

# **Why Do Closed-End Bond Funds Exist?**

## **An Additional Explanation for the Growth in Domestic Closed-End Bond Funds**

by

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## **Abstract**

In this paper we explore an important explanation of why closed-end bond funds exist despite the fact that similar open-end funds are available. While some closed-end funds operate in the less-liquid parts of the market, and this could partially explain their existence, we find an additional and important reason for their existence. When we compare closed-end bond funds with a matched set of open-end funds with the same objective, same manager and issued by the same fund family, we find no difference in the returns earned on assets and very little difference in asset holdings. There is a difference in performance, whether measured in terms of return on net assets or market returns. We show that this is due to the use of leverage by closed-end funds. Closed-end funds use leverage, borrowing short and lending long, increasing return on net assets in most years, but also increasing variance while decreasing the correlation with both stock and bond indices. We show the net effect of leverage is an increase in the attractiveness of closed-end bond funds for inclusion in an investor's portfolio. This implies that leverage should affect the price investors will pay for the net assets of closed-end bond funds. We show, using all closed-end bond funds, that leverage affects the average size of the discount on closed-end funds and its time pattern. We close with a brief history of performance since the crisis in the credit markets.

**Keywords:** closed-end funds, leverage, fund discount, fund premium

## **Introduction**

In this paper we explore a new reason for the existence of closed-end bond funds. Closed-end bond funds are an important investment vehicle. Both the number and assets under management of closed-end bond funds have grown tremendously. For example, in the four years 2001-2004, 150 new closed-end bond funds were introduced.

There is a large literature analyzing closed-end funds. Most of this literature offers explanations for the discount at which closed-end funds sell. Explanation for the discount includes the value of management (Chay and Trzcinka (1999)); agency costs (Malkiel (1977) and Brennan and Jain (2008)); liquidity of investments and management fees (Cherkes, Sagi and Stanton (2009)); tax liability (Malkiel (1977), Brennan and Jain (2008) and Brickley, Manaster and Schallheim (1991)); distribution policy (Wang and Nanda (2006) and Pontiff (1996)); volatility of price (Pontiff (1997)); uncertainty of the size of the premium (Elton, Gruber and Busse (1998)); and sentiment (Lee, Shleifer and Thaler (1991)). While these articles with varying degrees of success account for part of the premium puzzle, with some exceptions noted below, these articles do not attempt to account for the fact that closed-end bond funds continue to be started and to exist alongside often similar open-end fund alternatives.

Literature has developed that studies the reason for the existence of closed-end funds. The principal reason given is that they can hold less liquid assets and maintain lower cash positions (see Cherkes, Sagi and Stanton (2009) and Deli and Varma (2002)). While there is no doubt that closed-end bond funds are likely to be offered in less liquid segments of the market, we show that there is at least one more important explanation for their existence.

In this article we hypothesize and test the importance of leverage in increasing the performance and attractiveness of closed-end bond funds to investors. There are two related

articles that mention that closed-end funds are levered. Deli and Varma (2002) use a dummy variable for leverage as a control variable, where the independent variable is a 0, 1 variable indicating whether a fund is organized as closed end or open end.<sup>1</sup> They argue (page 10) that this should be included as a control variable because open-end funds could borrow to handle outflows. They don't discuss borrowing in relation to closed-end funds, although they find that leverage is positively related to whether or not a fund is organized as a closed-end fund. Cherkes et al (2009) come closest to the spirit of this paper. They measure the effect of leverage on the premium or discount for closed-end funds, one of the relationships we examine. They assume that the discount as a fraction of total assets should be a constant no matter how total assets are financed. This leads to levered funds selling at a premium measured in the normal way (premium on net asset value), which is equal to the premium on the unlevered funds divided by one minus the leverage ratio (see their footnote 23). This implies that as leverage is added the fund should sell further below its net asset value if the unlevered fund sells at a discount, and higher above net asset value if the unlevered fund sells at a premium. The premium they test is not the actual premium, but the actual premium divided by one minus the leverage ratio. This changes the premium on all levered funds from the value observed in the market. To the extent that their assumption that the premium on total assets is constant does not hold, and we find it does not, their results may be caused by the adjustment they make to the actual premium. Neither of these studies look at the impact of leverage on earnings return on assets, return to stockholders, and the risk characteristics of earnings and return.

Unlike prior studies, our paper analyzes (1) whether shareholders have higher earnings on their assets due to leverage; (2) the impact of leverage on shareholder market and NAV return;

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<sup>1</sup> Deli and Varma measure leverage as a dummy variable (0, 1) rather than as a continuous variable, as in other studies.

(3) the impact of leverage on shareholder and NAV risk, (correlation and volatility); and (4) the effect of leverage on the overall desirability of a closed-end fund. We quantify the size of the impact of leverage on these variables using both accounting and market data.

In this paper we limit our analysis to closed-end bond funds. One reason for this choice is the number and growth of these funds; there are about eight times more closed-end bond funds than domestic closed-end stock funds (see Cherkes, Sagittal and Stanton (2009)), and the number of closed-end bond funds has grown over time, while the number of domestic stock funds has remained relatively stagnant. The second reason is that the ability of management to affect performance should be more limited in bond funds than in stock funds. Thus differences between open-end and closed-end bond funds should be more reflective of the different opportunities provided by organizational structure than differences in management skill

As discussed above, it has been shown that closed-end funds are more common in certain areas such as international stock or municipal bonds, areas where the markets are less liquid. Because we are studying the differences in structure between open- and closed-end funds, we wanted a sample where management abilities, fund family policies, type, objectives and purpose of the open- and closed-end funds are matched as closely as possible. For this reason we analyze a sample of closed-end bond funds for which we can identify open-end funds with the same objective, with the same portfolio manager, and sponsored by the same fund family. The matched sample represents the closed-end funds for which management is most likely to have thought about ways to exploit the opportunities provided by differences in organizational structure. While we employ the matched sample to examine differences in assets and liabilities between open- and closed-end funds, when we examine the effect of leverage on discounts we

use the population of closed-end funds. The characteristics of the two samples are discussed in Section 1.

In Section 2 of this paper we examine differences in portfolio characteristics between the matched set of open-end and closed-end funds. First we examine portfolio holdings and find differences are small to non-existent. We then examine differences in the pre-expense characteristics of the return on total assets of the matched funds to see if the mean return or the patterns of return on closed-end and open-end funds are different. To do this we collect data on earnings, both realized and unrealized capital gains and fiscal year ends from the financial statements of closed-end funds. This is the first study to examine the return on the gross assets of closed-end bond funds. This is important, for it allows us to see how management is managing assets as opposed to how investors view the return stream. Once again we find little difference in the return earned on total assets between open-end and closed end funds in our matched sample. In Section 3 we examine the difference in liability structure. We find that closed-end funds almost always use leverage (often in the form of auction preferred stock) to raise large amounts of money to finance their investment while open-end funds do not. In fact, many of the closed-end funds employing leverage choose to lever to the legal limit defined in the SEC's Investment Company Act of 1940. We examine the impact of leverage on the earnings on shareholder assets (net assets) as opposed to total assets of closed-end funds and find that leverage leads to large differences between open- and closed-end funds. In examining the impact of leverage on the return to net assets, we do not simply look at interest rates. We first measure the full cost of borrowing, including the cost of re-issuing preferred stock, and the impact of borrowing on expense ratios. We then combine this with pre-expense return to measure profitability.

After examining the effect of leverage on the funds' earnings on net assets, we turn to examining the effect of differences due to leverage on the desirability of closed-end and open-end funds to shareholders. We start this examination in Section 4, where we examine the return and pattern of return to investors in the two types of funds. We separately examine levered and unlevered closed-end funds. As expected, we find that levered funds have higher mean return and variance of return compared to either unlevered closed-end funds or open-end funds. However, levered funds have lower correlation with other types of assets, partially mitigating the increase in variance of return. The net effect of these three influences is that levered closed-end funds are more likely to be added to an existing portfolio of stocks or bonds than unlevered funds or matched open-end funds. In Section 5 we examine the determinants of the discount both cross-sectionally and over time to examine whether investors value leverage so that a lower discount exists on levered closed-end funds. We find that the discount varies with the spread between short- and long-term interest rates and that leverage reduces the discount, indicating that investors value levered funds more highly. Finally, in Section 6 we examine what happened to closed-end bond funds since the debt crisis. Section 7 contains our conclusions.

