

Revised Educational Note

Setting the Accounting Discount Rate Assumption for Pension and Post-employment Benefit Plans

Committee on Pension and Post-retirement Benefit Accounting Discount Rates

June 2018

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MEMORANDUM

To: All Pension Actuaries

From: Faisal Siddiqi, Chair
Practice Council

Gavin Benjamin, Chair
Committee on Pension and Post-retirement Benefit Accounting Discount Rates

Date: June 19, 2018

Subject: **Revised Educational Note – Setting the Accounting Discount Rate Assumption for Pension and Post-employment Benefit Plans**

In September 2011, the Task Force on Pension and Post-retirement Benefit Accounting Discount Rates (the task force) published an educational note entitled [Accounting Discount Rate Assumption for Pension and Post-employment Benefit Plans](#). The educational note offered advice to actuaries who are engaged to provide guidance to a pension or post-employment plan sponsor on the selection of the discount rate for a Canadian plan under Canadian, U.S., or international accounting standards.

The educational note included a suggested approach for extrapolating the corporate Aa yield curve for maturities greater than 10 years. Under this approach, the curve was extrapolated using Aa-rated Canadian provincial bonds, to which a spread adjustment was added to reflect the additional risk of Aa-rated corporate bonds. The educational note also included a suggested approach for calculating the spread to be added to the provincial bond yields.

The approach suggested in the educational note relied upon having a sufficient number of Aa-rated corporate bonds with maturities greater than 10 years. Following changes in the Canadian bond market since the educational note was published, in particular regarding the significant decrease in the number of Aa-rated corporate bonds with maturities greater than 10 years, the Practice Council requested that the committee develop a new approach that would be more appropriate and sustainable in the new environment.

This educational note has been prepared by the Committee on Pension and Post-retirement Benefit Accounting Discount Rates and describes a revised approach for extrapolating the corporate Aa yield curve for maturities greater than 10 years that is being recommended by the Committee. The revised approach has been used by Fiera Capital Corporation to publish a monthly corporate Aa spot curve since October 2016. The Practice Council wishes to express its gratitude to all the committee members:

Gavin Benjamin (chair), Maxime Carrier, Louis-Bernard Désilets, Elana Hagi, Uros Karadzic, Jason Malone, Sébastien Rannaud, Martin Raymond, and Guillaume Turcotte.

The committee would like to thank Fiera Capital Corporation for the analyses they performed that were instrumental to the development of this educational note.

This educational note has been prepared by the committee in accordance with the Institute's Policy on Due Process for the Approval of Guidance Material other than Standards of Practice and Research Documents, and has received final approval for distribution by the Practice Council on May 15, 2018.

If you have any questions or comments regarding this educational note, please contact Gavin Benjamin at his CIA online directory address, gavin.benjamin@willistowerswatson.com.

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1. Introduction

This educational note has been prepared by the Committee on Pension and Post-retirement Benefit Accounting Discount Rates (the committee) which was appointed by the Practice Council.

When preparing pension-related information for their financial statements, pension plan sponsors are responsible for the selection of the assumptions used to value the plan liabilities. One of the most material assumptions that plan sponsors must select is the discount rate assumption (i.e., the assumption used to discount the projected pension plan cash flows to the accounting measurement date). Plan sponsors often engage actuaries to provide guidance on the selection of pension accounting assumptions. This educational note highlights some of the considerations of which an actuary ought to be mindful when engaged to provide guidance to a plan sponsor on the selection of the discount rate for a Canadian pension plan under accounting standards. In addition, this educational note describes an approach for extrapolating the long end of the high-quality corporate yield curve that the committee believes would be sufficiently robust to be appropriate in a variety of economic environments, including the current economic environment.

Many accounting standards provide that the discount rate assumption can be determined in reference to high-quality corporate bond yields. These accounting standards include part II¹, part III, and part IV of the *CPA Canada Handbook – Accounting* of the Chartered Professional Accountants of Canada, codification 715.30.35-43 and 44 of the U.S. accounting standards, and section 19 of the International Accounting Standards (referred to collectively in this educational note as “Accounting Standards”). This educational note provides guidance for the selection of the discount rate for a Canadian defined benefit pension plan under the Accounting Standards. The guidance contained in this educational note may not be appropriate for the selection of discount rates in accordance with other accounting requirements that are not based on high-quality corporate bond yields. The actuary would use his or her judgment to determine when the guidance contained in this educational note applies.

