TERRY

Bond Market Update – December 2022
January 5, 2023

Terry Group A-Grade Corporate Bond Yield Curve for Valuing Long-Duration Insurance Contracts

The valuation of long-term insurance policy benefits is shifting to a current-market valuation basis for large public companies in 2023, with restated liability figures generally required as of the two prior year-ends.

Current market discount rates are based on an "upper-medium grade" fixed income yield, which is broadly interpreted to mean A-grade corporate bonds.

In valuing future policy benefits, the new FASB rules further specify that insurers reflect the duration characteristics of the liabilities and use valuation rates that maximize reference to observable bond data.

Constructing an Appropriate A-Grade Bond Portfolio

Adhering to these new standards entails an assessment of relevant bond yields across the full range of maturities. The most direct way to reflect market rates is to develop a complete yield curve from a portfolio of A-grade bonds, applying year-by-year rates developed from that curve to discount future policy benefits.

Constructing a curve from market data requires addressing a number of technical and methodology considerations, including:

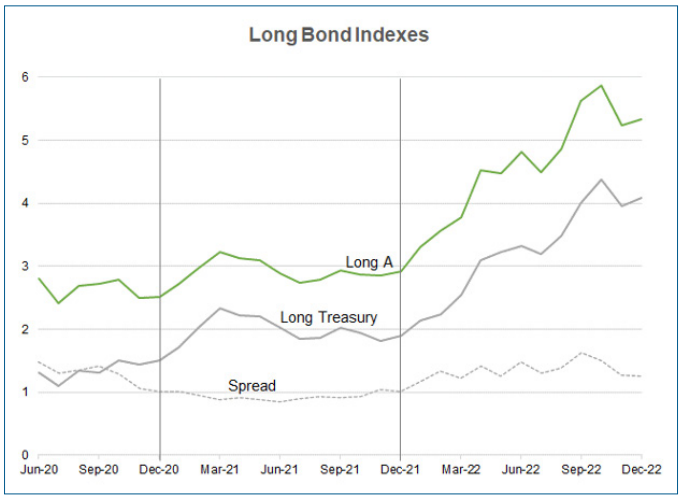
- range of credit ratings by different rating agencies
- minimum issue size to ensure credible bond trading/pricing
- inclusion/exclusion/adjustments for bonds with call features and other embedded options
- inclusion/exclusion of private placement, quasi-government and less broadly-traded bonds
- relative quality/appropriateness of pricing sources and timing for end-of-day price measures
- potential curve-fitting approaches, with varying emphasis on tightness of data-fit vs. smoothness
- extrapolation of long-end rates, beyond the range of credible bond data (a critical factor since payments for many insurance products extend well past 30 years).

Ensuring acceptance by auditors will require that the yield curve be comprehensively documented, consistently applied, and provide results closely reflective of current capital markets and market changes across time.

Bond Market Update

Monitoring generally available market information such as bond index averages is necessary to ensure market consistency. Any variation in model vs. market results should be evaluated and rationalized.

	Corp A	Treasury	Spread
12/31/2022	5.34	4.08	1.26
11/30/2022	5.23	3.96	1.27
10/31/2022	5.87	4.37	1.50
9/30/2022	5.63	4.00	1.63
8/31/2022	4.87	3.48	1.39
7/31/2022	4.49	3.19	1.30
6/30/2022	4.81	3.33	1.48
5/31/2022	4.48	3.23	1.25
4/30/2022	4.52	3.10	1.42
3/31/2021	3.78	2.55	1.23
2/28/2022	3.56	2.23	1.33
1/31/2022	3.31	2.14	1.17
12/31/2021	2.91	1.89	1.02
11/30/2021	2.85	1.81	1.04
10/31/2021	2.87	1.94	0.93
9/30/2021	2.94	2.03	0.91
8/31/2021	2.79	1.86	0.93
7/31/2021	2.74	1.84	0.90
6/30/2021	2.88	2.03	0.85



Sources: Bloomberg Barclays Long A US Corp, US Treasury Long Indexes

The December bond market was rather uneventful, as long bond yields nudged up slightly, thus recapturing a portion of the significant yield decline in the prior month.

Full year results were much more dynamic: long corporate yields moved up a rather startling 3% over the first ten months of 2022, before falling back about 50 basis points over the year's last two months, resulting in a **2.5% increase for the year**. (Note that this movement in long yields is by far the largest year-over-year increase in recent economic history.) The uptick in long Treasury yields was a bit less extreme, with an increase of roughly 2.5% as of October 31 followed by a slide back to a 2.2% increase as of year-end.

Recent long bond yields are strongly affected by the shift in monetary policy aimed at dampening inflation expectations. Corporate rates are further impacted by cyclical vagaries in economic activity and the resulting demand for capital funds.