## **1. Sample**

In this paper we examine two groups of closed-end bond funds. The first is a sample of 54 funds (excluding single-state municipal funds) for which we can identify an open-end fund with the same portfolio manager policy and fund family as one of the closed-end funds. These funds were distributed by 28 different fund families. The second sample consists of all 332 closed-end bond funds (excluding single-state funds) contained in the data sources listed below.<sup>2</sup> This second sample is used in the latter sections of this paper when having a matched open-end fund is not necessary for the analysis. In the first sample we pair the open-end and closed-end

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<sup>2</sup> We exclude single-state municipal bond funds because of different tax rates across states.

fund if each has at least one manager in common, are distributed by the same fund family, and are classified as the same type of bond fund. Since these funds are managed by the same people, sold by the same fund family, and have the same objectives, these are the funds for which differences in characteristics should reflect management's attempt to take advantage of differences in organizational structure. We collected data on all funds in both of our samples from 1996 through 2006.<sup>3</sup> We initially collected data on closed-end bond funds from Lipper, Morningstar and Bloomberg. For open-end funds we use the CRSP mutual fund database and for returns on closed-end funds we use the CRSP stock file.

Although Lipper supplied us with some data that allowed us to infer leverage (either using auction preferred stock or debt), the information was incomplete. We hand-collected the remaining data along with the associated costs, the realized and unrealized gains and losses, and any missing data from the closed-end funds' annual reports. Some characteristics of our matched-sample data are shown in Table 1.

In Table 1, data are presented for all fund years in our matched sample, and a division into those fund years when the closed-end funds employed leverage and those when they did not. Note that the matched open-end funds have results recorded separately for the levered and unlevered closed-end funds. The open-end funds did not use leverage, but the separate comparison was made to hold year effects the same.<sup>4</sup>

Note from Table 1 that closed-end bond funds employed leverage in 71% of the fund years in our sample. All but 7 out of 54 funds employ leverage by 2006. The size of closed-end bond funds measured by net assets is slightly more than 60% of the size of open-end funds. We would expect closed-end bond funds to be smaller, but comparisons using net assets exaggerate

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<sup>3</sup> In section 6 we collected a subset of data for our matched sample from 2007-2009.

<sup>4</sup> The use of leverage by closed-end funds was more predominant in later years, and a failure to examine open-end funds in the same time period could confuse a general trend with differences in fund characteristics.

the difference in size. Leverage increases the size of the portfolio of assets held by closed-end bond funds. When leverage is used, the average amount borrowed is 51.25% of pre-borrowing assets.<sup>5</sup> The average size of the total assets owned by the two-thirds of our sample using leverage is \$575.4 million or 91.5% of the size of matched open-end funds. Looking at the entire sample and employing the same analysis, the average closed-end fund holds 84.5% of the total assets held by the matched open-end funds. These differences are sufficiently small that scale economies should not be an impediment to the ability to manage the closed-end or open-end funds.<sup>6</sup>

The other fact worth noting is that the discount on closed-end bond funds (2.2% in our sample) is on average much smaller than that typically found for closed-end stock funds.

## **2. Differences in Portfolio Characteristics**

To examine the characteristics of the assets in our matched sample, we compute, for the closed-end funds in our sample and the open-end funds that had the same portfolio manager, two measures. First, we examine the differences in the characteristics of the securities held by matched pairs of open-end and closed-end funds. More specifically we examine differences in the maturity of the assets held, the quality ratings of the securities, the types of securities, and the amount of cash held. Second, we compare the return on total assets before fees. While with aggregate measures the matched samples are indistinguishable, more micro differences in types of investments held could result in differences in the mean return and the pattern of return. We first compare average return on total assets before fees. Then we examine the correlation between pre-fee returns on open- and closed-end funds to see if the time pattern of returns

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<sup>5</sup> In our sample only 70 fund years out of 276 have a leverage ratio smaller than 40%. Funds are restricted by the Investment Act of 1940 on how much they can borrow. The limit is 100% of shareholder equity when auction preferred stock is used, and 50% when debt is used.

<sup>6</sup> Our matched sample of closed-end funds has average asset values within 10% of the average asset value for the population of closed-end funds, and the distribution across fund families is similar.

differs. More specifically, we examine the time series correlation on the return on each open-end fund and its matched closed-end fund and compare this with the correlation between open- and closed-end funds of the same type in our sample that had different portfolio managers. Finally, we examine differences in the variance of returns on total assets before fees between the matched pairs of closed-end and open-end funds.

## **2.1. Differences in Portfolio Composition**

The first way to compare open-end and closed-end bond funds is to look at the differences in composition of the assets held. These results are presented in Tables 2, 3 and 4.

Table 2, Panel A shows the breakdown of portfolios by investment grade, non-investment grade, and unrated bonds. Higher rated bonds are considered more liquid. (See Harris and Piwowar (2006) for municipal bonds and Edwards, Harris and Piwowar (2007) for corporate bonds.) The percentages in each category are almost identical, with none of the differences being statistically significant at any meaningful level. Table 2, Panel B presents a finer breakdown by risk level. Again there is no evidence that closed-end bond funds and open-end bond funds differ in the quality of the securities they hold.

While quality is substantially the same, closed-end and open-end funds could differ by the maturity of the assets they hold. Shorter maturity assets are thought of as more liquid. (See Fabozzi (2010) and Harris and Piwowar (2006).) From Table 3 we see that the percentage of assets held in the maturity range 1 to 5 years is higher for closed-end funds than for open-end funds. In addition, open-end funds have higher percentage in long maturity bonds than do closed-end funds. There is no evidence that closed-end funds take less liquid positions by holding long-maturity portfolios. In fact, the data are more consistent with closed-end funds being more liquid.

In Table 4 we provide the percentage of the portfolio that non-municipal open-end and closed-end funds place in bonds of different types.<sup>7</sup> It has been shown that government debt is more liquid than corporate debt (Chakravarty and Sarker (2003)). Differences in the percentage held of each type of security are exceedingly small.

Before leaving this section we need to examine the impact of different cash positions in closed-end and open-end funds. Closed-end funds have an advantage in that they can maintain a smaller cash position relative to open-end funds. However, for our matched sample the advantage is extremely small. The median ratio of cash to assets in our open-end sample was 2.3%, while in the closed-end sample it was 0.60%. The difference of 1.7% can impact return by less than eight basis points.<sup>8</sup>

## **2.2. Differences in Return Characteristics**

The prior section showed that the aggregate characteristics of our matched sample were extremely similar. However, these aggregate characteristics might not capture all aspects of risk and liquidity. If the open- and closed-end funds hold securities with the same risk and liquidity, we would expect before any fees that the returns on total assets would be the same. However, if the closed-end fund held a less liquid or a riskier portfolio, it would do so presumably to earn a higher return, and we should find that the closed-end funds earn more on their assets before fees than the open-end funds. In addition, if closed-end funds need to hold less cash because they are not subject to redemptions, they should also earn a higher rate of return on total assets.

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<sup>7</sup> We have no breakdown by type for municipal bond funds.

<sup>8</sup> This number is computed by taking the difference in cash between the two types of funds and applying it to the return on assets pre-expenses. It is an overestimate because it assumes cash earns zero return when in fact what is classified as cash is often earning assets. Medians are reported in this section because a few open-end funds hold very large cash positions in conjunction with futures contracts, and including them in the mean would distort the estimate of cash held for transactions.

To determine the return on assets before expenses, we employ the following calculations. The monthly return for an open-end fund is the return from the CRSP mutual fund database plus 1/12 of the annual expense ratio for the fund. The annual return on assets for the closed-end fund is gross income (earnings before expenses and preferred dividends) plus realized and unrealized capital gains and losses for any year divided by average monthly total assets for that year.<sup>9</sup> To make the returns comparable, the return on the matched open-end fund was computed over the fiscal year of the closed-end fund.

The returns on total assets for closed-end and open-end funds before expenses are shown in Table 5. The returns are almost identical. On average, open-end funds have a return that is five basis points per year higher. This is not a meaningful difference economically, nor is it statistically significant at any meaningful level. When we disaggregate the funds into municipal and non-municipal funds, the results are similar. While there is no meaningful difference, the data show that, if anything, open-end funds earn a higher return, not a lower return on assets. This is inconsistent with closed-end funds investing in more illiquid or more risky higher return assets or having to hold less cash.

