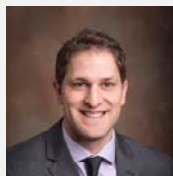




LDI Solutions

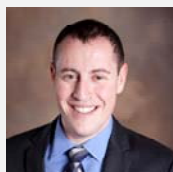
PENSION CURVE INSIDER

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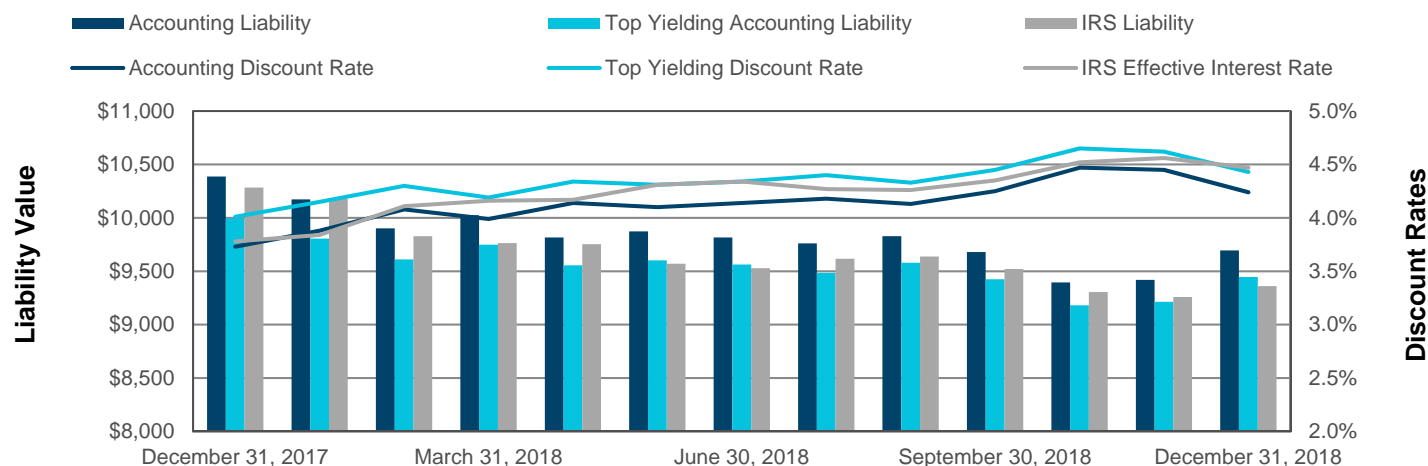
MONTHLY RECAP

Marked-to-market discount rates finished the year with a thud as the Treasury curve saw its most significant flattening during the final month. The short end of the Treasury curve rose by as much as 13 basis points, while the middle and long end of the curve fell around 30 basis points across the board. Discount rates generated using both the AA-rated spot and top-yielding curves followed suit, making it a more difficult disclosure season for sponsors with December 31 fiscal year ends. Investment grade spreads gapped out again while discount rates based on the IRS curve, with its averaging methodology, also fell during the month.

Sponsors shouldn't be completely discouraged as discount rates currently sit 50 basis points higher than a year ago, using the broad AA discount rate curve. Top yielding AA-rated bonds are 42 basis points higher than 2017 year-end and provide 19 basis points of additional yield relative to the broader market.

December was another quiet month for turnover within the AA-rated index, as less than 1% of the index changed eligibility. Market turbulence and the holidays restricted the new issues market. Exiting issues made up all the month's movement, totaling about \$6B in market value. Apple and Exxon Mobil each had one bond leave the index during the month, making up nearly 50% of the month's exits in terms of market value.

