PRICE PRESSURES FROM SHAREHOLDER LIQUIDITY EVENTS: EVIDENCE FROM CLOSED-END FUNDS

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Note to Notre Dame Workshop Participants

This paper is incomplete and very preliminary. Nevertheless, we hope our ideas and intentions are expressed well enough to facilitate a useful workshop discussion. Your comments and suggestions will be extremely useful to us given the early stage of our work.

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1. Introduction

In theoretical descriptions of efficient markets, investors without private information can buy and sell unlimited amounts of a stock without affecting its price. Stocks are simply risky claims on streams of future cash flow. The market price of a stock at any point in time is an unbiased estimate of its fair value based on all available information about its future cash flows and risk (Fama and Miller 1972). Rational investors without private information will not pay more than the market price for any given stock, and will not sell for less than the market price, because close substitutes to this stock are readily available. Noise and liquidity trading in a given stock will not affect its price because arbitrageurs will step in to eliminate any profit opportunities. If arbitrageurs are able to function in this capacity, then demand curves for stocks will be horizontal.

Whether demand curves are actually horizontal is an empirical question. In one of the first studies to investigate this question, Scholes (1972) reasons that excess (or short-term) demand curves might be downward sloping because a temporary decrease (increase) in price might be necessary to induce buyers (sellers) to absorb the increased supply of (demand for) shares. However, share price should revert to its original value after the excess demand (or excess supply) subsides. The prediction that share prices are *temporarily* affected by excess demand (or supply) is known as the *price-pressure hypothesis*. Prior studies have had mixed success in documenting price reversion. Failure to demonstrate price reversion implies that event precipitating the initial price change may have conveyed value-relevant information leading to a permanent price change, which is consistent with an upward (or downward) shift in a horizontal demand curve.

We investigate whether two types of recurring liquidity events for shareholders of closed-end funds affect trading volume and share prices of these funds. First, because most closed-end funds offer dividend reinvestment plans and many shareholders participate in these plans, we expect excess demand for fund shares and consequent buying pressure around dividend payment dates. We hypothesize that upward pricing pressure is created as the fund's transfer agent reinvests dividends through open-market purchases of fund shares, leading to positive abnormal returns on the days surrounding the dividend payment date. These abnormal returns should be increasing in the amount of dividends reinvested. Because dividend payments and automatic reinvestments convey no information about share value, these positive returns should reverse soon after the buying pressure is alleviated.

A second and less obvious source of pricing pressure may be created by investor liquidity needs immediately before the due dates of quarterly estimated income tax payments for individual taxpayers (i.e., January 15, April 15, June 15, and September 15). Because closed-end funds are predominantly retail investments and tax due dates are the same for all individual taxpayers, we expect to find evidence of selling pressure leading to negative abnormal returns in the days immediately preceding these due dates. Consistent with tax clientele theory, this selling pressure should be most pronounced in funds held almost exclusively by high-income individuals in non-retirement accounts (e.g., tax-exempt bond funds). We expect to find no evidence of price pressure with respect to taxable bond funds because such funds should be held by either low-tax individuals who are less likely to make estimated tax payments, or within retirement accounts of higher income individuals where withdrawals for liquidity needs are restricted until after retirement. [EMPIRICAL WORK ON THIS PART OF OUR STUDY IS INCOMPLETE.]

Our study differs from previous studies of price pressure in two important ways. First, the nature of these liquidity events rules out the possibility of any information effects on price. Second, unlike normal stocks, the shares of a closed-end fund almost certainly have close substitutes (i.e. other closed-end funds with a similar investment objective). Thus, to the extent we find evidence of price pressure, it is presumably due to the presence of transactions costs that limit arbitrage activity rather than the absence of close substitutes. Third, all prior studies of price pressure examine unique events (e.g. additions to the S&P500 index or large block sales) whereas the events we examine recur frequently. If these events create price pressures, one would expect rational investors to learn over time and change the timing of their trades to avoid adverse effects. Persistence of these effects over time may be viewed as evidence of irrational behavior if their magnitudes exceed reasonable costs of avoidance.

Our study makes three contributions to the literature. First, we provide evidence consistent with price pressure in two novel settings that are free of information effects, which confirms recent findings that excess-demand curves for stocks are downward sloping. Second, our results also help to explain why returns on shares of closed-end funds are more volatile than returns on the funds' underlying assets (Pontiff 1997). Third, we provide evidence that participation in dividend reinvestment plans may be, on average, somewhat detrimental to shareholders. The mean cumulative abnormal return around the dividend reinvestment period is approximatley 0.5%. Relative to a shareholder who receives cash and subsequently buys stock after the price pressure subsides, shareholders who participate in reinvestment plans lose approximately 0.5% of their dividends to other traders.

2. Background

2.1 Horizontal versus Downward Sloping Demand Curve for Stocks

In a perfect capital market all information is freely available, stocks have close substitutes, and arbitrage is costless. Suppose an investor operating in such a market wished to a buy a large block of a particular stock. This demand would be met at the prevailing market price because any other price would create an arbitrage opportunity. Specifically, an arbitrageur could meet the demand by selling short shares of the desired stock while simultaneously buying shares of a close substitute, realizing a profit to the extent the investor were willing to pay more than the prevailing market price for the desired stock. However, recognizing this opportunity, other arbitrageurs would enter the market until the asking price for the desired stock equaled its prevailing market price and arbitrage profits were driven to zero. Therefore, in a perfect capital market, the demand curve for stocks is horizontal—investors can buy and sell as many shares of a stock as they wish without affecting its price.

Scholes (1972, 186) notes that any attempt to measure the slope of a demand curve must specify the relevant time span over which changes in price and demand are measured. "In the very shortest of short runs, all demand curves will be almost perfectly inelastic. Yet, by waiting perhaps only a trivial length of time until news of the proposed sale had spread throughout the market, the sale might be affected without price-pressure effects." Nearly all prior studies define the relevant time interval as one trading day. Holthausen et al. (1990) find that prices adjust following large-block transactions within three trades. Thus, measuring the price change over a full trading day runs the risk of overlooking rather than overstating the effects of temporary price pressures.

