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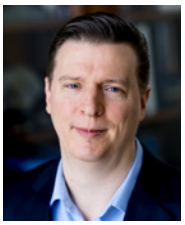

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Municipal Bond Market Performance

December 2019

Including 2019 Year in Review

Overview

The municipal bond market, as measured by the Standard & Poor's Municipal Bond Investment Grade Index, had a Total Return of 0.310% in December 2019, consisting of the components displayed in Table 1.

TABLE 1

Total Return	**0.310%**
Coupon Return	0.342%
Market Amortization Return	-0.188%
Parallel Shift Return	0.154%
Non-Parallel Shift Return	0.024%
Sector/Quality Return	-0.012%
Residual Price Return	-0.009%

Interpretation

The Coupon Return of 0.342% is based on the index's average coupon of 4.435% and the Market Amortization Return of -0.188% is based on the index's average beginning-of-month market yield of 1.753%. These two terms sum to a total income effect of 0.154%.

- Coupon Return reflects both interest payments and changes in accrued interest throughout the month.
- Market Amortization Return is negative because of the large number of premium bonds in the index due to the low yield curve environment. Premium bond prices, absent any change in yield, naturally decline over time to their redemption price. This decline is called market amortization.

The remaining 0.157% bp of total return is almost identical to the Parallel Shift Return of 0.154%. This is because the final three attribution terms largely cancel each other. Yield curve movement resulted in positive return (reflected in the Parallel Shift and Non-Parallel Shift Returns), but not enough to counteract the Market Amortization Return from the large number of premium bonds in the index. As a result, the overall total return was slightly less than the coupon return.

The spot curve movement for the month is depicted in Figure 1. There was almost no yield curve movement on the long end, but the short to intermediate portions of the curve did see a few basis points of decrease. The ten-year point dropped 3 bp, and this drop was used to compute the Parallel Shift Return of 0.154% (see Table 2). The green dotted line in the graph depicts the parallel shift implied by that ten-year point.

FIGURE 1

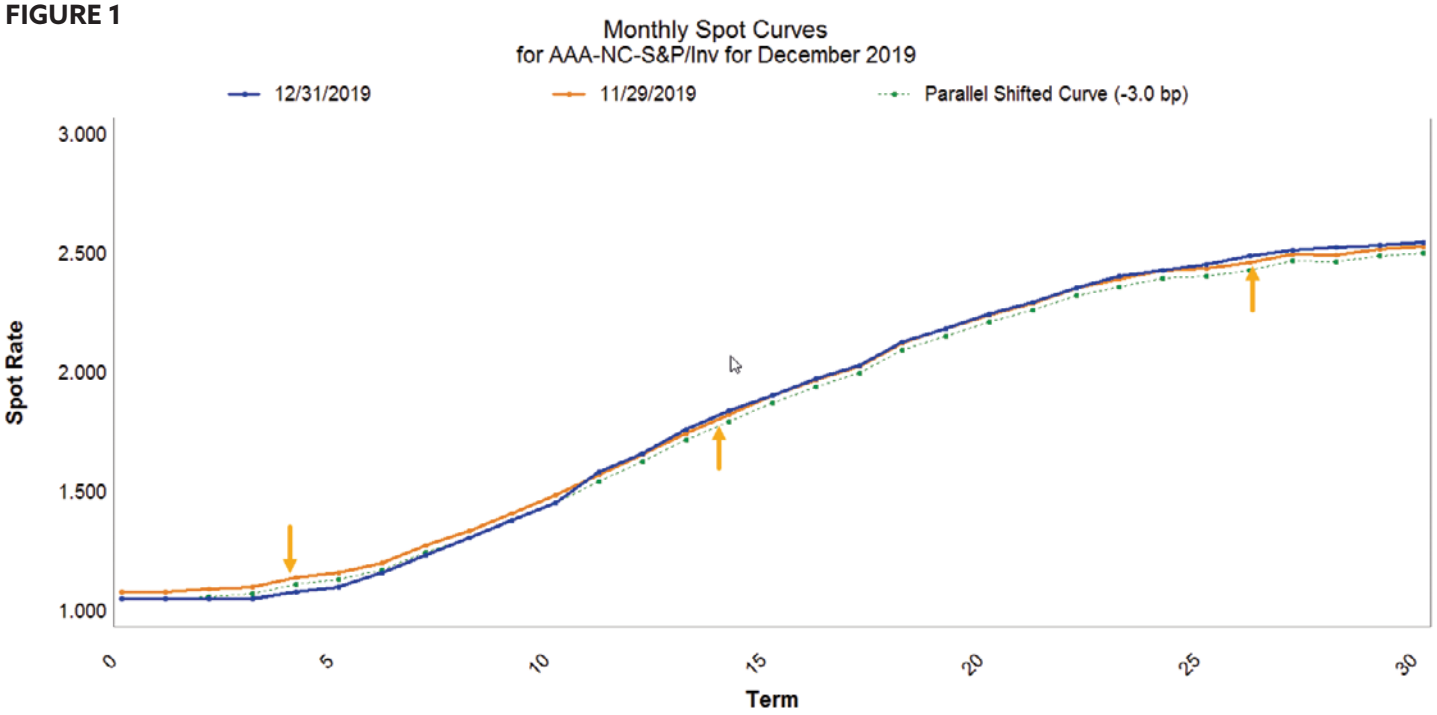


TABLE 2

Change in 10-Year Spot Rate[a]	-2.96
Total Key Rate Duration[b]	5.2031
Parallel Shift Return[-b*a]	0.154

