

Fiera Capital's CIA IFRS 17 Market Curves and Reference Curves – Implementation Note

Fiera Capital Corporation

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1 Background

In January 2021, the Canadian Institute of Actuaries (“CIA”) retained the services of Fiera Capital Corporation (“Fiera Capital”) to produce, on a monthly basis, the Fiera Capital’s CIA IFRS 17 Market Curves and Reference Curves.

A complete description of the methodology used to develop the IFRS 17 reference curves, as well as the rationale used to establish this methodology, can be found in the CIA’s Educational Note [IFRS 17 Discount Rates for Life and Health Insurance Contracts](#), published by the Committee on Life Insurance Financial Reporting (CLIFR) in September 2024. The material provided by the CIA also includes the Excel spreadsheet that builds the IFRS 17 reference curves. The Educational Note [IFRS 17 Discount Rates and Cash Flow Considerations for Property and Casualty Insurance Contracts](#) published by the Committee on Property and Casualty Insurance Financial Reporting (PCFRC) also provides guidance on the topic of Discount rates and refers to the IFRS 17 reference curves. The IFRS 17 reference curves apply to both Property and Casualty, and Life and Health Insurance Contracts. Actuaries would refer to the CIA educational notes for guidance related to the application of the reference curves.

It should be noted that the reference curves up to December 31, 2019 use the reference curve parameters described in the CIA’s Draft Educational Note [IFRS 17 Discount Rates for Life and Health Insurance Contracts](#), published by CLIFR in June 2020.

Some of the key inputs used in the establishment of the IFRS 17 reference curves for insurance companies in Canada are the observables market rates on the Canadian bond market. This includes a Government of Canada (i.e. “risk-free”) market curve, a provincial bond market curve and a corporate bond market curve. The purpose of this implementation note is to describe how these market curves are developed by Fiera Capital, and how these curves are then used to establish the IFRS 17 reference curves.

2 Securities Selection and Subset Definition

The first step in the market curves construction process is the securities selection. For this purpose, four bond subsets are defined: a Canada Bond subset, a Provincial Bond subset, a Corporate A-rated Bond subset and a Corporate BBB-rated Bond subset. The FTSE Canada Universe Bond Index¹, which is considered to be representative of the Canadian bond market, is used as the starting point to determine these four subsets. The pricing methodology used by FTSE Russell to establish the FTSE Canada Universe Bond Index is considered to appropriately reflect market valuation for fixed income securities in Canada.

In order to be representative of the Canadian fixed income market for the purpose of establishing the CIA IFRS 17 reference curves, a filter is applied to the FTSE Canada Universe Bond Index to remove all bonds with one of the following criteria. These bonds contain a liquidity premium that is not representative due to their particular structure or size :

- with non-standard cash flow structures such as “amortizers” and/or “sinking”;
- which have less than \$100,000,000 of outstanding nominal amount in the index.

¹ Source: FTSE Canada Fixed Income Indexes (used with permission). FTSE Russell is licensing the FTSE Canada Fixed Income Indexes “as is,” makes no warranties regarding same, does not guarantee the suitability, quality, accuracy, timeliness, and/or completeness of the FTSE Canada Fixed Income Indexes or any data included in, related to, or derived there from, assumes no liability in connection with their use, and does not sponsor, endorse, or recommend Fiera Capital, or any of its products or services.

In addition, in order to be included in the subsets, the following criteria must be met:

- for the Canada Bond subset, the issuer must be the Government of Canada;
- for the Provincial Bond subset, issuers must be direct provincial issuers (e.g., Ontario, Quebec, British-Columbia, Alberta, etc.);
- for the Corporate A-rated Bond subset and the Corporate BBB-rated Bond subset, bond ratings are based on the rating information provided by FTSE Russell.

The filtering characteristics of each issue in the index are drawn from the FTSE Canada Fixed Income Indexes. The methodology used by FTSE Russell to establish the rating for each security is based on the average rating of the four major rating agencies: Standard & Poor's (S&P), Moody's, Fitch Group and Dominion Bond Rating Service (DBRS). More details on the FTSE Canada Market Index construction methodology can be found [here](#).