Although we observe no difference in the level of return on total assets before expenses, perhaps they differ in the pattern of returns. To examine this we computed the correlation of return between each fund and its matched fund. The correlation is exceedingly high. The average value for our sample is 0.924; the highest correlation is 0.998, and the lowest is 0.639. The 0.639 is an outlier, as the next lowest is 0.810. When we examine municipal bond funds, the average correlation is 0.91 and for non-municipal bond funds the average correlation is 0.95.

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<sup>9</sup> Previous authors have examined the return on net assets of closed-end funds. This compounds the effect of differences in assets and differences in leverage. By collecting data from financial statements on income, and unrealized as well as realized capital gains, we can study the return characteristics of the assets held by closed-end bond funds.

While these numbers seem high, we need to put them in context. To do this we examined the correlation between all pairwise combinations of a closed-end bond fund and an open-end bond fund for funds in our sample that had different portfolio managers. We did municipal and non-municipal bond funds separately, and within non-municipal bond funds we only computed correlations between funds with the same objective. When we do so, we find an average correlation of 0.85 for municipal funds and 0.75 for non-municipals. Based on these data, it is easy to see that open-end and closed-end funds that are managed by the same managers and issued by the same firm have returns that are highly correlated and are much more highly correlated than funds of the same type with different managers.

The final characteristic we examine is the variance of pre-expense return for the open- and closed-end funds sample. We find that the standard deviation of open-end funds is 4.63%, while for closed-end it is 5.56%. The  $t$  of the difference is 0.22, which is insignificant.

Based on correlations and the characteristics of their respective portfolios, the portfolios of bonds held by our matched set of closed-end and open-end bond funds are very closely aligned, and there is no evidence supporting differences in liquidity or risk.

### **3. Differences in Liabilities**

If our matched set of open and closed-end funds does not differ on the asset side, perhaps fund families differentiate between them on the liability side.

The difference on the liability side of the balance sheet is notable: almost all closed-end funds lever their assets through the use of debt or auction preferred stock, while open-end funds rarely use leverage. In 2006 all but seven funds in our matched sample had leverage, and even a higher percentage of more recently created funds use leverage (in 2001-2004, 149 out of 150 new closed-end bond funds were levered). For those funds that used leverage, the amount of

leverage was substantial; on average equal to about half of the assets under management at the time of the borrowing (see Table 1), many leveraging to the legal limit.<sup>10</sup> Borrowing principally was in the form of auction preferred stock. All but one municipal closed-end fund that levered used only this form of borrowing. The one fund that took a loan did so in the last year of our sample, and the amount of the loan was very small relative to the amount of preferred stock the fund had outstanding. The pattern is understandable, since the dividend on the auction preferred is tax-exempt to the holder while interest on debt is not: issuing preferred is less costly. For non-municipal closed-end bond funds, loans were the principal form of leveraging until 2003, when auction preferred stock became the more common form. The rates paid on auction preferred stock are reset at auction usually every week or every month. Thus closed-end bond funds are borrowing short term and, as shown in Table 3, investing long term.

Why should this help the investor? Couldn't the investor lever on personal account and accomplish the same objective (a la Modigliani and Miller)? There are three possible reasons why closed-end funds have an advantage over the individual. First, closed-end municipal bond funds, which use preferred stock, borrow at municipal bond rates since preferred dividends paid by municipal closed-end bond funds are taxed at the same rates as income from municipal bonds. An individual could not get this tax treatment on direct borrowing. Second, even non-municipal closed-end bond funds borrow at rates lower than those available to most investors, both because of their size and because of their low risk.<sup>11</sup> Third, borrowing by the closed-end fund limits the liability to the investor, whereas the liability on personal accounts is not so limited.

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<sup>10</sup> If a fund uses preferred stock, it can issue preferred equal to shareholder equity. If they borrow they can have debt up to 50% of shareholder equity.

<sup>11</sup> The direct cost of borrowing by municipal bond funds was 1.1% less than the federal funds rate, while non-muni bond funds borrowed at rates slightly above the federal funds rate. For non-municipal bond funds, the use of leverage by the fund has an additional tax advantage over personal leverage for investors who do not itemize deductions. If an investor itemizes deductions, interest expense on money borrowed for investment can be deducted against income.

For leverage to be an explanation for the existence of closed-end funds, it needs to be beneficial to the investor. A necessary condition for this is that borrowing increases returns to investors. This involves examining the cost of borrowing and the return to investors.

To analyze this we first examine the cost of borrowing. This involves collecting data from the financial reports of closed-end funds to estimate not only interest costs but the cost of refinancing preferred stock and the impact of borrowing on management fees. We then examine the impact of borrowing costs on the return on net assets. We close this section with an examination of the timing of the issuance of new debt in order to examine whether new issuance is related to the benefits of borrowing.

### 3.1. **Costs of Borrowing**

The total cost to an investor of the borrowing by a closed-end bond fund is larger than simply the interest payments on bonds or the dividend payment on preferred stock. The total cost can have two additional components. First, the closed-end fund pays fees to brokers at frequent intervals for handling the issuance of the auction preferred stock. Across all funds in all years this averaged 33 basis points per year per dollar of preferred issued. This cost was much higher for non-municipal bond funds, 48 b.p. compared to 29 b.p. for municipal bond funds. Second, when a closed-end fund introduces leverage, assets under management are increased. Since management fees are paid on assets under management, this increases the fees paid by the holders of the fund's shares. For example, assume the investor has \$100 invested, borrowing is \$50, and management fees are 1%. Then the management fee the investor pays in the levered fund is  $\frac{\$1.50}{\$100}$  or 1.5%.

Total expenses included in the reported expense ratio consist of management fees and administrative costs. Potentially, administrative costs also change with asset size. As discussed in

Appendix A, we examined the change in expenses in two ways. First, we estimated the change in expenses for the eight funds that added leverage during our sample period and thus we had a history before and after they borrowed. Second, we assumed administrative expenses did not change and so the increase in expenses was due to an increase in management fees.

Table 6 shows the total leverage costs for both municipal bond funds and non-municipal bond funds. When auction preferred stock is used to lever, the borrowing costs consist of the preferred dividend, flotation expense, and the impact of the increased assets on the shareholder expense ratio. When loans are used to lever, the borrowing costs have two components: interest cost and the impact of the increased assets on shareholder expenses. Since there is uncertainty as to impact of leverage on shareholder expense, we report two estimates, one using the change in expenses estimated in Appendix A (labeled Total 1) and one using the actual management fees (labeled Total 2) for each fund. Several properties of the direct borrowing costs are worth noting. First, the direct borrowing costs on the auction preferred debt for municipal bond funds on average is 70% of that for non-municipal bond funds, reflecting the tax advantage on auction preferred issued by municipal bond funds.<sup>12</sup> Second, when interest costs and dividend over price of preferred stock for non-municipal bond funds are regressed on each other, the correlation is 0.96, indicating that their levels are highly correlated on average. Third, the direct borrowing costs on loans for non-municipal bond funds are 63 basis points more than the rate on auction preferred stock for non-municipal bond funds. However, auction preferred stock has weekly or monthly flotation costs averaging 48 b.p. for non-municipal bond funds. When these are taken

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<sup>12</sup> Recall that the receipt of dividends on preferred stock issued by municipal bond funds is tax free to individuals to the extent that the dividends are paid out of municipal interest received by the fund.

into account, the difference in total borrowing costs between preferred and debt for non-municipal bond funds is reduced to 15 basis points.<sup>13</sup>

To better understand the total borrowing costs of closed-end funds, we regressed closed-end total borrowing costs on a wide variety of short-term interest rates. The best fit was obtained with the Federal Funds Rate. Total costs of auction preferred stock for municipal bond funds and for non-municipal bond funds and costs for loans to non-municipal bond funds were each highly correlated with the Fed Funds Rate ( $R^2$  greater than 0.90). The cost of leverage using auction preferred stock for municipal bond funds was below the Fed Funds Rate even when flotation expenses and the increase in expenses were included. For non-municipal bond funds, the cost of leverage was slightly higher than the Federal Funds Rate.