The guidance contained in this educational note would also be appropriate for post-employment benefits other than pensions that are accounted for in accordance with the Accounting Standards.

2. Requirements of Accounting Standards

Accounting Standards generally require that, for an ongoing pension plan, the discount rate be selected by reference to market yields at the accounting measurement date of high-quality corporate² debt instruments with cash flows that match the timing and amount of expected benefit payments.

¹ Under the approach using a separate accounting valuation basis (not the funding approach).

² Note that U.S. accounting standards do not specifically refer to corporate bonds, but this category of debt instruments has been widely used in setting discount rates in practice.

This definition can leave room for a range of different interpretations on issues such as the following:

- a. What “high quality” means;
 - b. How to address the lack of suitable debt instruments at certain maturities; and
 - c. Which debt instruments to include.
- a. On the first issue, it is understood that “high quality” in Canada has generally been interpreted as referring to market yields on corporate bonds rated Aa or higher, as is the practice in most other countries where Accounting Standards also apply. It is worth noting that in the U.S., the Securities Exchange Commission has provided an interpretation under U.S. accounting standards that “high quality” means the two highest credit ratings given by a recognized ratings agency (e.g., a fixed-income security that receives a rating of Aa or higher from Moody’s Investors Service).

At the time of preparation of this educational note, there were no Aaa-rated corporate bonds denominated in Canadian dollars with long maturities. As a practical matter, the rest of this educational note references Aa-rated corporate bonds as being representative of “high quality” corporate bonds in Canada. An actuary may consider including Aaa-rated corporate bonds as “high quality” corporate bonds in the analysis if they become available.

Issues b. and c. above are discussed in the sections that follow.

3. Insufficiency of High-Quality Corporate Bonds with Long Maturities in Canada

Given the long-term nature of pension plan obligations, the yields that matter most for purposes of selecting the discount rate for a pension plan are often the yields for debt instruments with long terms to maturity (e.g., maturities of 10 years and above). While there is a reasonably deep market of Aa-rated corporate bonds denominated in Canadian dollars with short and medium terms to maturity, there are few Aa-rated corporate bonds with terms to maturity beyond 10 years.

For example, based on one data source which is considered representative of the Canadian market, at November 30, 2017 there were only two corporate bonds rated Aa³ with maturities beyond 10 years that had a market capitalization of at least \$100 million, neither of which had a maturity beyond 20 years. This lack of long maturity Aa-rated bonds could continue for the foreseeable future.

In light of such scarcity in Aa-rated corporate bonds with long maturities, actuaries would consider the fact that yield curves developed from such a small pool of bonds may require a significant amount of subjectivity and may also lead to a lack of credibility

³ Excluding bonds issued by quasi-governmental entities and rated Aa by at least one of the following rating agencies: Standard & Poor’s (S&P), Moody’s, Fitch Group, and Dominion Bond Rating Service (DBRS).

in the outcome which could be heavily influenced by only a handful of issuers of long corporate bonds. Therefore, in preparing this educational note, various possibilities for improving the information used in the construction of the yield curve were reviewed.

4. Approach for Selecting the Discount Rate

When engaged to provide guidance on the selection of the discount rate assumption, a reasonable approach commonly used by actuaries would consist of the following steps:

- Step 1: Developing a yield curve based on Aa-rated corporate bond data or alternatively obtaining such a curve from a third-party provider. When developing the curve (or analyzing the curve provided by a third party), it is important that the actuary understands the underlying data, methods, and assumptions that were used in constructing the curve, in particular with respect to extrapolating the long end of the yield curve.
- Step 2: Converting the yields on the curve described in step 1 into spot rates (i.e., yields on zero coupon bonds). This is done because the yield at any point on the curve described in step 1 represents a blend of the yields on the semi-annual coupons and the yield on the principal that is repaid at the time the bond matures. The appropriate yields to reference in order to discount the projected stream of benefit payments would be yields on zero coupon bonds. Actuaries would be familiar with the difference between yield and spot curves.
- Step 3: Calculating the present value of the plan's expected benefit payments using the spot rates developed in step 2.
- Step 4: Recommending the discount rate assumption that would be the single rate that, when used to discount the plan's expected benefit payments, provides for an equivalent present value to the one calculated in step 3.

