Municipal Bond Mutual Fund Performance and Active Share

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KEY FINDINGS

- Municipal bonds possess several characteristics that satisfy traditional criteria qualifying them as a distinct asset class. In this first evaluation of the performance of actively managed open-end municipal security mutual funds, the authors find that the vast majority of funds underperform their benchmark indexes. They also document significant underperformance when accounting for four fixed-income market systematic risk factors.
- The performance results vary by fund type, with short-term funds underperforming more acutely than intermediate- or long-term funds. Single-state funds are among the worst performers, suggesting that managers do not possess unique insight about the issuer domicile and its securities.
- Portfolio active share for muni bond funds is about 25% (similar to what extant work finds for equity funds), which implies an annualized active expense ratio of about 3% (similar to fees charged by some hedge funds).

ABSTRACT

This article evaluates the performance of actively managed US open-end municipal bond mutual funds between 1999 and 2020. Fund classifications span national short, intermediate, and long-term, as well as high-yield and single-state portfolios. An initial investigation reveals that municipal securities manifest characteristics of a distinct asset class. Performance measures include benchmark-adjusted returns and single- and multifactor pricing models. During the sample period, only 8% of funds generated returns that beat their benchmark indexes, and 29% produced positive excess returns (alpha) based on a four-factor pricing model. Longer-maturity funds generally performed better than short-maturity funds. Based on portfolio performance, managers specializing in single-state issues do not manifest unique knowledge or insight. Active share for the aggregate sample was 25%, implying an active expense ratio exceeding 3% and annualized active alpha below −3%. The evidence overall suggests that active management of municipal bond portfolios is not a value-enhancing activity.

TOPICS

*Mutual funds/passive investing/indexing, fixed income and structured finance, factor-based models, performance measurement**

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The superiority of active versus passive investment management has been fiercely debated for several decades. Academic research shows that, for common stock investors, a passive strategy of merely tracking a benchmark index generally

outperforms active strategies, after accounting for portfolio-management fees. However, much of the seminal research on the costs and benefits of active management focuses on publicly traded corporate equities. In contrast, active management of fixed-income portfolios has been far less intensively scrutinized, and municipal bond portfolios hardly at all.

Despite the rise of passive strategies in the equity markets, Institutional Investor (2017) reveals that US investors have shifted significant amounts from fixed-income passive strategies to active strategies. Within this fixed-income market, US municipal bond mutual funds held almost $815 billion in investor assets at year-end 2019, and more than 99% of this amount was actively managed. Thus, most municipal bond portfolio managers selected individual securities issued by state and local governments, made geographical, quality, or duration bets, or timed movements into and out of cash, in an attempt to outperform benchmark indexes.

Given the size of the municipal bond market and the enduring popularity of active strategies, this article addresses a gap in the literature by focusing on the success of actively managed open-end mutual funds (OEMFs) that invest principally in municipal securities. The OEMFs for this asset class are segmented by the maturity, credit quality, and geographical location of the fund's security holdings. In the analysis, each fund's returns are compared to those of its benchmark index and also calculated on a risk-adjusted basis.

In view of the ongoing shift of investor capital from passive to active fixed-income strategies, we would expect actively managed municipal bond portfolios to generate incremental value for investors. Similar to equity portfolios, the performance evaluation of actively managed municipal bond portfolios requires consideration of the degree to which portfolio holdings depart from those implied by the relevant benchmark index.

To investigate this, our methodology follows that of Miller (2007), who proposes that each actively managed fund's portfolio contains a passive component that mirrors the benchmark and a second component that reflects security holdings and weights that deviate from those of the benchmark. Using Miller's framework, we calculate return-based measures for each fund's active share and active expense ratio. We find that that active share for municipal bond OEMFs is about 0.25, which is in line with Miller's findings for large-cap common stock funds. We also confirm that, on average, active muni fund managers have significantly negative alpha. Finally, and consistent with past literature for other asset classes, municipal bond portfolio performance is inversely related to the magnitude of the expense ratio. The average active expense ratio—the fees charged on the estimated active portion of the fund—is 3.30%, which dwarfs the expense ratios for passively managed municipal OEMFs.

LITERATURE SUMMARY

Several areas of research provide the foundation for this study. Relevant literature deals with the definition of an asset class, the active vs. passive investment decision, open-end mutual fund (OEMF) performance measurement, and analyses of portfolio active share and active expense ratio.

Defining an Asset Class

A variety of fixed-income securities—issued by corporations, the US government, and municipal issuers—are available to investors in OEMF form. For purposes of portfolio allocation, each is frequently treated as a separate asset class or subclass.

EXHIBIT 1

Correlation Coefficients Based on Index Daily Returns (January 2001–April 2020)

	BBgBarc Municipal	BBgBarc US Corp Bond	BBgBarc US Government	S&P 500	Russell 2000
BBgBarc US Corp Bond	0.5517				
BBgBarc US Government	0.4526	0.8623			
S&P 500	−0.0841	−0.2172	−0.3650		
Russell 2000	−0.1003	−0.2094	−0.3359	0.9081	
MSCI ACWI Ex USA	−0.0564	−0.0307	−0.2501	0.5486	0.5014

Yet municipal bonds have not previously been examined formally through the lens of whether they qualify as a distinct asset class.

