - R_f	-0.128	0.044	-2.881	0.005
SMB	-0.032	0.044	-0.728	0.468
HML	-0.038	0.057	-0.666	0.507
UMD	0.065	0.031	2.119	0.036
Panel B: Equal-Weighted Portfolio Return				
	Coefficients	Standard Error	t Stat	P-value
alpha	-0.019	0.122	-0.153	0.879
R_m - R_f	-0.049	0.032	-1.499	0.136
SMB	-0.108	0.032	-3.360	0.001
HML	-0.035	0.042	-0.837	0.404
UMD	0.069	0.023	3.075	0.003

Presented above is the regression of the zero-investment portfolio of buying diversified REITs and selling specialized REITS. Panel A presents the value-weighted portfolio and Panel B present the equal-weighted portfolio. The portfolio returns are regressed on the Fama-French three-factor model with the Carhart momentum

Table 1.10 - Included REITs

AMB Property Corporation	Kilroy Realty Corporation
Acadia Realty Trust	Kimco Realty Corporation
Agree Realty Corporation	LaSalle Hotel Properties
Alexander's, Inc.	Lexington Realty Trust
Alexandria Real Estate Equities, Inc.	Liberty Property Trust
Apartment Investment and Management Company	Macerich Company
Associated Estates Realty Corporation	Mack-Cali Realty Corporation
AvalonBay Communities, Inc.	Mid-America Apartment Communities, Inc.
BPO Properties Ltd.	Mission West Properties, Inc.
BRE Properties, Inc.	Monmouth Real Estate Investment Corporation
Boston Properties, Inc.	National Retail Properties, Inc.
Brandywine Realty Trust	One Liberty Properties, Inc.
CBL & Associates Properties, Inc.	PS Business Parks, Inc.
Camden Property Trust	Parkway Properties, Inc.
Colonial Properties Trust	Pennsylvania Real Estate Investment Trust
Corporate Office Properties Trust	Post Properties, Inc.
Cousins Properties Incorporated	ProLogis
Developers Diversified Realty Corporation	Ramco-Gershenson Properties Trust
Duke Realty Corporation	Realty Income Corporation
EastGroup Properties, Inc.	Regency Centers Corporation
Entertainment Properties Trust	Roberts Realty Investors, Inc.
Equity One, Inc.	SL Green Realty Corp.
Equity Residential	Saul Centers, Inc.
Essex Property Trust, Inc.	Simon Property Group, Inc.
Federal Realty Investment Trust	Starwood Hotels & Resorts Worldwide, Inc.
FelCor Lodging Trust Incorporated	Sun Communities, Inc.
First Industrial Realty Trust, Inc.	Tanger Factory Outlet Centers, Inc.
Glimcher Realty Trust	Taubman Centers, Inc.
HMG/Courtland Properties, Inc.	UDR, Inc.
HRPT Properties Trust	Universal Health Realty Income Trust
Hersha Hospitality Trust	Vornado Realty Trust
Highwoods Properties, Inc.	Washington Real Estate Investment Trust
Home Properties, Inc.	Weingarten Realty Investors
Hospitality Properties Trust	Winthrop Realty Trust
Income Opportunity Realty Investors, Inc.	

Table 1.11 – Correlation Matrix

	DIVERSIFIED	DIVER	HERFINDAHL	LN(TA)	LEVERAGE	SELF MANAGED	OCCUPANCY
LN(TA)	0.029	-0.080	0.068	1.000			
LEVERAGE	-0.205	-0.100	0.168	-0.033	1.000		
SELF MANAGED	-0.146	-0.025	0.073	0.026	0.034	1.000	
OCCUPANCY	0.035*	-0.019*	-0.028*	-0.196	-0.146	0.023	1.000

* Table 1.11 presents a correlation matrix of the independent variables used throughout the regressions These correlations represent the coefficients after 34 observations were dropped because of low occupancy rates.

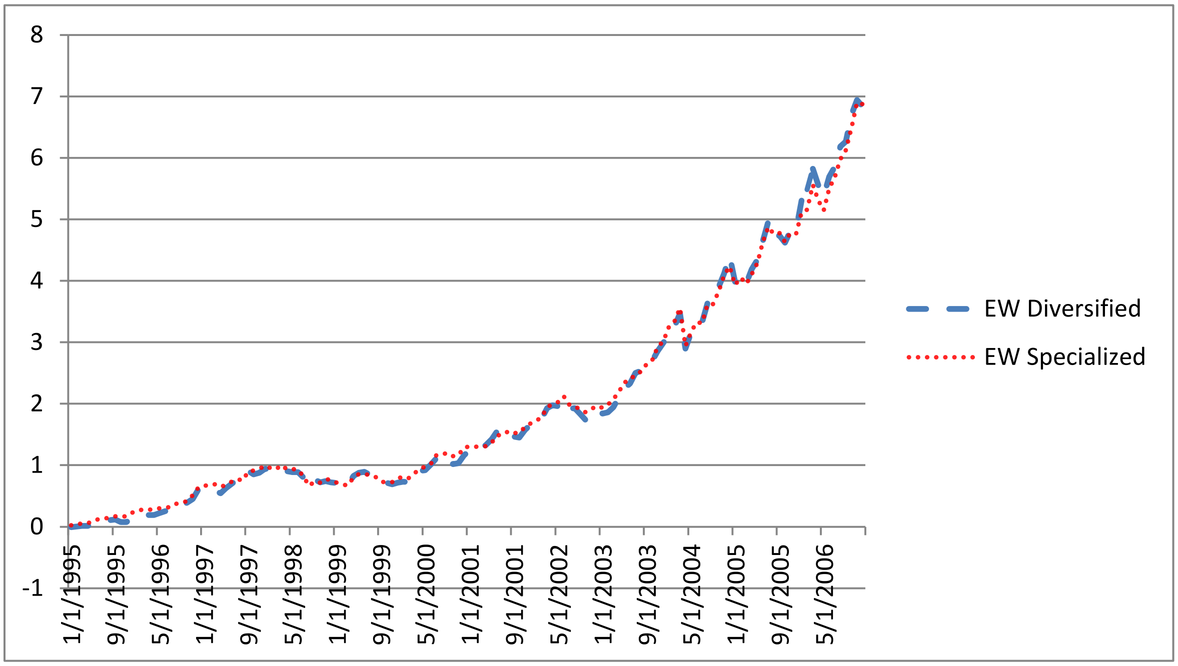

Figure 1.1 - Return Comparison for Diversified and Specialized REITs

Figure 1.1 plots the equal weighted return for Diversified and Specialized REITs for the twelve year period 1995-2006

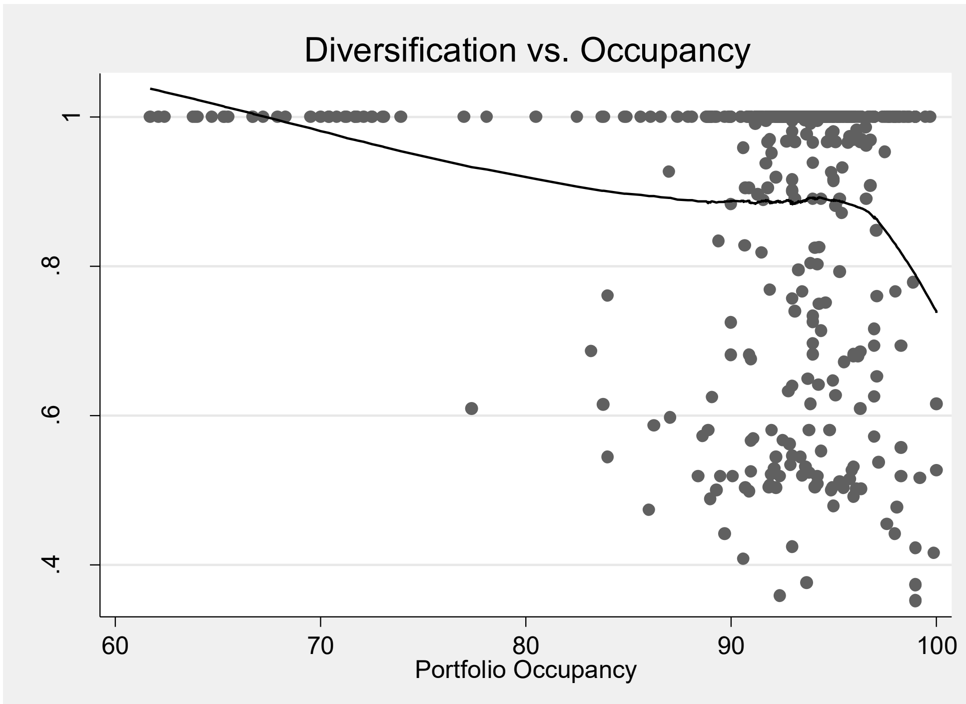

Figure 1.2– Portfolio Occupancy by Degree of Diversification
This figure presents the degree of diversification plotted against the REIT's total occupancy rate in percent.

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CHAPTER 2: MARCH MADNESS: TAX LIQUIDATION SELLING AND THE MARCH EFFECT

Introduction

There has been a considerable amount of research aimed at answering the question, “do taxes matter?” The general consensus is that a broad spectrum of the economy is affected directly by taxes, or by behavior stemming from taxes. Research in the area has shown that taxes have an effect on everything from executive compensation plans to the term structure of interest rates. In security markets, tax-related trading is given as an explanation of the well-known January Effect, as well as ex-dividend day stock price behavior.

Previous research on tax related trading has focused on minimizing the individual tax burden by holding winners and selling losers. This behavior, described as ”optimal tax trading” by Constantinides (1983), suggests that individuals should sell stocks that have lost value in the short term while holding onto stocks that have gained value until the stocks can be sold at the preferential long term capital gains rate. The key underlying assumption, one that is based on the long existing tax rates, is that there is a differential rate for short-term and long-term capital gains.

This study is most similar to previous work regarding tax effects and optimal tax trading. However, instead of looking at tax minimizing behavior, we look at what happens around tax filing times. According to Constantinides (1983), an investor who engages in optimal tax loss trading will hold a 'cash account.' This account measures his net liability due at tax filing, commensurate with his average tax rate. Subsequent gains will cause him to increase his holding, while losses, which can be used to offset prior gains, will cause him to decrease his net holding. At filing time, he needs only to liquidate his "cash account" in order to cover his tax liability.

The paper examines the effects of a simultaneous widespread liquidation of these holding accounts. It is likely that the choice of holding account varies by the individual according to his or her risk preferences, investment horizon, sophistication level, and relative magnitude of potential tax liability. However, the individuals who are most tax sensitive are also the ones who are paying the bulk of the taxes due at filing time. In accordance with the rules of Safe Harbor, individuals must make quarterly estimated tax payments of either 100% of the previous year, or 90% of the current year. Rational investors will of course choose whichever option allows them to pay the least amount in estimated payments.

Previous research in the area of behavior finance suggests that individuals engage in mental accounting for any number of reasons. Shefrin and Statman (1994, 2000) explain "behavioral portfolio theory" as an investor having separate mental accounts for different purposes. This phenomenon is supported by several experimental investigations that show people engage in *narrow framing,* that is, paying attention to individual gains and losses rather than total changes.

Thaler (1999) explains the separation of sources and uses of funds into specific accounts as the second component of mental accounting. Perhaps the most relevant piece of information for this study is that the separation of sources and uses of funds may be consistent with utility maximization if the ”holding account” can be liquidated to cover tax liability due at filing. Additionally, extant research suggests that when investors are faced with a short horizon - less than one year - they will favor less volatile investments. Furthermore, cognitive psychology suggests investments that are dividend producing and will not leave the investor with too much regret. We fully extrapolate the cognitive biases in the literature review section.

We choose to look for tax effects related to ‘holding account’ liquidation in municipal bond funds. The clientele and characteristics of these funds provides an acceptable natural experiment for examining tax liquidation behavior. We look at the returns and volume in the month of March because it is the last full month prior to tax filing. The average March return for these funds is -1.4%, excluding dividends. This is compared to an average monthly return, excluding dividends, of 0.14% for all other months[13].

We find that the phenomenon observed in these funds is related to increased liquidity selling in March to cover tax liability from the previous year, due in April, that is in excess of expected tax liability payments. The measure of liability is derived from the economy wide increase in capital gains and dividend income, and is fully described in the data section. Rational investors may employ a tax strategy such that they minimize expected liability payments on a quarterly basis,

13 When excluding January the average monthly return, not including dividends is negative 0.12%. This is still significantly greater than the negative 1.4% return in March.

thereby leaving the remainder to be paid at filing time. The tax-liquidation hypothesis supposes the negative returns and increased volume in March have a positive correlation with the aggregate tax liability. The phenomenon is statistically related to year-end volume, the current and previous year's fund returns, the tax rate on capital gains, and the amount of unanticipated capital gains and dividend income as a percentage of the previous year's income[14].

This study finds that abnormally low returns in the month of March are related to selling due to tax related liquidity reasons. As a preview to the results in this article, March returns are negatively related to the capital gains tax and unanticipated liability; March volume measures are positively related to the capital gains tax and unanticipated liability. The empirical findings show that abnormal returns in March are positively related to how much tax-loss selling an investor is able to engage in during the previous year. Furthermore, consistent with optimal tax-timing [Constantinides (1984),] investors are more likely to liquidate poorly performing funds. This study adds to the extant body of literature on tax-related liquidity issues and mental accounting. The most relevant of the extant anomalies for the current paper is the January effect. The March effect hypothesis provides evidence of an additional tax impact beyond the January effect. We conclude that there is evidence of additional tax timing behavior that is statistically related to aggregate tax liability.

The remainder of this study is organized as follows: Section II gives an overview of the literature related to the tax environment and theoretical trading behavior. Section III presents the

14 For robustness a measure of unanticipated liability is also calculated 110% of the previous year's liability.

hypotheses. Section IV explains the data. Section V discusses the empirical results, while Section V concludes.

Literature Review

This study seeks to understand the decision-making process of individuals facing a tax liability, the decision to establish a holding account, and the subsequent payment of taxes or liquidation of the holding account. In order for there to be a tax effect three cognitive conditions must be satisfied:

(1) *Loss Aversion. Investors must exhibit a pattern consistent with the Disposition Effect. The absolute utility of a loss is greater than an equal gain:* $v(x) < |v(-x)|$. *Investors are more likely to realize gains than losses, thus creating tax liability.*

(2) *A holding account that maximizes utility under mental accounting. Investors choose a vehicle consistent with myopic loss aversion, regret aversion, and problems with self-control.*

(3) *Liquidation of the holding account. Labeling accounts reduces the substitutability between accounts, thereby causing an account created to keep track of tax liability to be the first liquidated for tax payment.*

The Failure of Rational Tax Trading Under Prospect Theory and Mental Accounting

Two fundamental cognitive processes are *loss aversion* and *mental accounting*. Empirical research has shown that individuals behave differently with gains and losses (Barberis and Xiong, 2009; Frazzini, 2006; Grinblatt and Han, 2005; Tversky and Kahneman, 1979;1992). "Prospect theory," as proposed by Kahneman and Tversky (1979) and "mental accounting," as proposed by Thaler (1980) may explain the *disposition effect*. The disposition effect is the investor behavior of selling winners too soon and holding on to losers too long (Shefrin and Statman (1985)). In prospect theory, utility is defined by gains and losses relative to a predetermined reference point. The utility function is convex in area of losses and concave in the area of gains. Benartzi and Thaler (1995) point out that empirical estimation of the ratio of the slopes in the two regions are approximately 2, indicating that individuals are twice as sensitive to losses compared to gains.

The choice to sell an asset that has declined in value had the added incentive of capturing a tax-credit, as opposed to selling an asset that has gained in value, thus facing a tax liability. Prospect theory and mental accounting, on the other hand, would suggest that individuals would rather sell an asset that has appreciated in value. These two cognitive biases jointly referred to as PTMA, lead investors to engage in loss aversion and narrow framing, looking at individual assets irrespective of the overall changes in portfolio value.

Odean (1998), using data that tracked the trades of investors with a large discount brokerage firm, found that individual investors were more likely to sell a stock if it had a gain as opposed to a loss. Barber and Odean (2004) find evidence that investors are tax savvy even though they realize gains more frequently than losses. The Odean (1998) and Barber and Odean (2004) findings support mental accounting over rational analysis. Furthermore, this finding is evidence that investors, while concerned about tax implications, behave in a manner that would generate sizeable capital gains liabilities.

Establishing a 'Cash' Account Under Mental Accounting

Thaler and Johnson (1990) describe the *house money effect,* a behavioral bias whereby money earned is more valuable than money won. The transformation from paper profits to realized gains seems to be a convenient time to reset the reference point. The implication is the implicit method by which an investor selects a reference point. A simple explanation is that an investor has a dynamic reference point that is evaluated over some interval. We suggest that the transformation for paper to real profits will reset the reference point, thereby reducing the house money effect. The selection of a holding account is then independent of prior performance.

Benartzi and Thaler (1995) explain that the attractiveness of a risky asset will depend on the time horizon of the investor. They refer to the combination of loss aversion and a short holding period as *myopic loss aversion.* They find that a loss averse investor choosing between a risky asset such as stocks and a less risky asset such as bonds or treasury bills is more willing to accept the risky asset as the evaluation period becomes longer. Additionally, using a set of parameters consistent with the representative decision-maker, they find that the evaluation period necessary for an investor to be indifferent between the stocks and bonds is in the neighborhood of one year. The investor who faces a capital gain liability necessarily has an evaluation period no greater than 16 months and in most cases less than one year.[15] Therefore, the selection of a bond fund versus a stock fund seems plausible for reinvesting the expected tax liability.

Narrow framing may echo investors' considerations over non-consumption based utility, such as regret. Regret, as explained by Kahneman and Tversky (1982), ‘is a special form of frustration in which the event one would change is an action one has either taken or failed to take.’ The feeling of regret for errors of commission is stronger than for errors of omission. The regret of taking an action, and the choice being incorrect, is worse than failing to take the right action. Therefore the reinvestment of the holding account is likely to less risky and more likely to avoid regret.

Under the theoretical behavior of Constantinides (1984) the investor sets aside his capital gains tax liability in an account designated for tax purposes and therefore may distinguish between this account and his general investment account. Moreover, this may be a rational utility maximizing behavior if the investor has problems with self-control. Shefrin and Thaler (1981, 1988) propose

15 The period of 16 months comes from an investor selling an asset with a capital gain in January and reinvesting the expected liability until the following April.

that mental accounting is consistent with having a set of ‘rules’ that may help with problems of self-control. Dividends also help discourage dissaving when self-control is an issue.