Price reversion is difficult to demonstrate for at least two reasons. First, there is no consensus about the time period over which prices should revert. Most prior studies reviewed in this section do not find complete price reversion even after periods of several weeks. The length of the window over which one looks for and attributes price reversion to relaxation of price-pressure is critical. Some studies that find partial reversion after several weeks interpret their results as supporting the price-pressure hypothesis (i.e. a downward sloping *excess*-demand curve) rather than as evidence of imperfect substitutes (i.e. a downward sloping *long-term* demand curve). Other studies interpret similar results as evidence that "demand curves" for stocks are downward sloping. The belief that prices should "quickly" revert to their pre-event values assumes that investors are fully informed and transaction costs of minimal, but if that were true prices would not have deviated in the first place. Second, the longer the time period considered, the greater the potential impact of confounding events that might offset or obscure reversion, making statistical tests weaker.

The extent to which demand curves for stocks are horizontal in real capital markets is an empirical question. Researchers have sought to answer this question by examining price changes around events that create supply or demand for a stock, presumably without revealing any *real or perceived* value-relevant information about the stock. If investors interpret the event as a signal about the stock's value, then any observed price change could be attributed to new information rather than price pressure or a long-term downward sloping demand curve.

For example, studies that examine large-block sales of stock or secondary distributions (e.g. Scholes 1972; Holthausen et al. 1990; Mikkelson and Partch 1985) find that most of the subsequent price change is permanent, suggesting that large-block sales convey private information about firm value.[1] The fact that these studies do not find evidence of significant temporary price effects might be attributable to the successful selling efforts of underwriters (Kraus and Stoll 1972).

Several studies examine the price-pressure hypothesis in the context of additions to the S&P 500 index, which creates tremendous demand for newly-included stocks by index funds seeking to track the return on the S&P 500. Until October 1989, Standard & Poor simultaneously announced and implemented changes to its index. Using similar samples from this era, Harris and Gurel (1986) and Shleifer (1986) both find significant positive returns on the first day of inclusion, but reach different conclusions about whether the price increases are temporary or permanent. To the extent investors interpret inclusion in the S&P 500 as a positive signal of quality, effects documented in these studies could be attributable to information rather than downward sloping demand curves. Beneish and Whaley (1996) examine returns to stocks added to the S&P 500 index after Standard & Poor changed its policy to preannounce changes in index composition five business days before their inclusion. They find evidence of significantly positive returns beginning with the announcement and continuing through the effective date of inclusion. Most of this price increase appears to be permanent, although there is also evidence of significant partial reversal which Beneish and Whaley attribute to price pressure created by arbitrageurs.

Kaul et al. (2000) examine the effects of a change in the formula for computing the Toronto Stock Exchange 300 (TSE300) index. Changing the threshold level of ownership stake included in the definition of public float caused the TSE300 index weights for 31 firms to

[1] Liang (1999) documents significant price increases for stocks immediately after they are recommended by analysts, followed by reversion over the subsequent 15 trading days. Although Liang argues that this pattern of returns supports the price pressure hypothesis, it is also consistent with investors initially believing that the analysts' recommendations revealed value-relevant information.

increase, thereby creating demand for the stocks of these firms by index funds. Kaul et al. find significant positive abnormal returns for these firms during the event week and no evidence of price reversion over the subsequent six weeks.

Mitchell et al. (2003) examine returns to acquirers' stock during the pricing period and around the closing date of stock mergers. Although it is possible that these merger-related events reveal new information, Mitchell et al. estimate that approximately half of the negative announcement period stock price reaction to fixed-exchange-ratio stock mergers is due to short-term price pressure created by the short selling activities of merger arbitrageurs.

Reese (1998) and Blouin et al. (2002) examine price pressure created by changes to tax rules defining the long-term capital gain holding period and investors' tax incentives to recognize long-term, rather than short-term, capital gains. Both studies use samples of IPO firms to investigate whether increased trading volume and positive (negative) abnormal returns occur the firms' stock first qualified for long-term capital gains (loss) treatment. Ultimately, Reese (1998) and Blouin et al. (2002) both find evidence consistent with sellers of appreciated securities creating a seller's strike in the period immediately before a firm qualifies for favorable tax treatment.

Gibson et al. (2000) examine price pressure created by a tax rule requiring October 31 year-ends for all mutual funds and fund managers' incentives to recognize losses by selling loss stocks before that date. For 1990, the first year this rule was fully effective, they find evidence of significant negative returns for loss stocks in October followed by significant positive returns of equal magnitude for the same stocks in November. This effect does not recur in subsequent years. Gibson et al. interpret this pattern as evidence that fund managers learned from their experience in 1990, and subsequently had the foresight to spread their sales of losers over longer periods to avoid adverse effects of downward price pressure.

2.2 Closed-end Funds

Closed-end mutual funds (hereafter, CEFs) are "the simplest of corporations" (Pontiff 1995, 341). A CEF issues a fixed number of shares and invests the proceeds in a portfolio of other stocks and/or bonds consistent with the fund's advertised investment objective. Unlike open-end mutual funds that redeem shares from and issue new shares to investors at a price that reflects a pro rata share of underlying portfolio's net asset value (NAV), CEF shares are publicly traded on a stock exchange. Thus, if CEF shareholders wish to buy or sell shares, they do so via open market transactions at a share price that often deviates from NAV. A fund is said to trade at a discount (premium) when its share price is less than (greater than) its NAV.

CEFs share at least six characteristics that make them well-suited for testing the price pressure hypothesis. First, CEFs are predominantly retail investments for which there is very little institutional ownership. Table 1 indicates the average percentage of institutional ownership across a broad sample of CEFs, categorized by investment objective, as of January 1, 1993, and January 1, 1998.[2] Ownership data are taken from 13(f) filings, required of institutional investment managers who exercise discretion over $100 million or more of Section 13(f) securities. Institutions do not have to report holding of less than 10,000 shares with an aggregate value of less than $200,000. Thus, table 1 does not reflect all institutional ownership. On the other hand, much of the institutional ownership reflected in table 1 may actually represent shares owned by individual investors (e.g. shares held in street name by brokers and shares held in trusts managed by banks). Despite these potential measurement problems, table 1 clearly

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[2] As described in section 3.1, our sample spans the 16-year period between January 1988 and December 2003.

suggests that non-institutional (i.e. individual) investors are the predominant holders of CEF shares.