5. Considerations when Developing Aa-Rated Corporate Yield Curve

The following are some factors the actuary would consider when assessing the appropriateness of an Aa-rated corporate yield curve developed for accounting discount rate purposes, as described in step 1 of section 4 above.

- A. The approach used to extrapolate the long end of the yield curve, given the scarcity of Aa-rated corporate bonds with long maturities.

Due to the long-term nature of pension obligations, the long end is often the portion of the yield curve that matters most for purposes of establishing the discount rate. A detailed discussion on extrapolating the long end of the yield curve is contained in sections 6 and 8 and in the appendix.

- B. The characteristics of the bonds that have been included in the universe used to develop the yield curve.

It may be appropriate to consider excluding bonds with an outstanding amount below a certain threshold (e.g., \$100 million) because bonds with a smaller outstanding amount tend to be traded less frequently than bonds

with a larger outstanding amount and, thus, their pricing may be considered less reliable.

The actuary would consider excluding any bonds with characteristics that render the bond inappropriate for purposes of matching the timing and amount of expected payments from a pension plan. For example, the actuary would consider excluding bonds with one or more of the following features: callable (unless the call option includes a make-whole provision or the actuary is comfortable that the call option does not have a material effect on the bond price), putable, convertible, sinkable, extendable, perpetual, variable coupon, and inflation linked. At the time of preparation of this educational note, there are few corporate bonds denominated in Canadian dollars with characteristics that render them inappropriate for matching the timing and amount of expected benefit payments from a pension plan.

The actuary would determine whether debt instruments such as private placements have been included in the universe. For a private placement, the reliability of its pricing would be a key consideration in determining whether to include it.

The actuary would consider whether it is appropriate for bonds issued by government agencies or quasi-government entities, such as energy utilities, airport authorities, or universities, to be considered corporate bonds. If so, they would be eligible for inclusion in the universe used to develop the yield curve. Alternatively, if they are not considered corporate bonds, they could be included when extrapolating the long end of the yield curve subject to further adjustments to reflect Aa-rated corporate risk.

The actuary would consider whether to include outlier bonds (i.e., bonds with very high or very low relative yields). If the actuary decides to exclude outlier bonds, the actuary would consider the yield thresholds beyond which a bond would be classified as an outlier. A possible rationale for excluding outlier bonds could be that very high or low relative yields may indicate unusual characteristics of the bonds, market concerns about the strength of the bond issuer or the credit rating of these bonds, or may suggest an issue with the reliability of the pricing. On the other hand, a possible rationale for including outlier bonds could be that the classification of a bond as an outlier is subjective and the actuary often does not have sufficient knowledge to second-guess the bond ratings or the yield information provided by the bond data source.

Different ratings agencies may assign different ratings to a particular bond. For example, one ratings agency may rate a bond as Aa while another ratings agency may rate the same bond as A. The actuary would consider which ratings agency/agencies have been relied upon for purposes of selecting the bonds used to develop the yield curve and whether the choice of the ratings agency/agencies could materially affect the resulting discount rate.

- C. During periods of financial market volatility, the actuary would consider the following matters with respect to the appropriateness of the bond yield information used to develop the yield curve.

If a bond has not been traded recently, the yield information provided for the bond is often based on the yields of similar bonds that were recently traded. During periods of financial market volatility, this approach for estimating the yield may become less reliable.

During periods of financial market volatility, the spread between the bid and ask yields may increase. The actuary would consider whether to use the bid yields, ask yields, or something between the two (e.g., the average of the bid and ask yields).

The actuary would consider whether the yield information is dominated by either new issues or secondary sales. Bond issuers will often offer a new issue concession (i.e., higher yield) relative to the yield on the secondary sale of the same bond. While new issue concessions are not normally significant, they can increase significantly and become material during periods of financial market volatility.

The above information may not be readily available from the bond information the actuary normally receives. In that case, the actuary would generally question the data provider to understand how these issues are reflected in the data provided.

- D. The actuary would consider the manner in which bond yields are weighted when developing the yield curve.

One approach is to weight each bond by its market capitalization. However, the actuary would consider whether a few bonds with large relative market capitalizations are having undue influence on the resulting discount rate.

A second approach is to weight each bond equally. However, the actuary would consider whether a large number of bonds with small relative market capitalizations are having undue influence on the resulting discount rate.