Shefrin and Statman (1984) explain that mental accounting may explain investor’s preference for dividends. Dividends help investors segregate gains and losses and thus increase their utility. Barberis and Thaler (2002) show that investor’ utility with mental accounting is unambiguously higher with dividends. Due to the concavity of utility functions, v, $v(2) + v(8) > v(10)$. Shefrin and Statman (1984) argue that paying a dividend also helps investors avoid regret.

The behavioral biases discussed here point to a specific asset class, low risk dividend paying bond funds. Due to the nature of tax-free municipal bond funds it is very likely that the individuals realize real monetary gains on these securities due to the tax-free coupon. Moreover, the argument that rational investors should exhibit a tax-related dividend aversion does not apply to these funds because of the tax-free interest payment. Therefore, loss-aversion may be a simple but rational reason for investors to choose municipal bond funds as their ‘cash’ account.

The relationship between investor sentiment and the holding of municipal bond funds should be evident. Municipal bond funds pay a tax free dividend and are consistent with myopic loss aversion, regret aversion, and reduce problems associated with a lack of self-control. The holding and subsequent liquidation of these funds prior to the investor’s other portfolio holdings is consistent with the disposition effect and mental accounting.

Liquidating the 'Cash' Account Under Mental Accounting

A recent Wall Street Journal article titled 'Many Investors Are Their Own Worst Enemy' reports that investors, against the advice of their brokers, hold multiple accounts with several banks and brokerage houses, and have little knowledge of their overall portfolio exposure. Shefrin and Statman (1994, 2000) explain "behavioral portfolio theory" as an investor having separate mental accounts for different purposes. This phenomenon is supported by several experimental investigations that show people engage in *narrow framing,* that is, paying attention to individual gains and losses rather than total changes. Thaler (1999) explains the separation of sources and uses of funds into specific accounts as the second component of mental accounting. These mental accounts are considered independently and the covariation between the accounts is ignored. According to this narrow framing expenditures are grouped into categories for specific purposes, and investments are categorized similarly.

Badrinath and Lewellen (1991) show most securities with losses are liquidated around the turn-of-the-year; it may be the case that investors are simply less willing to liquidate a stock holding, as opposed to a pre-designated 'cash' account, to cover tax liability early in the year. Additionally, if the 'cash' account is simply an accumulation of his gains in individual stocks, his decision of where to hold these gains may be driven by loss aversion or regret aversion.

The choice to liquidate the 'cash account' should be inseparable from liquidating other assets for tax related liquidity reasons. Why then would any asset exhibit a systematic pattern consistent with tax liquidation? The answer proposed in this study is based on the psychological research that has given rise to behavioral finance. Thaler (1999) explains that individuals tend to label accounts according to their usage. Expenditures may be grouped to form budgets while wealth is allocated into accounts. There is a hierarchy of accounts such that individuals are more likely to spend current assets before future assets. A checking account is more likely to be used before an investor dips into a 401K (Thaler, 1999). Bracketing expenditures and assets by their uses and sources reduces the substitutability between accounts. People employ resources differently depending on the labels that are given to each account. By creating an explicit budget individuals are exerting self-control. However, this means that once an account is established as say, tax liability, then it will be difficult to repurpose these funds for other uses. The household balance sheet would have a liability for current taxes as well as an asset, the ”cash account”, and the hierarchy would suggest that this is the first place to look prior to using other sources. Essentially, labels matter.

Tax Timing

The tax codes governing capital gains and losses provide value to an investor who is tax savvy and engages in optimal tax timing as described by Constantinides (1984). These rules are summarized by Brickley, Manaster, and Schallheim (1991) as follows:

1. *Capital gains and losses are recognized for tax purposes when they are realized, not as they occur.*
2. *The tax rate is higher for short-term capital gains and losses than for long-term capital gains.*
3. *(Offset Rule) If there are net short-term losses, they must be used to offset net long-term gains before any tax rate is applied. Such offsets reduce the tax advantage associated with short-term losses that otherwise could be deducted directly from taxable income.*
4. *(Wash Sale Rule) Losses for tax purposes are not allowed if an asset is sold for a loss and repurchased within thirty days.*
5. *($3,000 Limit Rule) Capital losses can be used to deduct a maximum of $3,000 taxable income in any year. Losses greater than $3,000 can be carried forward indefinitely.*
6. *(Safe Harbor Rule) To avoid penalty a taxpayer must make minimum estimated tax payments equal to either 100% (110% for high income individuals) of the previous year's tax liability, or 90% of the current year's tax liability*[16].

From (2) and (3) it is clear that it is optimal to realize losses in the short run which are subject to the higher rates; from (6) it should be clear that it is optimal to prepay 100%[17] in years with unanticipated liability and 90% otherwise. In years when there are large uncovered capital gains, gains not covered by losses, the remainder of the tax liability comes due in April. Net short term capital losses offset long term capital gains on a dollar for dollar basis. Therefore, an increase in the capital gains tax rate increases the amount of taxes that capital losses can offset

16 The Safe Harbor Rule was not listed by Brickley, Manaster, and Schallheim (1991) but was added here to explain unanticipated tax liability.
17 High net worth individuals will have to pay 110% of the prior year's tax.

(Constantinides and Scholes (1980)). Capital gains tax rates also determine the amount of money to be set aside in a holding account.

There have been some significant changes to the tax code that directly affect tax behavior. The Tax Reform Act (TRA) of 1986 had several significant impacts on both corporate and noncorporate taxpayers. Under the prior law, individuals and other non-corporate taxpayers were permitted to deduct 60% of net capital gains from gross income.[18] After 1987 the peak marginal tax rate was 28% (33% in 1988 and 1989) equal to that of the rate on ordinary income for individuals with income greater than $29,750. Starting in 1988, capital gains were added to ordinary income. Additionally the number of tax brackets was reduced. Capital gains were less shielded from taxation and tax liability increased. The goal of the TRA 1986 was to lower the marginal tax rate, limit tax shelters, and be revenue neutral. The most salient feature of the Tax Reform Act was the repeal of the 60% deduction. If capital gains are considered additive, above and beyond income normal income, then the effective rate for capital gains greatly increased.

Subsequently the capital gains tax rate was dropped back to 20% in 1997 and to 15% in 2003 with the Jobs and Growth Tax Relief Reconciliation Act. Prior to the Jobs and Growth Tax Relief Reconciliation Act the income qualification for the higher capital gains rate was $56,800. Figure 2.1 shows the growth of assets invested in closed-end municipal funds following the TRA 1986 as investors were looking for other asset classes to shield their investments from taxes.

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18 Paraphrased from Act Sec. 401

It is also worth noting that high net worth individuals must make estimated tax payments on a quarterly (monthly) basis in accordance with the rules for Safe Harbor. A rational investor expecting to have gains in the current year that are larger than the previous year's gains will opt to pay quarterly payments equal to 100% of the previous year's tax liability. Alternatively, an investor who expects to have gains that are less than the prior year's gains will opt to make payments equal to 90% of the current year's tax liability. The interest penalty on untimely payments compels investors to make estimated payments, therefore foregoing the option to delay all payments until April.[19] Thus, the liquidation hypothesis proposes that the March effect is larger in years when there is unanticipated tax liability.

While this study explores new ground relative to tax effects related filing, it is most similar to previous work that has linked anomalies with tax related behavior. The tax-loss selling hypothesis has been repeatedly cited as an explanation for the abnormally high returns in the month of January since Branch (1977) and Givoly and Ovadia (1983). The tax-loss selling hypothesis has been shown to be more significant for small firms. Support for this hypothesis can be found in Branch (1977), Dyl (1977), Givoly and OVadia (1983), Roll (1983) and Reinganum(1983). Lakonishok and Smidt (1984) show that the frequency of trading in January is significantly less than that of December; also, the drop in frequency is more pronounced for small stocks. The tax loss selling hypothesis presumes that investors who are behaving rationally can reduce their year-end tax liability by selling stocks that have lost value and use the realized losses to offset capital gains. The increased number of sell-side transactions produces a

19 The penalty for an underpayment of over one thousand dollars is 120 percent of the underpayment rate. The historical penalty rates are available from the IRS at http://www.irs.gov/pub/irs-pdf/n746.pdf

downward pressure that results in more trades at the bid price. Mellow, Ferris, and Hwang (2003) show that at the turn-of-the-year the selling pressure subsides and the securities resume trading at market determined prices, and therefore results in positive abnormal stock returns in the beginning of the New Year. Starks et al. (2006) show that closed-end municipal bond funds also have higher returns in January that are positively related to measures of abnormal volume and turnover in November and December. Moreover, increased year-end volume and turnover are negatively related to the current and prior year's return. This is strong evidence in favor of tax loss selling because the funds exhibit this pattern but it is not present in the underlying assets. Additionally, the finding of abnormal returns in closed-end funds shows that the January effect is not isolated to small firms which favor the tax-loss selling hypothesis as opposed to the window dressing hypothesis. For a more exhaustive review of tax-loss selling research see Starks et al. (2006). The most closely related study may be Chen, Estes, Ngo (2011) which shows instances of increased outflow in open-ended municipal bond funds in the months of April, June, and September in order to pay quarterly anticipated tax payments. Additionally, Chen et al. (2011) show that investors trade more in short-term municipal bond funds instead of long-term bond funds around the time to pay estimated quarterly tax payments. This is a rational behavior since the short-term funds are more liquid and have less price variation.

The Theoretical Environment

Consider an investor whose liquid wealth, *w*, is fully invested. He is rational and trades according to the strategy described in Constantinides (1984). Under this scenario, the investor realizes capital losses in the short term, "the loss-realization option" (Brickley, Manaster, and Schallheim (1991)), and defers capital gains to the long term at which time he realizes his capital gains in order to reestablish the short term status, "the restart option" (Dammon, Dunn, and Spatt (1989)). Dammon, Dunn, and Spatt (1989) show that the "restart option" may not be as beneficial as Constantinides (1984) originally found. The "restart option" allows an investor to take advantage of gains and losses yearly as opposed to a buy-and-hold strategy in which only aggregate gains and losses matter. Short term status would be more favorable if it allows the investor to realize losses that carry forward indefinitely. The investor then sets aside a proportion of his realized capital gain that is commensurate with his marginal tax rate. Additional capital gains and losses will adjust the level of cash being set aside for tax purposes at any given time.

Constantinides (1983) estimates the value of the tax-timing option as a fraction of each dollar invested in stock, if the investor fails to take advantage of capital losses. Therefore, if an investor were to hold his anticipated tax liability in a money market account (with no chance of capital losses), he foregoes any possibility of tax-timing. Brickley, Manaster, and Schallheim (1991) explain that the tax-timing benefit of owning closed-end funds is likely to be less than the benefit of owning the underlying assets. This may be offset by significant improvements to liquidity and trading costs. The tax code does not allow the pass through of capital losses from the funds to the individual investors. Therefore, the tax timing benefit for the individual is realizable only from the selling of shares.

Without making generalizations about the investor's risk preferences we can infer two things: First, time value of money forces the investor to reinvest his pretax earnings. Second, if he has already engaged in optimal tax selling, there is a positive benefit for him reinvesting in assets where he will be able to employ additional tax loss selling. Low-risk, tax-exempt municipal bond funds propagated following the TRA 1986; these funds provide an alternative holding account with an attractive yield aimed at individuals in the highest income brackets who are the most tax sensitive. Furthermore, investors were likely looking for tax efficient means of investing after the repeal of the 60% exclusion.

Tax-exempt municipal bond funds provide the possibility of tax timing with a return that is higher than money market accounts. Two properties of closed-end funds are that they are levered to increase their return, and they often trade in illiquid assets. It is a reasonable assumption that a tax savvy investor may employ Markowitz diversification and invest in several closed-end municipal bond funds. The funds trade like stock and therefore the investor will not be subject to the illiquidity constraints of holding the underlying security. Therefore his money will be available to him when his tax bill is due. Moreover, he can delay liquidating his position until the last possible moment in order to pull out all possible tax free coupon payments. The last dividend that the investor is realistically able to realize without jeopardizing on time filing is in March. Monthly ex-dividend dates average the 13^{th} of the month with a standard deviation of four days.

Moreover, the strategy of using municipal bond funds as a cash account dominates all other strategies in the event of negative realized returns in an alternative investment. The tax-free nature of the municipal bond funds' dividend requires that any alternative investment have a return that is substantially higher than the municipal bond funds. Municipal bond funds employ significant amounts of gearing, selling short term preferred stock in order to purchase higher yield long-term bonds. Therefore the nominal historical yield on municipal bonds has been quite high. Individuals in higher tax brackets will be more likely to select into municipal bonds; the higher the marginal tax rate, the more income that is shielded and thereby often creating superior returns to the investor.

We propose that holding municipal bond closed-end funds is harmonious with the 'cash' account described in Constantinides (1984). The 'cash' account is a holding account for anticipated tax liability that varies with realized capital gains and losses. The balance of the ”cash” account should equate with the capital gains tax owed at filing. High net worth individuals are not financially constrained and may not have to liquidate a holding in order to ”stroke a check” for tax purposes. We propose that having cash on hand and liquidating for tax purposes are not mutually separable events. These events can coexist harmoniously. A rational investor holds a portion of his wealth in cash that maximizes his utility over liquidity; given an out of pocket expenditure, i.e. tax liability, he may unavoidably have to liquidate some portion of his invested wealth in order to rebalance his cash to investments ratio.

Hypotheses

The March effect and tax-liquidation hypothesis are joint hypotheses of lower returns and increased volume in the month of March. Tax-loss selling by definition reduces the amount of taxes owed in a given year[20]. In years with greater tax-loss selling less must be liquidated to cover tax liability and therefore higher returns are expected.

> *Hypothesis 1: There should be a positive relationship between March returns and year-end tax-loss selling.*

The capital gains tax rate, τ, determines the proportion of capital gains that must be set aside to cover tax liability. Since closed-end funds have a finite number of shares, when the capital gains tax rate is higher we would expect a greater proportion of the total funds to be held for tax purposes. Therefore, the magnitude of the March effect will be greater when the capital gains tax rate is higher.

> *Hypothesis 2a: March returns should be negatively related to Capital Gains tax rates.*
> *Hypothesis 2b: March volume measures should be positively related to Capital Gains tax rates.*

20 And subsequent years if there are carried forward losses.

Taxes on unanticipated capital gains can be deferred until filing in April. It is in the tax payer's best interest to have this money invested as long as possible.

> *Hypothesis 3a: March returns should be negatively related to unanticipated liability.*
> *Hypothesis 3a: March volume measures should be positively related to unanticipated liability.*

Prior to the start of the calendar (trading) year there is uncertainty as to whether or not an investor will have unanticipated capital gains that are above the prior year's gains. It is therefore always optimal to pay 100% (110%) of the previous year's tax liability (barring the possibility that the gains did not come from a unique event i.e. the sale of property or a one-time investment). The third quarterly tax payment is due September 15, by which time the investor will have a much clearer picture of his estimated tax liability.

The passage of the Tax-Reform Act of 1986 (TRA) changed mutual funds' fiscal year-end from December 31st to October 31st. This has further implications to the individual's tax liability if the mutual fund passes through capital gains. If the tax payer's upcoming tax liability is less than the prior year or he has already paid 90% of his current expected tax liability then there is no need for him to continue holding his "cash" account.[21] Additionally, the investor will have a better idea of the amount of tax-loss selling with which he will be able to engage; tax-loss selling in November and December will only help to further reduce his tax bill. Therefore, if the individual has unanticipated capital gains he will likely hold onto the fund until March. If the

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21 If you do not receive your income evenly throughout the year, your required estimated tax payment for one or more periods may be less than the amount figured using the regular installment method (four even quarterly payments).

investor does not have unanticipated capital gains and wishes to avoid a capital gain pass-through then he will likely sell prior to the ex-dividend date of any announced special dividends.

Data and Methodology

Data

Data on security prices, shares outstanding, monthly volume, and monthly returns (including and excluding dividends) comes from the Center for Research in Security Prices (CRSP) monthly stock files. Data on security prices, shares outstanding, daily volume, and daily returns (including and excluding dividends) comes from the Center for Research in Security Prices (CRSP) daily stock files. The sample consists of 168 municipal bond closed-end funds over the 1987 to 2009 time period.[22]

This study also looks at a sample of non-municipal closed end funds that trade in the same CRSP share code[s]. CRSP share codes are two digit codes that describe the type of security traded. The securities in this study are limited to share codes 14 and 44. The first digit describes the type of security, 1 indicates Ordinary Common Shares, and 4 indicates SBIs (Shares of

22 We would like to thank Laura Starks, Li Yong, and Lu Zheng for providing me with the fund codes.

Beneficial Interest)[23]. The second digit, 4, provides further information that both of these securities are limited to closed-end funds. Approximately 66% of funds have CRSP share code 14, the remainder have CRSP share code 44. The defining characteristic of the funds in CRSP codes 14 and 44 is that they are closed end funds that trade on organized exchanges and have uncharacteristically large dividend yields. The average dividend yield is 9.3% per annum over the sample period. On average 9.8 million shares are traded per month. There is a 61% correlation between the average return for municipals and non-municipals in the sample.

The summary statistics, reported in Table 2.1, show that the average size in closed end funds has been decreasing through time as the number of funds increased. The change in total value follows the rapid growth and subsequent decline in the number of funds reported in Table 2.1. Moreover, from Table 2.1 and Figure 2.1, we can see the net asset value of the funds, and the number of existing funds follows a pattern that is consistent with the capital gains tax rate changes.

The variable of interest, $March\_Return_{it}$, is defined as the returns in the month of March for fund i in year t. The average monthly March return excluding dividends is -1.4% and in a one-sided T-test the variable is statistically different from zero. The dependent variable used for the empirical tests is the excess return in March. This is calculated as the current year's March return less the prior year's average monthly return excluding January and March. Figure 2.2 shows the average monthly return excluding dividends for each calendar month. The return in

23 Shares of beneficial interest resemble common shares – the primary difference is that an SBI gets issued by a "trust entity" instead of a company.

January is consistent with the tax-timing explanation given by Starks et al (2006). Figure 2.3 compares the average monthly return for the sample to the average monthly return for all other funds in the same CRSP Share Code and to the monthly return for the CRSP value weighted index.

The primary covariant is a variable that we have constructed using the data from the Internal Revenue Service' Statistics of Income. The variable, *unanticipated liability,* a measure of net capital gains adjusted for capital losses and income tax due at filing, comes from the statistics of income from the Internal Revenue Service.[24] *Unanticipated liability* is calculated as the percentage of gains that would be uncovered by 100% (110%) payments of safe harbor liability under the tax code. Due to the nature of tax filing, unanticipated liability will either be positive or non-existent. It is for this reason that the variable is bound on the lower side by zero. In the event that capital gains are lower in time period (*t*) than in time period (*t-1*) the rules governing safe harbor would eliminate the possibility of an additional tax liability due in April.