It is important to note that the filters may change over time to reflect market conditions. Any change to these filters will be discussed and agreed upon by the CIA and Fiera Capital.

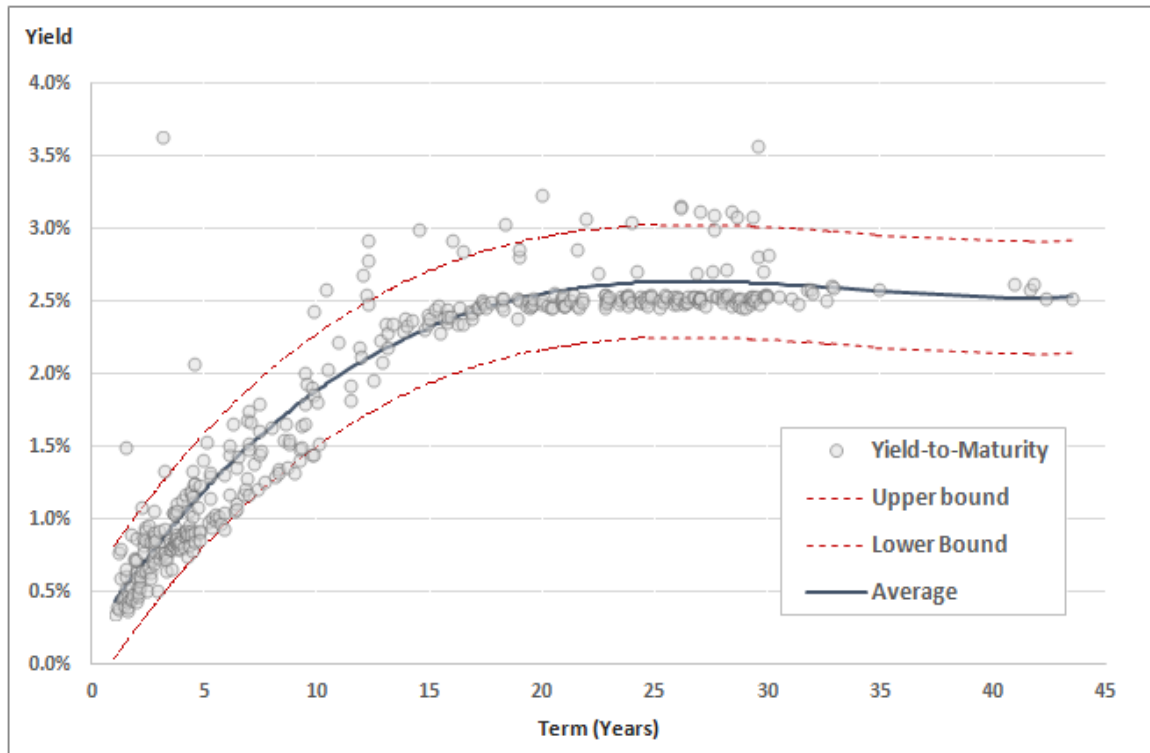
3 Exclusion of Outliers and Adjusted Bond Subsets

To ensure that the resulting market curves used to establish the IFRS 17 reference curves are fully representative of the Canadian bond market, the four previously described bond subsets are further adjusted to exclude any bonds that would be considered as outliers for the purpose of extracting the market curves from the FTSE Canada Universe Bond Index.

The detection approach used to identify outliers is based on a 3-step quantitative proprietary model developed by Fiera Capital which is applied separately on each of the four bond subsets. The 3-step outlier detection approach is summarized below:

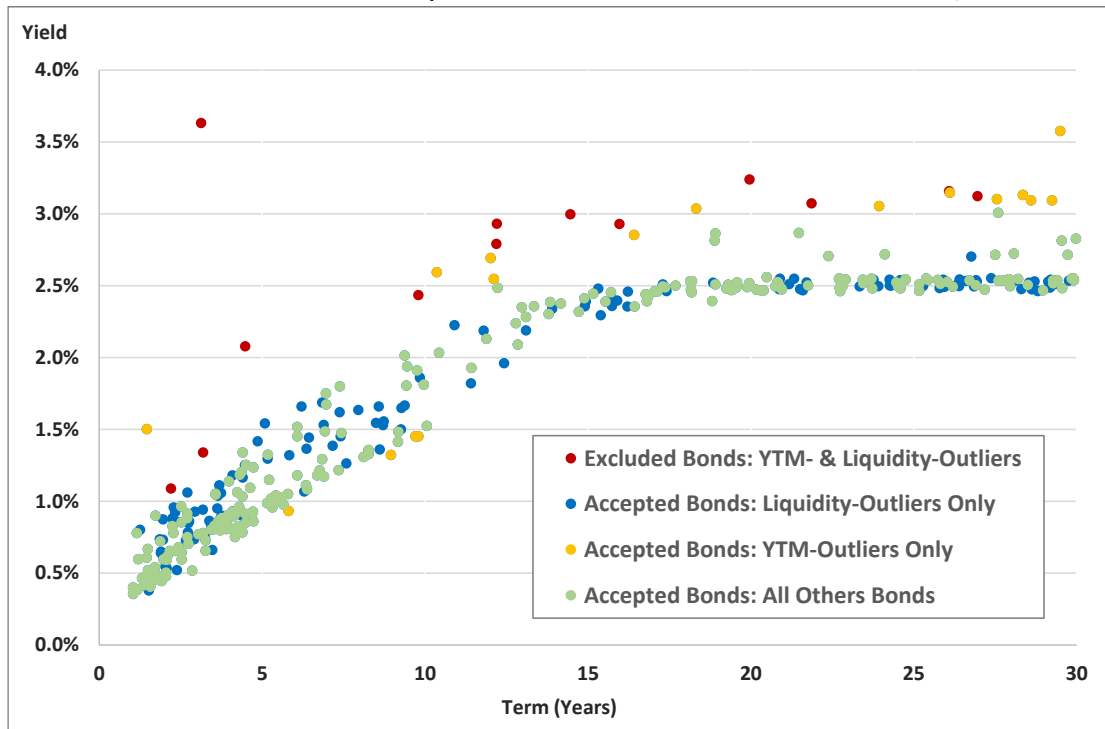
1. The first step is to quantitatively identify bonds with unusually small or large yields-to-maturity ("YTM") relative to their market. To attain this objective, a preliminary non-parametric yield curve is built by applying a spline model on the unadjusted bond subset, to which an upper and lower cushion is applied based on the yield dispersion around that curve. Securities having a yield-to-maturity falling outside these cushions are then identified as YTM-outliers.

Figure 1: Identification of YTM-outliers from the Corporate A-rated Bond subset as at December 31, 2020



2. The second step is to quantitatively identify bonds with particularly low liquidity relative to their market, based on the bid-ask spread information provided by FTSE Russell on the FTSE Canada Universe Bond Index. To achieve this objective, a non-linear regression model is derived to provide an acceptable upper bid-ask spread bound with respect to duration. Bonds with bid-ask spreads falling above this upper threshold based on their respective duration are identified as Liquidity-outliers.
3. As a final step, all bonds which are identified as both YTM-outliers and Liquidity-outliers are excluded from their respective bond subset in order to establish an Adjusted Canada Bond subset, an Adjusted Provincial Bond subset, an Adjusted Corporate A-rated Bond subset and an Adjusted Corporate BBB-rated Bond subset.

Figure 2: Identification of YTM-outliers and Liquidity-outliers for exclusion from the Corporate A-rated Bond subset as at December 31, 2020



The four resulting adjusted bond subsets are then used to extract the risk-free market curve, the provincial bond market curve and the corporate bond market curves.

4 Market Curves Extraction Methodology

The objective of the market curves extraction methodology is to derive the most representative market curves based on each of the four adjusted bond subsets, as defined in section 3. Fiera Capital's analysis tested various parametric and non-parametric models to achieve the best balance between the different criteria described below. As a result, a parametric approach for deriving the market curves was adopted.

The following criteria will govern the curve extraction methodology for each subset:

- The market curve should produce a good fit to the adjusted bond subset. The mathematical criteria used in Fiera Capital's methodology is to minimize the duration- and quantity-adjusted overall pricing error (i.e. the difference between the observed market prices and the prices obtained through the discounting of future cash flows with the resulting market curve);
- The chosen methodology should exhibit enough flexibility to enable various curve shapes;
- The market curve should be smooth (e.g. mathematically the second order finite difference approximation);
- The model implied short-term rate and ultimate long-term rate must be reasonable;
- The market curve model must be stable over time; and
- The curve should not be materially influenced by a small number of bonds.