Second, closed-end funds make frequent distributions and commonly offer dividend reinvestment plans (DRIP). Typical features of DRIPs are discussed in the next section. Under current tax law a mutual fund must distribute to their shareholders during the calendar year the sum of (1) 98 percent of its ordinary income for the year (e.g. dividends and interest income) and (2) 98 percent of its capital gain net income for the one-year period ending on October 31 of that year (I.R.C. Sec. 4982(b)(1)). Fixed income funds typically make distributions of ordinary income more frequently than equity funds (e.g. monthly versus quarterly). Both general types of funds usually distribute capital gain net income in November or December.

Third, relative to normal firms, there is considerably less information asymmetry among shareholders and fund managers of CEFs because the NAV of the fund's investment portfolio is disclosed on at least a weekly basis. Therefore, it is very unlikely that reasonably informed traders would interpret order imbalances around the events we examine as revealing any private information about share value. Unlike many prior studies of price pressure, the possibility for information effects is extremely remote in this study.

Fourth, CEFs, particularly those that specialize in bonds, are much more likely to have close substitutes than are normal stocks. This is true because many CEFs have the same investment objectives and, therefore, hold very similar portfolios of other securities. On the other hand, arbitrage strategies involving short selling may not be possible with tax-exempt bond funds because payments made by the short-seller to the owner "in lieu of dividends" would lose their tax-exempt character (Pontiff 1996). This limitation may not apply to short positions that will be closed quickly. For example, to take advantage of any mispricing around a dividend payment date, an arbitrageur could buy shares of a CEF that will pay a dividend shortly before the dividend payment and sell short the shares of a similar fund. The short position could be closed quickly, probably before the next ex-dividend day, thereby avoiding the need for a payment in lieu of dividends. However, despite the apparent availability of close substitutes among closed-end funds, arbitrage opportunities may still be limited by transaction costs.

Fifth, CEFs often trade at prices that differ significantly from NAV, and share price volatility greatly exceeds the volatility of the underlying NAV. Pontiff (1997) finds that the average closed-end equity fund's monthly return is 64 percent more volatile than its underlying assets, and only about 15 percent of this excess risk can be explained by proxies for market risk, book-to-market risk, small-firm risk, and risk that affects other closed-end funds (e.g., investor sentiment risk) (Lee et al. 1991). It is possible that some portion of this excess volatility may be explained by price pressure on funds' shares around the investor liquidity events examined in this study.

Sixth, in contrast to the one-time events used to investigate prior pressure in prior studies (e.g. inclusion in the S&P 500 index), the events we examine recur frequently for each fund (e.g. periodic dividend payments). Non-recurrence makes it difficult to distinguish between the price-pressure hypothesis and the imperfect-substitutes hypothesis unless price reversion is also documented. However, by examining recurring events, we can infer that positive (negative) returns created by upward (downward) price pressure must eventually revert even if we do not find evidence of price reversion over a short horizon. Otherwise, there would be an ever increasing diversion of share values from their fundamental values over subsequent recurrences of the event. Another implication of recurrence is that, to the extent the events we examine create adverse price pressures, one would expect rational investors to learn from prior experiences and change their trading behaviors to mitigate these effects in future periods (Gibson et al. 2000).

3. Empirical Study of Buying Pressure at Dividend Payment Dates

3.1 Data

We start with the population of closed-end funds identified in the Center for Research in Security Prices (CRSP) database (SHRCD = 14) from January 1, 1988 through December 31, 2003. Of the 703 closed-end funds identified, we eliminated 40 from our sample because they did not pay any dividends during our sample period. The resulting sample of CEFs is composed of 224 tax-exempt bond funds, 133 taxable bond funds and 286 equity funds. Over time, our sample of funds grew from 152 in 1988 to 473 in 2003.

These 663 CEFs made 40,134 dividend payments and yielded roughly 1.5 million daily return and volume observations. Ultimately, 1,504 of the dividend payments were eliminated from the following statistical tests because we trimmed our sample based on top and bottom 1% of all daily returns where the return was estimated as the change in price ignoring dividends. Table 2 documents the frequency of dividend payment by year and fund type. Notice that the majority of our sample payments are generated by the tax-exempt and taxable bond funds. The majority of these funds appear to be making monthly distributions whereas the equity funds make semi-annual dividend payments.

3.2 The Demand for Shares

Because many CEF shareholders participate in automatic dividend reinvestment plans (DRIP), we expect to observe an increase in demand for and consequent trading volume of CEF shares on or immediately after dividend payment dates. Excess demand around dividend payment dates should be increasing in the total amount to be reinvested, which is positively related to the dividend amount and the proportion of shareholders enrolled in the DRIP. Based on discussions with fund managers, DRIP participation depends on two factors. First, the participation rate depends on whether enrollment requires an affirmative election by the shareholder (opt-in) or is automatic unless the shareholder files an election to be excluded from the plan (opt-out). [WE DO NOT YET HAVE DATA ON THIS FEATURE FOR ALL FUNDS IN OUR SAMPLE.] Second, DRIP participation is more common in equity funds than in bond funds because fixed-income investors usually want a steady stream of cash flow from fund distributions.[3]

However, among bond funds, tax clientele theory predicts that DRIP participation should be greater for taxable-bond funds than for tax-exempt bond funds. Taxable-bond funds are more likely to be held within tax-deferred retirement accounts that restrict investors' use of investment income until their retirements. Because cash cannot be withdrawn prior to age 59 ½ without incurring a tax penalty, dividends from CEFs held within retirement accounts must be reinvested anyway, and DRIP participation is one way to achieve this result. In contrast, tax-exempt bond funds should never be held within tax-deferred accounts and, therefore, cash flow from tax-exempt funds is unrestricted.[4]

How a typical DRIP acquires CEF shares depends on whether the fund is trading at a discount or premium to its NAV. Shares are purchased on the open-market if the fund is trading at a discount. If the fund is trading at a premium, new shares may be issued by the fund at NAV, or treasury shares may be sold to the DRIP at NAV. When share price and NAV are compared for purposes of determining which acquisition rule is used will vary from fund to fund. For each

[3] In addition, some brokerage firms (e.g. Morgan Stanley and Merrill Lynch) offer dividend reinvestment plans to their clients. CEF shares purchased by these plans will also contribute to buying pressure around dividend payment dates. Unfortunately, we have no way of quantifying the level of participation in such plans.

[4] Holding tax-exempt bonds within a tax-deferred retirement account defeats tax exemption because all distributions from such accounts are treated as ordinary income.

dividend payment we […WILL IN FUTURE ANALYSIS…] classify the share acquisition as open-market or not based on whether total shares outstanding increased over the days surrounding the dividend payment. We expect increased trading volume around the dividend payment date only in the case of open-market share acquisitions.