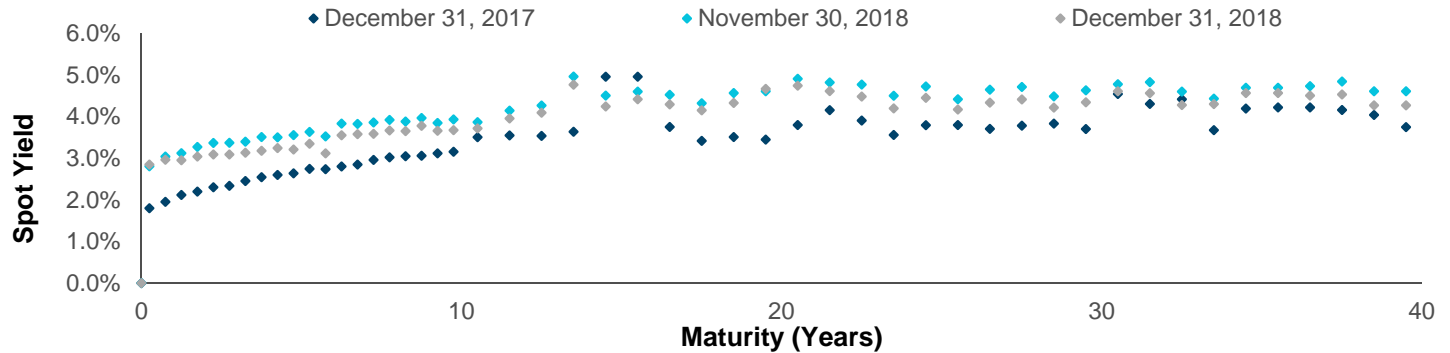
LIABILITY IMPACT



Yield Curve	Liability Value 12/31/18	Discount Rate 12/31/18	Liability Value 11/30/18	Discount Rate 11/30/18	Liability Value 12/31/17	Discount Rate 12/31/17
Accounting Yield Curve	\$9,695	4.24%	\$9,418	4.45%	\$10,386	3.73%
Top Yielding Accounting Curve	\$9,446	4.43%	\$9,214	4.62%	\$9,994	4.01%
IRS Yield Curve	\$9,361	4.47%	\$9,258	4.56%	\$10,310	3.76%

Sources: Bloomberg Barclays. Bloomberg Index Services Ltd. Copyright 2018, Bloomberg Index Services Ltd. Used with permission. IRS, and T. Rowe Price. Sample plan cash flows have a liability of \$10,000 at 4.0% discount rate.

ACCOUNTING CURVE



Sources: Bloomberg Barclays. Bloomberg Index Services Ltd. Copyright 2018, Bloomberg Index Services Ltd. Used with permission. T. Rowe Price.

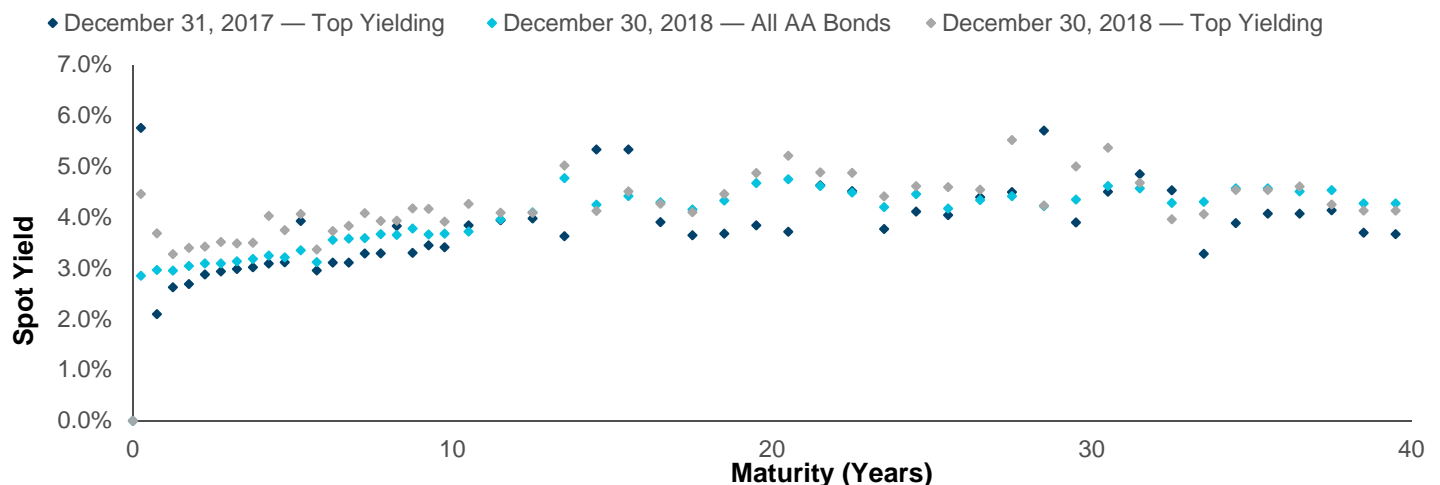
Issuer	Event	Curve Impact
Apple	Exiting – Other (1 bond)	Apple had one bond exit the AA-rated universe in December due to a callability rule. The issue was the largest exiting bond in terms of market value, coming in at \$1.7B and matures at the 6-year mark in 2024. Due to higher issuance at the belly of the curve, Apple's exiting bond had little impact on the discount curve.
Exxon Mobil	Exiting – Other (1 bond)	Exxon Mobil also had one bond leave the AA-rated index due to a callability rule. Albeit smaller than Apple's issue, Exxon's \$1B bond accounted for nearly 20% of the month's turnover in terms of market value and matures at the 6-year mark. It, too, had a negligible impact on the discount curve.

