

# Closed-end Fund Discounts and Interest Rates: Positive Covariance in US Data after 1985

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## Abstract

Previous papers find no relationship between interest rates and the discounts of US closed-end funds before 1985. This is taken as evidence against management fees being a cause of discounts because a negative relationship is expected: if interest rates rise, you would expect to see discounts fall as the present value of future fees is reduced. But from 1985 forward, there has been a strong positive relationship between interest rates and fees. This supports an alternative view in which the discount varies positively with interest rates because bond yields are an alternative return against which closed-end funds must compete.

*Key words:* Closed-end funds, Interest Rates

*JEL classification:* G11, G12, G14

## 1. INTRODUCTION

Closed-end funds are actively managed investment vehicles that differ from mutual funds in two important ways. First, they do not redeem their own shares at par with their portfolio values. Instead, their shares trade on major stock exchanges where supply and demand determine their prices. Second, they voluntarily release their net asset values once per week. Each fund's net asset value (NAV) is simply the value of its assets less its liabilities and represents the fund's fundamental value because if the fund were to liquidate immediately, its NAV would be distributed to its shareholders.

These two characteristics of closed-end funds enable a very direct test of arbitrage pricing and the Law of One Price. You simply compare fund share prices with the per-share value of fund NAVs. If you do so, you discover the infamous fact that the two values are only rarely equal.

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The observed differences are traditionally expressed as discounts or premia relative to per-share NAV. To formalize, suppose that a fund's price at time  $t$  is  $P_t$  and its NAV per share at time  $t$  is  $N_t$ . Then the discount or premium at which it trades at time  $t$  is defined as  $D_t = N_t/P_t - 1$ . Values of  $D_t > 0$  are referred to as discounts while values of  $D_t < 0$  are referred to as premia. In addition, please note that I will multiply  $D_t$  by 100 in order to express discounts and premia in percents.

Large differences between share prices and portfolio values are not uncommon, with discounts of 20% and premia of -20% being routinely observed. Truly extreme mispricings are rather rare, but it should be noted that among the 458 US funds examined here from 1985 to 2001, the maximum discount was 66.5% while the maximum premium was -205.4%.

The moderate discounts and premia that are routinely observed suggest at least some sort of violation of the Law of One Price, while the extreme values that are more occasionally observed are very hard to square with any sort of rational pricing. This has led to a large body of papers examining whether discounts and premia can be explained rationally. The debate is surveyed by Dimson and Marsh (1999), and empirical results are mixed, with some papers finding support for one or more of the explanatory hypotheses while others reject them or find no support for them.

One rejected hypothesis has to do with whether management fees affect  $D_t$  levels. The test for this has been to see whether  $D_t$  values move inversely with interest rates. The rationale for the test is that if the markets were in the habit of reducing the share price of a fund below its NAV per share by the present value of expected future management fees, then if interest rates were to go up, the present value of future fees would fall, thereby leading to a smaller discount.

Lee, Shleifer, and Thaler (1991) are the first to reject this hypothesis based on finding no relationship between unexpected changes in the term structure of interest rates and the average  $D_t$  levels across US stock funds between 1965 and 1985. Pontiff (1996) directly regresses  $D_t$  values on interest rates for the same 1965-1985 period and again finds no relationship. In addition, Gemmill and Thomas (2002) also find no relationship for UK data over the period 1991-1997. But as I demonstrate, there is a robust positive relationship between  $D_t$  and interest rates in US data after 1985. While this later positive relationship is also inconsistent with interest rates affecting  $D_t$  by changing the present value of future management fees, it is consistent with an alternative explanation for  $D_t$  levels suggested by Flynn (2002).

## 2. THE DATA

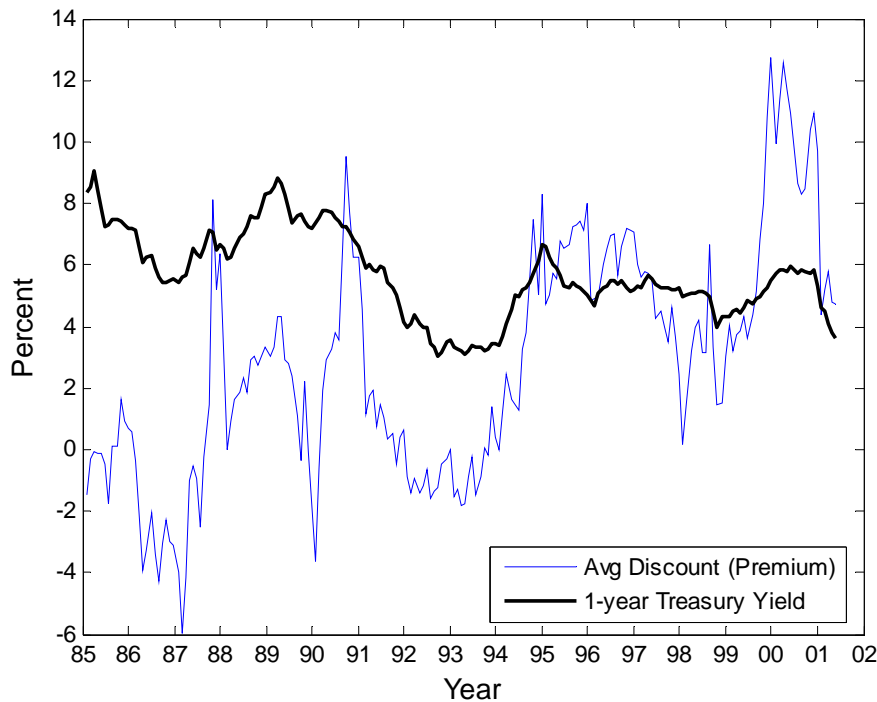
The data comes from the Fund Edge data set of US closed-end funds published by Weisenberger Thompson Financial. The data covers all 458 US closed-end funds trading in June 2001, with historical data of daily prices and weekly NAVs for each fund going back to each fund's inception. The data set suffers from survival bias, but is much larger

than any other data set used to study the relationship between interest rates and  $D_t$  levels. For instance, Lee, Shleifer, and Thaler (1991) use just 20 funds from 1965-1985, while Pontiff (1996) uses only 52 funds covering 1965-1985. For a complete description of the data set, see Flynn (2005).