A third approach is to use weightings which are between the two approaches above.

- E. Fitting a yield curve to the available bond yield data requires judgment and the use of a mathematical technique (e.g., a regression technique). The actuary would consider whether appropriate judgment is being applied, especially at the long end of the curve where bond yield information may be scarce.

6. Extrapolating the Long End of the Yield Curve: Approaches Considered

A number of approaches for extrapolating the long end of the yield curve have been assessed, given the scarcity of corporate bonds rated Aa and above with maturities beyond 10 years. The underlying objective of all the approaches that were examined is

to increase the number of relevant data points used to extrapolate the long end of the yield curve, thereby avoiding reliance on too few data points.

To help develop and evaluate the appropriateness of different approaches, the following guiding principles were used by the committee:

- Compliance with accounting standards⁴;
- Consistency with the principles of the prior educational note published in September 2011;
- Approach that is robust and appropriate for both current and changing market conditions;
- Avoidance of relying on very few data points for extrapolating the yield curve; and
- Preference for an approach that requires fewer subjective judgment calls.

The following approaches to extrapolate the long end of the yield curve were considered and analyzed in detail.

- A. For maturities greater than 10 years, use Aa-rated provincial bonds to which a spread adjustment is added to reflect the additional risk of Aa-rated corporate bonds.
- B. For maturities greater than 10 years, use Aa-rated provincial bonds and A-rated corporate bonds to derive a spread adjustment that is added to Aa-rated provincial (or removed from A-rated corporate) bonds based on the relative risk of Aa-rated corporate bonds. This approach attempts to range bound the yields expected for Aa-rated corporate bonds between the yields on provincial Aa-rated bonds and the yields on corporate A-rated bonds.
- C. For maturities greater than 10 years, use A-rated corporate bonds from which a spread adjustment is removed to reflect the lower risk of Aa-rated corporate bonds.

Further details and commentary regarding each of the above approaches are provided below.

Following the analysis and review described below, the Committee is recommending approach A.

⁴ For example, an approach that would rely on Aa-rated corporate bonds denominated in U.S. dollars was considered but ultimately rejected as it would likely not be considered permissible under current Accounting Standards due to the underlying data being denominated in a currency other than Canadian dollars.

A. For maturities greater than 10 years, use Aa-rated provincial bonds to which a spread adjustment is added to reflect the additional risk of Aa-rated bonds.

In order to increase the number of data points used to extrapolate the long end of the yield curve, this approach uses information from Aa-rated provincial bonds, for which there is a deep market across the entire maturity spectrum.

This approach is based on the premise that an additional yield spread is generally expected between Aa-rated corporate bonds and Aa-rated provincial bonds of similar duration/maturity.

Therefore, to reflect the difference in risk between Aa-rated corporate bonds and Aa-rated provincial bonds, a spread adjustment is added to the provincial bond yields.

An advantage of this approach is that it relies exclusively on high-quality bonds (from the corporate and government sectors).

It is worth noting that while this approach is similar to the approach recommended in the September 2011 educational note, a different methodology for deriving the spread adjustment is being recommended. The methodology recommended in the September 2011 educational note, which relies heavily on information from Aa-rated corporate bonds with maturities greater than 10 years, is deemed unsustainable in the current environment and may no longer be consistent with the aforementioned guiding principles. A description of the methodology recommended in this educational note is contained in section 8.

B. For maturities greater than 10 years, use Aa-rated provincial bonds and A-rated corporate bonds to derive a spread adjustment that is added to Aa-rated provincial (or removed from A-rated corporate) bonds based on the relative risk of Aa-rated corporate bonds.

In order to increase the number of data points used to extrapolate the long end of the yield curve, this approach uses information from both Aa-rated provincial bonds and A-rated corporate bonds, two subsets of the bond universe that are deep across the entire maturity spectrum.

This approach is based on the premise that the yields of Aa-rated corporate bonds are expected to be higher than the yields of Aa-rated provincial bonds but lower than the yields of A-rated corporate bonds (of similar duration/maturity and sector).

Therefore, to reflect the relative risk of Aa-rated corporate bonds, a spread adjustment is added to the Aa-rated provincial (or removed from the A-rated corporate) bond yields.