Kritzman (1999) proposes four criteria for determining whether an investment should be considered an asset class: (1) investments should be independent of other asset classes, (2) their passive inclusion in portfolios should raise investor expected utility, (3) constituents in the class should be homogeneous, and (4) the market should have sufficient capacity to absorb investor demand.

In evaluating whether municipal securities satisfy Kritzman's first criterion, it is useful to consider the magnitude of return correlations with traditional asset classes. Exhibit 1 shows Pearson correlations between the following indexes: Bloomberg Barclays Municipal Total Return, US Corporate Bond, US Government Bond, S&P 500, Russell 2000, and MSCI All-Country World ex-USA (ACWX) between January 2001 (when daily data became available for all the indexes) and April 2020. The muni index has a return correlation with US corporates of 0.5517 and US governments of 0.4526. This contrasts with much higher correlations of 0.8623 between US corporates and US governments and 0.9081 between the S&P 500 and Russell 2000 and is similar to the correlation of 0.5486 between the S&P 500 and MSCI ACWX.

Untabulated results confirm that municipal bonds had nonzero weights in minimum-variance and optimal (maximum Sharpe ratio) portfolios, when including all six proposed asset classes. The efficient frontier for portfolios containing municipal securities plots above an efficient frontier without municipal securities, suggesting that inclusion of muni securities raises investors' expected utility. This addresses Kritzman's second criterion.

Municipal securities are probably least compliant with Kritzman's third criterion, homogeneity. Munis span the credit-quality and maturity spectrum and can be general obligation or revenue bonds, callable or noncallable, have floating- or fixed-rate coupons, and differ on other dimensions like geographical exposure. However, it is unlikely that municipal securities are more heterogeneous than US and international stocks, each recognized as a distinct asset class.

As for Kritzman's final criterion concerning sufficient market capacity, on a practical basis, US municipal securities are treated by investors as a distinct sector. Evidence for this includes the fact that sponsors offer more than 1,000 mutual funds that invest principally in municipal securities. In conclusion, the evidence suggests that it is reasonable to evaluate municipal securities as an asset class that is distinct from other fixed-income securities such as corporate and Treasury bonds.

Active vs. Passive Investment Decision

For investors pursuing passive portfolio management, securities held and their weights are prescribed by a benchmark index, and no further analysis is required to

achieve the goal of tracking the index returns. In contrast, exploiting market pricing inefficiencies through active management requires additional analysis, generating costs that are passed along to the ultimate investor.

Sharpe (1991) demonstrates that before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar, but the cost difference weighs in favor of passive management. French (2008) estimates the actual deadweight cost of investing actively in common stock. He finds that, on a societal level, active portfolio management costs 0.67% of total stock market capitalization annually. French notes that average mutual fund expense ratios (administrative and management fees expressed as a percentage of the assets under management) were slightly higher in 2006 than in 1980 (85 basis points vs. 70 bps).

Mutual Fund Performance

Benchmark-adjusted returns (BARs) are a performance measure to evaluate a fund's returns versus the returns of a performance benchmark. Other measures account for risk explicitly. Carhart's (1997) four-factor model for equity OEMFs is the basis for the Angelidis, Giamouridis, and Tessaromatis (2013) study of whether OEMF manager performance should be measured against their self-designated benchmark index or a generic index such as the S&P 500. They use a slight modification of Carhart's four-factor pricing model wherein excess returns are measured as the difference between a fund's returns and its self-designated benchmark listed in the offering prospectus document. Angelidis, Giamouridis, and Tessaromatis (2012) find that the use of generic benchmarks may result in mismeasurement of managerial skill because a fund's benchmark may itself contain abnormal returns (alpha) or additional systematic risk factors.

The performance-measurement literature summarized above pertains only to equity mutual funds. Clare et al. (2019) track 884 US OEMF bond funds, using both the CAPM and a four-factor model that they propose. As the CAPM market risk factor, the authors use the return on the Bloomberg Barclays Global Aggregate Total Return Index less the return on the one-month T-bill. In their four-factor approach, they augment using the risk premium on the self-designated benchmark, term spread, and credit spread. Unlike prior results for stocks, using their models, they find positive alphas for bond OEMFs, both gross and net of investor fees. Results are particularly strong for short-term and high-yield OEMFs, although performance prior to the global financial crisis does not tend to persist afterward.

Active Weights, Active Expense Ratio, and Active Alpha

Sharpe (1991) points out that one strategy by which active managers can beat the market is to track the benchmark index for most of the year and only at the end make minor portfolio adjustments to differentiate the portfolio. This begs the question of how much investors pay incrementally for active management. Two methods of measuring the "active share" for a managed portfolio are proposed by Miller (2007) and Cremers and Petajisto (2009).