### 3. INTEREST RATES AND DISCOUNTS IN THE US AFTER 1985

The positive relationship between interest rates and  $D_t$  levels is clearly visible in Figure 1, which plots yields on 1-year US Treasuries on the same graph as the average  $D_t$  level across all funds in operation each month between January 1985 and May 2001. As you can see, the two series move positively nearly all the time, with the only major exception being the sharp increase in the average  $D_t$  level in mid-1990 at a time when interest rates were falling. However, please note that this anomaly is easily explained as being the result of the financial market turmoil caused by Iraq's invasion of Kuwait that summer.

**Figure 1. Interest rates and the average discount of US closed-end funds, 1985-2001.**



The time series regressions summarized in Table 1 confirm the statistical significance of the positive relationship between interest rates and average  $D_t$  levels. Columns (1) and (2) present, respectively, regressions of the levels and first differences of 1-year Treasury yields on the levels and first differences of the average  $D_t$  series. For both regressions, an AR(1) process was used to account for serial correlation, and  $t$ -statistics are given in parentheses.

As you can see, levels regression (1) shows that a one-percentage point increase in interest rates causes a highly statistically significant 2.26 percent increase in the average  $D_t$  level. The first differences regression (2) strongly confirms this positive relationship, with a one-percentage point increase in interest rates leading to a highly statistically significant 2.32 percent increase in average  $D_t$  levels. In addition, please note that the AR(1) error correction is insignificant in first differences regression (2), indicating that no error correction method is needed. Consequently, you can run a simple OLS regression for the first differences of the two variables. If you do so, the  $R$ -squared is 0.158, indicating that nearly 16% of the first differences of the average  $D_t$  series are explained by first differences of 1-year Treasury yields.

**Table 1. Time Series Regressions in levels and first differences of 1-Year US Treasury Yields on the Average Discount or Premium ( $D_t$ ) of US Closed-end Funds, January 1985 to May 2001.**

| Dependent Variable      | (1)<br>Level of Avg. $D_t$ | (2)<br>Change in Avg. $D_t$ |
|-------------------------|----------------------------|-----------------------------|
| Intercept               | -8.14<br>(-2.83)           | 0.08<br>(0.94)              |
| Level of 1-year Treas.  | 2.26<br>(5.84)             |                             |
| Change in 1-year Treas. |                            | 2.32<br>(6.17)              |
| AR(1) parameter         | 0.95<br>(47.30)            | -0.08<br>(-1.07)            |
| R-squared               | 0.88                       | 0.16                        |
| Durbin Watson           | 2.12                       | 2.01                        |
| Observations            | 196                        | 195                         |

#### **4. THE COMPARATIVE RETURNS OF CLOSED-END FUNDS AND ALTERNATIVE ASSETS**

The positive relationship between interest rates and  $D_t$  levels is consistent with the investor sentiment model presented by Flynn (2002). In that model, if interest rates rise, then closed-end fund returns look comparatively less attractive to the small investors who dominate US closed-end fund markets. This causes closed-end fund prices to fall relative

to portfolio values, whose prices aren't affected by the sentiment of closed-end fund investors because the markets for the assets in fund portfolios are dominated by large institutional shareholders who hire rational, professional asset managers (Lee, Shleifer, and Thaler 1991.) The result is that when interest rates rise, closed-end fund prices fall relative to NAVs, causing  $D_t$  levels to increase.

## 5. CONCLUSION

In US data covering 1985-2001, closed-end fund  $D_t$  levels vary positively with interest rates. The positive relationship between the variables is consistent with the intuition of Flynn (2002), but it may only be a coincidence given that for US funds prior to 1985 and for UK funds from 1991-1997, no relationship between  $D_t$  and interest rates is found in the literature.

That being said, the positive relationship should likely be taken seriously for four reasons. First, finance professionals are aware of it and tell their clients to trade on it (Bush 2001.) Second, the post-1985 period contains vastly more funds than the pre-1985 period, so that the inability to find a relationship between  $D_t$  and interest rates during the earlier period may have simply been due to insufficient data. Third, the huge interest rate volatility of 1970s may have obscured the positive relationship between interest rates and  $D_t$  levels during the 1965-1985 period studied by Lee, Shleifer, and Thaler (1991) and Pontiff (1996). Fourth, the post-1985 period studied here represents a new era for small investors in the US, with both mutual funds and closed-end funds growing hugely more popular and attracting vastly more attention. It may be that the positive relationship between  $D_t$  levels and interest rates is a new phenomenon intimately related to the ability of small investors to rapidly re-allocate their investment capital in reaction to changes in interest rates. Since UK closed-end funds are dominated by institutional investors rather than small investors, this would also explain why Gemmill and Thomas (2002) find no relationship between  $D_t$  and interest rates in UK data during their 1991-1997 sample period.

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