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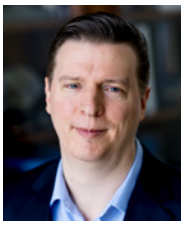

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Municipal Bond Market Performance

November 2019

Overview

The municipal bond market, as measured by the Standard & Poor's Municipal Bond Investment Grade Index, had a Total Return of 0.157% in November 2019, consisting of the components listed in Table 1.

It was another strongly income-dominated month. The net yield curve movement was very small. There were a few spread stories, but coupon and yield effects accounted for all but 1.8 basis points of the index's total return.

TABLE 1

Total Return	**0.157%**
Coupon Return	0.319%
Market Amortization Return	-0.180%
Parallel Shift Return	-0.110%
Non-Parallel Shift Return	0.110%
Sector/Quality Return	0.004%
Residual Price Return	0.014%

Breakdown

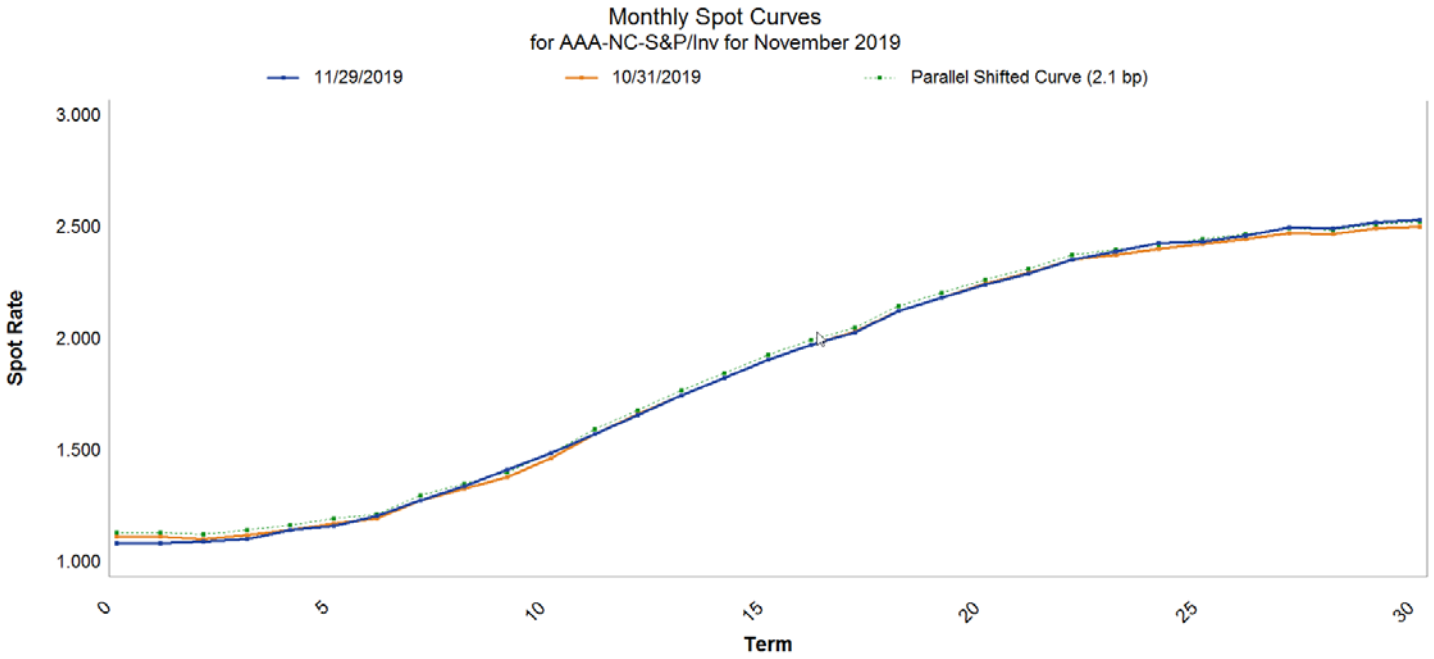
Like October, the biggest contributing factors in November were the Coupon Return of 0.319% (based on the index's average coupon of 4.440%) and the Mkt Amortization Return of -0.180% (based on the index's average yield to worst of 1.756%).

- 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 value. This natural decline is called market amortization.

Adding these two return components together gives a total income effect of 0.139%, which is within 1.8 basis points of the overall total return.