Fiera Capital's market curves extraction methodology can qualitatively be described by the following optimization program:

- An optimal parametric specification by minimizing the sum of squared pricing differences (i.e., the norm) between the observed market prices and the theoretical prices obtained by discounting the future cash flows with the adopted parametric curve model;
- The price difference norm uses a different weighting scheme than the usual "1/N" weights in order to obtain a better fit to the observed market prices that is based on the duration and quantity outstanding of each bond. Bonds are grouped in term buckets, and those with high quantity outstanding within their bucket are given more weight² in the final least-square metric; and
- The parametric specification is constrained through constraints on the short- and long-term rates obtained by the adopted parametric curve model.

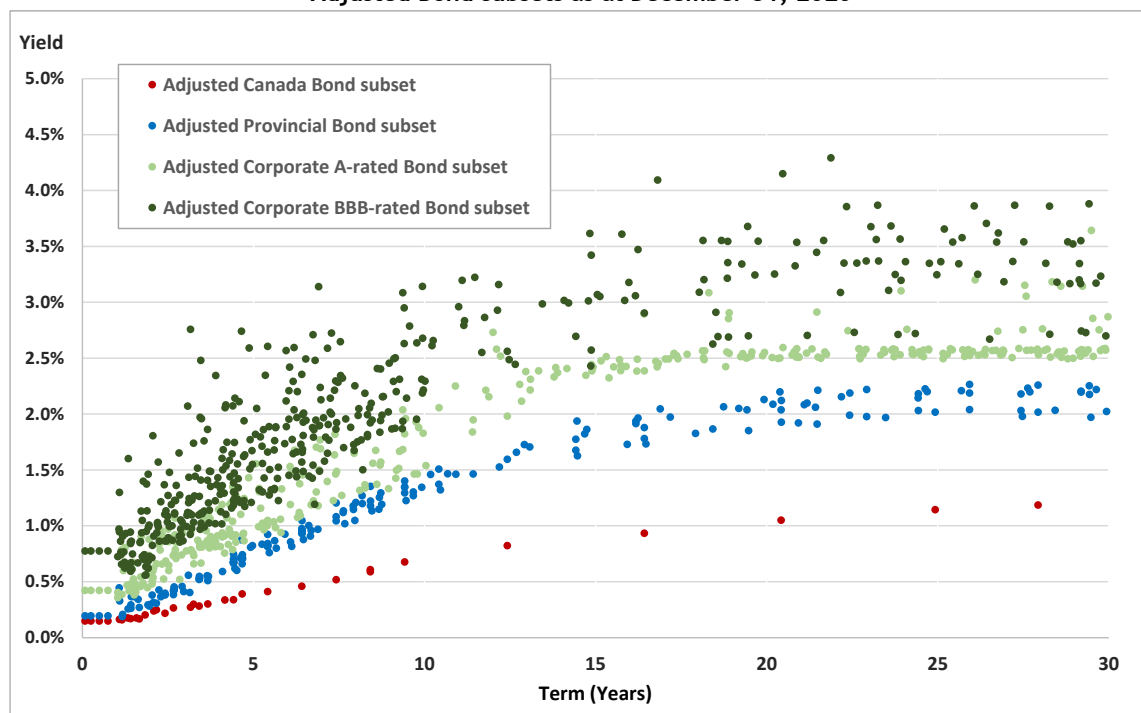
² For example, a bond with a quantity of 10mm is given a weight of 10% if the total quantity in its term bucket is 100mm.

The quantitative procedure required to fit the adopted parametric curve model is based on non-linear least squares regression techniques involving non-linear optimization routines. All the quantitative models involved in the market curves extraction methodology are developed by Fiera Capital.

The above-described market curves extraction methodology is applied separately on the four adjusted bond subsets to extract the risk-free market curve, the provincial bond market curve, the corporate A-rated bond market curve and the corporate BBB-rated bond market curve. A final corporate bond market curve is then established by averaging the corporate A-rated and the corporate BBB-rated bond market curves across the term structure.