An advantage of this approach is that it uses not only information from other high-quality bonds (i.e., provincial Aa-rated bonds), but also uses information from the upper-medium grade portion of the corporate bond sector (i.e., corporate A-rated bonds). This provides a mechanism to range bound the yields that could be reasonably expected for Aa-rated corporate bonds.

Some drawbacks of this approach are that it does not rely solely on high-quality bonds and is more complex from an implementation perspective compared to other approaches that were considered. Examples of the implementation complexities of this approach are the need to address questions such as the following:

- Should certain sectors of the corporate bond market be excluded to promote consistency between Aa-rated and A-rated corporate bonds used to draw relationships? If so, what classification criteria would be used?
- Should some or all rate-regulated utilities (which represent an important portion of the A-rated corporate bond market but have a distinctive risk profile and pricing behavior) be included or excluded? What would be the basis for inclusion/exclusion?
- Is the mix of A-rated corporate bonds sufficiently homogenous across the maturity spectrum (i.e., would relationships drawn at maturities below 10 years be expected to hold beyond 10 years)? If not, what adjustments may be warranted?

C. For maturities greater than 10 years, use A-rated corporate bonds from which a spread adjustment is removed to reflect the lower risk of Aa-rated corporate bonds.

To increase the number of data points used to extrapolate the long end of the yield curve, this approach would use information from A-rated corporate bonds, a market that is deep across the entire maturity spectrum.

This approach is based on the premise that the market would generally assign wider yield spreads to A-rated versus Aa-rated corporate bonds of similar duration/maturity and sector.

Therefore, a spread adjustment would be subtracted from the yields on A-rated corporate bonds when extrapolating the long end of the yield curve.

Similar to approach B above, a key benefit of this approach is that it uses information from the upper-medium grade portion of the corporate bond sector.

A drawback of this approach is that it does not incorporate all information available from high quality-bonds (i.e., as it excludes Aa-rated provincials). In addition, it suffers from the same implementation challenges as approach B with regard to inclusion/exclusion of certain bonds (e.g., rate-regulated utilities).

Note that this approach was also considered in 2011 as part of the work culminating in the prior educational note. Even though this approach was not recommended as the preferred approach at the time, the committee deemed it appropriate to consider the approach again as conditions had changed considerably since 2011 (i.e., with regard to the number of long-term Aa-rated corporate bonds).

Approach C was considered as part of the preliminary analysis, but did not yield significantly different historical results to approaches A and B above. In light of the analysis results and the drawbacks outlined above, it was not considered further.

7. Feedback on Extrapolation Approaches

A number of different methodologies to calculate the spread adjustment under Approach A, B, and C (as described in section 6) were developed and evaluated by the committee. Three different methodologies to derive the spread adjustment (one for approach A and two for approach B) were analyzed in greater detail. A brief description of these methodologies and a summary of back-testing results appear in the appendix.

In order to increase the likelihood that this guidance will be acceptable to auditors, feedback was requested from the Canadian audit firms' Technical Partners Committee (TPC). While guidance from the TPC is not binding on Canadian auditors, it is understood that TPC guidance provides a strong indication of the approaches and methods that will likely be acceptable to Canadian auditors.

After considering the information provided, the TPC indicated that they have a preference for approach A, since it is only reliant on high-quality bonds and produces similar historical results to approach B and the approach recommended in the 2011 educational note.

Based on the committee's analysis and the guidance provided by the TPC, it was concluded that the committee would recommend approach A as an appropriate approach for extrapolating the yield curve in accordance with current Accounting Standards.

8. Deriving the Spread Adjustment to Account for the Risk of Aa-Rated Corporate Bonds

In order to implement approach A, a methodology is needed for deriving an appropriate spread adjustment to the long-term Aa-rated provincial bond yields to account for the additional credit risk of Aa-rated corporate bonds.

Deriving an appropriate spread adjustment under approach A to translate Aa-rated provincial bond yields into Aa-rated corporate bond yields for bonds with maturities in excess of 10 years requires judgment. It is recognized that there are different approaches for calculating the spread. Based on the analysis conducted, the committee concluded that the methodology recommended below is reasonable, pragmatic, and sustainable given the scarcity of long Aa-rated corporate bonds.

This methodology is underpinned by the following premises:

It is expected that there will be a positive spread between the yields on Aa-rated corporate bond and Aa-rated provincial bonds at longer maturities and that the spread increases with term to maturity.