The spot curve ended the month almost exactly where it started (see Figure 1 on next page). The minimal curve movement made the traditional breakdown between parallel & non-parallel effects of limited value.

FIGURE 1



Because there was a slight increase of 2.1 basis points at the 10-year point, Parallel Shift Return was calculated as in Table 2.

TABLE 2

Change in 10-Year Spot Rate[a]	0.0212%
Total Key Rate Duration[b]	5.200
Parallel Shift Return[(-b*a)]	-0.110%

Non-Parallel Shift Return makes up the remainder of return from the yield curve. It is calculated at each key rate by multiplying each key rate duration by the remaining (non-parallel) spot curve change at that point and then reversing the sign, as in Table 3.

TABLE 3

	6 Mos	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	20 Yrs	30 Yrs
Key Rate Duration	0.0297	0.0993	0.2443	0.5623	0.9772	1.2903	1.0367	0.7575	0.2031
Non-Parallel Change	-0.051	-0.051	-0.031	-0.041	-0.031	-0.021	0.000	-0.0218	0.006
Non-Parallel Shift Return	0.0015	0.005	0.008	0.023	0.030	0.027	0.000	0.0165	-0.001

Summing the values in the last row gives the total Non-Parallel Shift Return of 0.110% displayed in Table 1.

However, Table 1 also shows that the Parallel and Non-Parallel Shift Returns perfectly cancel each other, giving a total yield curve return of 0.000%. This can be more readily seen by breaking down the yield curve return by key rate as in Table 4. This table shows that the total spot curve change at each key point is quite small, with some changes positive and some negative. Summing all the values in the last row results in a 0.000% total yield curve return. Portfolios or indices with a different distribution of key rate durations might have non-zero yield curve returns.

TABLE 4

	6 Mos	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	20 Yrs	30 Yrs
Key Rate Duration	0.0297	0.0993	0.2443	0.5623	0.9772	1.2903	1.0367	0.7575	0.2031
Total Spot Curve Change	-0.030	-0.030	-0.010	-0.020	-0.010	0.000	0.021	-0.001	0.0273
Total Yield Curve Return	0.001	0.003	0.002	0.011	0.010	0.000	-0.022	0.001	-0.006

Sector/Quality Return captures changes in average option-adjusted spread (adjusted by duration) to various sector/quality categories. These averages reveal the follow patterns for November:

- The Housing, State GO, Local GO, and Other Revenue sectors all saw spreads widen in higher quality categories and tighten in lower quality categories, suggesting a reach for yield.
- The Public Power and Water / Sewer sectors saw the opposite pattern, suggesting movement to higher quality within those sectors.
- The Resource Recovery sector saw spreads tighten overall, while the Tobacco Settlement sector saw spreads widen overall.
- Other sectors saw mixed results.

Overall Sector/Quality Return reflects not just these average OA spread changes, but also each sector/quality category's contribution to duration. The biggest positive contributors to overall Sector/Quality Return are listed in Table 5, and the most negative contributors are listed in Table 6.

TABLE 5

	A-rated Transportation	BBB-rated State GO	BBB-rated Transportation	BBB-rated Local GO
Change in Duration-Adjusted Average OA Spread[a]	-1.725	-6.488	-2.849	-10.375
Total Key Rate Duration[b]	5.685	4.348	6.479	6.031
Sector/Quality Return[-b*a]	0.098	0.282	0.185	0.626
Market Value Weight%[c]	5.446	0.667	0.619	0.174
Contribution to Duration[b*c]	0.30963	0.02900	0.04013	0.01049
Contribution to Sector/Quality Return[-b*c*a]	0.00534	0.00188	0.00114	0.00109

TABLE 6

	AA-rated Local GO	AA-rated Housing	AA-rated Transportation	AA-rated Tax Support
Change in Duration-Adjusted Average OA Spread[(a)]	0.323	1.135	0.519	0.212
Total Key Rate Duration[(b)]	5.417	7.382	5.219	5.009
Sector/Quality Return[(-b*a)]	-0.017	-0.084	-0.027	-0.011
Market Value Weight%[(c)]	9.208	1.677	5.014	7.841
Contribution to Duration[(b*c)]	0.49882	0.12383	0.26164	0.39275
Contribution to Sector/Quality Return[(-b*c*a)]	-0.00161	-0.00141	-0.00136	-0.00083

Finally, the Residual Price Return of 0.014% reflects the positive effects of rolling down the yield curve and also the effect of convexity on price movement.