Miller's method uses the correlation between returns on an OEMF and its benchmark index to estimate active share. He applies his method to 4,754 equity OEMFs that have an average expense ratio of 1.26%. Miller finds that the average active weight is 22.05% and the active expense ratio is 5.20%. Active alphas are estimated to be –3.19%, a finding that suggests that the active management of those stock portfolios was a value-destroying activity.

Cremers and Petajisto (2009) propose an alternative decomposition that tracks the holdings of an OEMF in comparison to its benchmark. They replicate a fund's

EXHIBIT 2

Frequency Distribution of Municipal Bond OEMFs

Fund Classification	Number of Funds	% of Sample
National	199	38.9%
Short-Term	38	7.4%
Intermediate Term	86	16.8%
Long-Term	59	11.5%
High Yield	16	3.1%
Single State	313	61.1%
California	48	9.4%
New York	28	5.5%
Florida	19	3.7%
Pennsylvania	15	2.9%
Ohio	14	2.7%
Minnesota	14	2.7%
New Jersey	14	2.7%
Others	161	31.4%
Total Funds	**512**	**100.0%**

SOURCE: Morningstar, May 2020.

returns by creating a synthetic fund with a 100% position in the benchmark along with an additional long–short portfolio, wherein the long position represents the extent to which the portfolio overweights benchmark positions and the short position represents underweightings.

Cremers and Petajisto (2009) also find that truly active funds (as opposed to those that simply track the index for a large portion of time, referred to as "closet indexers") manage to outperform their benchmarks before and after expenses. Cremers and Petajisto propose that there is enough inefficiency within individual stock pricing that funds can take advantage of and produce superior abnormal performance.

DATA

Data for OEMFs in this study are drawn from Morningstar Direct, and all market yield data are from the St. Louis Federal Reserve Economic Database (FRED). The initial dataset is a survivor-bias-free set of 1,254 US municipal bond OEMFs that existed at any time between January 1999 and April 2020. These funds are then screened to retain only the oldest share class (to prevent double counting of funds). Index funds and all funds without a listed expense ratio are deleted. In addition, only funds that had one self-designated performance benchmark index are retained in the dataset. An examination of the average characteristics of single-benchmark funds (expense ratio, turnover ratio, assets under management) reveals that they are not statistically different from those of the deleted funds. Finally, all OEMFs retained are required to have two years of monthly returns available from Morningstar. Each OEMF's returns are expressed net of the expense ratio.

The final dataset contains 512 US municipal bond OEMFs. In the sample, 199 "national" funds are classified as high-yield, short-term, intermediate-term, and long-term classifications. The remainder of funds have geography as the dominant feature, and they are focused on a single state issuer. The sample distribution is shown in Exhibit 2.

Morningstar is the source of all classifications shown in Exhibit 2. The majority of funds in the sample holds securities of issuers from within a single state, with more than 30% of these funds focused on California, New York, or Florida. Most of the remaining sample is associated with a particular maturity range for security holdings, with 7.4% classified as short term (maturities of less than 4.5 years); 16.8%, as intermediate term (maturities of 4.5 to 7 years); and 11.5%, as long term (maturities of longer than 7 years).

Among benchmark indexes, the Bloomberg Barclays Municipal Total Return Index (in USD) is the most commonly used market proxy. The index represents the US long-term tax-exempt bond market, covering state and local government general obligation bonds, revenue bonds, insured bonds, and "pre-refunded" bonds. As shown in Exhibit 3, more than half of the sample funds designates this as their primary prospectus benchmark, and an additional 30% of funds uses some variation on this index. The largest proportion of fund managers in every classification except short term uses the Bloomberg Barclays Municipal Total Return Index. About 34% of all municipal OEMF asset value is managed against this index.