The variable for *Capital gains tax rates* is defined as the prevailing tax rate for long-term capital gains in a given year. The IRS also provided penalty rates for underpayment. The Federal Funds rates come from the Federal Reserve. The capital gains tax rates are available from several websites and were cross checked for accuracy.

Over the sample period the average per capita capital gains for all individuals was approximately \$4,000 compared to \$25,800 for filers in the top ten percent. The unanticipated tax year over

24 All amounts are in actual dollars.

year for all filers was 5.6% compared to 10.5% for filers in the top ten percent. The approximate tax due at time of filing on a per capita basis was $560 for all filers and $4,600 for filers in the top ten percent.

Methodology

We use panel data and maximum likelihood estimation techniques to show that March abnormal returns are positively related to both the fund's year-end volume and the average volume across funds. Additionally, we propose that the March effect is more likely when capital gains tax rates are higher and when there are unanticipated capital gains and dividend income. The March effect is a joint hypothesis of lower returns and higher volume in the month of March. For robustness we have two models within each regression. Model I uses turnover and Model II uses volume ratios. The following regression equations are used to examine the March effect:

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume\_measure_{it} + \alpha_3 capital\_gains\_rate_t + \alpha_4 unanticipated\_capital\_gains_t + \mu_i \quad (2.1)$$

$$volume\_measure_{it} = \alpha_{0t} + \alpha_{1t} return_{it}^{c} + \alpha_{2t} return_{it}^{p} + \alpha_3 capital\_gains\_rate_t + \alpha_4 unanticipated\_capital\_gains_t + \mu_{it} \quad (2.2)$$

The Hausman specification test rejects the null hypothesis that the efficient estimator is preferred[25]. Therefore the remainder of the restricted regression models will be run using fixed effects and will control for clustering by year when appropriate.

Results

The March Effect in Municipal Bond Closed End Funds

In order to document the March effect in closed-end municipal bond funds the average monthly return is calculated across all funds. Figure 2.2 presents the average return by month for all funds.[26] For all years the average in March (not including dividends)[27] for all fund years was (1.4)% compared to an average of (0.1)% for the 10 months of the year not including January. This finding is primarily driven by the years prior to 2003. In 2003 capital gains tax was limited

25 The rejection of the null hypothesis that both the consistent and efficient estimators are acceptable was significant at a 1% level. The primary reason for the rejection was the difference in the firm specific volume measure.
26 Figure 2.7 and 2.8 graph the March returns and the average returns for all other months by year to show the consistency of the March effect through time.
27 The graph for returns including dividends is similar to the one presented in Figure 2.2.

to a maximum of 15% for long-term gains and 35% for short-term gains. The abnormal return for March for the earlier time period was 1.7% compared to 0.3% in the later time period.

The significant underperformance in March is supported by a simple time-series regression of cross-fund average returns on a March dummy variable. The results in Table 2.2 show that March has significantly lower returns than the others months. In the first regression the difference is (1.6)% (significant at 1%). The second regression, which excludes the month of January from the estimation shows that the March returns are lower by (1.3)% (significant at the 5% level).

In order for the negative abnormal returns to be attributable to a price pressure effect the underlying assets cannot be systematically affected by macroeconomic forces. There is an inverse relationship between bond prices and interest rates. Figure 3 graphs the average Federal Funds Rate adjustment by month. It is clear from Figure 3 that changes in the short-term interest rate are not clustered in March. If it were the case that macroeconomic forces were the cause of the persistent negative returns in March we would expect to see clustering of rate hikes in March.

The sample funds most likely have a duration that is more sensitive to interest rate changes and therefore a comparison to a vehicle with similar duration is in order. We replicate Figure 2 using the return excluding dividends (capital appreciation) for Long Term Government Bonds. Ibbotson reports the historical monthly capital appreciation for intermediate as well as long term corporate and government bonds. Figure 5 shows the average monthly returns. There is a similar seasonality that exists in long term government bonds that appears to be unrelated to domestic tax filing.[28]

March Abnormal Returns and Abnormal Year-End Volume

The tax-liquidation hypothesis assumes that investors trade according to the optimal tax strategy (Constantinides 1984), and sell losers in order to offset the maximum amount of gains. Contrary to the optimal strategy discussed by Constantinides (1984), Badrinath and Lewellen (1991) show that most sales of securities with capital losses take place in November and December. The findings of Bharbra, Dhillon and Ramirez (1999) give additional support to the year-end tax-loss selling hypothesis.

The current paper proposes a positive relationship between March returns and the turn of the year volume measure. The intuition for volume mitigating the March effect is that in years when an investor is able to offset more capital gains he reduces his tax liability and is thus required to sell less in order to cover his tax liability. The volume measures of the current paper are defined identically to Starks et al. (2006):

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28 This study tests the hypothesis using controls for both the long term government bond capital appreciation as well as changes in the municipal bond yields.

$$turnover_{it} = \frac{average\ November\ and\ December\ trading\ volume\ of\ fund\ i\ in\ year\ t}{Number\ of\ shares\ outstanding\ for\ fund\ i\ at\ the\ beginning\ of\ year\ t} \qquad (2.3)$$

$$vol\_ratio_{it} = \frac{average\ November\ and\ December\ trading\ volume\ of\ fund\ i\ in\ year\ t}{average\ February\ to\ October\ trading\ volume\ of\ fund\ i\ in\ year\ t} \qquad (2.4)$$

The first measure of volume, $turnover_{it}$, equals fund i's average volume in November and December normalized by the number of shares outstanding. This measure is used to control for volume traded relative to number of shares across funds. The second measure, vol_ratio_{it}, is used to compare the year-end volume relative to the average monthly volume within a fund. In addition to the two year-end volume measures we calculate the following two March volume measures for each fund:

$$Mar\_turnover_{it} = \frac{March\ trading\ volume\ of\ fund\ i\ in\ year\ t}{Number\ of\ shares\ outstanding\ for\ fund\ i\ at\ the\ beginning\ of\ year\ t} \qquad (2.5)$$

$$Mar\_vol\_ratio_{it} = \frac{average\ November\ and\ December\ trading\ volume\ of\ fund\ i\ in\ year\ t}{average\ February\ to\ October\ trading\ volume\ of\ fund\ i\ in\ year\ t} \qquad (2.6)$$

The March volume measures are defined analogously to the year-end volume measures.

The tax-liquidation hypotheses proposes that we should see higher volume in the month of March relative to the other months. As shown in Figure 5, March has the highest monthly volume behind the turn-of-the-year effect months (October-January). This is consistent with the hypothesis of increased selling pressure driving down the returns in March. The March volume ratio[29] shows that on average, the volume in March is 10% greater than the average volume for February through October (12% excluding October). The abnormal monthly volume for March is significant at the 1% level. This was verified with a simple cross sectional regression of monthly volume on a dummy variable for March.[30]

In Table 2.3 the March return is calculated in three separate ways: First for the calendar month, second from March 15th to April 15th, and finally for the seven days following the ex-dividend date to coincide with the theory that an investor should wait as long as possible before liquidating his holdings. The ex-dividend date for the month of April is on average the 13th. It is therefore more likely to see the March effect in the month of March with liquidation occurring subsequent to the March ex-dividend date. The magnitude of the coefficients for *Turnover* and *Volume_Ratio* decrease as expected. However, the test statistics increase dramatically. Moreover, the R^2 statistic increases substantially when the return period is redefined to coincide with optimal liquidation timing. This suggests that a sizeable proportion, 40% (60%) of the abnormal return in late March (the week following the ex-dividend date) is explained by the model.

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29 The March volume ratio is the volume in March divided by the average monthly volume for the months February to October.

30 The months of January, November, and December were not included

Table 2.4 includes the municipal bond yield change calculated as:

$$\frac{Yield_{March} - Yield_{Feb}}{1 + Yield_{Feb}}$$

Table 2.4 shows that the variables for unanticipated liability and capital gains tax rates maintain sign and significance after accounting for the change in yield from the end of February to the end of March. The variable for the yield change, delta, is negative and significant. This is consistent with increases in yield leading to negative capital appreciation.

The tax-liquidation hypothesis further implies that funds that have had positive returns in the previous year should experience significantly less liquidation selling in March. Investors will delay realizing capital gains indefinitely, choosing to first liquidate funds that have performed poorly to take advantage of offsetting capital losses. Table 2.5 presents the regression of March volume on current and previous year's fund returns. It is reasonable to assume that both the current and prior year return will have an effect on which fund an investor chooses to liquidate.

Table 2.5 reports the results for March volume measures regressed on contemporaneous and prior year returns, the capital gains tax rate, and unanticipated liability.[31] In Model I, the coefficients for lagged returns are negative and significant at the 1% level. This reveals a negative relationship between March turnover and past fund returns. Additionally, the coefficient of determination shows that the models explain a non-trivial amount of the March volume. The relationship between a fund's return and its liquidating volume is vital to showing

31 Contemporaneous returns are the returns for January and February of the current year.

that the most likely candidates for liquidation are the poorest performing funds. This is consistent with the optimal tax-timing strategy of Constantinides (1983,1984). The funds that have performed well over the past year will be the least likely to be sold for liquidity reasons, postponing any net capital gains until it is optimal.

March Abnormal Returns, Volume and the Capital Gains Tax Rate

The effective capital gains tax rate on an asset depends on the realization of gains and losses on other assets. Constantinides and Scholes (1984) note that the rules in the tax code regarding capital gains and losses make the optimal liquidation policy nonseparable across different assets. If an investor is able to offset more ordinary income with capital losses taken in municipal bond funds then we would expect to see more tax-liquidation selling in years with higher capital gains tax rates.

The results in Table 2.3 show that the returns in March are negatively related to the capital gains tax rate (significant at the 1% level). This finding is robust to clustering by fund and controlling for prior year's return and year end volume and average year volume measures across funds. The coefficient estimate of -0.05 predicts, at the margin, a unit increase in the natural log of the capital gains tax rate will result in a 5% percent drop in the returns during the month of March. This is economically significant given the historical rate for capital gains tax is between 15-33% with changes of between 8-15%. The results, presented in Table 2.5, for abnormal March volume on the capital gains rate are equally revealing. The findings for March turnover (volume ratios) suggest that there is increased volume relative to shares outstanding (average monthly volume) when the capital gains tax rate is higher. The findings for abnormal volume measures are positive and significant at the 1% level.

March Abnormal Returns, Volume and Unanticipated Liability

The results, reported in Table 2.3, show that March abnormal returns are decreasing in unanticipated liability. This is paramount in proving that the March effect is related to tax liability liquidation. Tax liability on unanticipated gains can be delayed until tax filing which is due April 15 or October 15 (if an extension is filed). Furthermore, the coefficient of *Unanticipated_NCG* (-0.011) suggests that a 100% increase in the population wide NCG predicts negative March returns of more than 4 percentage points. The mean unanticipated liability for the time period in this study was 21 percent. The results found in Table 2.3 are therefore statistically and economically significant. Furthermore, the measure of net capital gains from the Statistics of Income is a crude measure for the most tax sensitive investors who are more likely to hold municipal bonds.

The existence of the March effect is more likely when the capital gains tax rate is higher and when unanticipated liability is higher. This is due to the rules in the tax code that allow for an investor to pay the minimum of 100% of the prior year's tax liability or 90% of the current year's anticipated tax liability. The results, reported in Table 2.6, present the logistic regression of the existence of the March effect on the natural log of the capital gains tax rate and the percentage of capital gains in excess of the prior year's capital gains. The limited dependent variable $March\_Effect_{it}$ takes a value of one if the return in March is negative and zero otherwise. The coefficients and z-statistics from Table 2.6 show that both the capital gains tax rate and unanticipated liability are positive and significant at all conventional levels. The marginal effects are calculated as the partial derivative of the dependent variable with respect to the independent variable. The results from Table 2.6 show that tax-liquidation selling is more likely in years when the capital gains tax rate is high or when there are unanticipated liabilities, all else being equal. The results from the logistic regression are more significant when the average volume measures across funds are used instead of the volume measure of each fund. This indicates that the tax loss selling over all funds has a positive impact on which fund is more likely to be sold in March.

Robustness Checks

The results found in the empirical section are robust to winsorizing the March abnormal returns at the 2.5% level to control for extreme outliers. This is done by replacing all observations that fall outside the interval [2.5, 97.5] equal to the values at those percentiles.

Theoretically the March Effect is primarily caused by the most tax sensitive tax filers. To test this assumption we calculated the percentage of tax paid and capital gains for the top 10% of taxpayers. The IRS keeps track of the number of filers in the top 1%, 5%, 10%, 25%, and 50% brackets. Additionally, the Statistics of Income from the IRS reports the percentage of tax paid by each bracket. From this we have calculated the unanticipated tax liability and estimated capital gains for the top 10% and 1%. The results in this study are strengthened when using these alternative measures. The nature of these funds makes them almost exclusively held by investors in the top marginal tax brackets. We would therefore expect the unanticipated liability of the top 1% to be more strongly related to the March effect than the tax liability of the top 10%. The regression reporting the alternative measures for the top 1% and 10% are reported in Table 2.10. Additionally, because the top 10% of earners are most likely subject to paying 110% percent of Safe Harbor as opposed to only 100% we have included a second model to test the unanticipated liability in excess of 110%. This is also included in Table 2.10. The results of this study maintain significance levels well above 1% when using either alternative specification.

Additionally, the results are unchanged when using monthly returns including or excluding dividends. There is no statistical evidence that there is a clustering of dividends in March or that the dividends paid in March are greater than any other month. There is some evidence that the dividends paid in October exceed the dividends in other months on average. This is consistent with the Mutual fund year end occurring on October 31st. Additionally, the persistent negative return in October can be partially explained as a market wide underperformance that may be related to mutual fund year-end window dressing.

The results in this study are robust to accounting for the Orange County default in 1994. Additionally the results are robust to including dummy variables for the years in which there are clear outliers, 1994, 2002, and 2005. These results are presented in Table 2.11.

The market microstructure literature has shown that expected returns are increasing in illiquidity. Downing and Zhang (2004), Harris and Piwowar (2006) and Green, Hollifield, and Schurhoff (2007) have all cited that there is substantial illiquidity in the municipal bond market. Some of this could be transferred to the trading costs of closed-end municipal bond funds. The hypothesized relationship between illiquidity and return (volume) is positive (negative). We include as an explanatory variable the Amihud (2002) proxy for illiquidity.[32] Including illiquidity as an explanatory variable in the return regression has virtually zero effect. The coefficient on the proxy for illiquidity is not significant at conventional levels. The coefficients and t-statistics for the previously included variables remain virtually unchanged. The proxy variable for illiquidity when included as an explanatory variable in the regression for turnover (volume ratio) has a coefficient of -0.243 (-0.031) and a t-statistic of -3.90 (-2.06) which is significant at the 1% (5%) level. The results show that there is no detectable significance in March abnormal returns related to liquidity, but there is significantly less March turnover and volume in the more illiquid funds. The interpretation is that investors either choose not to use illiquid funds as ”cash” accounts for tax purposes or liquidate less in funds that are less liquid.

32 Calculated as the absolute daily return divided by the daily dollar volume and averaged over the year. The variable included in the regression is the natural log of the lagged liquidity variable.

The results found in this study are robust to including measures of market performance. The coefficient for market performance, using either a value weighted return of the CRSP index or the S&P 500 is positive and significant. This has two interpretations. First, when the market is doing well investors are less willing to hold bonds in favor of higher market returns. The second interpretation, consistent with prospect theory and the disposition effect, is that investors are more willing to sell off assets with gains, those in the broad market, and therefore less likely to liquidate municipal bond holdings.

The results in this study withstand the inclusion of the capital appreciation return for long-term government bonds. This suggests that while municipal bonds and United States government bonds have a high degree of correlation there is additional movement that can be explained by the variables of interest presented in this study[33].

Conclusion

This study proposes a previously undocumented March effect in municipal bond closed-end funds. The results from this study show that the magnitude of the March effect is greater i.e. March returns are more negative when the capital gains tax rate is higher and when there are unanticipated net capital gains. The negative returns seen in March are mitigated by increased tax-loss selling around the turn-of-the-year. The more an investor is able to offset his gains by

33 A table providing this finding can be provided upon request.

taking capital losses in November and December the less his total tax liability due in March and therefore he requires less liquidity selling. The coefficients of determination suggest that a significant proportion of the abnormal March return is caused by year-end trading (or lack thereof). This is consistent with intuition.

The behavior of liquidating a tax-holding account is consistent with profit maximizing behavior and may provide some evidence of mental accounting. An extension of the current work will be to see if the March effect exists for other securities. The absence of a March effect in other similar sized and similar performing securities would be strong evidence that investors separate accounts mentally for different purposes.

Individual investors will hold ”cash” accounts that are consistent with their preferences for risk and return. The ”cash” account may be different across individuals but the trading pattern and hypotheses regarding the liquidation of these accounts for tax reasons should be consistent with the findings of this study.

Tables and Figures

Table 2.1 Descriptive Statistics of Fund Size by Year

Year	5%	25%	Median	75%	95%	Mean
1987	$68,266	$180,000	$251,875	$313,875	$1,481,359	$410,964
1988	$50,000	$94,433	$240,833	$444,375	$1,406,353	$351,008
1989	$34,781	$101,250	$211,606	$395,109	$737,603	$299,479
1990	$33,745	$105,830	$185,084	$409,034	$740,759	$294,847
1991	$42,412	$119,170	$203,199	$422,018	$818,751	$311,860
1992	$46,468	$108,609	$188,891	$338,700	$810,294	$279,736
1993	$39,161	$79,512	$141,678	$285,229	$700,638	$234,365
1994	$29,294	$65,327	$128,305	$246,498	$610,256	$203,789
1995	$26,819	$73,650	$149,245	$265,332	$610,301	$215,759
1996	$32,228	$80,790	$160,369	$281,232	$632,618	$229,490
1997	$34,554	$85,121	$164,304	$288,585	$657,765	$239,926
1998	$37,537	$94,246	$168,768	$300,165	$688,365	$248,664
1999	$34,217	$86,765	$160,008	$269,902	$615,480	$224,753
2000	$29,859	$82,095	$147,874	$246,948	$543,165	$204,512
2001	$33,443	$93,627	$171,670	$275,945	$610,246	$234,330
2002	$35,032	$99,979	$176,518	$302,655	$628,480	$248,285
2003	$34,336	$113,535	$182,016	$307,937	$642,584	$254,163
2004	$34,436	$111,322	$181,125	$306,275	$638,152	$252,013
2005	$38,425	$117,276	$185,543	$316,315	$658,978	$658,978
2006	$39,038	$121,109	$186,940	$327,352	$684,099	$264,883
2007	$40,272	$121,257	$186,687	$313,058	$691,640	$260,130
2008	$37,777	$105,118	$164,066	$281,065	$597,404	$230,771
2009	$31,790	$106,078	$164,320	$278,439	$608,199	$237,400

This table shows the descriptive statistics of market cap for end funds that exist in a given year for which data was available. There are 168 funds and 22 years of data available. Dollar amounts are in 1,000's

Table 2.2 - Panel Regression of Monthly Returns on Dummy Variables

Monthly Return	= 0.001*(Intercept)* -	0.016(*March)*	
	(0.50)***	(-2.64)***	$R^2_{adjusted} = 0.01$
Monthly Return	= -0.001*(Intercept)* –	0.013(*March)*	
	(-0.40)	(-2.19) ***	$R^2_{adjusted} = 0.01$

* indicates statistically significant at the 10% level.