The ratio of the "all-in" credit spread of Aa-rated corporate bonds (i.e., the yields in excess of Canada bond yields of the same maturity) to the all-in credit spread of Aa-

rated provincial bonds is relatively stable across the maturity spectrum. (Based on back-testing from the end of 2006, the committee concluded that this premise is reasonable.)

The suggested methodology can be summarized as follows:

The spread of Aa-rated corporate bond and Aa-rated provincial bond yields is calculated relative to Canada yields for terms to maturity where both markets are deep and contain a sufficient number of observations (e.g., approximately five to 10 years).

A spread ratio is calculated by dividing the average Aa-rated corporate spreads by the average Aa-rated provincial bond spreads calculated in accordance with the paragraph above. At any point in time, it is generally expected that the *spread Ratio* would be higher than 100 percent.

The long-term Aa-rated corporate bond yields are supplemented by long-term provincial bond yields adjusted upward by each long-term Aa-rated provincial bond's spread multiplied by [*Spread Ratio* - 100%].

9. Illustration of Developing the Yield Curve in Accordance with Approach A

This section illustrates the development of a yield curve based on approach A described in section 6 above and the calculation of the spread adjustment described in section 8 above. This illustration describes one possible approach to develop the yield curve but it is recognized that other approaches may be appropriate. The key steps in developing the yield curve are as follows:

1. Select suitable Aa-rated corporate, Aa-rated provincial and federal bonds based on the considerations described in section 5.
2. Fit a curve to the federal bonds across all terms to maturity. The resulting *Canada yield curve* would be the starting point to establish the relationships between the spreads of corporate Aa-rated bonds and the spreads of provincial Aa-rated bonds.
3. Calculate the *Spread Ratio* by dividing the *Average Corporate Spread* by the *Average Provincial Spread*.
 - a) Calculate the difference/spread between the yield of every Aa-rated corporate bond with a maturity between 4.5 and 10.5 years and the yield at the corresponding maturity on the *Canada yield curve*.
 - b) Calculate the *Average Corporate Spread* as the average of the spreads calculated in a) above.
 - c) Calculate the difference/spread between the yield of every Aa-rated provincial bond with a maturity between 4.5 and 10.5 years and the yield at the corresponding maturity on the *Canada yield curve*.
 - d) Calculate the *Average Provincial Spread* as the average of the spreads calculated in c) above.

- e) Calculate the *Spread Ratio* = *Average Corporate Spread* / *Average Provincial Spread*.
4. For every Aa-rated provincial bond with a maturity greater than 10.5 years, calculate a *Provincial Spread Adjustment*.
- a) Calculate the *Provincial Spread* as difference/spread between the yield of that bond and the yield at the corresponding maturity on the *Canada yield curve*.
- b) Calculate *Provincial Spread Adjustment* = *Provincial Spread* x (*Spread Ratio* – 100%).
5. Finally, fit a curve to the Aa-rated corporate bonds taken across all terms to maturity and the provincial bonds of maturities greater than 10.5 years with the provincial yields adjusted upward by the *Provincial Spread Adjustment*. The resulting yield curve would be the starting point for deriving accounting discount rates following the steps described in section 4.

10. Publishing a Monthly Curve

The Canadian Institute of Actuaries has chosen to partner with Fiera Capital Corporation to produce a monthly spot curve derived from a yield curve based on approach A that is accessible to actuaries and other interested parties. Engaging a third party to produce monthly spot curves creates efficiencies by avoiding the need for actuarial firms and other parties to each set up their systems to implement approach A. It would also lend itself to a consistent application of the suggested approach.

The spot curve and additional information and documentation with respect to implementation details can be found at the following web address:

<https://www.fieracapital.com/en/institutional-markets/cia-curve/cia-curve-overview>.

This recommendation is not intended to imply that the committee believes that approach A represents the only appropriate approach for developing a high-quality corporate spot curve to be used in developing discount rates for accounting purposes. While other appropriate approaches likely exist, the intention is to provide actuaries, plan sponsors, auditors, and others with ready access to a monthly spot curve that the committee has concluded is appropriate given the research that it has conducted.