EXHIBIT 3

Most-Common Benchmark Indexes in Municipal Bond OEMF Subsamples

	Percent within Classification					
Benchmark Index (all are total return, in USD)	National Short	National Intermed.	National Long	US Fund High-Yield Muni	Single State	Total
Bloomberg Barclays Municipal	2.6%	29.1%	89.8%	56.3%	58.5%	52.9%
Bloomberg Barclays Municipal 7 Yr 6–8	2.6%	14.0%	1.7%	0.0%	6.1%	6.4%
Bloomberg Barclays Municipal 3–15Y Blend	0.0%	9.3%	0.0%	0.0%	4.2%	4.1%
Bloomberg Barclays Municipal 5 Yr 4–6	2.6%	4.7%	0.0%	0.0%	2.9%	2.7%
ICE B of A US Muni	0.0%	1.2%	0.0%	0.0%	4.2%	2.7%
Bloomberg Barclays Muni Quality Interm	0.0%	2.3%	0.0%	0.0%	2.9%	2.1%
Bloomberg Barclays Municipal 1 Yr 1–2	18.4%	1.2%	0.0%	0.0%	0.6%	2.0%
Bloomberg Barclays Municipal 3 Yr 2–4	23.7%	0.0%	0.0%	0.0%	0.3%	2.0%
Bloomberg Barclays Municipal 10 Yr 8–12	2.6%	5.8%	1.7%	0.0%	0.6%	1.8%
ICE B of A 2–17Y US Muni	0.0%	1.2%	0.0%	0.0%	1.9%	1.4%
Bloomberg Barclays Municipal California Exempt	0.0%	0.0%	0.0%	0.0%	2.2%	1.4%
Bloomberg Barclays Municipal 1–5 Yr	13.2%	0.0%	0.0%	0.0%	0.3%	1.2%
Bloomberg Barclays Municipal 5 Yr GO (4–6)	2.6%	0.0%	0.0%	0.0%	1.6%	1.2%
S&P Municipal Bond Intermediate	0.0%	2.3%	0.0%	0.0%	1.3%	1.2%
S&P Interm National AMT Free Muni	0.0%	4.7%	0.0%	0.0%	0.3%	1.0%
Bloomberg Barclays Muni 1–15 Yr Blend (1–17)	0.0%	3.5%	0.0%	0.0%	0.6%	1.0%
Bloomberg Barclays Municipal 1–15 Yr	0.0%	5.8%	0.0%	0.0%	0.0%	1.0%
Bloomberg Barclays HY Muni	0.0%	0.0%	0.0%	25.0%	0.0%	0.8%
S&P Municipal Bond	0.0%	1.2%	0.0%	6.3%	0.6%	0.8%
Bloomberg Barclays Municipal M.F. CA Interm	0.0%	0.0%	0.0%	0.0%	1.3%	0.8%
Bloomberg Barclays US Agg Bond	0.0%	1.2%	0.0%	0.0%	1.0%	0.8%
Total Funds in the Sample	**38**	**86**	**59**	**16**	**313**	**512**

Exhibit 3 also breaks down the sample and shows the top benchmark indexes for each classification of fund, as well as the proportion of OEMFs in the overall sample that uses each benchmark. Of the 21 benchmarks listed, only five are not sponsored by Bloomberg. Those 21 indexes are used by 91% of the 512 sample funds.

In this study, the risk-free rate is measured as the annualized three-month US T-Bill yield for each month of the sample period. For the analysis of each OEMF's active weight, an annualized passive-investing expense ratio of 0.07% is used. This is the expense ratio for the lowest-cost municipal bond exchange-traded fund (ETF), the iShares National Muni Bond ETF (NYSE ticker: MUB). That fund passively tracks the return of the S&P National AMT-Free Municipal Bond Index. The index currently contains about 11,900 investment-grade municipal securities of issuers across the United States.

As described later, the four-factor regression model of Clare et al. (2019) is used to measure risk-adjusted returns. The four factors (each measured monthly) cover systematic risks associated with the market. The first, obtained from Morningstar, is the return on the Bloomberg Barclays Municipal Total Return Index less the return on the one-month T-bill. The second is the excess return of each OEMF's benchmark less the return on the one-month T-bill. The final two factors are the yield spread between 10-year and three-month constant-maturity Treasury securities (term spread) and the difference in average yield between Aaa and Baa corporate bonds (credit spread). The corporate bond spread is used in place of the municipal bond spread for data availability reasons. All data on term and credit spread are taken from FRED.

A single-factor pricing model, using only the first factor in the model described above, is calculated to evaluate ex post performance. The factor is calculated as the excess return of the Bloomberg Barclays Municipal Total Return Index, which is the most commonly used representative market index and also the most common fund performance benchmark.

Using the four-factor analysis necessitated a sample-selection trade-off. Many OEMFs report the same Bloomberg Barclays Municipal Total Return Index as their own fund's performance benchmark. Since the index is used in the calculation of the first of the four factors, using the same index in calculating the excess return on each OEMF's benchmark (second factor) will result in double counting. As a result, for the four-factor analysis, the sample size decreased by more than half because multicollinearity would be introduced if the index were used as an individual OEMF's benchmark as well as the overall market index. Consequently, and consistent with the methodology of Clare et al. (2019), a subsample of 238 funds is used for the four-factor analysis.

METHODS

This study employs both single- and multifactor regression to evaluate actively managed OEMF performance. A further analysis evaluates the active share of each OEMF. The methods are described in this section.

Benchmark-Adjusted and Risk-Adjusted Returns

As previously noted, Morningstar reports each OEMF's primary performance benchmark index. Managers' success is evaluated by comparing portfolio returns to the OEMF's self-designated benchmark. BAR is calculated as each fund's monthly return less its benchmark index's monthly return.

This study replicates the approach taken by Clare et al. (2019). First, a single-factor pricing model is used to evaluate manager ex post performance. The dependent variable is each OEMF's risk premium in month t, and the independent variable is the market's risk premium. The formula is as follows:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{Mt} - r_{ft}) + \varepsilon_i \tag{1}$$

where α_i, β_i, and ε_{it} are the intercept, slope, and error terms in the ordinary least squares (OLS) regression. The Bloomberg Barclays Municipal Total Return Index is used as the proxy for the municipal bond market return in month t (r_{Mt}). The risk-free rate for each month t is one-twelfth of the three-month US T-bill annualized yield reported in month t (r_{ft}).