### **3.2. Benefits of Borrowing**

Closed-end bond funds borrow short and invest long in hopes of increasing the return on investor capital (net asset value) and the return to investors. We know how leverage should impact the return on net assets: an increase in expected return and an increase in the variance of return. However, the increase in return depends on the shape of the yield curve. Thus we first examine whether closed-end funds on average earn more income for investors on the additional investment due to leverage. This was computed as the return on total assets pre-expenses less the percentage borrowing costs. Table 7 presents the data. On average, the return earned on the assets financed by leverage was between 2.64% and 2.78% higher than the total cost of borrowing for municipal bond funds, depending on the estimate of the increase in expenses, and between 2.39% and 2.51% higher for non-municipal bond funds. For municipal bond funds, income to investors was increased in 86% or 88.3% of the fund years, depending on the estimate

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<sup>13</sup> This is a small difference, indicating that uncertainty concerning the ability to reissue the preferred was not highly priced by the market at the time of this study.

of expense charges. This is statistically significant at the 0.01 level. For non-municipal bond funds, income to investors was increased between 68% or 70% of the years, which is also significant at the 0.01 level.<sup>14</sup>

In Appendix B we use historic data to extend our analysis back in time, to see if the extra return is unique to the period of this study. The results are consistent with those reported above. Extending the analysis backward in time reinforces what we observed over the period of our study. In most years, and for most funds, leverage increases return to shareholders.

### **3.3. Leverage and Timing**

The extra return shareholders earn on the additional capital financed with leverage depends on the risk premium.

It has been shown that the risk premium determines future expected returns at different maturities (see, for example, Ludvigson and Ng (2009)). Furthermore, future expected returns and risk premiums are higher when the yield curve is steeper (see Campbell and Shiller (1991), Ludvigson and Ng (2009), Bakus, Foresi, Mozumdar and Wu (2001), Dai and Singleton (2001), and Duffee (2002)). Thus a larger positive difference between short-term and long-term rates implies both a higher risk premium for longer maturities and a higher expected return for longer-maturing securities relative to short-term securities.

As the yield curve flattens out, shareholder asset return due to the preferred stock or debt issues decreases. This would suggest that firms should use leverage strategically, increasing or decreasing it as the term premium changes. However, they do not do so. The amount of borrowing remains constant through decreases in the term premium. Possible explanations include the cost of liquidating part of the portfolio, difficulty in floating different amounts of

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<sup>14</sup> Open-end and closed-end bond funds almost always pay dividends monthly. Levered closed-end funds paid dividends that were over 1.5% higher than open-end funds. Recall that 95% of earnings and capital gains must be paid out on dividends, and we have seen levered closed-end funds have higher earnings than open-end funds.

auction preferred stock, or reluctance on the part of the manager to give up assets and the associated fees.

While funds do not decrease the amount of leverage over time as the term spread changes, they do time their issuance of debt and preferred to reflect current spreads. Figure 1 shows the number of new debt or preferred stock issuance in each of 10 deciles as a function of yield spreads. The number of new issuances is computed across all closed-end bond funds for our larger sample (sample 2). Clearly, funds tend to float new issues of preferred when the term premium is high. To test this more formally we performed a probit analysis where the dependent variable was 1 if there was an issuance and zero if there was no issuance. The independent variable was the normalized yield spread. The yield spread for municipal bond funds was defined as the yield on a 20-year municipal bond (from Bloomberg) minus the Fed Funds rate, while the yield spread for non-municipal bond funds was defined as the difference between the 10-year constant maturity Treasury yield and the Fed Funds rate. So that we could combine municipal bond funds and non-municipal bond funds, we normalized the yield spread for each type of bond by dividing by the mean spread. Thus the independent variable is the proportion of normal spread that the current spread represents.

The results are:

$$-1.86 + 0.17 \times \text{change in yield spread.}$$

We also performed probit analysis separately for municipal bond funds and for non-municipal bond funds using the appropriate yield spread as the independent variable. For non-municipal bond funds we get:

$$-2.34 + 0.22 \times \text{change in yield spread.}$$

For municipal bond funds we get:

$$-1.61 + 0.14 \times \text{change in yield spread.}$$

For each of these probit analyses, the probability of the slope being zero is less than 1 in a 1000. The results are again highly significant, with the slope larger for municipals. The separate results are similar to the results we get when we combine the two groups. Thus closed-end funds time their issuance to coincide with larger spreads.

#### **4. Leverage and Attractiveness to Stockholders**

In the last section we showed that there was a potential benefit to investors from leveraging, since leverage results in a higher return on net assets. While higher return is a necessary condition for leverage to benefit investors, it is not sufficient. In this section we examine characteristics of returns to equity investors to see if leverage is desirable. We first examine the characteristics of return (mean, variance and correlation) and then put these together to see which is most attractive to investors.

##### **4.1 Return**

For closed-end funds, investor return is the dividend yield plus the percentage change in price. Since it is useful to see what would happen if the discount didn't change on closed-end funds, we also computed the dividend yield plus percentage change in NAV for closed-end funds. We examined a number of characteristics of both of these returns, their means, their standard deviation and their correlation with major indexes. Initially we examined mean returns. When we look at the return to shareholders in closed-end funds, we find that investors in levered funds earn a higher return than investors in unlevered funds: 8.40% compared to 7.01%. Since this could reflect differences in returns across years, a more relevant comparison are the differences in return from the matched open-end fund. The spread is 3.33% for levered funds

compared to 1.24% for unlevered funds. Part of these results is due to shrinkage of the discount over time.

Since one can't predict future discount changes, a more conservative comparison is probably return on NAV.<sup>15</sup> Shareholders in levered closed-end funds had higher NAV returns than unlevered closed-end funds, 6.82% compared to 5.77%. Examining the spread over matched open-end fund, we find the spread is higher for levered funds (2.08% higher) than it is for unlevered funds. To see if this difference is meaningful, we performed a test of the difference in spread assuming unequal variances. The  $t$  was 3.13, which is highly significant. Thus levered funds earn a high return to shareholders than unlevered funds, and both earn a higher return than their matched open-end funds.

## **4.2 Risk Considerations**

The attractiveness of closed-end funds compared to open-end funds will depend on the risk characteristics of the return stream as well as the expected return. The principal difference is the behavior of the premium or discount. Like exchange-rate risk for international funds, the premium or discount can increase or decrease the correlation with other funds in a likely portfolio. Likewise, movement in the premium or discount can make the stockholder return on closed-end funds more or less volatile than the return on open-end funds. The standard deviation of stockholder return for closed-end funds is 3.40% (for levered funds it is 3.51%, and for unlevered funds it is 2.71%). The corresponding numbers for open-end funds are 1.24% when matched with levered closed-end funds, and 1.19% when matched with unlevered closed-end funds. Stockholder returns on closed-end funds are more volatile than returns on open-end funds,

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<sup>15</sup> For open-end funds, NAV returns and price are identical. The return to the open-end investors is simply the dividend yield plus the percentage changes in NAV.

and levered funds are 30% more volatile than unlevered. The other aspect affecting the risk is the correlation with asset categories that will likely be held.<sup>16</sup>

The correlation between the return on net asset value of closed-end funds versus the return on open-end funds is 0.90. When we examine the correlation between the returns earned by the shareholder in the open-end funds with those earned in the closed-end funds, it is much smaller (0.56). Changes in price to NAV decrease the correlation of closed-end funds with open-end funds. Another way to see this is to examine correlation with security indexes. Table 9 shows the coefficient of determination for the return to shareholders on closed-end funds (levered and unlevered), the return on net asset value for closed-end funds, and the return on open-end funds with a bond and stock index separately and jointly.<sup>17</sup> This table shows that for closed-end funds the NAV return is much more highly correlated with a return index for bonds than is the return to shareholders. Also, the return on open-end funds is more highly correlated with the bond index than is the shareholder return on closed-end bond funds. The same pattern follows when we examine the correlation with the stock index. Open-end fund returns are most highly correlated, closed-end fund NAV returns are slightly less, and closed-end return to shareholders much less. There is no consistent pattern when we compare levered and unlevered closed-end funds. The movements in premiums and discounts of closed-end funds increase the standard deviation but lower the correlation with open-end funds, bonds, and stocks.

### **4.3 Overall Desirability**

We have seen that for closed-end funds, over the period of this study, investors have a higher mean return, a higher variance, and a lower correlation with the stock and bond markets. The net effect of these differences can be studied using standard mean-variance analysis. If an investor

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<sup>16</sup> This is in contrast to the standard deviation of return on total assets where we found no difference.