Sources: Bloomberg Barclays. Bloomberg Index Services Ltd. Copyright 2018, Bloomberg Index Services Ltd. Used with permission. T. Rowe Price.

	New Issues	Other Bonds Entering	Downgrades	Other Bonds Exiting
December 2018				
Count	0	0	0	5
Market Value (\$M)	\$0	\$0	\$0	\$6,003
Market Value (%)	0.00%	0.00%	0.00%	0.92%
2018 YTD				
Count	84	65	26	29
Market Value (\$M)	\$79,708	\$63,780	\$21,552	\$30,854
Market Value (%)	12.44%	9.91%	3.52%	4.84%

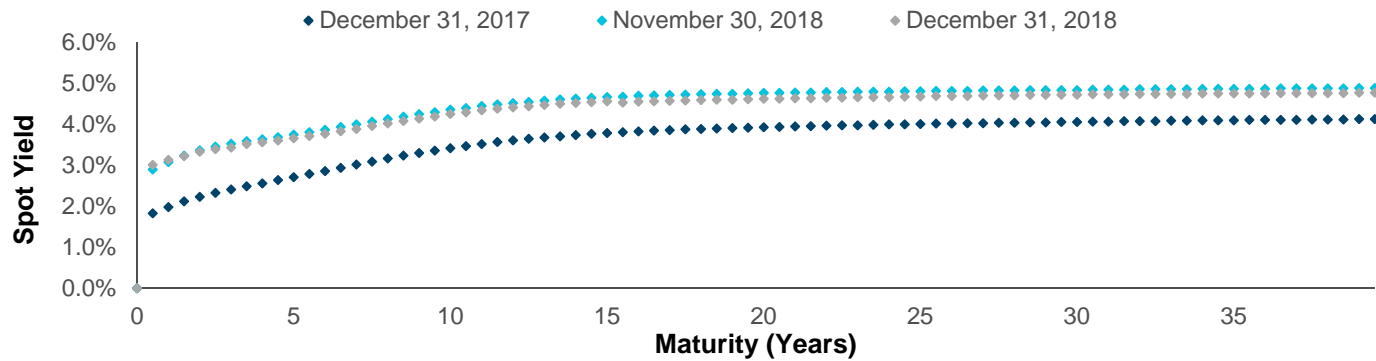
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TOP YIELDING ACCOUNTING CURVE



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IRS CURVE

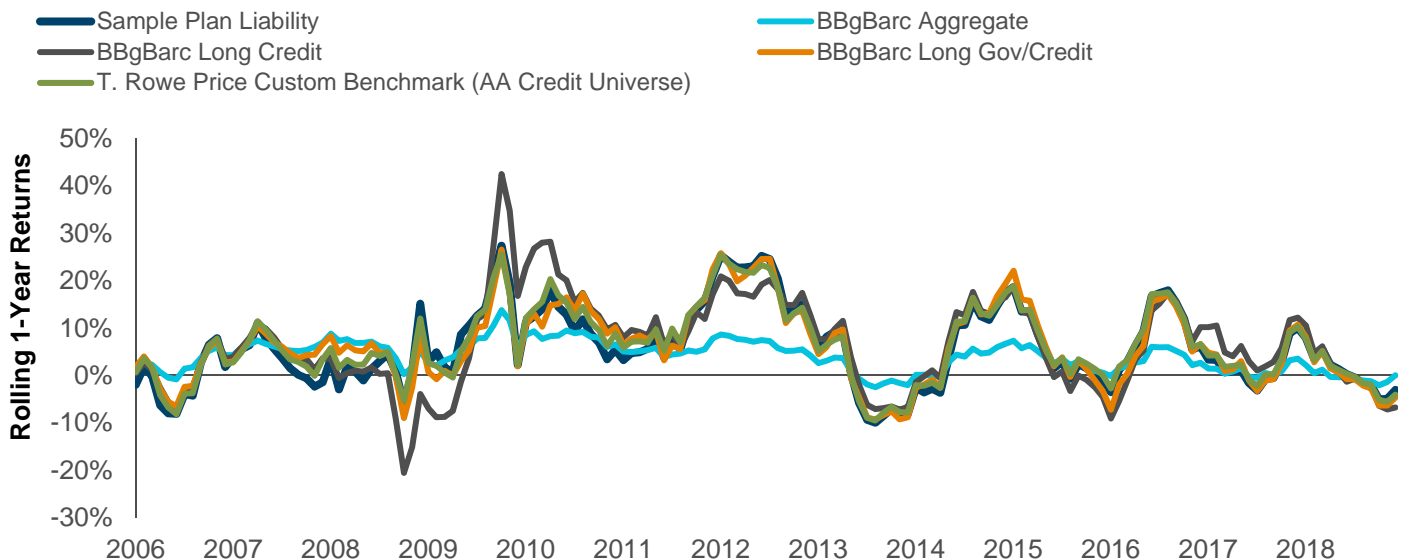


Sources: IRS and T. Rowe Price

Dates	AAA Corporate OAS	AA Corporate OAS	A Corporate OAS
November Monthly Average	49	59	95
December 3, 2018	55	66	105
December 14, 2018	56	69	106
December 31, 2018	65	73	115
December Monthly Average	58	70	110