This study also conducts a four-factor analysis, once again following Clare et al. (2019), that incorporates additional systematic risks associated with benchmark performance, term spread, and credit spread. The regression equation is as follows, for each OEMF i in month t:

$$r_{it} - r_{ft} = a_i + \beta_{1i}(r_{Mt} - r_{ft}) + \beta_{2i}(r_{bt} - r_{ft}) + \beta_{3i}(TS_t) + \beta_{4i}(CS_t) + \varepsilon_i \tag{2}$$

where r_{bt} represents the return of the OEMF's benchmark in month t and TS and CS represent term and credit spread, respectively. In this four-factor model the Bloomberg Barclays Municipal Total Return Index is used as the market index for the purpose of calculating r_{Mt}.

Active Share

This study uses Miller's (2007) approach to estimate OEMF active share. Miller's methodology is preferred here to the Cremers and Petajisto approach, because the former is return-based, does not require managed-portfolio composition data, and is not sensitive to OEMF managers' tendency to "window dress" their portfolios near the end of performance reporting periods.

Miller's (2007) method uses the correlation of each OEMF's return versus its benchmark index to estimate active share. Additional variables in this portion of the analysis include each OEMF's expense ratio and the expense ratio of a representative passively managed fund to estimate the cost for the active portion of the OEMF. In addition, his method permits estimation of abnormal returns attributable to active management. The approach is summarized by Equations 3, 4, and 5:

$$\text{Active weight: } w_A = \frac{\sqrt{1-R^2}}{R+\sqrt{1-R^2}} \tag{3}$$

$$\text{Active expense ratio: } C_{iA} = C_i + \frac{R(C_i - C_b)}{\sqrt{1-R^2}} \tag{4}$$

$$\text{Active alpha (abnormal performance): } \alpha_{iA} = \alpha_i + \frac{R(\alpha_i + C_b)}{\sqrt{1-R^2}} \tag{5}$$

In these equations, w_A, C_{iA} and α_{iA} are the active weight, active expense ratio, and active alpha attributable to the OEMF manager; C_i and C_b are the expense ratios for the fund and its benchmark; α_i is the abnormal performance of the fund in question; and R represents the correlation coefficient.

The active weight (or share) formula estimates the percentage of each OEMF portfolio that is actively managed based on the return correlation between the fund and its performance benchmark. The measures of active expense ratio and alpha are simply the cost and benefit attributable to that active share.

Subperiod Analysis

The global financial crisis (GFC) of 2008–2009 was a critical event in recent economic history that had a substantial impact on both equity and bond markets. Similar to the methodology of Clare et al. (2019), we split our analysis with the GFC as an approximate midpoint and subperiods of January 1999–December 2008 (120 months) and January 2009–April 2020 (136 months). Only funds with at least 24 months of returns in both subperiods are included in the analysis. Thus, we are comparing the pre- and post-GFC performance of the same funds.

RESULTS

Municipal OEMF returns net of benchmark index returns are generally poor. As Exhibit 4 shows, over the January 1999–April 2020 period, the average monthly return net of each OEMF's self-designated performance benchmark is –7 bps. Only 8.2% of funds produces a positive BAR. With the exception of high-yield funds (with its low sample size), a preponderance of statistically significant negative BARs is observed for all classifications of muni bond OEMFs. In summary, active managers do not tend to beat their benchmark indexes.

EXHIBIT 4

Monthly Performance Measures for OEMFs

	Classification of Municipal Bond Fund					
	Short-Term	Interm. Term	Long-Term	High Yield	Single State	Total
Panel A: BARs						
Average BAR	–0.10%	–0.07%	–0.05%	–0.06%	–0.07%	–0.07%
% of BARs positive	5.3%	12.8%	18.6%	37.5%	3.8%	8.2%
% positive and significant	5.3%	3.6%	2.6%	12.5%	4.8%	4.1%
% of BARs negative	94.7%	87.2%	81.4%	62.5%	96.2%	91.8%
% negative and significant	65.8%	71.4%	59.0%	12.5%	73.5%	64.8%
Number of funds	38	56	39	16	313	512
Panel B: One-Factor Alphas						
Average one-factor alpha	–0.07%	–0.07%	–0.07%	–0.14%	–0.07%	–0.07%
% of one-factor alphas positive	15.8%	14.0%	6.8%	6.3%	1.6%	5.4%
% positive and significant	5.3%	4.7%	1.7%	0.0%	0.0%	4.1%
% of one-factor alphas negative	84.2%	86.0%	93.2%	93.8%	98.4%	94.5%
% negative and significant	50.0%	62.8%	71.2%	25.0%	80.5%	72.5%
Number of funds	38	86	59	16	313	512
Panel C: Four-Factor Alphas						
Average four-factor alpha	–0.08%	–0.06%	–0.07%	–0.13%	–0.06%	–0.07%
% of four-factor alphas positive	17.1%	34.4%	33.3%	71.4%	26.4%	28.6%
% positive and significant	2.9%	3.3%	16.7%	0.0%	7.8%	5.9%
% of four-factor alphas negative	82.9%	65.6%	66.7%	28.6%	73.6%	71.4%
% negative and significant	51.4%	24.6%	33.3%	14.3%	44.2%	39.1%
Number of funds	35	61	6	7	129	238