11. Standards of Practice and Using the Work of Others

Whether an actuary is relying on a yield curve purchased from a third party or pricing and ratings data for individual bonds, the actuary is using the work of another person. If the actuary's work is destined for use in Canada, the actuary's work is subject to Canadian actuarial standards of practice. When subject to Canadian actuarial standards of practice, the actuary would consider the following paragraphs of the Standards of Practice, which are reminders of the responsibility of an actuary to assess whether work obtained from others is appropriate to use for purposes of the actuary's work.

Paragraph 1510.04: "If the actuary uses the work of a person other than colleagues and assistants, the actuary may or may not take responsibility for that person's work. Taking responsibility may require more work of the actuary and may expose

the actuary to risk of legal liability, but may give the user greater confidence that the other person's work is appropriate"

Paragraph 1510.06: "If the actuary does not take such responsibility, the actuary reports with reservation . . ."

Paragraph 1510.12: "If the actuary uses but does not take responsibility for another person's work, the actuary would nevertheless examine the other person's work for evident shortcomings and would either report the results of such examination or avoid use of the work. For clarity, even though the other person may use a model in his or her work, the actuary is not considered to have used that model."

When assessing whether the yield curve purchased from a third party or the pricing and ratings data for individual bonds provided to the actuary is appropriate, the actuary would consider the guidance contained in this educational note. The actuary would pay particular attention to the manner in which the scarcity of Aa-rated corporate bonds with long maturities was addressed when developing the yield curve or in the data provided.

12. Conclusion

The various issues mentioned in the preceding sections of this educational note were examined and different approaches were explored for developing a high-quality corporate bond yield curve from which discount rates could be derived to value pension and other post-employment benefit obligations. Subsequently, the possible options were narrowed down, feedback was sought from the TPC, and it was concluded that approach A combined with the methodology described in this educational note for deriving the spread adjustment represents an appropriate approach in varying financial market environments, including the current environment. Further information about the associated work was provided in a [webcast](#) held on October 19, 2016.

Throughout its work, the objective of the committee was to address the scarcity of Aa-rated corporate bonds with long maturities in the Canadian market. Approach A and the methodology proposed to derive the spread adjustment rely on having a deep market for Aa-rated corporate bonds with maturities of less than 10 years and a deep market for Aa-rated provincial bonds and federal bonds across all terms to maturity. Although some judgment is required in developing the spread adjustment, it was concluded that the identified approach provides for a reasonable yield curve to be used in providing guidance to plan sponsors on the selection of accounting discount rates.

If the number of long-term Aa-rated corporate bonds were to increase in the future (e.g., due to the issuance of more of these bonds or the upgrade of existing corporate bonds from an A to Aa rating), the actuary would use his or her judgment in deciding whether the changed environment enables reference to Aa-rated corporate bonds alone for purposes of developing a high-quality corporate yield curve.

Similarly, if a significant number of Aa-rated provincial or Aa-rated corporate bonds (with 4.5 to 10.5 years to maturity) were to lose their Aa ratings, the actuary would evaluate the continued appropriateness of approach A.

Actuaries are encouraged to consider the guidance described in this educational note, while recognizing that other approaches could be acceptable with sufficient justification by the actuary. Furthermore, the actuary would use his or her judgment in deciding whether changes in the environment enable continuation of any approach chosen or warrant adoption of another approach.

Actuaries are also reminded that decisions with respect to methods and assumptions used to prepare financial statements are made by the plan sponsor and not the actuary (although actuaries would be mindful of the potential application of Rule 6 of the Rules of Professional Conduct, Control of Work Product).

Appendix: Analysis of Alternatives for Extrapolating the Long End of the Yield Curve

The committee retained Fiera Capital Corporation to analyze various approaches for extrapolating the long end of the yield curve. The remainder of this section contains highlights from the analysis. Further details regarding the methodology used and the results of the analysis are contained in the slides prepared for an October 19, 2016 CIA [webcast](#) entitled Accounting Discount Rate Assumption for Pension and Post-employment Benefit Plans.

Given the scarcity of Aa-rated corporate bonds with maturities greater than 10 years, each of the methodologies considered to derive the spread adjustment relied on the relationship between bonds from other subset(s) of the Canadian bond market and Aa-rated corporate bonds with maturities of less than 10.5 years.

At a high level, the approach for deriving the spread adjustment can be summarized by answering two questions:

- Which subsets of the bond universe should be included to help infer what the spreads/yields of long-term Aa-corporate bonds would be?; and
- What is the assumed relationship between the yields/spreads of such bonds and Aa-rated corporate bonds across terms to maturity?