**indicates statistically significant at the 5% level.
*** indicates statistically significant at the 1% level.

This table presents two regressions of monthly returns. Model (1) presents the regression of monthly returns on a dummy variable for the month of March. Model (2) is similar to the previous model except it drops the month of January. There are 168 funds and 22 years of data. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for contemporaneous correlation, autocorrelation, and heteroskedasticity (*t*-statistics in parentheses).

Table 2.3 Panel Regression of March Returns on Volume Measures, Net Capital Gains Rate, and Unanticipated Gains

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	
Coefficient Estimates (t-statistics in parentheses)			
$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_liability_{t-1} + \mu_{it}$			
Panel A1: March Monthly Returns Adjusted for Previous Feb, Apr-Dec Returns on Previous Year's Volume Measures, March Volume Measure, Capital Gains Rate, and Unanticipated liability			
Year-End Turnover	0.011	Year-End Volume Ratio	0.006
	(3.40)***		(4.78)***
Average Year-End Turnover	0.103	Average Year-End Volume Ratio	0.023
	(19.74)***		(14.25)***
Capital Gain Rate	-0.065	Capital Gain Rate	-0.046
	(-23.80)***		(-19.49)***
Unanticipated liability	-0.044	Unanticipated liability	-0.043
	(-12.89)***		(-12.05)***
Intercept	0.09	Intercept	0.065
R^2	0.35	R^2	0.36

Panel B: March 15th to April 15th Returns Adjusted for Previous Feb, Apr-Dec Returns on Previous Year's Volume Measures, Capital Gains Rate, and Unanticipated liability

Year-End Turnover	0.001	Year-End Volume Ratio	0.008
	(1.43)		(5.71)***
Average Year-End Turnover	0.020	Average Year-End Volume Ratio	0.023
	(16.46)***		(113.04)***
Capital Gain Rate	-0.013	Capital Gain Rate	-0.042
	(-4.72)***		(-16.36)***
Unanticipated liability	-0.019	Unanticipated liability	-0.034
	(-4.64)***		(-8.96)***
Intercept	0.105	Intercept	0.075
R^2	0.29	R^2	0.33

Table 2.3 Panel Regression of March Returns on Volume Measures, Net Capital Gains Rate, and Unanticipated Gains

Panel C: Seven day return following March ex-dividend date, adjusted for Previous Feb, Apr-Dec Returns on Previous Year's Volume Measures, Capital Gains Rate, and Unanticipated liability

Year-End Turnover	0.001	Year-End Volume Ratio	0.005
	(7.54)***		(13.79)***
Average Year-End Turnover	0.013	Average Year-End Volume Ratio	0.013
	(40.38)***		(27.58)***
Capital Gain Rate	-0.017	Capital Gain Rate	-0.009
	(-21.86)***		(-13.57)***
Unanticipated liability	-0.003	Unanticipated liability	-0.000
	(-84.28)***		(-0.35)
Intercept	0.021	Intercept	-0.002
R^2	0.51	R^2	0.53

* indicates statistically significant at the 10% level.

**indicates statistically significant at the 5% level.

***indicates statistically significant at the 1% level.

This table shows the coefficients from regression of March returns, adjusted by the previous February through December (excluding March) average returns, on volume measures for year-end trading, contemporaneous March volume, the capital gains tax rate, and unanticipated liability. Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. In Panel A the return is calculated using all trading days in March. In Panel B the return is calculated using only the last fifteen trading days of March and the first fifteen of April. In Panel C the return is calculated for the week following the ex-dividend date for the fund. There are 168 groups and 22 years of data. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity

Table 2.4 - Panel Regression of March Returns on Volume Measures, Net Capital Gains Rate, and Unanticipated Gains

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	
Coefficient Estimates (*t*-statistics in parentheses)			
$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_liability_{t-1} + \mu_{it}$			
Panel A1: March Monthly Returns Adjusted for Previous Feb, Apr-Dec Returns on Previous Year's Volume Measures, March Volume Measure, Capital Gains Rate, and Unanticipated liability			
Year-End Turnover	0.012	Year-End Volume Ratio	0.006
	(2.56)***		(4.87)***
Average Year-End Turnover	0.055	Average Year-End Volume Ratio	0.012
	(8.85)***		(6.69)***
Capital Gain Rate	-0.001	Capital Gain Rate	-0.001
	(-5.57)***		(-5.58)***
Unanticipated liability	-0.012	Unanticipated liability	-0.014
	(-6.28)***		(-5.58)***
March Muni Yield Δ	-9.22	March Muni Yield Δ	-9.01
	(-22.69)		(-20.97)
Intercept	-0.016	Intercept	-0.017
R^2	0.41	R^2	0.40

This table shows the coefficients from regression of March returns, adjusted by the previous February through December (excluding March) average returns, on volume measures for year-end trading, contemporaneous March volume, the capital gains tax rate, and unanticipated liability. Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. In Panel A the return is calculated using all trading days in March. In Panel B the return is calculated using only the last fifteen trading days of March and the first fifteen of April. In Panel C the return is calculated for the week following the ex-dividend date for the fund. There are 168 groups and 22 years of data. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

Table 2.5 - Panel Regression of March Volume Measures on Current Year and Previous Year's Returns, Net Capital Gains Rate, and Unanticipated Gains

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	

Coefficient Estimates (t-statistics in parentheses)

$$volume\_measure_{it} = \alpha_{0t} + \alpha_{1t} return^{c}_{it} + \alpha_{2t} return^{p}_{it} + \alpha_3 capital\_gains\_rate_t + \alpha_4 unanticipated\_capital\_gains_t + \mu_{it}$$

Panel A: March monthly volume adjusted for share outstanding or average monthly volume on Current and Previous Year's returns, Capital Gains Rate, and Unanticipated liability

Return^P	-0.213	Return^P	-0.365
	(-9.29)***		(-7.51)***
Return^C	-0.288	Return^C	-0.785
	(-4.24)		(-5.45)
Capital Gain Rate	.001	Capital Gain Rate	0.008
	(2.34)**		(6.30)***
Unanticipated liability	0.047	Unanticipated liability	0.079
	(4.17)***		(3.30)***
Intercept	0.25	Intercept	0.668
R^2	0.06	R^2	0.04

Panel B: March 15th to April 15th average daily volume adjusted for share outstanding or average monthly volume on Current and Previous Year's returns, Capital Gains Rate, and Unanticipated liability

Return^c	0.207	Return^c	0.202
	(2.21)**		(4.18)***
Return^p	-0.288	Return^p	0.009
	(-3.23)***		(0.21)
Capital Gain Rate	0.038	Capital Gain Rate	-0.074
	(0.83))		(-3.13)***
Unanticipated liability	0.126	Unanticipated liability	0.05
	(3.35)***		(2.56)***
Intercept	1.04	Intercept	1.20
R^2	0.26	R^2	0.09

* indicates statistically significant at the 10% level.
**indicates statistically significant at the 5% level.
***indicates statistically significant at the 1% level.

Table 2.5 - Panel Regression of March Volume Measures on Current Year and Previous Year's Returns, Net Capital Gains Rate, and Unanticipated Gains

This table shows the coefficients from regression of March volume measure, against contemporaneous and previous year's returns, the capital gains tax rate, and unanticipated liability. $Return^c$ denotes the current year's return through February and $Return^p$ denotes the prior year's return of the fund. Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. In Panel A the volume is calculated using all trading days in March. In Panel B the volume is calculated as the average daily volume of the last fifteen trading days of March and the first fifteen of April. There are 168 groups and 22 years of data. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

Table 2.6 Logistic Regression of March Returns on Volume Measures, Net Capital Gains Rate, and Unanticipated Gains

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	
Coefficient Estimates (z-statistics in parentheses)			
$March\_Effect_{it} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_t + \alpha_4 unanticipated\_capital\_gains_t + \mu_{it}$			
March Effect on Previous Year's Volume Measures			
Year-End Turnover	-1.07	Year-End Volume Ratio	-0.56
	(4.60)***		(-7.54)***
March Turnover	1.23	March Volume Ratio	0.25
	(2.66)***		(2.08)**
Capital Gain Rate	2.24	Capital Gain Rate	2.47
	(10.27)***		(11.05)***
Unanticipated Liability	1.04	Unanticipated Liability	1.08
	(6.18)***		(6.35)***
Marginal Effects			
Year-End Turnover	-0.25	Year-End Volume Ratio	-0.13
March Turnover	0.29	March Volume Ratio	0.06
Capital Gain Rate	0.53	Capital Gain Rate	0.58
Unanticipated Liability	0.25	Unanticipated Liability	0.25

* indicates statistically significant at the 10% level.
**indicates statistically significant at the 5% level.
***indicates statistically significant at the 1% level.

This table presents the logistic regression estimates and marginal effects of the existence of the *March_Effect* on capital gains tax rates and unexpected liability. The dependent variable *March_Effect* takes a value of one if March returns are negative, and zero otherwise. The independent variable *ln_NCG_Tax_Rate* is the natural log of the contemporaneous capital gains tax rate; *Unanticipated_NCG* is the current year's capital gain as a percentage of the previous year's capital gains. There are 168 funds and 22 years of data.

Table 2.7 - Panel Regression of March Returns on Volume Measures for funds with CRSP Share code 14,44

Model (1): Turnover Coefficients — Model (2): Vol_ratio Coefficients

Coefficient Estimates (*t*-statistics in parentheses)

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_capital\_gains_{t-1} + CRSP_{t-1} + \mu_i$$

Municipals with CRSP Share Code 14,44	Model(1)	Model(2)	Non-Municipals with CRSP Share Code 14,44	Model(1)	Model(2)
Year-End Turnover	0.049	0.012	Year-End Volume Ratio	-0.008	0.001
	(18.64)***	(10.36)***		(-3.63)***	(0.53)
Average Year-End Turnover	0.001	0.039	Average Year-End Volume Ratio	-0.001	0.014
	(7.08)***	(14.00)***		(-2.12)**	(4.04)***
Capital Gain Rate	-0.002	-0.003	Capital Gain Rate	-0.001	-0.002
	(-8.99)***	(-17.56)***		(-6.15)	(-7.50)***
Unanticipated liability	-0.010	-0.018	Unanticipated liability	-0.075	-0.081
	(-3.82)***	(-7.22)***		(-16.50)***	(-17.87)
CRSP Value Weighted Return	-.174	0.032	CRSP Value Weighted Return	0.083	0.033
	(-8.81)	(1.65)*		(2.82)***	(5.26)
Intercept	-0.029	-0.069	Intercept	.029	-.018
R^2	0.34	0.37	R^2	0.11	0.09

This table shows the coefficients from regression of March returns, adjusted by the previous February through December average returns, on volume measures for year-end trading, the capital gains tax rate, and unanticipated liability and the CRSP value weighted return . Panel (1) is for municipal funds; Panel (2) is for non-municipal funds. Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. All t-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

Table 2.8 - Panel Regression of March Returns on Volume Measures Controlling for LTGB Capital Appreciation

Coefficient Estimates (*t*-statistics in parentheses)

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_capital\_gains_{t-1} + CRSP_{t-1} + LTGB_t + \mu_i$$

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	
Year-End Turnover	0.019	Year-End Turnover	0.007
	(3.95)***		(5.97)***
Average Year-End Turnover	0.025	Average Year-End Turnover	0.004
	(3.59)***		(2.14)**
Capital Gain Rate	-0.001	Capital Gain Rate	-0.001
	(-5.83)***		(-5.25)***
Unanticipated liability	-0.034	Unanticipated liability	-0.032
	(-15.10)***		(-13.83)***
CRSP Value Weighted Return	-0.039	CRSP Value Weighted Return	-0.048
	(-2.79)***		(-3.39)**
LTGB	0.805	LTGB	0.786
	(23.87)***		(22.92)***
Intercept	0.003	Intercept	
R^2	0.35	R^2	0.36

This table shows the coefficients from regression of March returns, adjusted by the previous February through December average returns, on volume measures for year-end trading, the capital gains tax rate, and unanticipated liability, the CRSP value weighted return, LTGB is the capital appreciation return for Long Term Government Bonds . Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

Table 2.9 - Panel Regression of March Returns on Unanticipated Tax Liability, Controlling for LTGB Capital Appreciation Accounting for cluster by year

Coefficient Estimates (*t*-statistics in parentheses)

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_capital\_gains_{t-1} + CRSP_{t-1} + LTGB_t + \mu_i$$

Model (1): Turnover Coefficients		Model (2): Vol_ratio Coefficients	
Year-End Turnover	0.019	Year-End Turnover	0.007
	(2.75)***		(3.93)***
Average Year-End Turnover	0.025	Average Year-End Turnover	0.004
	(0.93)		(0.56)
Capital Gain Rate	-0.001	Capital Gain Rate	-0.001
	(-1.20)		(-1.11)
Unanticipated liability	-0.034	Unanticipated liability	-0.032
	(-2.04)*		(-1.91)*
CRSP Value Weighted Return	-0.039	CRSP Value Weighted Return	-0.048
	(-0.45)		(-0.55)**
LTGB	0.805	LTGB	0.786
	(3.31)***		(3.21)***
Intercept	0.003	Intercept	
R^2	0.35	R^2	.36

This table shows the coefficients from regression of March returns, adjusted by the previous February through December average returns, on volume measures for year-end trading, the capital gains tax rate, and unanticipated liability, the CRSP value weighted return, LTGB is the capital appreciation return for Long Term Government Bonds . Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for contemporaneous correlation, autocorrelation, and heteroskedasticity. This regression accounts for clustering by year.

Table 2.10 - Panel Regression of March Returns on Unanticipated Tax Liability by Top 1% and 10% of Population

Model (1): 100% Safe Harbor — Model (2): 110% Safe Harbor

Coefficient Estimates (*t*-statistics in parentheses)

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_{t-1} + \alpha_4 unanticipated\_capital\_gains_{t-1} + CRSP_{t-1} + \mu_i$$

Top 1% of Population / Top 10% of Population

	Model(1)	Model(2)		Model(1)	Model(2)
Year-End Turnover	0.019	0.019	Year-End Volume Ratio	0.019	0.019
	(4.20)***	(4.10)***		(4.25)***	(4.17)***
Average Year-End Turnover	0.061	0.045	Average Year-End Volume Ratio	0.062	0.047
	(8.95)***	(6.74)***		(9.11)***	(7.07)***
Capital Gain Rate	-0.001	-0.001	Capital Gain Rate	-0.001	-0.001
	(-8.46)***	(-6.06)***		(-7.63)***	(-6.10)***
Unanticipated liability	-0.058	-0.026	Unanticipated liability	-0.061	-0.025
	(-14.06)***	(-10.53)***		(-10.23)***	(-7.63)***
CRSP Value Weighted Return	-0.008	-0.013	CRSP Value Weighted Return	0.009	0.007
	(-0.63)	(-0.92)		(0.64)	(0.47)
LTGB	0.561	0.664	LTGB	0.565	0.629
	(17.38)***	(20.79)***		(17.57)***	(19.80)***
Intercept	-0.000	-0.010	Intercept	-0.005	-0.011
R^2	0.35	0.33	R^2	0.33	0.32

This table shows the coefficients from regression of March returns, adjusted by the previous February through December average returns, on volume measures for year-end trading, the capital gains tax rate, and unanticipated liability and the CRSP value weighted return . LTGB is the capital appreciation return for Long Term Government Bonds. Model (1) measures Safe Harbor as 100% of prior year liability; Model (2) measures Safe Harbor as 110% of prior year liability. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

Table 2.11 - Panel Regression of March Returns on Volume Measures, Net Capital Gains Rate, and Unanticipated Gains accounting for the Orange County Default in 1994

Model (1): Turnover Coefficients — Model (2): Vol_ratio Coefficients

Coefficient Estimates (*t*-statistics in parentheses)

$$March\_Return_{it} - ret_{it-1}^{2;4-12} = \alpha_0 + \alpha_1 year\_end\_volume\_measure_{it-1} + \alpha_2 Average\_year\_end\_volume_{it-1} + \alpha_3 capital\_gains\_rate_t + \alpha_4 unanticipated\_capital\_gains_t + year\_Dummy + \mu_i$$

Panel A1: March Monthly Returns Adjusted for Previous Feb, Apr-Dec Returns on Previous Year's Volume Measures, March Volume Measure, Capital Gains Rate, and Unanticipated liability and 1994-Dummy

Year-End Turnover	0.01	0.01	Year-End Volume Ratio	0.007	0.008
	(3.47)***	(3.76)***		(5.78)***	(6.61)***
Average Year-End Turnover	0.08	0.07	Average Year-End Volume Ratio	0.02	0.015
	(16.30)***	(15.36)***		(11.30)***	(9.99)***
Capital Gain Rate	-0.03	-0.04	Capital Gain Rate	-0.025	-0.031
	(-10.57)***	(13.55)***		(-8.72)***	(-11.71)***
Unanticipated liability	-0.008	-0.03	Unanticipated liability	-0.005	-0.029
	(-3.87)***	(-10.22)***		(-2.20)**	(-10.29)***
1994-Dummy	-0.04	-0.04	1994-Dummy	-0.04	-0.04
	(-14.21)	(-17.47)***		(-14.18)***	(-17.29)***
2002-Dummy		-0.05	2002-Dummy		-0.05
		(-17.33)***			(-18.64)***
2005-Dummy		-0.03	2005-Dummy		-0.02
		(-10.52)***			(-9.15)***
Intercept	-0.017	0.08	Intercept	-0.28	0.05
R^2	0.36	0.51	R^2	0.38	0.53

This table shows the coefficients from regression of March returns, adjusted by the previous February through December average returns, on volume measures for year-end trading, contemporaneous March volume, the capital gains tax rate, and unanticipated liability. Model (1) measures volume by turnover and Model (2) measures volume by the volume ratio. The variable *1994-Dummy* takes a value of one if the year is 1994 and zero otherwise. There are 168 groups and 22 years of data. All *t*-statistics are based on the panel corrected standard errors (PCSEs), which adjust for autocorrelation, and heteroskedasticity.