<sup>17</sup> The S&P 500 index was used for the stock index, while for bonds either Barclays government-credit index or Barclays 10-year municipal bond index was used, depending on the type of fund being examined.

were to choose among an unlevered closed-end fund, a levered closed-end fund or an open-end fund, which fund would be the most desirable to add to a diversified portfolio of bonds or stocks? We know that the criteria for inclusion of a new asset  $N$  to a stock or bond portfolio  $P$  is<sup>18</sup>

$$\frac{\bar{R}_N - R_F}{\sigma_N \rho_{NP}} \geq \frac{\bar{R}_P - R_F}{\sigma_P} \quad (1)$$

where

1.  $\bar{R}$  is expected return;
2.  $\sigma$  is standard deviation;
3.  $R_F$  is the riskless rate;
4. Subscript  $P$  is for a stock or bond portfolio, and subscript  $N$  is for a new asset.

Since the right-hand side is the same for any stock or bond index portfolio, the size of the left-hand side represents the desirability of adding a type of fund to a stock index portfolio or a bond index portfolio. We use the actual values of average investor returns, correlations, standard deviations, and the average  $R_F$  over the history of each fund to compute the left-hand side of the equation (1). When we examine levered closed-end funds, we find that more than 80% of these funds have a higher ratio than their matched open-end funds, whether we considered adding the fund to a stock or bond portfolio. This percentage is statistically significant from what we would expect by chance at the 1% level. When we examine unlevered closed-end bond funds, we find that only slightly less than one-half (the number we would expect by chance) outperform their open-end matched sample. Both are dominated by levered closed-end bond funds. An investor

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<sup>18</sup> This formula follows from first-order conditions. (See Elton, Gruber, Brown and Goetzman (2010), Chapter 12.) For municipal bond funds, bond portfolio  $P$  is Barclays Capital 10-year municipal bond index; for non-municipal bond funds, bond portfolio  $P$  is Barclays Capital government-credit index; for both municipal and non-municipal bond funds, stock portfolio  $P$  is the S&P 500 index.  $R_F$  was set at an average value of 3.76.

holding a stock portfolio or a bond portfolio would want to add a closed-end levered bond fund rather than an open-end fund or an unlevered closed-end fund. Leverage makes the closed-end funds more desirable.

## **5. Evidence that Shareholders Value Leverage**

If leverage is desirable, then evidence of its desirability should be seen in discounts. In this section we will analyze what determines the discount cross-sectionally and over time, using data on all 332 closed-end bond funds.

### **5.1. Cross-Sectional Determinants**

We have shown that leverage increases return to closed-end bond fund investors. The use of leverage also increases the risk to the investors in closed-end bond funds. In the prior sections we provided some evidence that the investor is better off with leverage. We can get further evidence by examining the price an investor will pay for a dollar of net assets as a function of leverage.

Table 9 presents the results of regressing (cross-sectionally) the ratio of price to net asset value on leverage and on leverage and other variables that affect investor returns for all government and corporate closed-end bond funds. The Fama-MacBeth procedure is used to estimate betas and their significance. Each month a cross-sectional regression is estimated. The average values for the regression coefficients across all months, their time series standard deviation and the average cross-sectional  $R^2$  are reported.<sup>19</sup>

When the ratio of price to net asset value is regressed against the leverage variable, the coefficient is positive, large, and statistically significant at the 0.01 level, and the average cross-

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<sup>19</sup> Cherkas, Sagi and Stanton (2009) regress the unlevered discount, defined as levered discount divided by one minus leverage, on leverage and find a positive relationship. They interpret this as evidence on liquidity.

sectional  $R^2$  (adjusted for degrees of freedom) is 0.24. Clearly, leverage explains a great deal of the difference in premiums across funds.

We add two additional variables to the cross-sectional regression to see if they increase the ability to explain premiums and to see whether leverage is still important when these two variables are introduced. The first variable is dividend yield. Since managers of closed-end funds, like managers in general, are reluctant to raise or lower dividends, the dividend variable serves as a proxy for expected long-run earnings. The second variable is past returns. There is ample evidence in the literature that investors chase return. This could drive up the price, causing firms with higher past returns to sell at a smaller discount. Both of these variables are correlated with leverage, since the use of leverage increases earnings and thus dividends and returns. The question remains as to whether, when we introduce these two variables into a cross-sectional regression, leverage still enters as a significant variable.

Lagged return was measured using the average monthly return over the previous three months. Dividend yield was measured in two alternative ways: annual dividend divided by the price at the beginning of the year, and annual dividend divided by NAV at the beginning of the year. The reason for measuring it in two ways is because, if no relationship was present, having the same variable in the denominators of the dependent variable and the independent variable would bias the regression coefficient on the independent variable upward, while having the same variable in the numerator of the dependent variable and the denominator of the independent variable would bias the regression coefficient downward. By performing the analysis both ways we can unequivocally see the result of leverage on the discounts.

The results from running the additional regressions are presented in Table 9. With either definition of dividend yield, the leverage coefficient maintains its positive sign and is statistically

significant at the 0.01 level. The dividend yield coefficient is positive and statistically significant at the 0.01 level for either definition, and the coefficient on past returns is positive and statistically significant at the 0.05 level or better. All standard errors are corrected using the Newey-West adjustment with lag 3. The average adjusted  $R^2$  on the monthly cross-sectional regressions is 0.54 when dividend/NAV is used to describe the dividend yield and 0.35 when dividend/price is used. These three variables go a long way toward explaining the cross-sectional variation in the discount on closed-end bond funds. When dividend yield and past returns are introduced, leverage still shows up as an important influence, increasing the premium at which closed-end bond funds sell.<sup>20</sup>

## 5.2 Time-Series Determinants

We have argued that leverage is especially valuable when the term premium is high. The market should recognize this advantage by increasing the price to net asset value of funds that use leverage relative to funds that do not use leverage at those times. In Table 10 we present results of a regression of weekly values for the price divided by the value of net assets for levered bond funds minus the same ratio for unlevered bond funds for all closed-end funds on the long-term bond rate minus the short-term rate over the period.<sup>21</sup> We corrected the standard errors with the Newey-West adjustment using a lag of 12 weeks. The results are clear. For municipal funds (970 observations) the slope is positive and statistically significant at better than the 0.01 level with an  $R^2$  of 0.22. For corporate and government bond funds, the same levels of significance are found with an  $R^2$  of 0.12. Once again we find strong evidence that the use of

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<sup>20</sup> The analysis described above was repeated for closed-end municipal bond funds. The cross-sectional variance in leverage was so small (almost all municipal funds are levered and all by about the same amount) across municipal bond funds that its impact could not be observed in a cross-sectional study.

<sup>21</sup> Tables 10 and 11 are based on Sample 2 (as described earlier); since the analyses do not depend on a matching set of open-end funds, we can employ the larger sample. We tried different lags from 3 to 12 for the Newey-West adjustment. The results are highly significant for all lags.

leverage and the impact of the shape of the yield curve are recognized and rewarded in the pricing of closed-end bond funds.

## **6. 2007 and Beyond**

The economic crisis that began to develop in 2007 resulted in an increased difficulty in borrowing in general and failures in the auction preferred market. In this section we analyze how levered closed-end funds fared in the last three years.<sup>22</sup>

Rates on auction preferred stock are generally reset by auction every 7, 28 or 35 days. Buyers pay par value for the securities. Buyers submit an amount they wish to purchase and the minimum yield they will accept. Current holders can agree to hold or sell at whatever rate is set at auction or only agree to hold if the rate is above a specific value. The market clears at the minimum rate that causes all preferred to be held.

If there are not sufficient investors who wish to hold a specific preferred issue, the rate is set at a contractual rate. When this occurs it is referred to as a failed auction.<sup>23</sup> According to McConnell and Saritto (2009), prior to the end of 2006 there were only 13 failures out of 100,000 auctions. In 2007 the pattern started to change. According to McConnell and Saritto, September and November had five failures out of 13,000 auctions, December 22 failures, January 158 failures, and February 104 failures. Failures continued to increase until almost all auctions failed and most rates were set at contractual levels.

What happened to the return on levered closed-end funds relative to open-end funds from the end of the sample used in the earlier part of this paper through 2009? Whether we examine shareholder returns or NAV returns, the conclusion is the same. Closed-end funds (almost all

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<sup>22</sup> Over the period 2007-2009 the number of domestic closed-end bond funds, most of which used leverage, shrunk by 3%, while the number of closed-end stock funds shrunk by 15%.