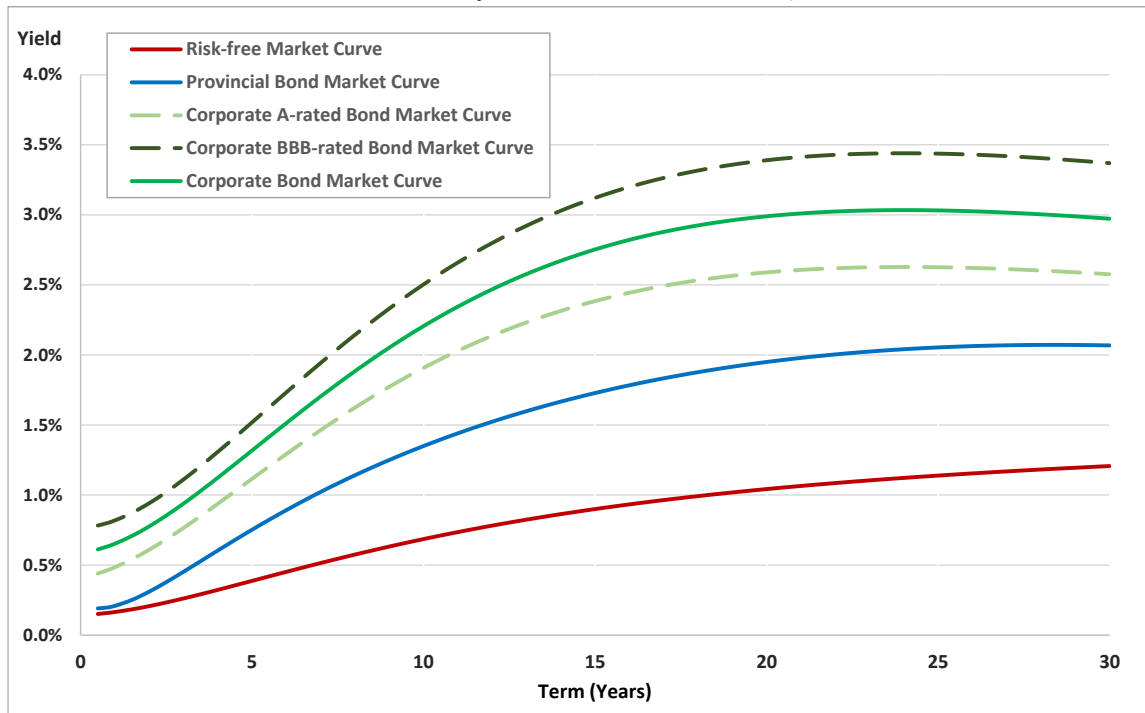
The following figure shows, as at December 31, 2020, the yields-to-maturity from the four adjusted bond subsets, as defined in section 3.

Figure 3: Yield-to-Maturity of the Adjusted Bond subsets as at December 31, 2020



The following figure shows, as at December 31, 2020, the four fitted yield-to-maturity curves based on the curve extraction methodology described above, as well as the final corporate bond market curve as defined above.

**Figure 4: Canadian Bond Market
Yield-to-Maturity Curves as at December 31, 2020**



The above-described market curves extraction methodology is applied separately on the four adjusted bond subsets to extract the risk-free market curve, the provincial bond market curve, the corporate A-rated bond market curve and the corporate BBB-rated bond market curve. A final corporate bond market curve is then established by averaging the corporate A-rated and the corporate BBB-rated bond market curves across the term structure.

To assist actuaries in discounting liabilities mid-year, particularly considering 2022-2024 yield curve inversion and volatility, Fiera Capital has added a 0.5-year data point to the risk-free market curve. This enhancement provides a more granular representation of short-term discount rates, enabling more accurate discounting for reporting and improving curve applicability in dynamic rate environments. However, given the lack of an appropriate index for provincial and corporate bonds with maturities below 1 year, Fiera Capital is not providing a 0.5-year data point for the provincial and corporate market curves. This decision allows flexibility for the actuaries to align with prior practices.