3.3 Abnormal Trading Volume

If dividend reinvestment plans create excess demand for shares, then we expect to see abnormally high trading volume around the dividend payment date. We measure abnormal trading volume as follows:

$$AVOL_{it} = \frac{\ln\left[1+\left(\$\text{Vol}_{it}\right)\right]}{\ln\left(1+\text{MVE}_{it}\right)} - \left\{\alpha_{it} + \beta_{it}\left[\frac{\ln\left[1+\left(\$\text{Vol}_{mkt,t}\right)\right]}{\ln\left(1+\text{MVE}_{mkt,t}\right)}\right]\right\} \tag{1}$$

The second term in equation (1) represents the log transformed dollar value of firm *i* shares traded on day *t*, $\$Vol_{it}$, as a fraction of the log transformed dollar value of firm *i*'s total shares outstanding on day *t*, MVE_{it}. The third term in the model represents the expected dollar value of trading volume for firm *i* based on a regression of the second term on the ratio of the dollar value all shares traded in the market to the total market value of all firms. Firm specific estimates of α_{it} and β_{it} are derived by estimating this regression over the 100 trading days preceding the third day prior to each dividend payment (i.e. days -103 to -4).

Table 3 shows the average daily value of *AVOL* for the eleven days centered on the dividend payment date by fund type (i.e. taxable bonds, tax-exempt bonds, and all equities). Figure 1 plots these averages across days. For all three fund types the highest values of *AVOL* occur on day 0, +1, and +2, but *AVOL* is significantly positive on at least nine days in the eleven day window examined. Positive *AVOL* on days preceding the dividend payment date might be explained by short-term traders attempting to "front-run" the DRIP. Such traders would gradually build long positions in shares of funds for which high demand is expected due to dividend reinvestments, which they would sell to the DRIP at a higher price during the reinvestment period. Contrary to the tax clientele prediction that dividend reinvestment should be more common for funds held in retirement accounts; *AVOL* is actually higher for tax-exempt bond funds than for taxable bond funds.

Based on the discussion in section 3.2, we estimate the following model to explain cross-sectional variation in abnormal trading volume:

$$C3VOL_{it} = \beta_{0i} + \beta_1 DIV_{id} + \beta_2 TAXB_{id} + \beta_3 TAXB{*}DIV_{id} + \beta_4 DEC_d + u_{\text{i}} \qquad (2)$$

where,

$C3VOL_{id}$ =	cumulative abnormal trading volume for firm *i* as defined in equation (1) over the three-day period, days -1, 0, and +1,
DIV_{id} =	dividend amount divided by share price on day -3,
$TAXB_{id}$ =	indicator variable equal to 1 if firm *i* is a taxable bond fund, and zero otherwise,
$TAXB{*}DIV_{id}$ =	interaction term equal to *DIV* if firm *i* is a taxable bond fund, and zero otherwise.
DEC_d =	indicator variable equal to 1 if the dividend payment occurs in December, and zero otherwise.

In future drafts we plan to add two additional explanatory variables to equation (2), OPTOUT and OPENMKT, to capture other determinants of demand described in section 3.2.

Table 4 presents the coefficient estimates for equation (2), which we estimate for bond funds only. We first estimate this equation without a separate intercept dummy for distributions occurring in December (model 1), and then add *DEC* to the analysis (model 2). The intercept in model 1 (model 2) represents the average value of *C3VOL* for tax-exempt bond funds around dividend payments (occurring in months other than December). When DEC_d is not in the model the coefficient on *DIV* is significantly positive, consistent with the argument that abnormally trading volume is positively related to the total amount of dividends that could potentially be reinvested. However, the overall positive effect of *DIV* disappears when *DEC* is added to the analysis. We suspect the significantly positive coefficient on *DEC* reflects large capital gain distributions that typically occur in December, which would also be subject to dividend reinvestment. In both models the coefficient on *TAXB* is significantly negative, suggesting that investors in taxable bond funds engage in less dividend reinvestment than investors in tax-exempt bonds funds. This result is contrary to expectations based on tax-clientele theory. However, the coefficient on the interaction term *DIV*TAXB* is significantly positive in both models, indicating that abnormal volume is increasing in the amount of dividends paid by taxable bond funds.

3.4 Abnormal Returns

The preceding section provides evidence that CEFs' dividend reinvestment programs create excess demand for funds' shares and abnormally high trading volume around dividend payment dates. In this section we ask whether this excess demand leads to positive abnormal returns.

We use two different methods for computing expected returns. The first method recognizes the diversity of each fund's investment portfolio by deriving firm-specific estimates for a market model with seven different market indices. Because equity funds may specialize in different geographical areas, we include equity indices for the U.S. (CRSP value-weighted market), the U.K. (FTSE), Germany (DAX), Japan (Nikkei), and Hong Kong (HK). We also include two indices for interest rates, daily changes in the ten-year Treasury bill rate (TB) and the six-month LIBOR rate (LIB). In recent years most CEFs publish per share NAV values at the end of each market day. If CEF shareholders make valuation decisions based on published NAV values, then changes in NAV may not affect share values until the following day. Therefore, we also include one-day lag values for each of the seven indices. We estimate this model separately for each fund over the 250 trading-days preceding January 1 of the year of payment. Coefficient estimates are then used to calculate expected returns around each dividend payment in the subsequent year.

Table 5 shows the coefficients on each market-model parameter averaged across funds of a similar type (i.e. two types of bonds funds and four types of equity funds). In general, the two interest rate indices, TB and LIB, have the largest average coefficients for bond funds, whereas the equity indices (particularly CRSP) have the largest average coefficients for equity funds. The average adjusted R-square statistic for these market model regressions is around 15% for bond funds, 32% for global equity and U.S. equity funds, and 23% for "growth and income" and "other" equity funds.

Our second approach for estimated expected returns is based on Elton, Gruber and Blake's (2002) recent study of ex-dividend day price changes for closed-end funds. Under this method a fund's expected return for any day is the average same-day return of all other similarly-classified funds excluding funds that paid dividends on that day. For this purpose we use the same seven fund classifications as shown in table 5. Weaknesses of this approach are that it relies on proper classification of fund's investment objectives and does not recognize diversity within these classifications.