Table 3 shows that the Non-Parallel Shift Return's overall positive value came largely from modest decreases in the 3-year to 7-year range where there were relatively large key rate durations. Although the long end of the curve saw increases with respect to the parallel shift, the corresponding key rate durations were smaller due to large numbers of bonds priced to calls significantly in the money.

TABLE 3

	6 Mos	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	20 Yrs	30 Yrs
Key Rate Duration	0.031	0.099	0.247	0.559	0.978	1.279	1.041	0.760	0.208
Non-Parallel Change	0.0	0.0	-1.0	-2.1	-3.1	-1.0	0.0	3.2	4.5
Non-Parallel Shift Return	0.000	0.000	0.003	0.011	0.030	0.013	0.000	-0.024	-0.009

Each value in the table's Non-Parallel Shift Return row is calculated by multiplying together the two cells above it and reversing the sign.

Sector/Quality Return captures return from changes in average option-adjusted spread (adjusted by duration) in various sector/quality categories. The index's overall Sector/Quality Return was -0.012%. The sector/quality categories with the biggest negative contributions, considering both weight and the groupings' own sector-quality returns, are listed in Table 4. The biggest positive contributors are listed in Table 5.

TABLE 4

	AAA-rated Local GO	AA-rated Local GO	A-rated Health Care	AA-rated Tax-Supported
Change in Duration-Adjusted Average OA Spread[a]	0.699	0.514	1.510	0.606
Total Key Rate Duration[b]	5.387	5.478	6.212	5.001
Sector/Quality Return[-b*a]	-0.038	-0.028	-0.094	-0.030
Market Value Weight%[c]	9.330	9.625	2.798	7.767
Contribution to Duration[b*c]	0.50257	0.52732	0.17382	0.38844
Contribution to Sector/Quality Return[-b*c*a]	-0.00351	-0.00271	-0.00262	-0.00235

TABLE 5

	A-rated Transportation	AA-rated State GO	BBB-rated State GO	BBB-rated Transportation
Change in Duration-Adjusted Average OA Spread[a]	-0.883	-0.997	-4.732	-3.459
Total Key Rate Duration[b]	5.758	4.664	4.508	6.360
Sector/Quality Return[-b*a]	0.051	0.046	0.213	0.220
Market Value Weight%[c]	5.509	5.532	0.693	0.575
Contribution to Duration[b*c]	0.31723	0.25803	0.03126	0.03660
Contribution to Sector/Quality Return[-b*c*a]	0.00280	0.00257	0.00148	0.00127

2019 Year in Review

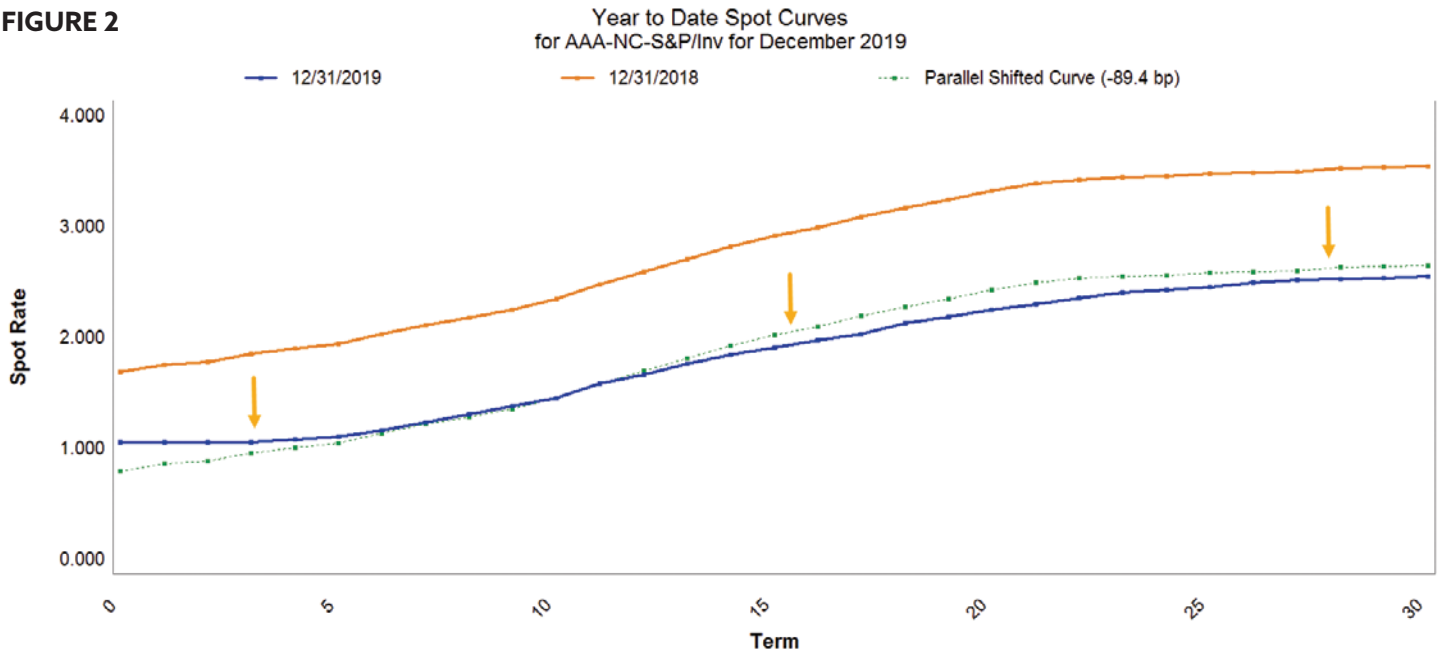
Table 6 contains the 2019 monthly and annual total returns and their breakdowns.