<sup>23</sup> If there are buyers at rates below the maximum, sell orders are filled proportionally. Thus even in failure, some sales can occur.

levered) outperformed their matched open-end fund by 3.63% using return to shareholders, and by 1.46% using NAV return. The difference in shareholder return is significant at the 5% level. The results above do not include returns on three firms that merged and one that liquidated over the period. This might have biased these results since, at least for mutual funds, merger normally occurs after poor performance (see Elton, Gruber and Blake (1996)). However, this does not introduce bias in this case since the four funds outperformed their matched open-end counterparts and the average of other continuing closed-end funds relative to their open-end counterparts right up to the time of the merger or liquidation. Thus leaving them out does not bias results in favor of closed-end funds.<sup>24</sup>

### **6.1. Financing Pattern**

The performance over the 2007-2009 period has held up quite well. What did the funds do with respect to leverage?

Let's examine municipal bond funds separately from non-muni funds. The market value of the assets in the municipal bond funds in our matched sample shrank by 18.3%. Given the decrease in the market value of the asset base, the potential increase in leverage associated with a constant dollar amount of borrowing and the problems described above in the floating rate preferred market, we might expect a decrease in the amount of debt and preferred stock used by closed-end bond funds. This did occur. However, for municipal bond funds there was an imperceptible change in the leverage ratio, moving from 0.384 in 2007 to 0.383 in 2009.<sup>25</sup> In fact, over this period 50% of the funds increased their leverage ratio and 50% decreased it. There

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<sup>24</sup> Examining why they merged or liquidated helps explain this result. Two of the merged funds were in the same family, and when the family was sold the new family merged many of the similar closed-end funds. The liquidated fund was involved in a battle with some shareholders over open-ending the fund, but they chose to liquidate it instead. Thus there were other reasons than poor performance for the mergers and liquidation.

<sup>25</sup> The ratio in 2005 was actually slightly higher (0.408). In this section the leverage ratio is defined as debt or preferred over total assets.

was a slight change in the composition of leverage over this period. There was a small tendency to substitute debt for preferred stock. The ratio of preferred stock to total assets fell from 0.322 to 0.293 over this period. The bulk of this change was accounted for by two funds that entirely replaced preferred stock with debt. Thus, despite disarray in the auction rate preferred market, closed-end municipal bond funds managed to maintain their financing pattern.

Examining non-municipal closed-end bond funds, we find similar results. The leverage ratio for non-muni funds decreased from 0.276 to 0.265. As we know from previous sections, the role of short-term debt relative to preferred was much more important for non-municipal closed-end funds. As problems developed in the auction preferred market, non-municipal taxable funds substituted some debt for preferred stock. The ratio of preferred to assets went from 0.187 to 0.142 over the period 2007-2009 for non-municipal bond funds.

## **6.2. Cost of Financing**

Closed-end bond funds continued to maintain leverage ratios and to use auction preferred stock. Obviously the breakdown in the market for auction preferred shares did not lead to a deterioration in the return to shareholders, nor did it lead to a large shift in the financing pattern of closed-end bond funds. The simple question to ask is: with rates on auction preferred set at contractual rates for much of the period, did these funds earn an interest rate on the securities they held that was above the cost of financing their short-term debt and preferred? As shown in Table 11 for our sample of closed-end bond funds (both municipal and non-municipal funds), the rate paid on borrowing and auction preferred was much lower than the interest rate earned on the assets held by our sample of funds.<sup>26</sup> While there was a severe breakdown in the market for auction preferred, the end result for closed-end bond funds and their investors was not disastrous;

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<sup>26</sup> Our estimate of the cost of preferred and debt for closed-end funds is upward-biased. During this period the dollar level of short term borrowing was decreasing and so dollars of interest were paid on a higher base than the level at the end of the year that was used to estimate costs.

in fact, those funds survived, did well for their investors, and continued to maintain their leverage ratios.

### **6.3. The Future**

We would be remiss if we did not say a few words about what is likely to happen in the future. Given the failure in the auction preferred market, funds have attempted to find alternative ways to lever. Tax-free closed-end funds have the more serious problem. Since preferred dividends are tax-free and interest on debt is not, issuing preferred stock is the cheaper way to lever for these funds. Two types of preferred are being issued: term preferred with a fixed horizon and preferred with a third party guarantee of liquidity (puttable preferred). Both of these are more costly forms of financing than auction rate preferred, but they maintain the tax-free treatment of preferred dividends paid by municipal bond funds. However, the borrowing costs of using these instruments to replace existing preferred are somewhat reduced because existing preferred is often purchased through below par tender offers or below par purchases in the secondary market. As funds substitute either of these instruments for traditional auction rate preferred stock, borrowing costs will rise because longer-term rates are higher than short-term rates and because liquidity guarantees cost money. We expect that further innovation in the design of preferred stock will reduce costs of leveraging in the future.

Taxable closed-end funds have less of a problem. Historically interest costs on debt have been close to preferred costs for taxable funds. In addition, these funds have historically used large amounts of short-term borrowing along with floating-rate preferred stocks, thus shifting to more debt financing should have a smaller impact on borrowing costs for taxable closed-end bond funds.

Especially for non-taxable closed-end bond funds, the failure of the auction market will reduce their advantage as an investment vehicle. Alternative sources that are being used are more costly. Only time will tell how large these added costs will be. However, given the historic spread between return on assets and borrowing costs, we do not expect these added costs to eliminate the advantage of leverage for closed-end bond funds.<sup>27</sup>

## **7. Conclusions**

In this paper we examine why closed-end bond funds exist alongside open-end funds from the same family, with the same objective, and managed by the same manager. The principal reason previously presented for the existence of closed-end funds is that they can invest in less liquid parts of the market. This is clearly true if one compares the population of closed-end funds with the population of open- funds. Closed-end funds are more likely to hold securities in less liquid markets. If one compares open and closed-end funds that operate in the same segment of the capital markets, one gets added insight into advantages of closed-end funds. Surprisingly, in a matched sample of closed-end and open-end funds where policy, manager and fund family are held constant, there is no evidence of risk or liquidity differences in the assets held or the return earned on assets. What is different is that almost all closed-end bond funds borrow, where open-end funds do not. The borrowing is short-term while investment is long-term. We find that closed-end funds do not vary their borrowing as the term premium changes, but they do time issuances to coincide with a high-term premium. Because they do not vary their borrowing, the return they earn on net assets is directly related to the relative return on long and short-term bonds.

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<sup>27</sup> One effect of the increased difficulty of leveraging is the reduction in new closed-end funds being started. In 2008-2009 only seven started. None started with leverage. This compares to the 2001-2004 period when over 35 a year were started and all but one was levered.

We show that leverage increases returns in most years and decreases the correlation of returns with security market indexes, but it also increases the variability of return. The net effect of these three influences leads to investors being better off. We show this in two ways. First, using mean-variance analysis, levered funds are more likely to enter a bond or stock portfolio than unlevered or matched open-end funds. Second, if leverage has value, investors should pay more for a dollar of net assets (smaller discount) in levered funds than in unlevered funds. They do. Leverage explains much of the cross-sectional and time-series variation in closed-end bond fund discounts.

Finally, we find that, even after the credit crisis, closed-end bond funds have continued to outperform their open-end bond fund counterparts and continue to be highly levered.

## Appendix A

In order to estimate the effect of leverage on management fees and administrative costs, we need to examine how these costs change when funds add leverage. To estimate this we examined the administrative costs and management fee (A&M) paid by the eight funds that employed leverage for the first time several years after they were organized and thus had a history both before and after borrowing.<sup>28</sup> For closed-end funds, assets vary little from year to year except when the fund adds leverage. Thus, to examine the impact of leverage on the expense ratio paid by shareholders we looked at the average change in A&M in the two years after they borrowed compared to the average two years before they borrowed expressed as a percentage of the change in assets. This averaged 51 basis points. This was about 80% of the management fees charged. Thus, at least for these funds, the increase in A&M per dollar of borrowing was less than the management fee. For these funds the lower marginal fee was not due to administrative costs being less or the scheduled management fee being less, but rather it was due to management forgoing part of the fee. For funds that have borrowed since the beginning of their existence, we have no way to compute the impact of borrowing on A&M. Given that the sample size used to estimate the change in expenses was so small, that the percentage management fee for most funds is constant over a wide range of assets under management and that there is no evidence of funds that have employed leverage from the beginning of our sample systematically forgoing part of the management fee, we also use the percentage management fee on total assets as an alternative estimate of the added expense ratio associated with leverage. The average management fee across all bond funds employing leverage was 65 basis points for both municipal bond funds and for non-municipal bond funds.