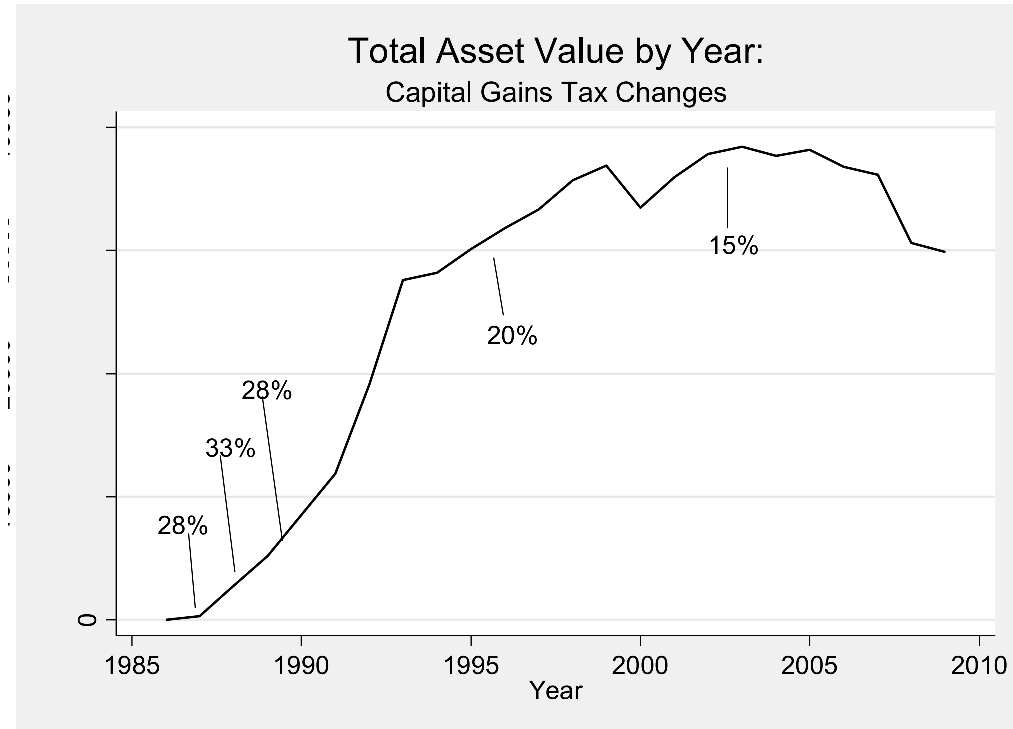

Figure 2.1 - Total asset value of muni bond closed-end funds by year.

The figure shows the cummulative value of all existing municipal bond closed-end funds in the sample with data available during the 1987-2009 time period. The percentages depict the top marginal tax rate for capital gains. Prior to 1997 capital gains were taxed as ordinary income.

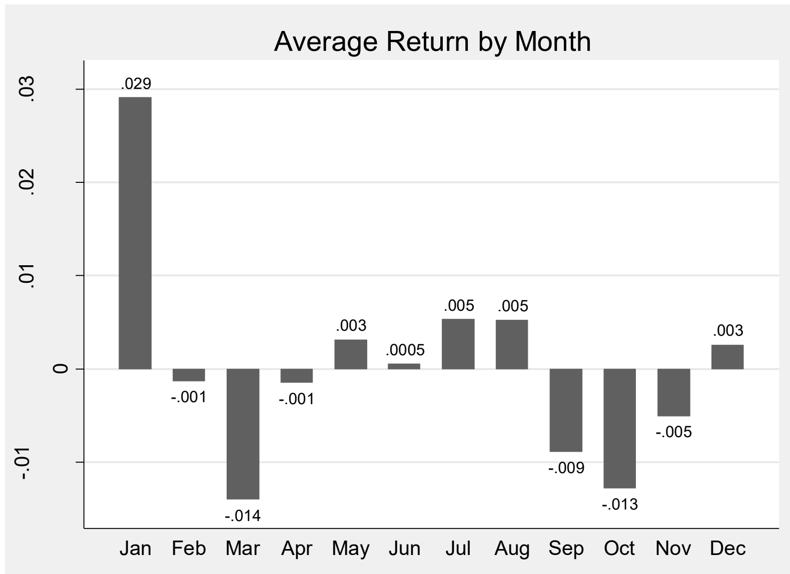

Figure 2.2 - Average monthly return of the municipal bond funds
The figure shows the average return excluding dividends across all municipal bond closed-end funds with data available for each month during the 1990-2009 time period.

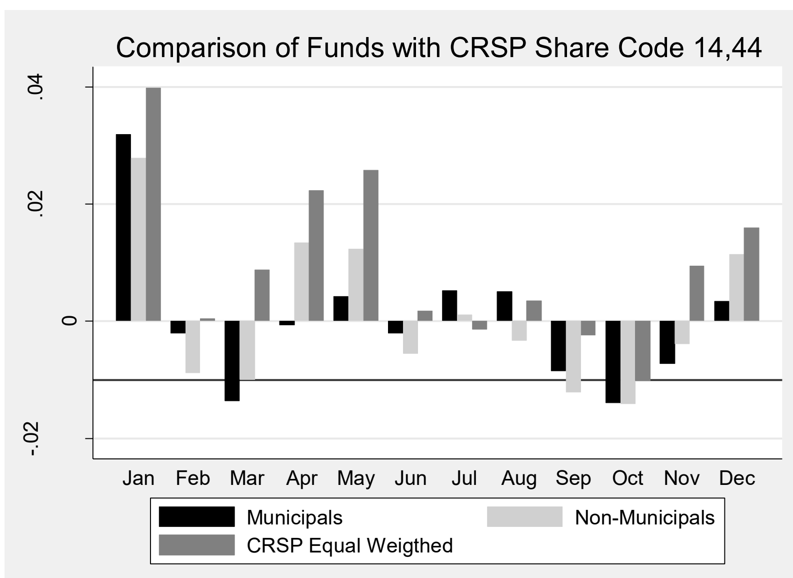

Figure 2.3 - Average monthly return of the municipal bond funds, non-municipal funds, and the CRSP Equal weighted return
This figure shows the average return across all municipal bond and non-municipal closed-end funds with data available for each month during the 1990-2009 time period.

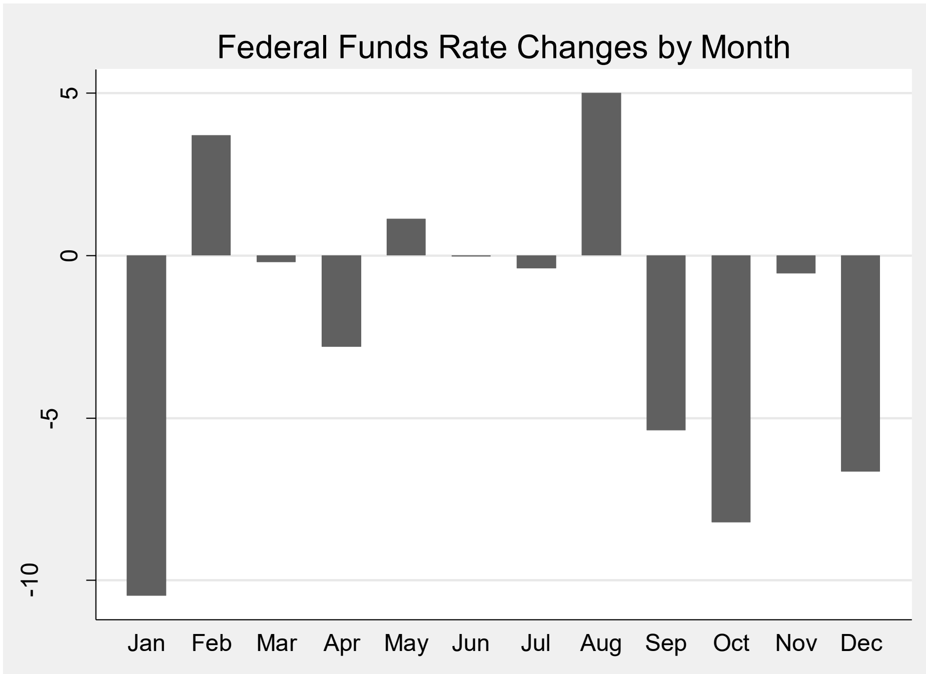

Figure 2.4 - Average Federal Funds Rate Adjustment by Month.
The figure shows the average monthly for the Federal Funds rate. The years available limit the period for this figure from 1990-2008.

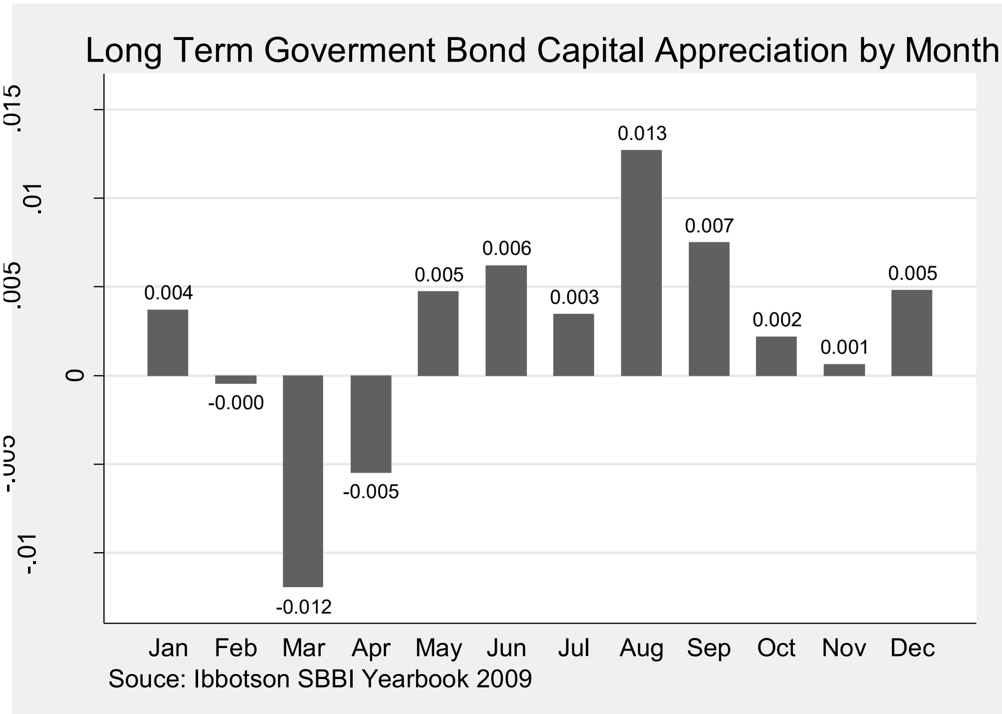

Figure 2.5 - Long Term Government Bond Capital Appreciation by Month

The figure below depicts the average monthly return for a single bond portfolio with a term of 20 years and a reasonably current coupon[34].

34 Paraphrased from the Ibbotson SBBI 2009 Yearbook.

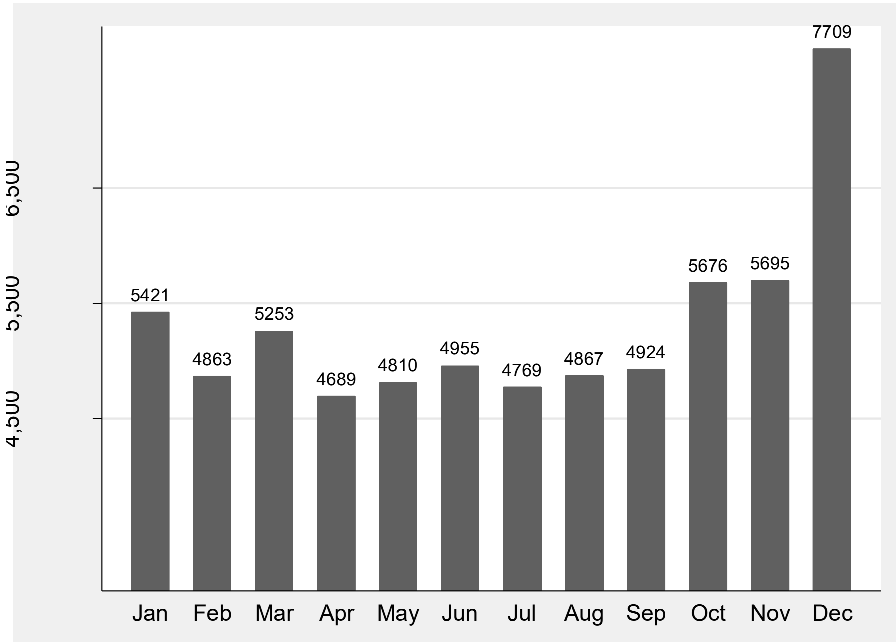

Figure 2.6 - Average monthly volume of the municipal bond fund for the 12 calendar months

The figure shows the average volume across all municipal bond closed-end funds with data available for each month during the 1990-2009 time period.

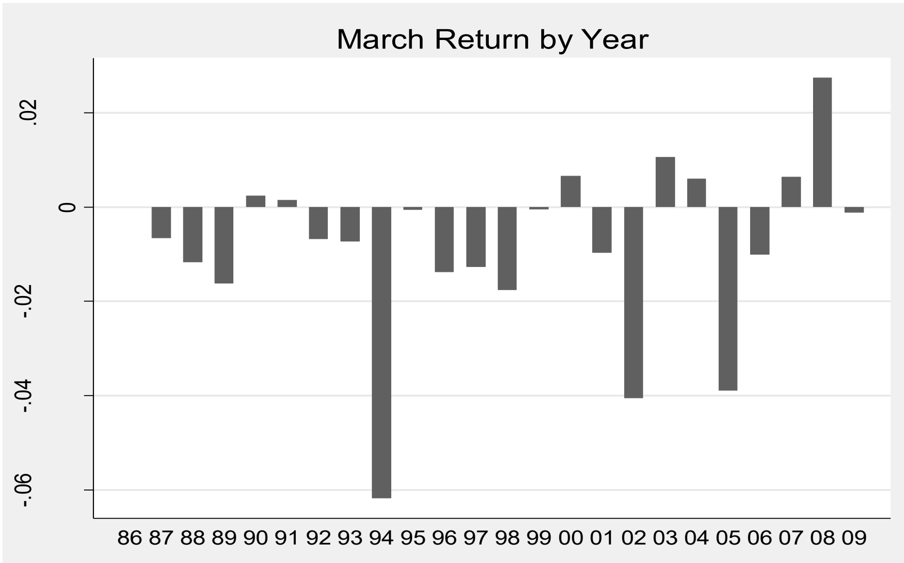

Figure 2.7 Mean March Return by Year

Figure 9 - presents the average return excluding dividends for all funds in the sample for the time period of 1990-2009.

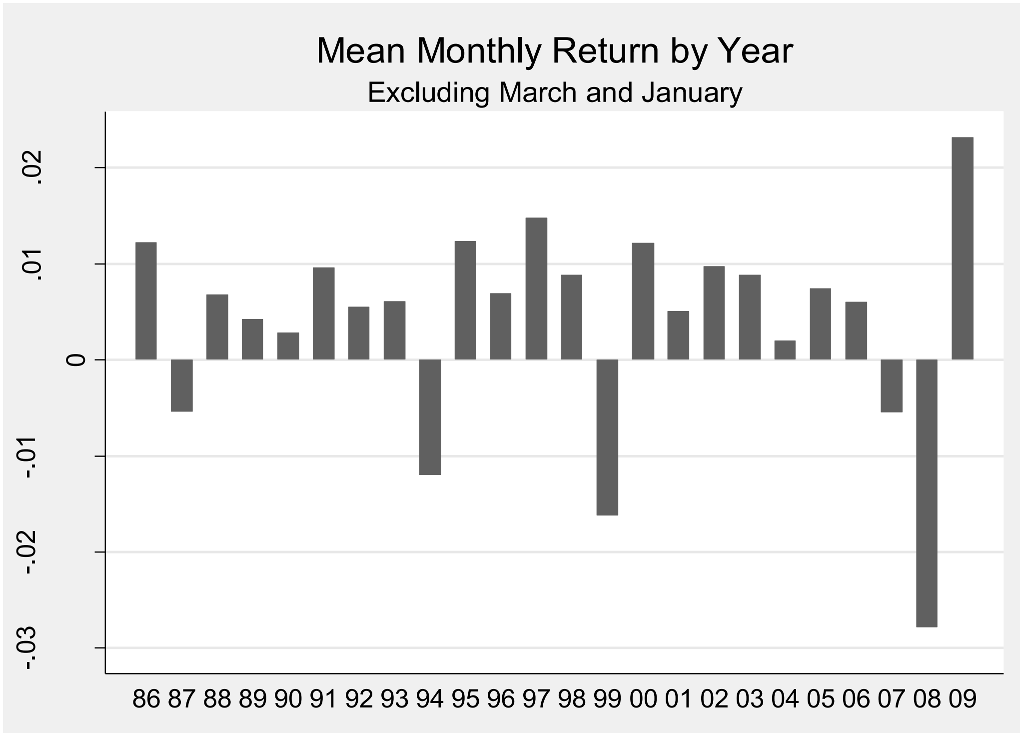

Figure 2.8 - Average Return by Year

Figure 2-8 presents the average return excluding dividends for all funds in the sample for the time period of 1990-2009 excluding the months of January and March.

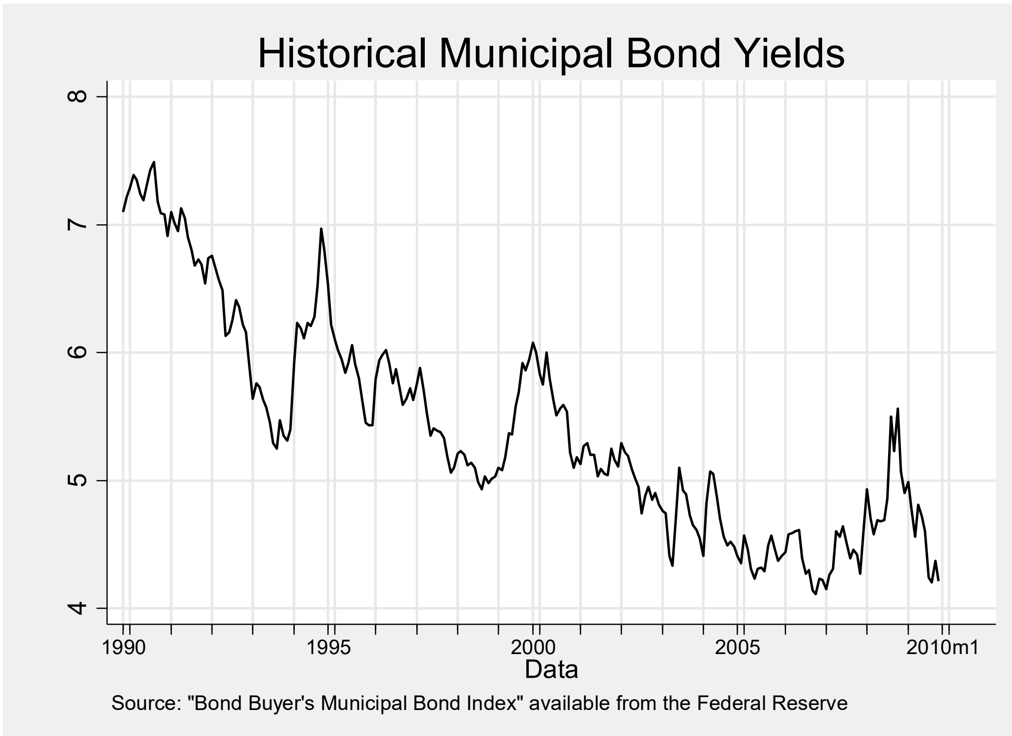

Figure 2.9 - The Bond Buyer GO 20-Bond Municipal Bond Index

An index published by *The Bond Buyer,* a daily finance newspaper that covers the municipal bond market. Investors use the Bond Buyer Index to plot interest rate patterns in the municipal market. Major ticks indicate 5-year periods; minor ticks indicate the month of March in each year.