Table 6 reports average daily abnormal returns by fund type for each of the eleven days centered on the dividend payment day. Abnormal returns reported in Panel A are based on the market model, while those reported in Panel B are based on the mean return for similar funds.

As shown in Panel A, average abnormal returns based on the market model are, in general, significantly positive from day -3 through day +3, with the largest values occurring on either the dividend payment day or the next day. These positive abnormal returns are consistent with price pressure created by the excess demand documented earlier. On the other hand, there is little evidence of price reversion in the narrow window we examine. Abnormal returns for day +5 are negative for each fund type, but not significantly so. A noteworthy aspect of Panel A is that, although we estimated a unique set of market model parameters for each fund, the pattern of average abnormal returns is fairly consistent across the three basic fund types over the eleven-day period.

In contrast, when expected returns are equal to the mean return of similar funds (Panel B), the pattern of average abnormal returns differs across the three basic funds types. The two estimation methods yield very different results for tax-exempt bond funds. Nevertheless, average abnormal returns are, in general, significantly positive on the dividend payment day and the following day, consistent with upward price pressure created by dividend reinvestment. In addition, the results in Panel B seem to reveal evidence of price reversion in that average abnormal returns are significantly negative on at least two days following the dividend payment for both tax-exempt bond funds (days 4 and 5) and equity funds (days 3 and 4).

3.5 Cross-sectional Differences in Abnormal Returns

In this section we attempt to explain cross-sectional variation in three-day cumulative abnormal returns (over days -1, 0, and +1) in terms of variables previously posited to explain demand for shares during the reinvestment period and other variables we expect to explain the willingness of other investors to satisfy this excess demand. We estimate the following model for this purpose:

$$C3CAR_{id} = \beta_0 + \beta_1 DIV_{id} + \beta_2 TAXB_i + \beta_3 DIV*TAXB_{id} + \beta_4 GAINLOSS_{id} + \beta_5 DEC_d + \beta_5 DEC*GAINLOSS_{id} + \beta_6 TO_{id} + \beta_7 1/P_{id} + u \quad (3)$$

As explained in section 3.3, demand for shares by dividend reinvestment programs is a function of dividend amount, participation in the program, and the share acquisition method (open-market purchases vs. new issuances). Dividend amount is represented by *DIV*. We expect program participation to differ across fund types. Because we consider only bond funds in this analysis, fund type is represented by an indicator variable, *TAXB*, which is equal to 1 if the fund is a taxable bond fund, and zero otherwise. We include *DIV*TAXB* to allow for the possibility that the effect of dividend amount might differ across fund type.

The more interesting parts of this model are the variables used to explain the willingness of other investors to sell their shares in order to satisfy the excess demand. As dividend reinvestment creates excess demand and exerts upper pressure on prices, other investors might immediately step in to sell shares at temporarily higher prices. However, shareholders' willingness to sell might depend on whether such selling triggers capital gains or losses, and transaction costs.

If trading behavior is motivated by tax planning considerations, investors should be more willing to recognize losses and less willing to recognize gains. Consistent with tax incentives, prior research (e.g. Badrinath and Lewellen 1991) document that investors are more willing to sell losing investments near year-end. In a study of price pressure, Kaul et al. (2000) find that abnormal returns are greater and abnormal volume lower for stocks that had appreciated more than 50 percent in the prior ten months, consistent with a capital gain lock-in effect. However, Odean (1998) reports evidence that is also consistent with a behavioral disposition effect—investors are less willing to sell losing investments than profitable investments—except during December.

Equation (3) includes three variables to capture these effects. *GAINLOSS* represents the percentage appreciation or depreciation of the fund's share price (*P*) over the preceding year, calculated as $(P_{t-3} - P_{t-253}) / P_{t-253}$. *GAINLOSS*DEC* captures any differential selling behavior in the month of December, when income taxes are more likely to be a salient concern to investors. Consistent with prior research, we expect a negative coefficient on *GAINLOSS* indicating investors' general reluctance (willingness) to realize losses (gains), and a positive coefficient on *GAINLOSS*DEC* indicating that tax loss selling (and gain deferral) dominates in December. We also include *DEC* as a separate variable to capture any overall effect of year-end activity on cumulative abnormal returns.

We include a measure of median share turnover, *TO*, over the 100 trading days preceding day -3 as a proxy for market depth. We expect that stocks with higher turnover are better able to absorb excess demand without affecting price. Finally, we include the inverse of share price on day -3, *1/P*, as a proxy for transaction costs a seller would incur (Naranjo et al. 2000). Because stocks with higher transaction costs should command higher abnormal returns, we expect a positive coefficient on *1/P*.

Coefficient estimates for regression equation (3) are reported in Table 7. We include only tax-exempt and taxable bond funds in this analysis. As in Table 6, results in Panel A relate to three-day *CAR* values based on market model estimates of expected returns, while the dependent *CAR* variable in Panel B uses the mean return of funds in the same category as the expected return on any given day.

The intercept in equation (3) represents the average *CAR* value for tax-exempt bond funds around dividend payments in months other than December, whereas the coefficient on *TAXB* represents the incremental *CAR* for taxable-bond funds relative to this reference group.

The estimated intercepts and coefficients on *TAXB* in Table 7 are consistent with the daily abnormal returns reported in Table 6. Specifically, in Panel A of Table 7, the significantly positive intercept is consistent with the positive abnormal returns of tax-exempt funds reported in Panel A of Table 6 for days -1, 0, and +1, while the negative coefficient on *TAXB* is consistent with the somewhat smaller abnormal returns for taxable bonds reported in Panel A of Table 6 for these same days. With regard to Panel B of Table 7, the insignificant intercept and positive coefficient on *TAXB* are consistent with the weak (strong) evidence of positive abnormal returns for tax-exempt (taxable) bond funds in Panel B of Table 6.

The remaining coefficient estimates are fairly consistent across the two dependent measures of three-day *CAR*s. In both panels of Table 7, the estimated coefficient on *GAINLOSS* is significantly negative, indicating a general reluctance of investors to sell loss stocks and willingness to sell gain stocks. Specifically, the abnormal return demanded by sellers to satisfy excess demand is decreasing in the amount of unrealized gain. This result is consistent with the behavioral disposition effect documented by Odean (1998). However, the significantly positive coefficient on *DEC*GAINLOSS* indicates that sellers tend to behave in a more tax-efficient manner in the month of December, though not completely so. In Panel A, the coefficients on *GAINLOSS* and *DEC*GAINLOSS* are of approximately the same magnitude, indicating that tax sensitivity in December is sufficient to mitigate, but not reverse, the behavioral disposition effect. In Panel B, the magnitude of the coefficient on *GAINLOSS* exceeds that of *DEC*GAINLOSS*, suggesting that tax sensitivity in December reduces but does not eliminate the behavioral disposition effect.