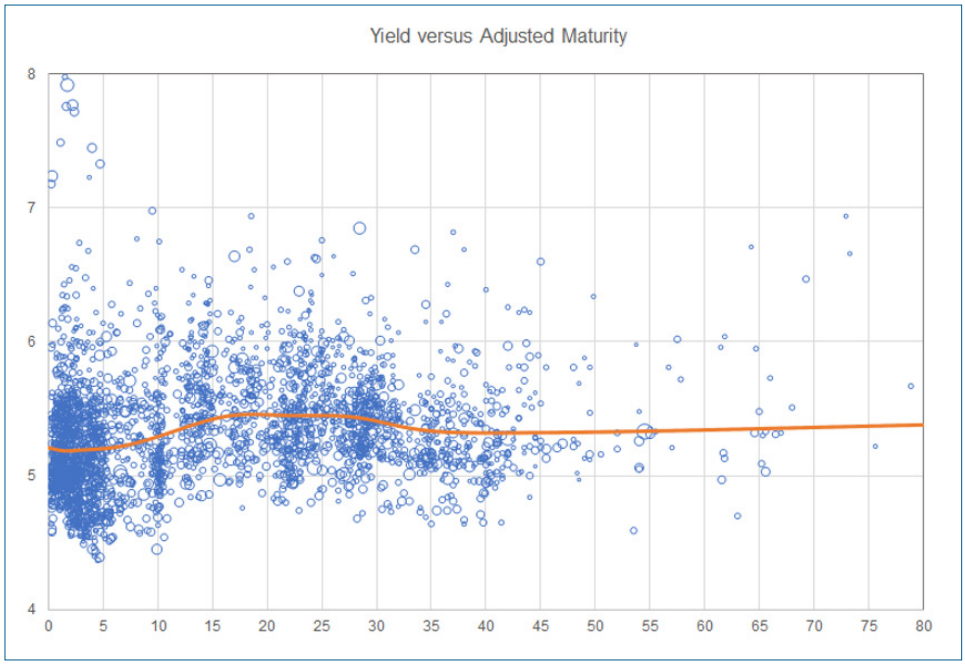
The future trend for interest rates depends on how effective the current monetary policy restraint will be in suppressing the level of economic activity and thus constraining the inflation rate. A meaningful decline in economic activity (i.e., a recession) or in inflation measures is likely required to break the recent pattern of rate increases. Looking beyond these near-term macro-economic issues, analysts generally do not expect a continuation of current high rate levels going forward, in light of the country's maturing demographics and economy and the government's tendency toward expansionary monetary policy.

Building and Applying a Yield Curve

The following exhibits illustrate the results of an A-grade yield curve model developed as of December 31, 2022.

After filtering the A-grade bond universe for grading, optionality and other factors, the portfolio consists of almost 3,000 bonds. These are arrayed across maturity groups; a curve is then fit to that array, with a goal of reflecting the mean/median yield for each maturity group. Note that two technical adjustments are made in the course of fitting the curve:

- The fitted curve is modified to the extent necessary to ensure a relatively smooth pattern of yields, with these adjustments tightly controlled to ensure that the overall curve maintains an accurate representation of mean/median yield levels.
- The bonds are characterized, and maturity group averages determined, based on "adjusted" rather than nominal maturities. These adjustments are necessary since the fitted curve is based on a par bond assumption, while few bonds pay coupons at current market rates.* Thus, bonds are reflected in curve-building at maturity points that align each bond's actual duration with that of a par bond.

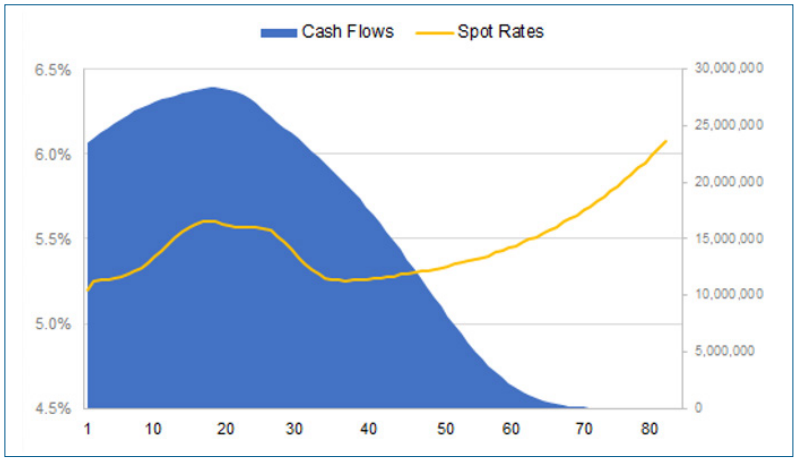


Bond data from Bloomberg

Once yields have been determined at each maturity point, spot rates can be derived (based on a methodology termed "bootstrapping"). These spot rates are then applied to a given set of projected benefit cash flows, and a present value determined. Often, a flat/single equivalent discount rate consistent with that present value is calculated and used to represent the valuation result.