NOTES: The top row of each panel shows the average monthly BAR, one-factor model return, and four-factor model return on OEMFs. Subsequent rows show the percentage of funds in each investment that have positive (negative) performance measures and that are statistically different from zero at the 5% level.

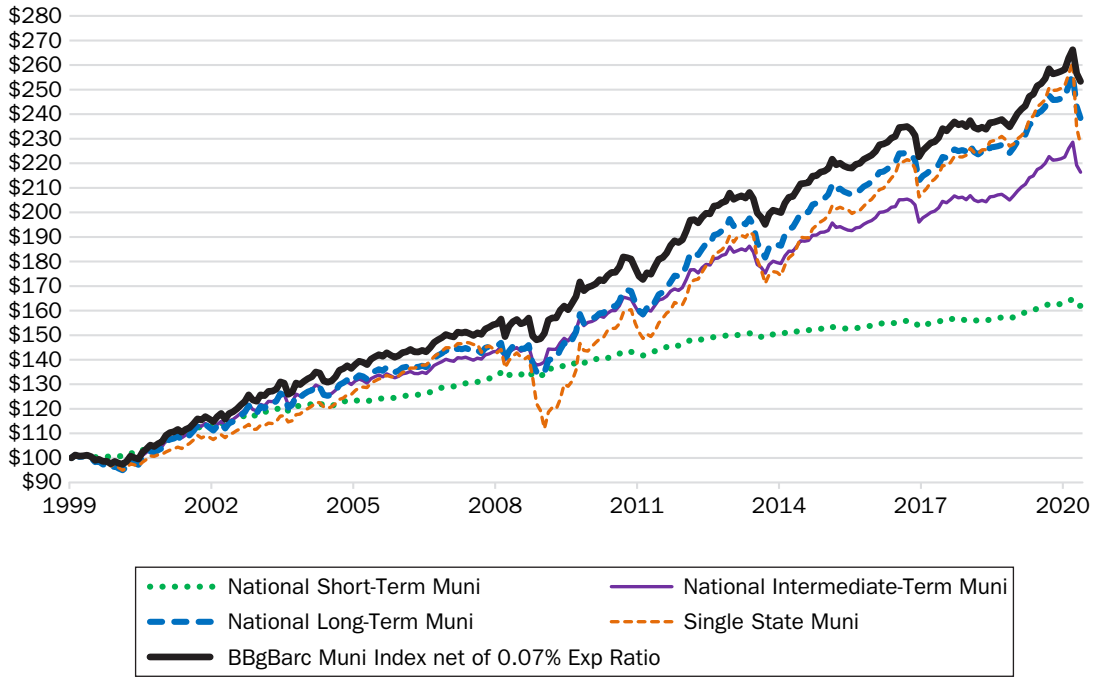
The BAR calculation does not control explicitly and precisely for systematic risk. Panel B contains one-factor alphas, and the results are similar to those reported for BAR. A strong majority of fund managers generate negative alphas, and most of these are statistically significant at the 5% level.

The final performance metric is alpha from a four-factor model. Importantly, this model accounts for term and credit spread conditions in the market, two vital dimensions for active fixed-income portfolio management. On average, four-factor alphas are –7 bps per month. More than 70% of OEMFs have negative alphas, and they are also statistically significant in one-third of all cases. There is no clear relation between alpha and portfolio term to maturity class (short term, intermediate term, or long term). As to whether managers of single-state OEMFs bring specialized knowledge about the credit quality of those states that allows them to exploit market inefficiencies, the portfolio performance results suggest they do not. The proportion of such funds with positive BARs and alphas is generally among the lowest of all fund categories.

While the finding that municipal OEMFs trail performance benchmarks by 7 bps per month appears significant, the implication of this underperformance is best illustrated through its cumulative impact during all the years covered by this study. Exhibit 5 shows the cumulative value of a hypothetical $100 invested on January 1, 1999, in the average short-term, intermediate-term, long-term, and single-state municipal OEMF in existence each month. The respective April 30, 2020, cumulative values are $162, $216, $238, and $228. High-yield funds generated a cumulative value of $215, but the series is not shown on the graph because it almost perfectly overlaps

EXHIBIT 5

April 2020 Value of $100 Invested in Municipal Bond OEMFs in January 1999



the intermediate-term series. For comparison, the cumulative value of $100 invested in the Bloomberg Barclays Municipal Total Return Index (net of a 7 bp annual expense ratio, 0.00583% monthly) is also shown: $253. Exhibit 5 shows pictorially that municipal bond actively managed OEMFs, like those of many other asset classes, have underperformed their passively managed alternatives over the long term.