The significantly positive coefficients on *1/P* in both panels indicate that CAR values are increasing in the transaction costs sellers incur to satisfy the excess demand. Sellers demand higher returns to offset higher transaction costs. The coefficients on *TO* are insignificant in both analyses.

4.0 Conclusion

We report initial evidence of positive abnormal trading volume and positive abnormal returns around dividend payment dates for closed-end funds. We conjecture (and provide some evidence) that this pattern of trading volume and returns is due to excess demand for funds' shares created by dividend reinvestment programs. In future analysis we hope to provide additional evidence that cross-sectional variation in abnormal trading volume is explained by fund-specific features that affect demand for shares by dividend reinvestment programs.

Although this study is very preliminary, we are optimistic that it will ultimately provide evidence consistent with the price pressure hypothesis around two events that are entirely free on potential information effects. Additional work is necessary in both cases. First, supplementing the analysis completed to date with data from NYSE's Trades & Quotes database; we plan to confirm that order imbalances exist around the dividend payment date and that these are causes by excess demand. Second, in future analysis we intend to examine downward price pressure driven by excess supply created by individual investors liquidating securities to pay estimated taxes around quarterly estimated tax due dates. In addition, this study may explain some part of the excess volatility of returns on shares of closed-end funds relative to the volatility of the funds' underlying assets (Pontiff 1997).,

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Figure 1
Abnormal Trading Volume by Fund Type

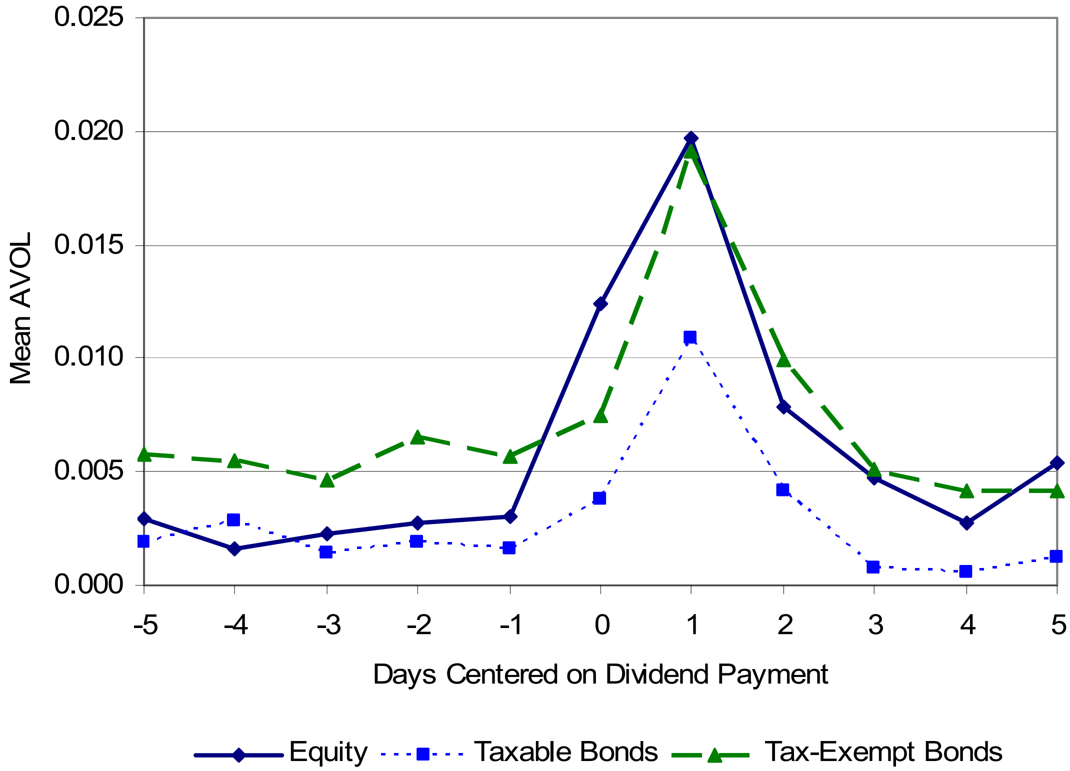

Table 1
Institutional Ownership by Fund Investment Objective
This table reports the average institutional ownership across closed-end funds that share a common investment objective. We measure institutional ownership using quarterly releases from Thomson Financial's Institutional Ownership database, which reflect data from the quarterly 13(f) filings of institutional investment managers who exercise discretion over $100 million or more of Section 13(f) securities. This table reports institutional ownership data at two points within our 16-year sample period (from January 1, 1988, through December 31, 2003).

	As of January 1, 1993			As of January 1, 1998		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Bond Funds						
Tax-exempt bonds	85	0.68%	1.41%	129	1.02%	2.01%
Taxable bonds	75	1.73	5.12%	99	5.84	7.68%
Equity Funds						
Growth & Income	4	6.11	9.04		9.56	
U.S. Equity	27	8.38	13.7	28	8.61	12.12
Global Equity	51	12.31	9.36	88	23.70	17.78
Other	28	7.36	9.62	25	14.01	16.41
All Equity Funds		9.86			13.90	

Table 2
Sample Derivation

	Funds	Dividend Payments
Closed-end funds with CRSP data	703	40,134
Less: Funds that did not pay dividends	(40)	0
	663	40,134
Less: Trimming criteria (describe)		(1,507)
Final Sample		38,627
Sample Composition by Investment Objective		
Tax-exempt bond funds		20,549
Taxable bond funds		12,099
Equity funds		5,979
Total		38,627

	Number of Funds by Investment Objective			
Year	Tax-Exempt Bonds	Taxable Bonds	Equity	Total
1988	18	50	84	152
1989	28	54	92	174
1990	38	59	112	209
1991	64	63	114	241
1992	109	79	120	308
1993	146	104	132	382
1994	148	111	155	414
1995	144	111	153	408
1996	141	104	180	425
1997	142	103	171	416
1998	146	105	154	405
1999	157	99	154	410
2000	156	95	195	446
2001	146	88	200	434
2002	177	90	202	469
2003	173	84	216	473
Total Funds	1,933	1,399	2,544	5,876
Dividend Payments	20,549	12,099	5,979	38,627
Payments per Year	10.63	8.64	2.35	

Table 3
Average Daily Abnormal Trading Volume by Fund Type
This table reports the mean daily abnormal trading volume, *AVOL*, by fund type for the eleven days centered on the dividend payment day (day 0). *C3Vol* is cumulative *AVOL* over the three-day period, day -1 to day +1.