* Longer-maturity bonds in our portfolio have an average coupon of about 4.4%. Since the curve utilizes a par bond convention, representing a given long bond at the maturity point where its actual duration is consistent with that of a par bond (with coupons presumed paid based on the market yield) maintains the integrity of the yield curve. This adjustment becomes an especially critical issue when market rates vary significantly from historic levels. Since market yields in recent months have tended to be significantly higher than coupon rates, their maturities must be extended in order to align with par bonds represented at these market rates. On average bonds in the long maturity portion of the December portfolio are being extended by 3+ years.

The example below reflects a very long duration cash flow (e.g., that for a deferred income annuity), along with the application of The Terry Group's moderate or baseline yield curve:



Single Equiv Discount Rate	5.44%
Present Value (millions)	$449.9
Duration	15.1

Variations in Discount Rate Outcomes

Discount rate outcomes almost always vary based on the duration of a given set of benefit cash flows—since the yield curve is almost never totally flat. Another element of variation in outcomes results from the approach taken to extrapolate the curve beyond the maturity point at which the most credible data ends—generally considered to be at about 30 years. The extrapolation impact will of course vary based on the duration of a given cash flow, i.e., for durations below 12 there is generally little impact.

The Terry Group's December portfolio includes almost 500 bonds with adjusted maturities beyond 30 years, 170 of which have adjusted maturities beyond 40 years. This information enables a fairly robust curve build beyond the typical 30-year credibility boundary:

Dec 31, 2022	*Extrapolated Slope*		
Duration	Flat	Moderate	Upward
Short	5.41	5.41	5.41
Long	5.50	5.50	5.50
Very Long	5.44	5.44	5.44

Note: the three sets of cash flows have approximate durations 7, 14, and 15.

December discount rate outcomes increased about 15 basis points, slightly ahead of the bond index results. But recent months' discount rate results have indicated two rather atypical patterns that have significantly changed the nature of the curve build:

- Recent rate increases have pushed market yields ahead of typical bond coupons, so that on average long bond yields now exceed average coupons by roughly 1%. This means that the typical bond at a given maturity point, with a coupon below the market yield, will have a longer duration than the par bonds represented on the curve at that maturity point. Thus, based on our "adjusted maturity" approach,

these bonds are represented as par bonds at longer maturities that align with each bond's calculated duration. This results in a curve build that has become more credible at longer maturity points.

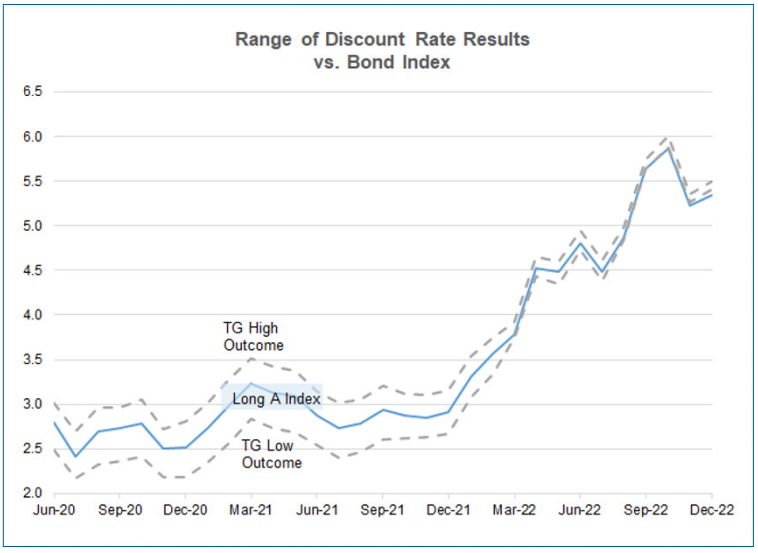
- December yields start out very high at the short end, then rise only slightly before essentially reaching a plateau in the 15–25 year maturity range. Rates then decline slightly thereafter out to the longest duration/maturity bonds. A likely rationale for this abnormally flat/humped yield pattern would be a market expectation that the current high rate period will be short-lived.

The summarized discount rate outcomes indicate that the variation in results based on duration is thus significantly dampened—there is a range of only 9 basis points across our three sample cash flows for December, a small fraction of the typical dispersion across durations.

The variation in results based on the choice of extrapolation approach is completely eliminated given the flatter yield pattern. (In comparison, results from the December 2021 model showed variations up to 15 basis points.)

You should expect both sources of volatility—related to duration and curve-fitting impacts—to change significantly over time with evolving capital market conditions.

The following graph shows the range of model results over the period since The Terry Group's yield curve model was initiated in June 2020. Over time, the variations in discount rate outcomes for our sample cash flows, encompassing variations in both cash flow duration and model/slope, have generally resulted in a range of about 50–60 basis points, roughly centered around the index average yield. As the graph illustrates, this pattern was significantly disrupted by the flatter slope and humped pattern of recent months' curves.



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