Exhibit 6 contains the results for municipal bond OEMF active share. The third column of data indicates that active share for the entire sample is about 25%. Thus, only 25% of a typical municipal bond OEMF's holdings and weightings is chosen independently of the benchmark index, while the other 75% can be thought of as, in effect, an index fund. Inspection of all panels in Exhibit 6 reveals a weakly convex relation between alpha and active share. That is, both the highest- and lowest-performing OEMFs have relatively high active shares.

Exhibit 6 also confirms that active portfolio management in this sector is relatively expensive. The average expense ratio for muni OEMFs is 76 bps (expressed annually), as shown in the second column. Assuming a passive expense ratio of 7 bps per year (what an investor would pay for the least-expensive muni ETF, the iShares National Muni Bond ETF), the average cost of a muni OEMF's active portion is 3.30%. These costs are not justified by BAR fund performance, as the average BAR from the active share is –29 bps per month. As shown in Panels B and C of Exhibit 6, the results are similar for the single-factor and four-factor models. Only the top quintile of funds in Panels A and C are able to generate a positive risk-adjusted return. Figures in the top quintiles are not driven by outliers, as the means and medians within those quintiles are nearly identical. A small group of managers was able to produce outperformance even after accounting for expenses and up to four systematic risk factors.

Exhibit 7 breaks down the active-share results by fund classifications. Not surprisingly, the active share is a relatively high 35%–40% for high-yield and short-term national funds. It is only 23% for single-state funds, where a portfolio manager's investment constraints may be greater. The average monthly active alpha ranges

EXHIBIT 6

Municipal Bond OEMF Monthly Excess Return, Expense Ratio, and Active Measures, with Averages (in %) Presented by Performance Quintile

Quintile	Excess Fund Return, α	Expense Ratio, C	Active Share, w_A	Active Alpha, α_A	Active Exp. Ratio, C_A
Panel A: BAR					
Q5	0.01	0.52	25.70	0.04	1.97
Q4	–0.04	0.68	24.45	–0.18	2.89
Q3	–0.06	0.76	20.59	–0.30	3.64
Q2	–0.08	0.82	21.96	–0.39	3.82
Q1	–0.17	1.00	30.73	–0.60	4.21
Total sample (n = 512)	–0.07	0.76	24.70	–0.29	3.30
Panel B: One-Factor Alpha					
Q5	0.00	0.54	26.07	–0.01	2.08
Q4	–0.04	0.65	22.93	–0.18	2.78
Q3	–0.06	0.76	23.00	–0.26	3.39
Q2	–0.08	0.83	20.68	–0.40	4.04
Q1	–0.17	1.00	30.74	–0.62	4.24
Total sample (n = 512)	–0.07	0.76	24.70	–0.30	3.30
Panel C: Four-Factor Alpha					
Q5	0.15	0.52	31.68	0.56	1.72
Q4	0.00	0.58	21.58	–0.01	2.64
Q3	–0.06	0.62	24.89	–0.26	2.58
Q2	–0.11	0.71	25.07	–0.49	2.96
Q1	–0.30	0.81	32.03	–1.01	2.99
Total sample (n = 238)	–0.07	0.65	27.08	–0.24	2.58

NOTES: The first two columns are the measures of OEMF average monthly excess return (shown in respective Panels A, B, and C as BAR, one-factor alpha, and four-factor alpha), and average annual expense ratio. The final three columns summarize average active share and active measures for both monthly alpha and the annual expense ratio. Results in each panel are presented for excess fund return quintile and for the total sample.

EXHIBIT 7

Active Performance Measures for Municipal Bond OEMFs by Fund Classification

	Classification of Municipal Bond Fund					
	Short-Term	Interm. Term	Long-Term	High Yield	Single State	Total
Panel A: Active Share						
Active share, w_A	40.3%	24.9%	20.8%	34.5%	23.0%	24.7%
Number of funds	38	86	59	16	313	512
Panel B: Performance						
BAR, α	–0.10%	–0.07%	–0.05%	–0.06%	–0.07%	–0.07%
One-factor alpha, α	–0.07%	–0.07%	–0.07%	–0.14%	–0.07%	–0.07%
Four-factor alpha, α	–0.08%	–0.06%	–0.07%	–0.13%	–0.06%	–0.07%
Active alpha (BAR), α_A	–0.22%	–0.24%	–0.26%	–0.22%	–0.31%	–0.28%
Active alpha (one-factor model), α_A	–0.13%	–0.23%	–0.36%	–0.57%	–0.31%	–0.30%
Active alpha (four-factor model), α_A	–0.22%	–0.21%	–0.32%	–0.61%	–0.24%	–0.24%
Panel C: Expense Ratio						
Expense ratio, C	0.60%	0.60%	0.72%	0.81%	0.82%	0.76%
Active expense ratio, C_A	1.78%	2.61%	3.59%	2.43%	3.67%	3.30%

NOTES: Panel A shows active share by fund classification. Panel B shows monthly alpha and active alpha, calculated using three approaches: BAR, one-factor model, and four-factor model. Panel C shows annualized expense ratio and active expense ratio.