	Tax-Exempt Bond Funds				Taxable Bond Fund				Equity Funds			
Day	**N**	**Mean AVOL**	**t-stat**	**p-value**	**N**	**Mean AVOL**	**t-stat**	**p-value**	**N**	**Mean AVOL**	**t-stat**	**p-value**
-5	17,804	0.0058	10.53	<.0001	10,748	0.0019	4.28	<.0001	5,272	0.0029	3.69	0.0002
-4	18,539	0.0055	10.04	<.0001	11,220	0.0028	6.40	<.0001	5,606	0.0016	1.89	0.0586
-3	18,037	0.0046	8.19	<.0001	10,940	0.0014	3.03	0.0024	5,393	0.0023	2.75	0.0059
-2	19,063	0.0065	12.11	<.0001	11,515	0.0019	4.35	<.0001	5,769	0.0027	3.40	0.0007
-1	18,509	0.0057	10.29	<.0001	11,145	0.0016	3.63	0.0003	5,462	0.0030	3.85	0.0001
0	20,380	0.0075	14.51	<.0001	12,306	0.0038	8.90	<.0001	6,400	0.0124	16.68	<.0001
+1	20,535	0.0191	43.58	<.0001	12,306	0.0109	25.66	<.0001	6,351	0.0197	27.35	<.0001
+2	20,263	0.0099	19.42	<.0001	12,270	0.0042	9.56	<.0001	6,346	0.0079	10.52	<.0001
+3	20,273	0.0051	9.68	<.0001	12,278	0.0008	1.83	0.0666	6,350	0.0047	6.20	<.0001
+4	20,202	0.0042	8.04	<.0001	12,229	0.0006	1.40	0.1615	6,328	0.0027	3.57	0.0004
+5	20,210	0.0042	7.81	<.0001	12,236	0.0012	2.85	0.0043	6,336	0.0054	7.26	<.0001
C3Vol	18,008	0.0308	32.51	<.0001	11,038	0.0151	17.97	<.0001	5,342	0.0315	20.83	<.0001

Table 4
Regression Results for Cumulative Abnormal Volume

This table reports the results for estimating regression equation (2) for bond funds. $C3VOL_{id}$ is cumulative abnormal trading volume for firm *i* over the three-day period, days -1, 0, and +1. Abnormal trading volume is the log transformed dollar value of firm *i*'s shares traded on each day in excess of the expected dollar value of trading volume for firm *i*. DIV_{id} is firm *i*'s dividend amount divided by its share price on day -3. $TAXB_{id}$ is an indicator variable equal to 1 if firm *i* is a taxable bond fund, and zero otherwise. $TAXB*DIV_{id}$ is equal to DIV_{id} if firm *i* is a taxable bond fund, and zero otherwise. DEC_d is an indicator variable equal to 1 if the dividend payment occurs in the month of December, and zero otherwise.

$$C3VOL_{id} = \beta_0 + \beta_1 DIV_{id} + \beta_2 TAXB_{id} + \beta_3 TAXB*DIV_{id} + DEC_d + u_i$$

	(1) Without *DEC*		(2) With *DEC*	
	Coefficient Estimate	t-statistic	Coefficient Estimate	t-statistic
Intercept	0.02760	18.08	0.02554	16.82
DIV	0.56374	2.50	0.00295	0.01
TAXB	-0.02664	-12.13	-0.02742	-12.57
*DIV*TAXB*	0.92908	3.71	1.35534	5.43
DEC			0.04646	21.01
N	32,003		32,003	
Adj. R^2	0.91%		2.26%	

Table 5
Estimated Coefficients in Expected Returns Model by Fund Type

Expected returns for each closed-end fund are estimated using a common expected returns model that includes measures of market returns domestic equities, foreign equities, and bonds. For each closed-end fund, market coefficients are estimated over the 250 trading days in the year preceding the year in which the dividend is paid. We present average coefficient estimates by fund type. We classify funds by type based on their classification at www.etfconnect.com or, when this classification is not available, the investment objective described in N-30D annual and semi-annual reports to shareholders obtained through the SEC's Edgar database.

$$E(R_{it}) = \beta_{0i} + \beta_{1i}CRSP_t + \beta_{2i}CRSPLAG_t + \beta_{3i}FTSE_t + \beta_{4i}FTSELAG_t + \beta_{5i}DAX_t + \beta_{6i}DAXLAG_t + \beta_{7i}NIK_t + \beta_{8i}NIKLAG_t + \beta_{9i}HK_t + \beta_{10i}HKLAG_t + \beta_{11i}TB_t + \beta_{12i}TBLAG_t + \beta_{13i}LIB_t + \beta_{14i}LIBLAG_t + u_i$$

Fund Type	Tax Exempt Bonds (N = 1938)	Taxable Bonds (N = 1425)	Global Equity (N = 1107)	U.S. Equity (N = 675)	Growth & Income (N = 104)	Other (N = 600)
B_0	0.00137	-0.00023	-0.00049	-0.00003	-0.00017	0.00003
B_1 *(CRSP)*	0.04386	0.10720	*0.54197*	*0.48705*	0.27161	0.62169
B_2 *(CRSPLAG)*	0.01810	0.01133	*-0.11438*	*0.08057*	0.05396	0.25763
B_3 *(FTSE)*	0.01778	0.02763	*0.14800*	0.05239	0.06846	0.03912
B_4 *(FTSELAG)*	-0.01231	0.04041	*-0.03514*	0.00822	0.03524	-0.05901
B_5 *(DAX)*	0.00364	0.04501	*0.14047*	0.04518	0.04597	-0.22682
B_6 *(DAXLAG)*	-0.00143	-0.00581	*0.03469*	-0.00923	-0.01821	0.09737
B_7 *(NIK)*	0.00111	-0.00083	*0.07076*	0.00205	0.01417	-0.04530
B_8 *(NIKLAG)*	-0.00014	0.01091	*0.00408*	0.00568	0.01180	-0.09311
B_9 *(HK)*	0.00854	-0.00425	*0.11786*	0.00506	-0.00437	-0.13608
B_{10} *(HKLAG)*	0.00261	0.01616	*0.02211*	0.00863	-0.00111	0.01990
B_{11} *(TB)*	*-0.11457*	*-0.06716*	0.04063	-0.00496	-0.05796	-0.17003
B_{12} *(TBLAG)*	*-0.04570*	*-0.02432*	0.00283	-0.01468	-0.01252	0.06448
B_{13} *(LIB)*	*0.26907*	*0.02157*	-0.02237	0.01811	0.05960	-0.11962
B_{14} *(LIBLAG)*	*0.15721*	*0.07972*	-0.01904	0.00162	-0.02610	0.12554
Adj. R^2	0.15156	0.13454	0.31746	0.32381	0.22662	0.23986