5 Review Process

The purpose of this section is to describe the review process for the IFRS 17 market and reference curves published by Fiera Capital. This process involves multiple teams, leveraging their expertise to ensure a robust, multi-layered approach. By adhering to this comprehensive review framework, Fiera Capital ensures the accuracy, consistency, and reliability of the published curves.

1. Underlying Data

The IFRS 17 market curves are derived from data provided by the FTSE Canada Universe Bond Index, which are utilized with permission from FTSE Russell. This data is foundational not only for the IFRS 17 curves but also for the daily operations of our fixed-income investment platform.

Given its critical importance, the data undergoes rigorous quality assurance processes to ensure its completeness and accuracy. These processes include daily testing of, but not limited to, the following key attributes:

- Number of securities
- Issuer
- Sector
- Credit rating
- Term
- Duration
- Yield to maturity
- Price

Any anomalies identified during these tests are promptly flagged and escalated to an internal working group for resolution. This proactive approach ensures the integrity of the data before it is used in downstream processes.

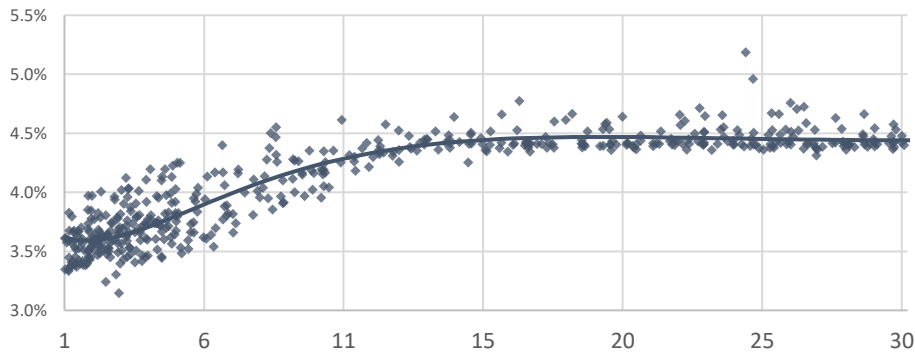
2. Market Curves

The market curves are generated through an internal algorithm. This algorithm applies various filters to the index data, following the methodology described in our documentation.

The steps involved in the creation of market curves include:

- **Data Filtering:** Applying predefined filters to align the data with the curve construction methodology.
- **Curve Generation:** Automating the production of the market curves through the algorithm.
- **Visual Analysis:** Conducting a visual fit analysis of the curves against the yields of the underlying securities. This ensures the curves accurately represent the target universe and comply with the agreed methodology.

Figure 5: Curve Fitting Example
Corporate A Market Curve as of November 29, 2024



3. Reference Curves

The reference curves are developed through a robust process that includes comparisons and validations to ensure consistency and alignment with market expectations. Key steps include:

- **Comparative Analysis:** Internal market curves are compared against Bloomberg-generated curves. While differences are expected due to variations in underlying datasets and methodologies, this step serves as a high-level validation check.
- **Month-Over-Month Change Analysis:** Examining changes in curve yields to identify any unusually large or small movements. For instance, the rate change in the 30-year curve is compared against the average yield change for the corresponding bond universe. This ensures that movements in the curve align with market trends.
- **Peer Review:** Each step in the reference curve generation process undergoes a thorough peer review. This ensures robustness, reduces errors, and increases confidence in the final published curves.

Finally, Fiera Capital's multi-team approach to reviewing the IFRS 17 market and reference curves ensures a high standard of accuracy and reliability. By combining rigorous data management, sophisticated algorithmic processing, and thorough validation procedures, Fiera Capital continues to provide high-quality, dependable outputs for clients and stakeholders.

6 References

- Canadian Institute of Actuaries (2024), IFRS 17 Discount Rates for Life and Health Insurance Contracts, Educational Note by the Committee on Life Insurance Financial Reporting (CLIFR)
<https://www.cia-ica.ca/publications/224099e>
- Canadian Institute of Actuaries (2024), IFRS 17 Discount Rates and Cash Flow Considerations for Property and Casualty Insurance Contracts, Educational Note by the Committee on Property and Casualty Insurance Financial Reporting (PCFRC)
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