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<sup>28</sup> The costs of issuing auction preferred stock are usually included in administrative costs. We include this as a separate component of total cost rather than part of administrative cost.

## Appendix B

To examine whether these results are typical, we performed the following experiment. Since open- and closed-end funds have similar returns pre-expenses, and since we can obtain a long return history for open-end funds, we computed yearly returns pre-expenses for all open-end funds that have returns sometime between 1988 and the start of our sample, 1995. We started in 1988 because that is the first year in which a closed-end bond fund borrowed. To proxy for borrowing costs we used the regression relationship (estimated using data from 1996-2006) of each of the total borrowing rates with the Fed Funds Rate and historical actual rates of the Fed Funds. To see if borrowing would have increased the returns on net assets over this earlier period, we compared the returns on the open-end funds (pre-expenses) with the cost of borrowing implied by the regression relationship. For the seven years 1988 to 1995 we have 1,101 fund years for municipal bond funds and 2,185 fund years for non-municipal bond funds. For municipal bond funds the return earned on assets averaged between 4.40% and 4.54% higher than borrowing costs, while for non-municipal bond funds the increase in return on assets averaged between 2.34% to 2.74% higher than borrowing costs, depending on the source of financing and the estimate of marginal expenses. For municipal bond funds, about 84% of the fund years had returns which were above borrowing costs and for non-municipal bond funds more than 68% of the time returns exceeded borrowing costs. These numbers are very similar to what we found over our sample period.<sup>29</sup>

All of the numbers are highly statistically significant whether we test difference from zero for differential return or perform a binomial test on the number positive.

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<sup>29</sup> There is some growth in the number of municipal bond funds over these years, and substantial growth in the number of non-municipal bond funds. However, the number of funds that had returns less than borrowing cost on assets was greater at the end of the simulation period. Thus, if we compute the return differential each year and weight each year equally, we would obtain a higher number.

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**Table 1**

**Some Characteristics of Our Sample**

	<b>Fund Years*</b>	<b>Net Assets</b>	<b>Leverage</b>
All Funds			
Closed-End	389	382.3	35.29
Open-End	389	612.0	0
Unlevered			
Closed-End	113	313.4	0
Open-End	113	544.4	0
Levered			
Closed-End	276	380.4	51.25
Open-End	276	628.6	0

\* Some columns have slightly fewer observations because the data were unobtainable. Not all funds existed over the entire 11-year period.

This table shows various characteristics of closed-end funds and a matched set of open-end funds.

Net assets are shown in millions of dollars; leverage is the amount of preferred stock and debt divided by total net assets, expressed as a percentage.

**Table 2**  
**Comparison of Closed-End Funds and Open-End Funds**  
**By Rating of Bonds Held**

**Panel A**

General Rating	Overall		Municipal		Non-Municipal	
	Open-End	Closed-End	Open-End	Closed-End	Open-End	Closed-End
Investment Grade	73.9%	71.9%	87.3%	84.3%	47.2%	47.2%
Non-Investment Grade	20.5%	21.9%	6.0%	7.2%	49.5%	51.2%
Unrated	5.6%	6.2%	6.8%	8.5%	3.3%	1.5%

**Panel B**

Detailed Rating	Overall		Municipal		Non-Municipal	
	Open-End	Closed-End	Open-End	Closed-End	Open-End	Closed-End
AAA	47.7%	42.6%	58.8%	53.7%	25.4%	20.4%
AA	6.8%	6.1%	9.0%	7.7%	2.5%	3.0%
A	7.5%	8.0%	8.0%	8.8%	6.7%	6.5%
BBB	11.9%	15.2%	11.5%	14.1%	12.6%	17.4%
BB	7.7%	9.4%	4.0%	4.8%	15.1%	18.5%
B	10.3%	10.7%	1.6%	2.0%	27.9%	29.0%
Below B	2.4%	1.9%	0.3%	0.4%	6.6%	4.6%
Unrated	5.6%	6.2%	6.8%	8.5%	3.3%	1.5%

This table shows the percentage of assets held in each rating category for closed-end funds and a matched set of open-end funds. The closed-end and open-end funds have the same investment manager, same objective, and are issued by the same fund family.

**Table 3**

**Comparison of Closed-End Funds and Open-End Funds  
By the Maturity of Assets Held**

Maturity (Years)	All		Municipal		Non-Municipal	
	Open-End	Closed-End	Open-End	Closed-End	Open-End	Closed-End
1-5	8.86%	16.58%	3.21%	11.32%	19.09%	26.11%
5-10	27.09%	30.93%	11.45%	18.36%	55.37%	53.68%
10-20	29.11%	21.26%	40.41%	27.97%	8.67%	9.14%
20+	34.94%	31.22%	44.93%	42.34%	16.87%	11.08%
<10	35.95%	47.51%	14.66%	29.68%	74.46%	79.79%
>10	64.05%	52.48%	85.34%	70.31%	25.54%	20.22%

This table shows the percentage of the assets in different maturity ranges held by open-end funds and a matched set of closed-end funds, where the closed-end funds are from the same fund family, have the same objective, and are managed by the same manager.

**Table 4**

**Comparison of Closed-End and Open-End Funds  
By Type of Asset Held**

Asset Type	Closed-End	Open-End
Government Bonds	8.9%	9.6%
Mortgages	7.9%	10.2%
Corporate	70.3%	69.1%
Foreign Bonds	11.5%	8.9%
Stocks	0.5%	0.6%
Preferred	0.6%	1.5%
Convertibles	0.3%	0.5%

This table shows the percentage of the holdings in each asset category held by closed-end funds and open-end funds. The closed-end and open-end funds have the same managers, same objective, and are issued by the same fund family.

**Table 5**

**Comparison of Closed-End and Open-End Funds by Annual Return on Assets**

Return on All Assets	Open-End	Closed-End	Difference
All Funds	6.40%	6.35%	-0.05%
Municipal Funds	6.05%	6.03%	-0.02%
Non-Municipal Funds	6.92%	6.83%	-0.09%

This table shows the return on total assets before any expenses for closed and a matched set of open-end funds. The closed and open-end funds have the same objective, are issued by the same fund family, and have the same manager.

None of the differences are statistically significant at the 0.05 level.

**Table 6**  
**Cost of Levering (Annual Data)**

Calendar Year	Municipal Bond Funds				Non-Municipal Bond Funds							
	Number with Preferred	Dividend Divided by Preferred	Total Cost 1	Total Cost 2	Number with Preferred	Dividend Divided by Preferred	Total Cost 1	Total Cost 2	Number with Loans	Interest Cost	Total Cost 1	Total Cost 2
1996	11	3.66%	4.44%	4.61%	1	2.76%	3.54%	3.47%	5	4.91%	5.42%	5.45%
1997	11	3.39%	4.16%	4.33%	1	4.62%	5.31%	5.20%	6	5.89%	6.40%	6.06%
1998	12	3.34%	4.10%	4.25%	1	5.07%	5.77%	5.65%	6	6.36%	6.87%	6.93%
1999	16	3.21%	3.98%	4.10%	1	5.39%	6.12%	6.00%	7	5.97%	6.48%	6.60%
2000	17	4.03%	4.81%	5.01%	1	7.54%	8.32%	8.22%	7	7.18%	7.69%	7.83%
2001	18	3.31%	4.07%	4.26%	3	5.82%	7.98%	8.30%	7	6.07%	6.58%	6.75%
2002	21	1.58%	2.35%	2.50%	5	2.41%	3.82%	4.13%	7	3.08%	3.59%	3.83%
2003	26	1.08%	1.84%	1.98%	7	1.35%	2.14%	2.36%	7	1.68%	2.19%	2.42%
2004	28	1.09%	1.86%	1.99%	11	1.33%	2.12%	2.34%	7	1.80%	2.31%	2.53%
2005	29	2.26%	3.03%	3.16%	11	2.70%	3.63%	3.87%	7	3.33%	3.84%	4.09%
2006	29	3.06%	4.07%	4.18%	11	4.27%	5.24%	5.49%	7	5.24%	5.75%	6.01%

This table shows the cost of borrowing. For auction preferred stock the direct costs are the preferred dividend over the amount of the preferred. The total costs include, in addition to the direct costs, the costs of flotation plus the impact of the borrowing on shareholder expenses. Shareholder expenses are estimated in two different ways, either at 0.51 (labeled as Total Cost 1) or as the management fee (labeled as Total Cost 2). For loans, the direct cost is the interest over the amount of the loan. The total cost also includes the impact of the loans on shareholder expenses, estimated at either 0.51 (labeled as Total Cost 1) or as management fees (labeled as Total Cost 2).