Sources: Bloomberg Barclays. Bloomberg Index Services Ltd. Copyright 2018, Bloomberg Index Services Ltd. Used with permission. T. Rowe Price.

ONE-YEAR ROLLING RETURNS AND TRACKING ERROR



	December 2018 Return	YTD Total Return	Annual Tracking Error Relative to Liability	Average Monthly Return Difference from Liability
Hypothetical Sample Plan Liability	3.27%	-3.05%	NA	NA
BBgBarc Aggregate	1.84%	0.02%	6.48%	1.41%
BBgBarc Long Credit	2.45%	-6.76%	4.53%	0.92%
BBgBarc Long Gov/Credit	3.70%	-4.67%	3.13%	0.65%
Hypothetical T. Rowe Price Custom Benchmark	3.09%	-4.05%	2.04%	0.32%

Sources: Bloomberg Index Services Ltd., T. Rowe Price; Analysis by T. Rowe Price. Performance shown in graph and tables above shown from February 1, 2005 through December 31, 2018.

Past performance cannot guarantee future results. Custom Benchmark returns do not reflect the deduction of management fees. Please refer to the disclosure at the end of the article for important additional information.

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GLOSSARY

IRS Yield Curve: Plan sponsors of qualified defined benefit pension plans use this yield curve to determine funding requirements per IRS regulations. These funding requirements are disclosed on form 5500 annually. Yields on AAA, AA, and A corporate securities determine the yield curve for discounting purposes. The yield curve is not a marked-to-market curve representing any single date, but rather an average yield over the course of the entire month. For more information on the IRS methodology, please see treasury.gov/resource-center and irs.gov/Retirement-Plans.

Accounting Yield Curve: US GAAP requires pension plan sponsors to disclose pension obligations using “fixed-income debt securities that receive one of the two highest ratings given by a recognized ratings agency”. As a proxy for bonds useable for accounting purposes, we use the constituents of BBgBarc AA credit universe to develop the accounting yield curve shown. Please see fasb.org for more information.

Top Yielding Curve: Since the US GAAP rules allow the use of a fairly broad range of securities for accounting purposes, some plan sponsors use an optimized yield curve approach to value their pension liabilities on the disclosure dates. Bonds trading at higher yields than other bonds of similar maturity tend to be used for this purpose. To quantify the effectiveness of this approach, T. Rowe Price developed a yield curve using the highest yielding bonds designed to meet SEC requirements at each node.

Annual Tracking Error Relative to Liability: Calculated as the standard deviation of return differences between a fixed income index and a set of cash flows discounted using the accounting yield curve. The liability return has two components: an interest cost component analogous to roll return on a bond, and yield change component analogous to price return on a bond. The table shows annualized ex-post tracking error.

Average Monthly Return Difference: Similar to the tracking error metric, this metric demonstrates how closely a fixed income benchmark tracks a set of liability returns. We calculate this measure by simply averaging the difference in returns over the period shown.

Sample Plan Liability: Pension plan sponsors must account for the cost of their retirement plan on their financial statements. The amount of this liability can fluctuate over time based on several factors, including benefits earned, benefits paid out, mortality experience, and most significantly, interest rates. The Sample Plan is intended to be a representative defined benefit pension plan and does not reflect the cash flows from any specific plan.

T. Rowe Price Custom Benchmark: An index of fixed income securities created using T. Rowe Price proprietary methodology that attempts to replicate interest rate exposures embedded in a pension plan’s liability structure.

To learn more, please visit troweprice.com

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The illustrations presented are hypothetical and used to demonstrate capabilities. Certain assumptions have been made for modeling purposes and with the benefit of hindsight and are unlikely to be realized. The specific issuers and bond issues mentioned in this document had significant impact on liability curves calculated using BBgBarc index universes. The modeling used for plan and benchmark development has certain inherent limitations. Benchmark construction may not reflect all material economic and market factors that could have impacted implementation or weighting decisions if the modeled plan actually existed during the time period presented. Actual T. Rowe Price Custom Benchmark characteristics, including (among other things) yield, annualized return, liability-relative tracking error and average monthly returns difference relative to plan liability may differ substantially from the hypothetical scenario presented.

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