EXHIBIT 8

Municipal Bond OEMF Monthly Excess Return, Expense Ratio, and Active Measures, with Averages (in %) Presented by Subperiod

	Subperiod 1: 1999–2008	Subperiod 2: 2009–Apr 2020
Panel A: BARs		
Average BAR	–0.11%	–0.02%
% of BARs positive	3.2%	31.9%
% positive and significant	0.6%	8.9%
% of BARs negative	96.8%	68.1%
% negative and significant	71.0%	37.6%
Average active share	24.8%	23.4%
Average active alpha	–0.37%	–0.12%
Number of funds	348	348
Panel B: One-Factor Alphas		
Average alpha	–0.08%	–0.05%
% of one-factor alphas positive	6.8%	15.4%
% positive and significant	0.0%	1.1%
% of one-factor alphas negative	93.2%	84.6%
% negative and significant	51.6%	35.1%
Average active share	24.1%	23.3%
Average active alpha	–0.30%	–0.20%
Number of funds	279	279
Panel C: Four-Factor Alphas		
Average alpha	–0.04%	–0.18%
% of four-factor alphas positive	38.03%	36.6%
% positive and significant	16.9%	6.3%
% of four-factor alphas negative	62.07%	63.4%
% negative and significant	40.1%	32.5%
Average active share	25.1%	24.8%
Average active alpha	–0.20%	–0.41%
Number of funds	142	142

NOTE: The top row of each panel shows the average monthly BAR, one-factor model return, and four-factor model return on OEMFs. Subsequent rows show the percentage of funds in each investment that have positive (negative) performance measures and that are statistically different from zero at the 5% level.

from –0.61% for high-yield funds to –0.23% for short-term national funds. The active expense ratio measure "penalizes" funds that have low active share, so shareholders of long-term national and single-state funds pay more than 3.5% annually for management of the active portion of their funds.

Subperiod Performance

The GFC of 2008–2009 was a watershed event in economic history. Given that it occurs near the midpoint of our sample period, the crisis serves as a convenient dividing point around which to investigate pre-and postcrisis municipal OEMF performance.

Exhibit 8 contains the results. Although 97% of muni bond funds underperforms their benchmarks prior to the crisis, only 68% lagged in the postcrisis period. Average BAR remains negative throughout, as does active alpha. Findings based on the single- and four-factor models are qualitatively similar. As shown in Exhibit 8, estimated active share has been quite stable between the two subperiods.

Untabulated results compare the proportion of OEMFs existing in both subperiods that has positive alphas in both and negative alphas in both. For each performance measure, *z*-tests of proportions fail to confirm that fund managers outperform persistently across periods. By far the most common outcome is negative performance in both periods, and the least common is positive performance in both periods.

CONCLUSION

Almost all of the $815 billion of investor funds in US municipal bond OEMFs is actively managed. Both the ubiquity of specialized municipal funds as well as their return characteristics suggest that municipal securities can be considered an asset class that is distinct from other fixed-income securities.

Extant research on equity and other types of bond funds demonstrates that active management tends to be a wealth-destroying activity. This article investigates whether active muni fund managers outperform their self-designated benchmark indexes and generate alpha after controlling for systematic risks in the fixed-income market. A further analysis, following Miller (2007), estimates active share, active expense ratio, and active alpha for these funds.

The results show that most managers underperform their benchmark indexes, whether performance is based on return net of performance benchmark (BAR) or models incorporating systematic risk factors. Irrespective of the OEMFs' maturity of holdings, credit quality, or single- or multistate status, fund managers underperform dramatically based on all metrics. Further examination by performance quintile reveals that underperformance is tied closely to fund expense ratio.

Municipal-security OEMFs' average active share is approximately 25%, a figure consistent with Miller's (2007) results for equity OEMFs. The average reported expense ratio for this sample of actively managed muni OEMFs is 76 bps. Assuming a 7 bp annual expense ratio for the least-expensive muni ETF, the estimated active expense ratio is 3.30%. This implied cost for managing the active portion of the portfolio bears similarity to fees charged by the hedge fund industry.

Monthly active alphas (alphas associated with the active share) range between –30 bps to –24 bps. This result confirms the degree to which active management of muni bond funds against their benchmarks has not been a reliably successful endeavor. Considering two subperiods with the GFC as the approximate midpoint, only 2.8% of muni OEMF managers beat their benchmarks in the 1999–2008 period, while 32.1% were able to outperform in the 2009–2020 period. Taken as a whole, this study provides evidence of the challenges of active money management in yet another domain.

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