**Table 7**

**Effect of Leverage on Returns (Annual Data)**

	Number of Observations	% Return on Total Assets	Extra Return on Assets Finance with Leverage (return-cost)		Number Positive		Percentage Increase in Returns	
			Using 0.51	Using Management Fee	Using 0.51	Using Management Fee	Using 0.51	Using Management Fee
Non-muni	113	7.186	2.51***	2.39***	79***	77***	34.9	33.3
Muni	214	6.071	2.78***	2.64***	189***	185***	45.8	43.5

\*\*\* Significant at 1% level. For marginal returns, significance is from zero. For numbers, significance is from equally likely.

This table shows the net return (earnings less cost of financing) earned on the assets financed with leverage. Return is pre-expenses and includes realized and unrealized gains and losses. Cost for preferred is computed as the sum of preferred dividends over the amount of preferred plus flotation expenses plus impact on shareholder expenses. The last is computed as either 0.51 or as the management fee. For loans the cost is interest cost plus impact of the loans on firm expenses.

**Table 8**

**$R^2$  Between Monthly Returns and Indexes**

	Levered			Unlevered		
	Shareholder Return	NAV Return	Open End	Shareholder Return	NAV Return	Open End
Bond Index	.256	.553	.658	.215	.610	.672
Stock Index	.019	.072	.078	.019	.041	.043
Bond and Stock Index	.282	.622	.729	.235	.663	.743

This table shows the average  $R^2$  between three types of returns: the return an investor would receive from holding a closed-end fund, the return a closed-end fund earned on net asset value, and the return an investor would earn on a set of matched open-end funds with the return on each of three indexes. The bond index is Barclays government-credit index for corporate and government bond funds and Barclays 10-year municipal bond index for municipal bond funds. The stock index is the S&P 500 index.

**Table 9**

**Relationship of Price to Net Asset Value to Determining Variables (Cross-Sectional)**

	Corporate and Government Bond Funds			
Leverage	Lagged Returns	Div/Price	Div/NAV	$R^2$
0.1805 (13.60)				0.24
0.1527 (11.03)	0.0059 (1.86)			0.29
0.0325 (2.21)	0.0077 (2.77)		3.1220 (8.68)	0.54
0.1113 (7.86)	0.0068 (2.22)	1.1045 (2.80)		0.35

This table shows the results of using a Fama-MacBeth procedure (monthly) to estimate the effect of leverage, divided payout and past returns on the discount. (*t*-values are in parentheses.) The results are for all closed-end funds (sample 2) for the years 1996-2006. All estimates are computed using the Newey-West correction with lag 3.

**Table 10**

**Differences in Price to Net Asset Value between  
Levered and Unlevered Funds as a Function of Yield to Maturity Spread  
(Weekly Data)**

	Number of Observations	$R^2$	Slope	$t$ Value
Non-Municipal Bond Funds	1001	0.124	0.0061	3.48
Municipal Bond Funds	970	0.220	0.0058	5.80

This table presents the results of a regression of market price over net asset value across all closed-end funds (sample 2) for levered bond funds minus the same ratio for unlevered bond funds against the yield spread between long and short bonds across all closed-end funds (sample 2). For municipals the spread is calculated as the difference between the yield to maturity on a 20-year municipal (from Bloomberg) and the Fed Funds rate. For non-municipals the spread is calculated as the difference between 10-year constant maturity Treasury yield (from the Fed) and the Fed Funds rate. All estimates are computed using the Newey-West correction with lag 12.

**Table 11**

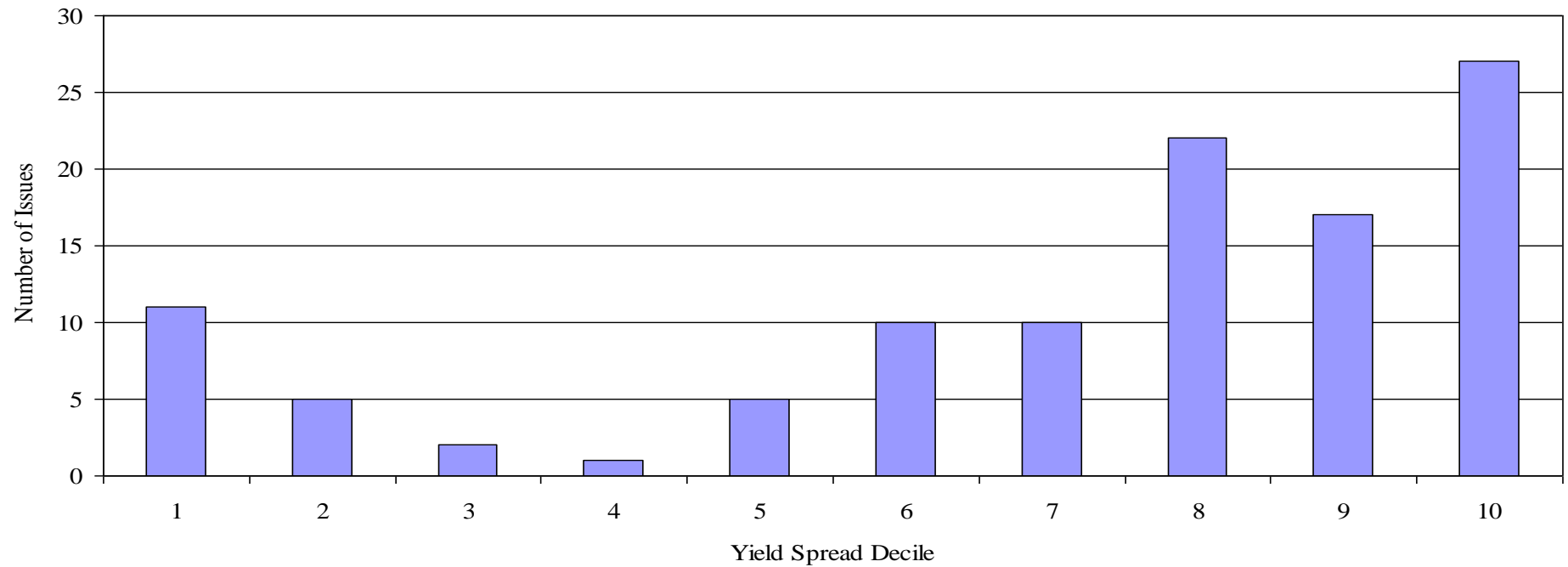
**Borrowing Costs for Closed-End Bond Funds**

Year	Municipal Bond Funds			Non-Municipal Bond Funds		
	2007	2008	2009	2007	2008	2009
Cost of Preferred	3.95	4.19	1.56	5.37	5.00	1.85
Combined Cost of Preferred and Debt	4.00	4.42	1.56	5.61	4.45	2.86
SIFMA*	3.71	3.40	0.95	5.25	3.55	0.73
Interest Rates Earned on Assets Held by Funds in Our Sample	5.29	6.34	5.51	6.72	8.81	7.52

\*SIFMA is the average rate on auction preferred stock paid by issuers in the periods of time specified above. The average is computed by broker-dealers and auction agents across all issues reported.

**Figure 1**

**Number of New Issues by Yield Spread Deciles**



This figure shows the total number of new issues for all municipal and non-municipal closed-end bond funds (sample 2) by yield spread deciles. For municipal bond funds, the yield spread is Moody's weekly 20-year composite municipal bond yield minus the weekly Federal Funds rate; for non-municipal bond funds, the yield spread is the 10-year constant-maturity Treasury yield minus the weekly Federal Funds rate. Deciles are calculated separately for municipal and non-municipal bond funds across all weeks from the first week in 1988 through the last week in 2006.