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CHAPTER 3: TAX EFFECTS OR SHORT-TERM TRADING: EVIDENCE FROM MUNICIPAL BOND CLOSED-END FUNDS

Introduction

This study is the first, to my knowledge, to use distributions within the same asset that vary only by their tax status, in addition to being the first to test for indications of short-term trading within closed-end funds.[35] The uniqueness of the sample allows for tests of previously unexamined relationships between short-term trading and transaction costs as well as taxability.

Since the seminal paper by Elton and Gruber (1970) there has been an abundance of articles either aimed at confirming or disproving their interpretation of the relationship between ex-dividend day price behavior, dividend yields, and the implied marginal tax rates. The consensus in the literature is that shares on the ex-dividend day exhibit a pattern of falling in price by slightly less than the dividend amount; the cause however, is heavily debated.[36] Elton and Gruber (1970) were among the earliest authors to assert that ex-dividend day price behavior reflected the marginal tax rate of the firm's investors in what has become known as the *tax penalty hypothesis*. Investors are concerned primarily about maximizing their after tax wealth, and since dividends are taxed at a higher rate than capital gains for most individuals, they will tend to gravitate towards companies that have payout and reinvestment plans that coincide with their

35 Eades et al. (1984) compare ex-dividend day behavior of common stock versus preferred shares.
36 There are several exceptions to the rule of price-drop to dividend ratios less than one. These will be further expounded upon in the literature review section of this study.

maximization goals. Individuals in the highest tax brackets will be drawn to lower yielding stocks, while investors with low marginal tax rates will prefer higher yielding stocks.

The second widely accepted explanation for ex-dividend day behavior, the *short-term trader hypothesis*, is that tax neutral short-term traders drive ex-day prices instead of long-term investors. These traders do not have differential tax rates for dividends and capital gains (in some cases, corporations actually have a lower effective rate on dividends) and are attracted to stocks going ex-dividend because of the abnormal returns on the ex-day. The *short-term trader hypothesis* proposes that ex-dividend day price behavior may be, at least partially, driven by traders who correct mispricing up to a point that reflects their marginal costs. This study provides support that the tax penalty and short-term trader hypothesis are not mutually exclusive, and therefore it is not possible to infer marginal tax brackets from ex-dividend day behavior. I reexamine many of the existing hypotheses regarding the relationship between ex-day abnormal returns, volume, and evidence of short-term trading. Persuasive evidence that short-term trading drives the ex-day anomaly is highlighted by the fact that these funds are known to be held primarily by tax sensitive individual investors.[37]

Confirmation of trading *because* of a dividend, as opposed to timing a dividend, is evidence that short-term traders are most likely the marginal investors around the ex-dividend day. This has potential ramifications for the theory that companies can infer their clientele from ex-day price behavior and tailor their investment strategies accordingly. This study provides evidence

37 The National Association of U.S. Investment Companies cites that "retail" investors hold approximately 71% of municipal bonds. Approximately 35% of municipal bonds are held directly and 36% indirectly through mutual funds, closed-end funds or elsewhere.

showing that the behavior of short-term traders depends critically on their expectations regarding the magnitude of the cum-ex price change relative to the dividend.

The theoretical price-drop relative to the dividend of municipal bond closed-end funds around their ex-dividend days suggests that the proposed behavior of short-term traders is exactly the opposite of what it would be under the assumption of differential tax rates. This leads to a stylized trading strategy and one that is identifiable and not easily refutable. Specifically I show that when the price-drop to dividend ratio exceeds one, all of the previously proposed relationships between trading costs, dividend yields, and abnormal returns must be reevaluated or inverted.

The rest of this study is organized as follows: Section II reviews the literature. Section III presents the hypotheses. Section IV discusses the data sample and the methodology. The empirical results are presented in Section V. Section VI concludes.

Literature Review

With the exception of the period following the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JAGTRRA), the marginal tax rate on dividends has almost always exceeded the effective tax rate on capital gains. The differential tax rates gives rise to a fundamental question in financial literature: Does it matter if a firm retains earnings or distributes them as dividends? The cost of retained earnings is a function of the marginal stockholder's tax bracket, which Elton and

Gruber (1970) claim can be inferred from the ex-dividend price behavior of the company's common stock. For consistency with the extant literature in describing share prices and tax rates let,

1. P_c *be the cost of a share,*
2. P_b *be the price of a share the day before the stock goes ex-dividend,*
3. P_a *be the price of the stock the day the stock goes ex-dividend,*
4. t_g *be the capital gains tax rate,*
5. t_d *be the tax rate on ordinary income,*
6. t_0 *be the 0% tax rate on municipal bond distributions,*
7. $\frac{P_b - P_a}{D}$ *be the raw price ratio (E&G measure),*
8. $\frac{P_b(1+R_M) - P_a}{D}$ *be the market-adjusted price ratio.*

The long-term investor is indifferent as to timing a sale (purchase) if the after tax wealth is equivalent, that is,

$$P_b - t_g \; P_b - P_c \; = P_a - t_g \; P_a - P_c \; + D \; 1 - t_d \qquad (3.1)$$

In the above equation the investor is indifferent between selling a share cum-dividend for the higher price P_b and paying capital gains on $P_b - P_c$ and selling at the lower price P_a paying less in capital gains and receiving the dividend which is taxed at the higher ordinary income rate.

When dividend distributions are taxed at a higher rate than capital gains, $t_d > t_g$, we should observe a drop in price that is slightly less than the dividend. Most investors have a preference for capital gains income and will accept slightly less in dollar terms because the effective tax rate is substantially lower. Formally the E&G measure of cum-ex price change is written,

$$\frac{\Delta P}{D} = \frac{P_b - P_a}{D} = \frac{1-t_d}{1-t_g}$$

Elton and Gruber (1970) show that the price-drop to dividend ratio is almost monotonically increasing in the dividend yield; they surmise that this is evidence of tax clienteles, and that from the price-drop ratio they are able to calculate implied marginal tax rates.[38] Consistent with their hypothesis they find the behavior of low yielding stocks implies the marginal investors are in high tax brackets while investors in low tax brackets hold high-yielding stocks. This was interpreted as strong evidence of dividend aversion.

In a 2005 paper, Elton, Gruber, and Blake show that ex-dividend effects exist in nontaxable closed-end funds and that the drop in share price exceeds the tax-free dividend. This is consistent with the theory of tax effects being responsible for the observed ex-dividend price behavior. They show that in the absence of differential tax rates, when dividends are subject to a zero marginal tax rate,

$$\frac{Pb(1+r) - Px}{D} = \frac{1-t_0}{1-t_g} > 1 \tag{3.2}$$

Consistent with the theoretical behavior, they find that the average price-drop to dividend ratio is greater than one. There is also a noticeable decrease in the ratio following the tax regime change that occurred in 1997 that changed the effective capital gains rate for the highest earners from

38 Except in the case of high-yield stocks with $\frac{\Delta P}{D} > 1$ which imply a negative marginal tax rate.

28% to 20%. Finally there is a difference in the magnitude of the E&G measure between taxable and nontaxable closed-end funds. They interpret these findings as evidence that taxes are playing a major role in the ex-dividend day price behavior of these funds.

The behavior of municipal bond funds described in the previous paragraph is compelling evidence that there is a difference by tax regime and tax status. However, other authors have also found E&G ratios greater than one for the high-yielding stocks [Elton and Gruber (1970), Kalay (1982); Miller and Scholes (1982); Eades et al. (1984)] and Shaw (1991) for high-yield MLPs. Results such as these are consistent with tax-induced dividend clienteles if the marginal trader has a lower tax rate on dividends than on capital gains, which is the case with many corporations.[39] In sharp contradiction to the findings of Elton, Gruber, and Blake (2005), Shaw (1991) concludes that the price and volume reactions around the ex-day are hard to reconcile with a strictly tax-motivated explanation.

While difficult to disprove that taxes influence long-term investor behavior, many articles have attempted to show that more than just taxes may be influencing ex-dividend day behavior. The two most commonly cited oppositions to the *tax penalty hypothesis* explanation have been the argument that short-term traders and existing market microstructure conditions can cause a similar pattern of price-drop ratios that are less than one.

Unlike Elton and Gruber (1970), many subsequent studies have focused on the marginal investor who engages is dividend-induced trading or the characteristics of a given market, as opposed to

39 Corporations have been able to exclude between 70-100% of dividend income received. At 70% exclusion and a corporate tax rate of 35% this implies the effective tax rate on dividends is 10.5%.

assuming long-term investors as the marginal traders. In the Elton-Gruber framework, ex-dividend day price behavior has informational content because the investors are assumed to already have decided to trade a given stock but are only concerned with the timing. In many of the papers that followed, this assumption is relaxed and a class of trader who chooses to trade *because* of the dividend is introduced. In these models transaction costs become very relevant and the informational content of the ex-day behavior becomes suspect. The theory that prices are at least partially set by the marginal trader is known as the *short-term trader hypothesis*.

Miller and Scholes (1982) refute the tax clientele explanation, claiming it allows for abnormal ex-dividend day returns and therefore is inconsistent with Walrasian no-arbitrage equilibrium conditions; the Elton and Gruber (1970) *tax penalty hypothesis* may not fully determine ex-dividend price behavior. Kalay (1982) argues that, in a world of certainty, the discrepancy between the theoretical change in price and the stated dividend amount should be captured by short-term traders or tax-exempt institutional traders who are indifferent between capital gains and dividend income.[40] In revised empirical testing Kalay (1982) finds support that ex-day returns are positively related to dividend yields, but cannot confirm previously proposed tax or clientele effects. Michaely (1991) analyzes the ex-dividend price behavior around enactment of the 1986 Tax Reform Act; he finds that the act did not significantly increase premiums as would be expected with an increase in the effective capital gains rate. His conclusion is that short-term and corporate traders are most likely the marginal traders around ex-dividend days.

40 Boyd and Jagannathan (1994) list these participants as pension funds, market makers, floor traders etc.

Consistent with the *short-term trader hypothesis,* Lakonishok and Vermaelen (1986) find that trading volume increases around the ex-dividend day for some stocks.[41] For taxable dividends the increase in volume is more prominent in high-yield stocks, where dividend capture strategies are likely to be more profitable.[42] Interestingly enough, most of the volume increase around ex-dividend days occurs a few days after the ex-day. They attribute this phenomenon to the minimum holding rule for corporations.[43] Koski and Scruggs (1998) use data from the New York Stock Exchange (NYSE) TORQ database to distinguish between individual trading, short-term trading of market makers and that of corporations engaged in dividend capture strategies.[44] Their findings confirm that there is abnormal trading volume on and around ex-dividend days, and that this volume is negatively related to transaction costs and positively related to dividend yields. Additionally, the richness of the TORQ provides evidence that security dealers engage in abnormal selling volume of high-yield stocks, while corporate traders engage in abnormal buying.

Evidence of short-term trading, according to Kalay (1982) severely hampers or eliminates our ability to infer marginal tax rates from ex-dividend day price behavior. Eades et al. (1984) find additional support for the short-term trader hypothesis by examining the difference between common and preferred stock behavior around ex-dividend days. Their evidence suggests that

41 Lakonishok and Vermaelen (1983) also find evidence inconsistent with the tax penalty hypothesis and loosely supporting the short-term trader hypothesis following a Canadian tax reform.
42 For nontaxable distributions such as stock splits and stock dividends Lakonishok and Vermaelen (1986) find negative abnormal volume around ex-days.
43 During the time of their study, January 1, 1970 to December 31, 1981 the minimum holding period for incorporated traders was 16 days, in order to be eligible for the 85% dividend exclusion.
44 The TORQ data provides information about the identity of traders on both sides of a transaction.

abnormal returns are smaller for high-yield preferred stock, suggesting that dividend capture strategies may be playing a large role, especially in high-yielding stocks.

Karpoff and Walking (1988) propose that the dividend *tax penalty hypothesis* and the *short-term trading hypothesis* explanations of observed ex-dividend behavior are not competing hypotheses, rather two sides of the same coin. They explain that positive ex-dividend day returns (E&G measures of $\Delta P/D<1$) are indicative of the preferential treatment of capital gains but that short-term traders attracted by the positive abnormal returns will trade until the return is eliminated or reflects the marginal cost of a roundtrip trade. They also conclude that more trading will take place in stocks that are easier to trade and therefore ex-dividend day returns will be positively related to transaction costs.[45] To the extent that the reward for short-term trading is the amount of the dividend relative to the transaction costs, there should be more short-term trading in stocks with higher yields. This hypothesis is a marriage between the short-term trader hypothesis of Kalay (1982) and the lucrative dividend capture strategies practiced by many corporations prior to the Tax Reform Act of 1984.[46] Although the dividend capture strategy has received considerable attention in the institutional literature there has been little mention of the reverse strategy (selling cum-dividend and buying ex-dividend).[47] Karpoff and Walking (1990) infer that because short selling is not specifically mentioned in the institutional literature combined with the observation that ex-day returns are positive, that short selling would be unpopular

45 They use four proxies for transaction costs: inverse price, inverse market capitalization, negative inverse of shares outstanding, and share price standard deviation.
46 The Tax Reform Act of 1984 substantially increased the risk associated with dividend capture strategies by increasing the required holding period from 16 to 45 days without changing the expected return.
47 Gillespie (1986) and Brown and Lummer (1986) discuss hedged dividend capture strategies which can be quite profitable for corporations.

around ex-dividend days. Karpoff and Walking (1990) admit that short selling would only be profitable if the ex-day return is “sufficiently negative.” Given the year of publication combined the relative novelty of closed-end municipal bond funds it is easy to see how this exception to the rule could have been overlooked. Koski and Scruggs (1998) study, using TORQ data, is one paper that recognizes the potential benefit of short selling cum-dividend. Their results indicate that for high-yield stocks where the expected price drop exceeds the dividend, securities dealers engage in a “short-position dividend capture strategy.” Abnormal selling volume by securities dealers reaches a peak at 176% of normal volume on the cum-day. Blau et al. (2011) find that there is positive abnormal selling volume prior to ex-dividend days, when abnormal volume is measured as short volume relative to shares outstanding.

As this study focuses on ex-dividend price behavior of closed-end municipal bond funds the findings can only loosely be applicable for common stocks when making corporate financial management and optimal dividend policy decisions. However, the findings in this study may have direct implications for policy decisions regarding short-term trading. One example of legislation related to dividend capture is evident in the Tax Reform Act of 1984. This act increased the holding period that corporations were required to hold common stock in order to be eligible for the dividend exclusion from 16 to 45 days. Furthermore, it took away a loop hole that allowed corporations to borrow funds in order to purchase shares. This legislation is suggestive that short-term dividend capture strategies were prevalently used prior to 1984 and the legislation made it subsequently more risky and less advantageous for corporations to employ such strategies. Regulations such as this have implications for market liquidity and depth.

Hypotheses

According to Kalay (1982), when the dividend is less than the expected price drop, as is the case with municipal bond funds according to equation (3.2), investors (arbitrageurs) would be able to sell short the stock cum-dividend, reimburse the dividend, and buy it back ex-dividend, thereby netting,

$$1 - t_0 \quad P_b - P_a - D - \alpha P \; > \; 0$$

Where α represents roundtrip transaction costs. Conversely, if the dividend is more than the expected price drop, as is the case when investors face differential tax rates (assuming the ordinary income rate exceeds the capital gain rate) as is the case with most common shares, an arbitrageur would buy the stock cum-dividend, collect the dividend, and sell the stock on the ex-dividend day, thereby receiving,

$$1 - t_0 \quad D - \; (P_b - P_a) - \alpha P \; > \; 0$$

In the former (later) case, when $\Delta P/D>1$ ($\Delta P/D<1$) the buying (selling) activity of the arbitrageur will prop up (drive down) the share price leading to higher (lower) abnormal returns. Karpoff and Walking (1988, 1990) hypothesize that abnormal returns in ordinary shares should be positively correlated with transaction costs.[48] Confirmation of such a finding provides evidence

48 The findings of Karpoff and Walking (1988) loosely confirm the finding that abnormal ex-dividend day returns are positively related to transaction costs. The evidence is stronger among high-yield stocks particularly after 1975

that ex-dividend day behavior is intertwined with dividend capture strategies and that the *tax-penalty hypothesis* of Elton and Gruber (1970) may only be a partial explanation for the ex-dividend day controversy. When *ΔP/D*<1 and transaction costs are high (or there is substantial risk) arbitrageurs will be less willing to attempt to capture the dividend, thereby leading to less selling on the ex-dividend day and higher abnormal returns for shares with high transaction costs.

In the case of municipal bond closed-end funds with an expectation of *ΔP/D*>1, higher transaction costs will lead to less ex-dividend day buying and lower abnormal returns.[49]

Hypothesis 1 – Ex-dividend day returns should be negatively related to transaction costs.

When the short-term trader (arbitrageur) sells short cum-dividend and is required to reimburse the dividend, this represents an added cost. Shorting, when the dividend yield is high, requires more capital because the short-term trader or arbitrageur has to pay a larger dividend. This is an increase in out of pocket expenses, but with the expectation that the price is going to fall by more than the dividend could also represent a relative reduction in transaction costs.[50] Furthermore, corporate dividend capture traders may bid up the price prior to the ex-day, and to the extent that their activity is concentrated in high-yield funds there should be a larger price drop for these shares.

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and the abolition of fixed commissions. Karpoff and Walking (1990) using estimate bid-ask spreads for NASDAQ stocks provide more convincing evidence that ex-day returns are positively related to transaction costs.
49 Please see the Appendix for a derivation of the hypothesis.
50 Assuming that the market maker or arbitrageur can borrow at $r_f \leq \frac{d}{p}$

Hypothesis 2 – Ex-dividend day returns should be more sensitive to transaction costs when dividend yields are higher[51].