Table 6
Abnormal Returns by Fund Type by Day during Dividend Reinvestment Periods

This table shows the average abnormal return by day by fund type. Abnormal returns are actual returns minus expected returns. In Panel A, expected returns are based firm-specific market model parameters as illustrated in table 4. In Panel B, the expected return for any fund by day combination is the average of that day's actual returns for all other funds of the same type for which there is no dividend payment on that day (e.g. Elton, Gruber and Blake 2003).

	Panel A: Expected Return from Market Model			Panel B: Expected Return is Mean for Similar Funds		
	Tax Exempt Bonds	Taxable Bonds	Equity	Tax Exempt Bonds	Taxable Bonds	Equity
Day – 5	-0.00023	0.00032	-0.00037	-0.00005	0.00026	-0.00025
	(-3.59)	(2.98)	(-2.13)	(-0.81)	(2.58)	(-1.60)
Day – 4	0.00019	0.00009	-0.00039	0.00012	0.00018	-0.00040
	(2.97)	(0.86)	(-2.28)	(2.10)	(1.81)	(-2.62)
Day – 3	0.00095	0.00103	0.00078	0.00042	0.00077	0.00049
	(14.88)	(9.58)	(4.65)	(7.10)	(7.70)	(3.17)
Day – 2	0.00083	0.00036	0.00026	0.00008	0.00047	0.00036
	(13.19)	(3.48)	(1.57)	(1.35)	(4.78)	(2.33)
Day – 1	0.00113	0.00072	0.00065	-0.00018	0.00055	0.00056
	(18.10)	(6.94)	(3.83)	(-3.09)	(5.60)	(3.64)
Dividend	0.00157	0.00164	0.00252	0.00001	0.00118	0.00189
Payment Date	(24.29)	(15.53)	(14.18)	(0.21)	(11.61)	(11.32)
Day + 1	0.00292	0.00206	0.00250	0.00111	0.00168	0.00185
	(18.02)	(18.38)	(13.97)	(18.00)	(15.92)	(11.08)
Day + 2	0.00120	0.00085	0.00045	-0.00010	0.00021	0.00004
	(2.39)	(7.87)	(2.65)	(-1.72)	(2.07)	(0.26)
Day + 3	0.00098	0.00043	0.00003	-0.00010	0.00012	-0.00042
	(3.32)	(4.12)	(0.15)	(-1.74)	(1.27)	(-2.73)
Day + 4	0.00021	0.00031	-0.00004	-0.00015	-0.00008	-0.00050
	(0.50)	(2.93)	(-0.24)	(-2.49)	(-0.79)	(-3.21)
Day + 5	-0.00044	-0.00006	-0.00030	-0.00031	-0.00015	-0.00015
	(-1.21)	(-0.58)	(-1.44)	(-5.15)	(-1.58)	(-0.98)

Table 7
Regression Results for Cumulative Abnormal Returns during Dividend Reinvestment Periods

This table reports results from estimating regression equation (3). $C3CAR_{id}$ is the 3-day cumulative abnormal return created by summing daily estimates of firm *i*'s abnormal returns for days -1, 0, and +1. In Panel A, abnormal returns are based on our market model estimation of expected returns. In Panel B, abnormal returns are based on expected returns equal to the average return for other funds in the same classification on that day, excluding funds that made a dividend payment on that day. DIV_{id} is firm *i*'s dividend amount divided by its share price on day -3. $TAXB_{id}$ is an indicator variable equal to 1 if firm *i* is a taxable bond fund, and zero otherwise. $TAXB*DIV_{id}$ is equal to DIV_{id} if firm *i* is a taxable bond fund, and zero otherwise. $GAINLOSS_{id}$ is represents appreciation or depreciation in share price (*P*) over the preceding year, calculated as $(P_{t-3} - P_{t-253})/ P_{t-253}$. DEC_d is an indicator variable equal to 1 if the dividend payment occurs in the month of December, and zero otherwise. $DEC*GAINLOSS_{id}$ is equal to $GAINLOSS_{id}$ if the dividend payment occurred in December, and zero otherwise. TO_{id} is the median share turnover ratio, daily trading volume in shares dividend by total shares outstanding, over the 100-day period from day -3 to day -103. $1/P_{id}$ is the inverse of the closing share price on day -3.

$$C3CAR_{id} = \beta_0 + \beta_1 DIV_{id} + \beta_2 TAXB_i + \beta_3 DIV*TAXB_{id} + \beta_4 GAINLOSS_{id} + \beta_5 DEC_d + \beta_5 DEC*GAINLOSS_{id} + \beta_6 TO_{id} + \beta_7 1/P_{id} + u$$

	Panel A: Expected Return from Market Model		**Panel B: Expected Return is Mean for Similar Funds**	
	Coefficient Estimate	t-statistic	Coefficient Estimate	t-statistic
Intercept	0.00466	11.06	-0.00020	-0.82
DIV	0.02357	1.06	0.01544	1.21
TAXB	-0.00201	-5.47	0.00158	7.51
*DIV*TAXB*	0.01212	0.46	0.03668	2.44
GAINLOSS	-0.01404	-10.39	-0.00795	-10.25
DEC	0.00177	4.04	0.00027	1.08
*DEC*GAINLOSS*	0.01421	3.87	0.00453	2.15
TO	0.00000	-0.02	-0.00000	-0.16
1/P	0.00891	1.94	0.01284	4.86
N	29,763		29,763	
Adj. R^2	0.57%		1.55%	