TABLE 6

	Total Return	Coupon Return	Market Amort Return	Parallel Shift Return	Non-Parallel Shift Return	Sector/Quality Return	Residual Price Return
YEAR	7.030%	4.210%	-2.089%	5.116%	0.052%	-0.680%	0.421%
Dec	0.310%	0.342%	-0.188%	0.154%	0.024%	-0.012%	-0.009%
Nov	0.157%	0.319%	-0.180%	-0.110%	0.110%	0.004%	0.014%
Oct	0.146%	0.342%	-0.191%	-0.289%	0.383%	-0.141%	0.042%
Sep	-0.690%	0.318%	-0.184%	-0.920%	-0.089%	0.183%	0.003%
Aug	1.388%	0.333%	-0.186%	1.494%	-0.307%	0.004%	0.048%
July	0.777%	0.346%	-0.171%	0.633%	0.150%	-0.204%	0.024%
June	0.416%	0.325%	-0.172%	0.258%	0.098%	-0.132%	0.038%
May	1.332%	0.351%	-0.162%	1.216%	-0.050%	-0.136%	0.112%
Apr	0.323%	0.330%	-0.134%	0.068%	-0.035%	0.086%	0.009%
Mar	1.426%	0.380%	-0.187%	1.322%	-0.146%	-0.098%	0.156%
Feb	0.500%	0.312%	-0.120%	0.407%	0.012%	-0.119%	0.010%
Jan	0.748%	0.348%	-0.126%	0.780%	-0.114%	-0.099%	-0.040%

This breakdown reveals that the very strong total return of 7.030% had Parallel Shift Return as its biggest contributing factor. Figure 2 shows why – the spot curve had an overall drop of around 90 bp in 2019 in addition to a modest overall steepening.

FIGURE 2



The return breakdown also gives a rough indication of what the total return might have been without that significant decrease in rates, or what it might have been with an increase in rates. For example, Table 7 shows Total Return with Parallel Shift Return subtracted out, which is a rough indicator of what total return might have been had the curve not dropped at all. Table 7 also shows monthly and annual Yield Returns (which represents the total income effect), computed by adding Coupon Return to Market Amort Return. The drop in this value throughout the year roughly mirrors the drop in the yield curve throughout the year.

TABLE 7	Total Return	Total Return Minus Parallel Shift Return	Yield Return	Annualized Yield Return
YEAR	7.030%	1.914%	2.121%	2.121%
Dec	0.310%	0.156%	0.154%	1.848%
Nov	0.157%	0.267%	0.139%	1.668%
Oct	0.146%	0.435%	0.151%	1.812%
Sep	-0.690%	0.230%	0.134%	1.608%
Aug	1.388%	-0.106%	0.147%	1.764%
July	0.777%	0.144%	0.175%	2.100%
June	0.416%	0.158%	0.153%	1.836%
May	1.332%	0.116%	0.189%	2.268%
Apr	0.323%	0.255%	0.196%	2.352%
Mar	1.426%	0.104%	0.193%	2.316%
Feb	0.500%	0.093%	0.192%	2.304%
Jan	0.748%	-0.032%	0.222%	2.664%

Note that accurately projecting an index's performance under various curve or spread scenarios requires complete modeling of every bond in the index. This can be done in Investortools, Inc.'s Custom Index Manager product. Custom Index Manager can perform the same calculations on a portfolio or group of portfolios and reveal how and why their projected performance differs from an index's.

CONTACT US

All table data and figures in this report were produced using Investortools, Inc.'s **Custom Index Manager** product.

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