Investors in municipals are routinely cited as being the most tax sensitive; with the most incentive to avoid paying tax or receiving taxable distributions. Long-term holders of closed-end funds that have announced a taxable distribution will be indifferent to selling prior to the close the day before the stock goes ex-dividend if the capital gain is "baked in." Similarly, when faced with an upcoming taxable distribution, prospective buyers of municipal bond closed-end funds would likely postpone purchasing until after the start of trading on the ex-dividend day. Investors will have a strong incentive to avoid capturing a taxable capital gain for which they did not see a commensurate benefit.

Hypothesis 3 –There should be negative abnormal volume in the week prior to the ex-dividend day for taxable distributions than for nontaxable distributions, and positive abnormal volume on the ex-dividend day and subsequent week .

Hypothesis 4 – Pent up demand and abnormal buying on the ex-dividend day may lead to positive abnormal returns for funds issuing taxable

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51 Karpoff and Walking's (1990) second hypothesis proposes "The cross-sectional correlation between ex-day returns and transaction costs will be higher among groups of high-yield stocks than among groups of low-yield stocks".

Data and Methodology

Using a similar sample to the EGB (2005) study I reexamine the ratio of price change to dividend payout. I also examine abnormal returns surrounding the ex-dividend day for evidence of short-term trading or market microstructure impacts that may explain observed ex-dividend day price behavior.

Data

The sample consists of daily data obtained from CRSP for all closed-end funds that can be readily identifiable and categorized as municipal bond funds. The total number of funds per year varies from 52 in 1992 to a peak of 301 funds. The sample period is from the first day of trading in January 1990 to the last day of trading in December 2010. I disregard funds that have a share price of less than five dollars in a given year or dividend less than two cents. The exclusion of these funds is to reduce the noise that can be introduced when a fund is trading under five dollars, usually towards the end of its life; small dividend amounts can cause extreme ratio values. The sample contains 54055 non-taxable dividends (CRSP distribution code 1223), and 1599 capital gains distributions (CRSP distribution code 2216) and 575 taxable at the ordinary income rate (CRSP distribution code 1222). The mean fund has on average 5.26 capital gains distributions and 1.5 distributions taxable at the ordinary dividend rate.

Methodology

I measure the price reaction relative to the dividend amount in two ways: First I use the actual price change that is unadjusted for market movements in order to capture real tax implications. Second, following EGB I calculate the E&G measure as the ratio of the price drop (adjusted for market movement) to the dividend [equation (3) in the text]. In order to properly adjust for ex-dividend fund movements closing prices from the day before the stock goes ex-dividend and the closing price on the ex-dividend day are used. I use a market model adjustment to adjust P_b for contemporaneous market moves. For each day in the sample an equally weighted market return for stocks that did not go ex-dividend on that day is created. Next, the return of each fund is regressed on the lag, contemporaneous, and lead market return and the coefficients are aggregated following the Dimson (1979) AC method to account for nonsynchronous trading. Shares in these funds are subject to thin trading and in 15308 observations there was no trade. As expected the average beta for the funds in the sample is one with a min of -0.136 and a max of 2.098. Using a market adjusted model can greatly reduce or eliminate the bias in using cum-dividend to ex-dividend closing prices. Furthermore, using market-adjusted prices provides a more accurate measure of abnormal return. Price-drop to dividend ratios are windsorized at the 1% level to reduce the impact of outliers.

Abnormal returns are calculated for each fund for each day using a single factor market model where the market return is calculated using funds in the sample that did not go ex-dividend on a given day. Cumulative abnormal returns are calculated both as buy-and-hold returns starting on day (-5) and ending on day (-1) as well as the sum of the abnormal returns CAR for days [-5,-1].

The methodology employed for calculating volume follows that of Lakonishok and Vermailen (1986). The first method used in the *event time method* [Fama, Fisher, Jensen and Roll (1969)]. The monthly distribution normal volume is calculated as both the median and mean dollar volume for all days during a given month that fall outside of the [-5,5] ex-dividend day window. The second method for calculating excess volume, *the calendar time method* of Jaffe(1974) and Mandelker(1974) is used only as a robustness check for the findings using the *event time method.*

Results

Short-Term Trading, Transaction Costs, and Volume

Table 3.1 presents regression results of abnormal returns on the ex-day on various proxies for transactions costs and on dividend yield. Using proxies for transaction costs originally tested by Karpoff and Walking (1988), I reexamine the relationship between these costs and ex-dividend day price behavior when the assumed transaction of short-term traders is selling short cum-div and buying ex-div.[52] The proxies used are (1) illiquidity[53]; (2) inverse price; (3) scaled inverse market capitalization; (4) negative scaled shares outstanding. For inverse price, illiquidity, and inverse market capitalization there exists a negative and significant relationship between ex-day abnormal returns and transaction costs. The coefficient for shares outstanding is virtually zero but positive and significant. The evidence presented is fairly demonstrative as to whether ex-dividend day price is negatively related to transaction costs, as posited by hypothesis (1). Ex-day returns are in general less sensitive to transaction costs when the distribution is taxable. The p-values for each of the regressions involving taxable distributions fail to reach conventional levels of significance. If short-term investors have to come out of pocket more, or borrow more, in order to reimburse a larger dividend they should theoretically be more leveraged and more sensitive to transaction costs. The evidence suggests that transaction costs are less important when distributions contain some portion that is taxable. It may be the case that short-term traders act to avoid these types of distributions.

Karpoff and Walking (1988) argue that the profitability of short-term trading is positively related to the dividend yield. High-yield stocks will have larger distributions relative to transactions costs and will therefore invite more short-term trading activity. As can be seen from the last row in Table 3.1, ex-day returns are negatively related to dividend yield for nontaxable distributions. Short-term traders, attracted by the profitability of shorting funds where the expected price-drop is more than the dividend paid will be drawn to these funds making the application of the

52 I chose to use liquidity instead of share price volatility because I believe that it has more of an impact for these funds.
53 Using the Amihud (2002) construction of aggregate movements in share price to priced volume.

profitable strategy more competitive, thereby eating away the negative ex-day returns i.e. more positive. The proposed relationship put forth by hypothesis (1) and seen empirically in Table 3.1 is that short-term trading activity and the hypothesized relationship between ex-day returns and transaction costs should be more evident in high-yield funds. In Table 3.2 the funds are divided into quartiles with (1) being the lowest yielding funds and (4) being the highest yielding funds. Each set of values in Table 3.2 represents a unique regression of abnormal return on transaction costs for a given dividend yield quartile. It is evident from Table 3.2 that there is an almost monotonically decreasing magnitude of the coefficients for the various transaction costs. I interpret this as support for hypothesis (2); higher yielding funds' ex-dividend day returns are more sensitive to transaction costs than lower yielding funds.[54] Consistent with Karpoff and Walking (1988, 1990) it appears that the benefits to "short position dividend capture" strategies increase with the size of the dividend and decrease with trading costs. Although the proposed negative relationship between transaction costs and ex-day return is seen across dividend quartiles it is clearly much stronger for the highest yielding funds as expected. This suggests that, all else equal, a fund with high transaction costs and high dividend yield will have a less of an abnormal return than a similarly yielding fund with lower transaction costs. The same can be said for funds in the other three dividend yield quarters but the magnitude of the difference is not as large.

Several facts help to strengthen the argument that this behavior is caused by short-term traders. First, the clientele in these funds does not vary much from fund to fund since they are all self-

54 A similar finding is reported by Karpoff and Walking (1988) who find that there is little evidence of short-term trading in low-yielding funds and suggestive evidence in high-yielding funds.

selected as tax-sensitive.[55] Second, the proposed switch in sign for ex-day returns is driven solely by the fact that the proposed behavior of short-term investors is to short before the ex-day and buy back after paying the dividend.

Ex-Dividend Window Abnormal Returns

Table 3.3 reports the average daily abnormal returns for the dividend window, day (-5) to day (5). The results confirm the findings of Eades, et al. (1984). In general, abnormal returns prior to the ex-day are positive and significant, while following the ex-day returns are negative and significant. This is further evidence that there abnormal run up prior to the ex-dividend day which may be partially attributed to dividend capture strategies. A comparison between the daily abnormal returns for taxable and nontaxable distributions suggests that the price run-up prior to the ex-day occurs only before nontaxable distributions. In four out of the five days prior to nontaxable distributions there is a positive and significant abnormal return. This is in stark contrast to the behavior of funds prior to a taxable distribution where no days have significant abnormal returns of any kind. Furthermore, the most significant difference occurs on the ex-day. Consistent with the theory that dividend capture traders as well as tax-sensitive long-term traders exhibit taxable distribution aversion, we see a 13 basis point difference between the abnormal

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55 Starks, Yong, and Zheng (2006) examine similar funds because they claim that they are held almost exclusively by wealthy investors who are particularly sensitive to taxes.

return for taxable and nontaxable distributions on the ex-day, which is significant at the 1% level.

I am not however advocating that this is an arbitrageable or economically significant difference. In fact the taxable distributions tend to cluster together by date, especially those in the same fund family. If for each day that there is at least one taxable and one nontaxable distribution the equally weighted average return is calculated across taxable and nontaxable funds we are left with exactly 342 unique days. There are 142 days when the difference between taxable and nontaxable distributions is negative and 200 days when the difference is positive. Additionally, when we treat each day as a unique observation the difference between taxable and nontaxable ex-dividend day returns drops to 9 basis points. The salient point is only that there appears to be differences in the abnormal returns for taxable and nontaxable funds in the week leading up to and on the ex-day.

In Table 3.4 the daily abnormal return for the ex-dividend window is further analyzed by the proportion of capital gains relative to the total dividend. What can be seen is that the average abnormal return is increasing in the capital gain proportion. The two columns on the left of Table 3.4 give the quartile and mean percentage of capital gains for distributions in the respective quartile. The remaining 11 columns give the average daily abnormal return for each day in the ex-dividend window. The lowest quartile has an abnormal return of 3.7 basis points, essentially flat, while the highest quartile has an average abnormal return of nearly 45 basis points or half a percent. An anomaly must be evaluated relative to roundtrip transaction costs, and while it may not be possible for individual investors to profit from the observed return pattern the levels of abnormal return are below the round trip transaction costs reported by Kalay (1982). These transaction costs may actually overstate current transaction costs given the reduction in tick size. Additionally, this finding may help investors who have already decided to purchase or sell a stock around taxable ex-dividend days. According to the observed pattern of returns an investor who owns the stock should postpone selling until after the ex-dividend day.

Finally, when comparing the compounded abnormal returns in the five day period before the ex-day for taxable and nontaxable distributions there is an interesting and perhaps revealing finding. For the overall period 1990-2010 the average compounded abnormal return for taxable and nontaxable distributions are -0.01% and 0.04% respectively. The five-day return before nontaxable distributions is significantly different from zero at the 1% level. Less abnormal run-up prior to the ex-day suggests long-term investors and dividend capture traders are vehemently opposed to capturing a dividend taxable as capital gains.[56]

Furthermore, the cumulative abnormal return in the week prior to the ex-day is negitively and significantly related to the abnormal return on the ex-day. The Spearman rank correlation coefficient for the two measures is 0.148 and is significant at a 1% level. This suggests that the more a fund runs up in the week prior to the ex-day, the larger the price correction will be on the ex-day. While this is consistent with intuition if prices revert to their mean levels, in may be an ex-ante signal to security dealers as to which funds to short. Table 3.6 confirms the nonparametric results of the Spearman rank correlation a positive relationship between price run-

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56 Further discussion of evidence suggesting taxable distribution avoidance is discussed in the results section on volume.

up prior to the ex-day and the corresponding abnormal return. This supports the conclusion of Blau et al. (2011) that shares that run up in price prior to the ex-day are subject to the most price decline, possibly due to the increased short volume.

Tests of the determinants of abnormal return are presented in Table 3.6. The dependent variable in the regressions is abnormal return using a single factor market model for the ex-dividend day. The results show that abnormal return is negatively and significantly related to the previous week's price appreciation, abnormal volume, and trading costs, which confirm several of the previously discussed hypotheses. Furthermore the results are positively related to the percentage of capital gains, which further suggests the avoidance of short-term trading when the distribution is taxable.

Abnormal Volume

There is positive abnormal trading volume in the dividend window, day (-5) to day (5), and that abnormal volume is negatively related to proxies for transaction costs and positively related to dividend yield. From Table 3.5 we can see that volume appears to increase during the five days before the ex-day, generally peaking on the cum-day. From panel B of Table 3.5 we can see that there is generally less abnormal volume for taxable distributions as compared to nontaxable distributions in the week prior to the ex-dividend day. Furthermore, abnormal volume for taxable distributions peaks on the ex-day. This evidence suggests that in general both long-term and corporate investors will actively avoid taxable distributions.

The previously reported findings are formally tested using fixed effect regression analysis. The results are presented in Table 3.7. The dependent variable is the abnormal dollar volume measure using the mean dollar volume for day that fall outside of the ex-dividend window as a benchmark for comparison. Both models present the same model but test for different proxies for transaction costs so they will only be discussed using generalities. It appears that the more a fund runs up in the week prior to the ex-dividend day the less volume there will be on the ex-day. A possible explanation for this result is the minimum holding period required to be eligible to deduct losses for these funds. Consistent with previous findings the dividend yield is positively related to abnormal volume at the one percent level. Two points of interest are that transaction costs and the percentage of capital gains are both negatively related to abnormal volume and are both highly significant. These findings both suggest that short term trading are playing an active role.

Conclusion

The results of this study show that the behavior of municipal bond closed-end funds on ex-dividend days as well as during the five days before and after the ex-day depends on the taxability of the distribution. Consistent with previous findings, these funds tend to increase in price and have positive abnormal volume in the time period right before the ex-day. Abnormal volume is positively related to dividend yield and negatively related to transaction costs. Interestingly, volume tends to peak on the cum-day for nontaxable distributions and on the ex-day for taxable distributions, suggestive of taxable distribution avoidance.

If the marginal holders of these funds were long-term traders they would be indifferent to selling and capturing a capital gain or receiving the gain as pass-through income. These results reveal that the rationalizations of ex-day behavior for taxable and nontaxable distributions are quite different.

This study is evidence of a trading behavior that is relatively uninvestigated in the literature, the "short-position dividend capture." Abnormal returns are negatively related to transaction costs, which according to Koski and Scruggs (1998) suggests that the marginal trader in these funds is a market maker engaged in "short-position dividend capture strategies" if the expected price drop is more than the dividend amount. These findings collectively suggest that the taxability of a dividend does matter to long-term investors, but moreover short-term traders will actively trade into and out of funds to eliminate abnormal returns.

Tables and Figures

Table 3.1- Abnormal Returns and Transactions Costs

$$(Ret_{it} - Beta_i * Ret_{mt}) = \propto + \beta_1 transaction\_cost_{i,t} + \varepsilon$$

		Total	Taxable	Nontaxable	Taxable=Nontaxable	
Spread	2*((Ask-Bid)/(Ask+Bid)	-0.021	-0.027	-0.02	F=	1.37
		0.001	0.091	(0.002)	p-value =	0.25
Inverse Price	$1/price_i$	-0.047	-0.026	-0.047	F=	5.90
		(0.077)	(0.581)	(0.095)	p-value =	0.0152
Illiquidity	$\Sigma_{i,t}[abs(ret_i)/(price_i*vol_i)$	-22.826	-49.131	-21.678	F=	11.79
		(0.001)	(0.163)	(0.001)	p-value =	0.0006
Inverse Size	$[1/(price_i * shares\ out_i)]*(1000)$	-0.075	-0.035	-0.092	F=	3.00
		(0.014)	(0.104)	(0.015)	p-value =	0.0832
Availability	-(#Shares Out)(1/1000)	-6.26e-06	1.97e-05	8.09e-06	F=	0.01
		(0.732)	(0.818)	(0.665)	p-value =	0.9119
Dividend Yield	D_i /P_i	0.004	0.054	-0.056	F=	91.35
		(0.684)	(0.000)	(0.006)	p-value =	(0.000)

The dependent variable in the regression is abnormal return measure using a one factor market adjusted model. The independent variable in the regressions ($\beta_1 transaction\_cost_{i,t}$) is one of four variables used as proxies for the true transaction costs. *Inverse Price* is measured as one over the price. *Illiquidity* is measured as the cumulative return divided by priced volume, following the Amihud (2002) measure. *Inverse Size* is the inverse of scaled market cap. *Availability* is the negative of scaled shares outstanding. *Dividend Yield* is the total distribution amount divided by the current fund price. Regression is estimated using fund fixed effects and controlling for clustering by date. Values in parentheses are p-values

Table 3.2 - Abnormal Return on Transaction Costs By Quartile

$$(Ret_{it} - Beta_i * Ret_{mt}) = \propto + \beta_1 transaction\_cost_{i,t} + \varepsilon$$

		Dividend Quartile			
		(1)	(2)	(3)	(4)
Spread	2*((Ask-Bid)/(Ask+Bid)	-0.004	-0.013	-0.036	-0.040
		0.632	0.139	0.003	0.000
Inverse Price	1/$price_i$	-0.063	-0.082	-0.062	-0.006
		(0.077)	(0.003)	(0.014)	(0.917)
Illiquidity	$\Sigma_{i,t}$[abs(ret_i)/($price_i$*vol_i)	-0.795	-14.355	-19.104	-87.75
		(0.870)	(0.056)	(0.028)	(0.018)
Inverse Size	[1/($price_i$ * shares out_i)]*(1000)	-0.007	-0.115	-0.244	-0.524
		(0.418)	(0.024)	(0.000)	(0.000)
Availability	-(#Shares Out)(1/1000)	-6.12E-06	-6.21E-05	2.08E-06	-1.88E-05
		(0.867)	(0.004)	(0.400)	(0.636)

The dependent variable in the regression is abnormal return measure using a one factor market adjusted model. The independent variable in the regressions ($\beta_1 transaction\_cost_{i,t}$) is one of four variables used as proxies for the true transaction costs. *Inverse Price* is measured as one over the price. *Illiquidity* is measured as the cumulative return divided by priced volume, following the Amihud (2002) measure. *Inverse Size* is the inverse of scaled market cap. *Availability* is the negative of scaled shares outstanding. *Dividend Quartile* divided the funds into four groups by *dividend yield* with (1) representing funds with the lowest dividend yield and (4) representing funds with the highest dividend yield. Regression is estimated using fund fixed effects and controlling for clustering by date. Values in parentheses are p-values

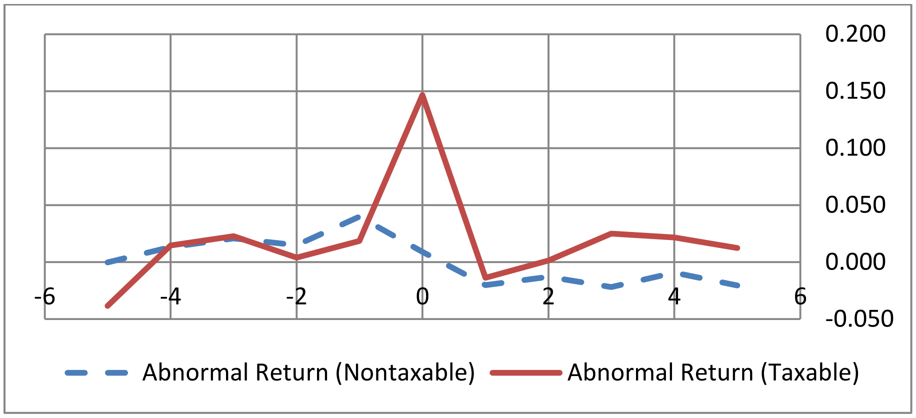

Figure 3.1 - Abnormal Return During Ex-Dividend Window

Figure 3.1 presents a graphic representation of the abnormal return during the ex-dividend window. The data is presente in the table below.