For reasons outlined in section 6, the committee decided to focus on variations of approaches A and B, both of which incorporate information from long-term Aa-rated provincial bond yields. The following table summarizes the approaches retained for detailed back-testing, with additional details and back-testing results contained below the table:

<i>Relationship across terms to maturity</i>	<i>Additional bonds used</i>	
	Approach A (Provincial Aa)	Approach B (Provincial Aa & Corporate A)
Fixed ratio applied to spread	Approach A	Approach B1
Fixed spread	Prevailing approach (comparison only)	Approach B2

Approach **A**: Provincial bond yields adjusted by fixed ratio applied to provincial spreads over Canada yields.

For maturities greater than 10 years, extrapolate the curve by maintaining the ratio (1) / (2), with

- (1) Average spread of corporate Aa bond yields (4.5–10.5 years) above Canada yield curve; and
- (2) Average spread of provincial Aa bond yields (4.5–10.5 years) above Canada yield curve.

Approach **B1**: Provincial bond yields adjusted for fixed ratio applied to provincial spread below corporate A.

For maturities greater than 10 years, extrapolate the curve by maintaining the ratio (1) / (2), with

- (1) Average spread of corporate Aa bond yields (4.5–10.5 years) below corporate A yield curve; and
- (2) Average spread of corporate Aa bond yields (4.5–10.5 years) above provincial Aa yield curve.

Approach **B2**: Provincial bond yields adjusted by fixed spread, with fixed spread based on fixed ratio applied to average corporate A spread above provincial Aa.

For maturities between 10–20 years and 20+ years, extrapolate the curve by adjusting provincial Aa bonds by a fixed spread, where the fixed spread is determined (for 10–20 years and 20+ years) based on [(1) / (2)] x (3), with

- (1) Average spread of corporate Aa bonds (4.5–10.5 years) over provincial Aa yield curve;
- (2) Average spread of corporate A bonds (4.5–10.5 years) over provincial Aa yield curve; and
- (3) Average spread of corporate A bonds (10–20 and 20+ years) over provincial Aa yield curve.

Under each of the approaches described above, a yield curve and discount rates were developed using available bond yield data after applying the methodology described in section 4. Three illustrative plans were used: a “mature” plan, with a modified duration of approximately 10 years; a “steady” plan, with a modified duration of approximately 14 years; and a “young” plan, with a modified duration of approximately 17 years.

The resulting discount rates obtained for the steady plan over a 10-year period, under each approach as well as the prevailing approach, are illustrated below:

Discount Rate for Steady Plan				
Approach Incorporate Corporate A Fixed ratio or spread	Prevailing No Spread	A No Ratio	B1 Yes Ratio	B2 Yes Spread
31/12/2006	4.95%	5.02%	5.28%	4.90%
31/12/2007	5.73%	5.79%	6.01%	5.84%
31/12/2008	7.68%	7.31%	7.78%	7.39%
31/12/2009	5.91%	5.79%	5.69%	5.67%
31/12/2010	5.07%	5.21%	5.03%	4.99%
31/12/2011	4.56%	4.55%	4.21%	4.22%
31/12/2012	4.10%	4.10%	4.00%	4.01%
31/12/2013	4.66%	4.73%	4.58%	4.59%
31/12/2014	3.80%	3.88%	3.78%	3.84%
31/12/2015	3.90%	3.93%	3.76%	3.87%
31/08/2016	3.25%	3.17%	3.21%	3.15%

The following are some observations regarding the results of the analysis summarized above.

For the most part, the differences between the various alternatives are relatively minor. This is particularly the case since December 31, 2012; the difference between the highest and lowest discount rates has been smaller than 20 basis points (bps) over that period.

The largest dispersion in discount rates occurred on December 31, 2008 in the midst of the financial crisis. The difference between the highest and lowest discount rates at December 31, 2008 is 47 bps, which is not unexpected given the circumstances.

Except for December 31, 2008, the discount rates under approach A have generally been very close to the results under the prevailing approach.

Similar relationships were observed from the analysis of the mature and young plans.

After obtaining guidance from the TPC, it was concluded that approach A is a reasonable approach for extrapolating the yield curve based on current Accounting Standards. A possible method for calculating the spread adjustments is described in sections 8 and 9.