Table 3.3 - Abnormal Return During Ex-Dividend Window

Nontaxable Ex-Dividend Window Abnormal Returns											
	-5	-4	-3	-2	-1	0	1	2	3	4	5
1990-1996	0.011	0.000	0.026	0.027	0.048	-0.079	-0.006	-0.017	0.001	-0.007	-0.028
	(0.398)	(0.987)	(0.054)	(0.045)	(0.000)	(0.000)	(0.595)	(0.14)	(0.968)	(0.6)	(0.035)
1997-2002	-0.006	0.017	0.013	0.014	0.034	0.019	-0.018	-0.002	-0.013	-0.017	-0.013
	(0.449)	(0.092)	(0.178)	(0.072)	(0.000)	(0.005)	(0.012)	(0.807)	(0.203)	(0.08)	(0.105)
2003-2010	-0.002	0.019	0.022	0.011	0.040	0.044	-0.028	-0.017	-0.043	-0.006	-0.022
	(0.762)	(0.042)	(0.016)	(0.099)	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.578)	(0.002)
1990-2010	0.000	0.013	0.021	0.015	0.040	0.009	-0.020	-0.013	-0.022	-0.009	-0.020
	(0.966)	(0.04)	(0.001)	(0.002)	(0.000)	(0.038)	(0.000)	(0.006)	(0.001)	(0.156)	(0.000)
Taxable Ex-Dividend Window Abnormal Returns											
	-5	-4	-3	-2	-1	0	1	2	3	4	5
1990-1996	-0.167	0.175	0.143	-0.013	0.051	0.026	-0.030	0.012	-0.022	0.136	0.025
	(0.020)	(0.058)	(0.053)	(0.840)	(0.411)	(0.665)	(0.617)	(0.859)	(0.815)	(0.081)	(0.732)
1997-2002	-0.043	-0.047	0.048	-0.002	0.040	0.171	-0.021	0.059	0.002	-0.094	0.032
	(0.294)	(0.487)	(0.486)	(0.955)	(0.163)	(0.000)	(0.476)	(0.043)	(0.978)	(0.184)	(0.252)
2003-2010	0.015	-0.038	-0.053	0.018	-0.019	0.177	0.000	-0.068	0.062	0.019	-0.018
	(0.608)	(0.312)	(0.407)	(0.672)	(0.588)	(0.000)	(0.996)	(0.021)	(0.116)	(0.753)	(0.67)
1990-2010	-0.039	0.015	0.023	0.004	0.018	0.147	-0.014	0.001	0.025	0.022	0.012
	(0.106)	(0.671)	(0.574)	(0.873)	(0.392)	(0.000)	(0.52)	(0.946)	(0.497)	(0.589)	(0.608)

Abnormal daily return during the ex-dividend day window for the period 1990-2010 and for three sub-periods corresponding to each of the tax regime changes. Abnormal daily returns are separated by tax status, the values in the top half of the table represent the daily returns for nontaxable distributions and the bottom half represent taxable distributions. The values in parentheses are p-values from a two-sided test that the mean is equal to zero.

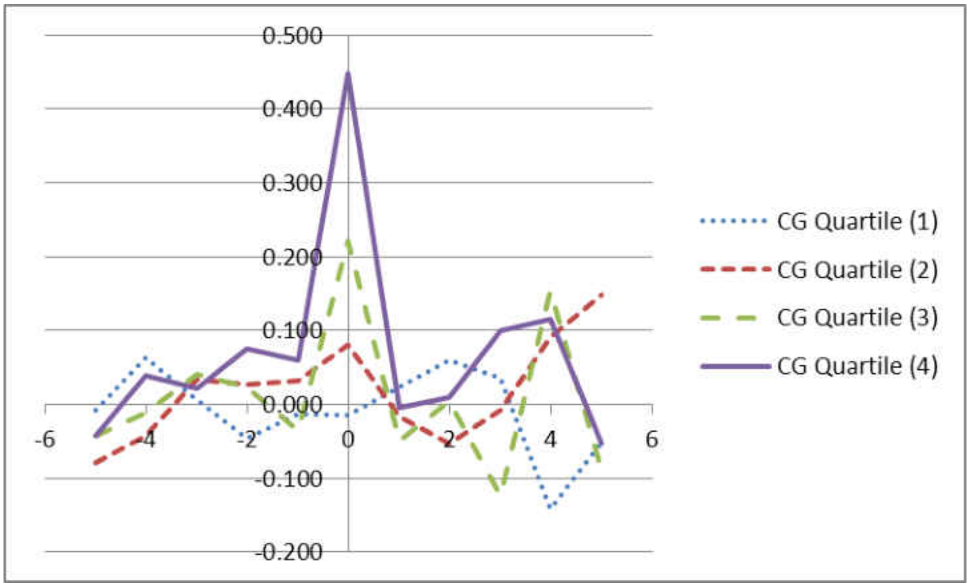

Figure 3.2 - Taxable Ex-Dividend Window Abnormal Returns by CQ Quartile
Figure 3.2 presents a graphic representation of the abnormal return during the ex-dividend window. The data is presente in the table below.

Table 3.4 - Taxable Ex-Dividend Window Abnormal Returns by CQ Quartile

CG Quart.	Mean CG (%)	-5	-4	-3	-2	-1	0	1	2	3	4	5
1	10.46%	-0.009	0.063	0.006	-0.046	-0.014	-0.015	0.024	0.060	0.036	-0.141	-0.050
2	31.36%	-0.079	-0.043	0.035	0.026	0.031	0.081	-0.016	-0.052	-0.008	0.091	0.149
3	52.16%	-0.042	-0.011	0.040	0.024	-0.035	0.221	-0.050	0.004	-0.123	0.153	-0.090
4	74.03%	-0.042	0.039	0.022	0.076	0.060	0.449	-0.005	0.009	0.099	0.116	-0.054

Abnormal daily return during the ex-dividend day window for the period 1990-2010 and for three sub-periods corresponding to each of the tax regime changes. Abnormal daily returns are separated by tax status, the values in the top half of the table represent the daily returns for nontaxable distributions and the bottom half represent taxable distributions.

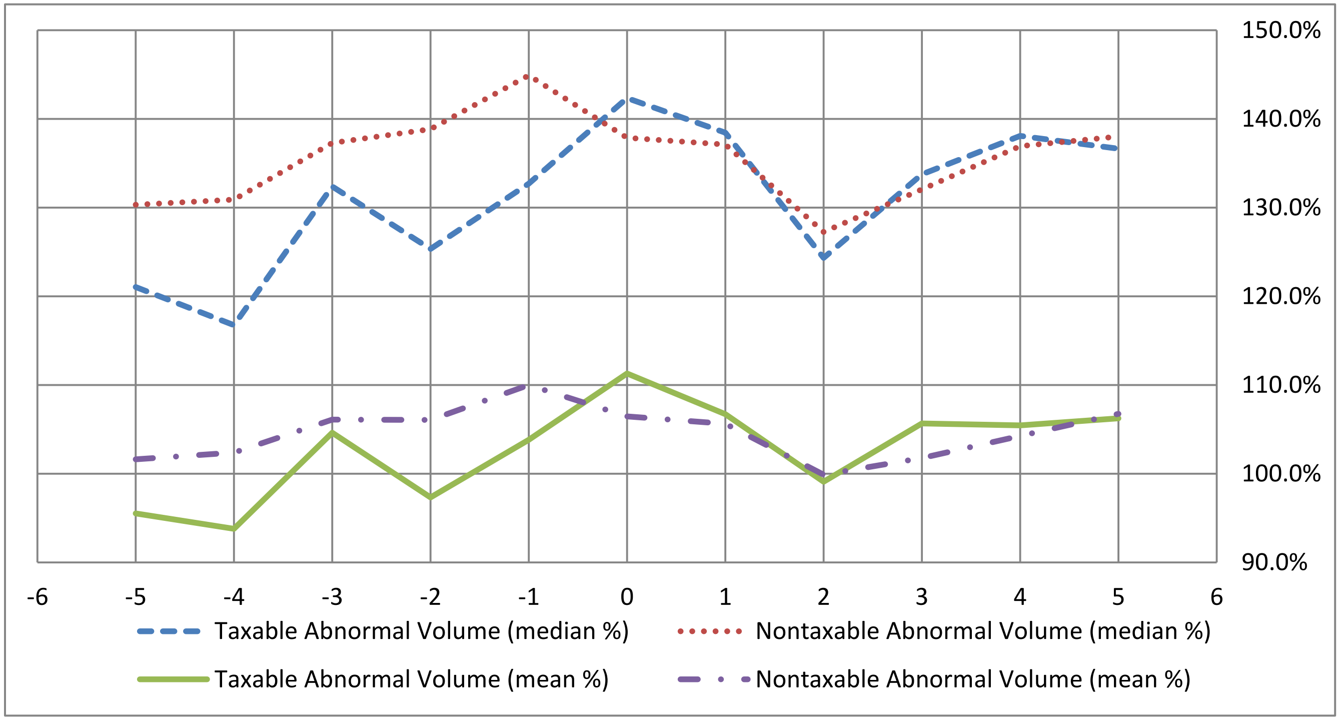

Figure 3.3 - Abnormal Volume During Ex-Dividend Window

Abnormal daily trading volume during the ten days around the ex-dividend days, for the total period 1990-2010 using event time methodology

Table 3.5 - Abnormal Volume During Ex-Dividend Window

Panel A (Median)											
Day	-5	-4	-3	-2	-1	0	1	2	3	4	5
Taxable	121.1%	116.8%	132.4%	125.3%	132.7%	142.3%	138.4%	124.3%	133.8%	138.1%	136.6%
Nontaxable	130.3%	130.9%	137.3%	138.9%	144.9%	137.9%	137.1%	127.3%	132.0%	136.9%	138.0%
Difference	-9.2%	-14.1%	-4.9%	-13.5%	-12.2%	4.5%	1.3%	-2.9%	1.7%	1.1%	-1.4%
	(0.077)	(0.016)	(0.254)	(0.015)	(0.16)	(0.159)	(0.399)	(0.753)	(0.412)	(0.439)	(0.603)
Panel B (Mean)											
Day	-5	-4	-3	-2	-1	0	1	2	3	4	5
Taxable	95.5%	93.8%	104.6%	97.3%	103.8%	111.3%	106.7%	99.1%	105.6%	105.5%	106.3%
Nontaxable	101.6%	102.4%	106.1%	106.0%	110.0%	106.5%	105.6%	99.9%	101.8%	104.3%	106.8%
Difference	-6.1%	-8.6%	-1.5%	-8.7%	-6.2%	4.9%	1.1%	-0.8%	3.9%	1.2%	-0.5%
	(0.011)	(0.008)	(0.337)	(0.000)	(0.008)	(0.982)	(0.674)	(0.365)	(0.845)	(0.638)	(0.434)

Abnormal daily trading volume during the ten days around the ex-dividend days, for the total period 1990-2010 using event time methodology. The values in parentheses represent the probability that the abnormal volume for taxable distributions is larger than the abnormal volume for nontaxable distributions on a given day. Panel A presents the abnormal volume using the median monthly volume of each fund excluding the dividend window [-5,5]; Panel B uses the mean month volume

Table 3.6 - Abnormal Return Regression Results

$$ABN\_RET_{i,t} = B_0 + B_1 Ret_{i,t-5,t-1} + B_2 Abn\_Vol_{t,i} + B_3 Div\_Yield_{t,i} + B_4 Size_{t,i} + B_5 Cap\_Pct_{t,i} + B_6(1997 - 2002) + B_7(2003 - 2010)$$

	[Nontaxable]		[Taxable]
Intercept	-0.009	Intercept	-0.024
	(0.001)		(0.174)
$Ret_{t-5,t-1,i}$	-0.102	$Ret_{t-5,t-1,i}$	-0.063
	(0.000)		(0.000)
$Abn\_Vol_{t,i}$	-0.0003	$Abn\_Vol_{t,i}$	0.001
	(0.000)		(0.000)
$Div\_Yield_{t,i}$	-0.040	$Div\_Yield_{t,i}$	0.002
	(0.000)		(0.891)
$Size_{t,i}$	0.001	$Size_{t,i}$	0.002
	(0.000)		(0.201)
$Cap\_Pct_{t,i}(\lambda)$		$Cap\_Pct_{t,i}(\lambda)$	0.008
			(0.000)
Inverse_Price	-0.052	Inverse_Price	-0.025
	(0.000)		(0.426)
1997-2002	0.001	1997-2002	0.003
	(0.000)		(0.001)
2003-2010	0.001	2003-2010	0.001
	(0.000)		(0.134)
Adj R^2	0.037	Adj R^2	0.086
Fund FE	Yes	Fund FE	Yes

The dependent variable is the market adjusted abnormal return on the ex-day. The independent variables include lagged return ($Ret_{t-5,t-1,i}$) for the five days prior to the ex-day. Abnormal volume ($Abn\_Vol_{t,i}$) measured as the percentage of abnormal dollar volume. Dividend yield ($Div\_Yield_{t,i}$). The percentage of capital gains relative to the total distribution ($Cap\_Pct_{t,i}$). Size ($Size_{t,i}$) is measure as the natural log of market capitalization. Stock specific characteristics are controlled for using fixed effects. The values in parentheses represent p-values.

Table 3.7 - Abnormal Volume Regression Results

$$ABN\_VOL_{i,t} = B_0 + B_1 Ret_{i,t-5,t-1} + B_2 Abn\_Vol_{t,i} + B_3 Div\_Yield_{t,i} + B_4 Size_{t,i} + B_5 Cap\_Pct_{t,i} + B_6(1997 - 2002) + B_7(2003 - 2010)$$

ABN_VOL = $PRC_{i,t} * VOL_{i,t} - (PRC * VOL)$

	(1)		(2)
Intercept	2,909,337 (0.000)	Intercept	2,262,283 (0.000)
Ret $_{t-5,t-1,\ i}$	-306,008.9 (0.000)	Ret $_{t-5,t-1,\ i}$	-271,690.2 (0.006)
$Div\_Yield_{t,i}$	1,619,866.0 (0.000)	$Div\_Yield_{t,i}$	685,353.4 (0.001)
$Size_{t,i}$	-242,810.3 (0.000)	$Size_{t,i}$	-197,534.8 (0.000)
$Cap\_Pct_{t,i}$ (λ)	-178205.1 (0.000)	$Cap\_Pct_{t,i}$ (λ)	-88,711.65 (0.001)
Inverse_Price	-2,544,482.0 (0.000)	Illiquidity	-3.89e+08 (0.000)
1997-2002	35,183.51 (0.000)	1997-2002	23,022.89 (0.000)
2003-2010	64,544.1 (0.000)	2003-2010	38,900.68 (0.000)
Adj R^2	0.403	Adj R^2	0.402
Fund FE	Yes	Fund FE	Yes

The dependent variable is the abnormal volume on the ex-day measured as price times shares traded less the mean monthly volume of days not in the ex-dividend day window [-5, 5]. The independent variables include lagged return ($Ret_{t-5,t-1,i}$) for the five days prior to the ex-day. Dividend yield ($Div\_Yield_{t,i}$). The percentage of capital gains relative to the total distribution ($Cap\_Pct_{t,i}$). Size ($Size_{t,i}$) is measure as the natural log of market capitalization. Stock specific characteristics are controlled for using fixed effects. The values in parentheses represent p-values.

Appendix

(Derivation of Hypothesis 1)

Under traditional dividend capture hypothesis such as the one presented by Karpoff and Walking (1990) a dealer in securities who faces $t_d = t_g$ can profitably buy a stock on the cum-day and sell it on the ex-day unless

$$p_{ja} + d_j \; 1 - t_d \; - p_{jb} + \; p_{jb} - p_{ja} \; t_d = 2x_{dj}(1 - t_d)p_j \tag{A1}$$

That is, if the amount of the loss $(p_{ja} - p_{jb})$ combined with the sought after dividend and consequent tax offset $[\; 1 - t_d \; + \; p_{jb} - p_{ja} \; t_d]$ is less than the round trip transaction costs where x_{dj} is the dealer's one-way transaction cost expressed as a percentage of the stock price.

Solving equation (A1) implies the following bounds for the ex-day rate of return:

Dividing both sides of (A1) by $(1 - t_d)$,

$$\frac{p_{ja}}{1 - t_d} + \frac{d_j \; 1 - t_d}{1 - t_d} - \frac{p_{jb}}{1 - t_d} + \frac{p_{jb} - p_{ja} \; t_d}{1 - t_d} = 2x_{dj}p_j$$

Simplifying and combining like terms,

$$p_{ja} - p_{jb} + d_j = 2x_{dj}p_j$$

Dividing both sides by the purchase price p_{jb},

$$r_j = \frac{2x_{dj}p_j}{p_{jb}}$$

In a world without transaction costs ex-day returns would be upper bound by zero; with positive transaction costs the relationship between ex-day return and transaction costs should be positive.

In a parallel to equation (A1), a dealer expecting ΔP/D>1 can profitably sell a stock on the cum-day and buy it back on the ex-day unless

$$-p_{ja} - d_j \; 1 - t_d \; + p_{jb} - \; p_{jb} - p_{ja} \; t_d = 2x_{dj}(1 - t_d)p_j \tag{A2}$$

Implying,

$$-p_{ja} + p_{jb} - d_j = 2x_{dj}p_j$$

Dividing both sides by the purchase sale price -p_{jb},

$$r_j = -\frac{2x_{dj}p_j}{p_{jb}}$$

In a world without transaction costs ex-day returns would be lower bound by zero; with positive transaction costs

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