Canadian Institute of Actuaries / Institut canadien des actuaires

Educational Note

Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates on or after December 31, 2021, and no later than December 30, 2022

Committee on Pension Plan Financial Reporting

March 2022

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The actuary should be familiar with relevant educational notes. They do not constitute standards of practice and are, therefore, not binding. They are, however, intended to illustrate the application of the Standards of Practice, so there should be no conflict between them. The actuary should note however that a practice that the educational notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation. Responsibility for the manner of application of standards of practice in specific circumstances remains that of the members. As standards of practice evolve, an educational note may not reference the most current version of the Standards of Practice; and as such, the actuary should cross-reference with current Standards. To assist the actuary, the CIA website contains an up to date reference document of impending changes to update educational notes.

MEMORANDUM

To: All pension actuaries

From: Steven W. Easson, Chair
Actuarial Guidance Council

Gus van Helden, Chair
Committee on Pension Plan Financial Reporting

Date: March 11, 2022

Subject: **Educational Note – Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates on or after December 31, 2021, and no later than December 30, 2022**

This educational note provides guidance on assumptions to be used for hypothetical wind-up and solvency valuations for 2022. It confirms the initial guidance for 2022 assumptions that was provided in the educational note supplement issued on January 18, 2022.

The creation of this cover letter and educational note has followed the Actuarial Guidance Council's (AGC's) protocol for the adoption of educational notes. In accordance with the Institute's *Policy on Due Process for the Approval of Guidance Material other than Standards of Practice and Research Documents*, this educational note has been prepared by the Committee on Pension Plan Financial Reporting (PPFRC) and has received final approval for distribution by the AGC on March 8, 2022.

The actuary should be familiar with relevant educational notes. They do not constitute standards of practice and are, therefore, not binding. They are, however, intended to illustrate the application of the *Standards of Practice*, so there should be no conflict between them. The actuary should note however that a practice that the educational notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation. Responsibility for the manner of application of standards of practice in specific circumstances remains that of the members. As standards of practice evolve, an educational note may not reference the most current version of the *Standards of Practice*; and as such, the actuary should cross-reference with current Standards. To assist the actuary, the CIA website contains an up to date reference document of impending changes to update educational notes.

The PPFRC would like to express its gratitude to Brookfield Annuity, Canada Life, The Co-operators, Desjardins Financial Security, Industrial Alliance, RBC Insurance, and Sun Life Financial for providing data.

The PPFRC would like to acknowledge its membership who assisted in the development of this educational note and the additional contribution of Warren D'Souza, Colleen Glenn, Alyssa Hariton, Charles Lemieux, and Isabelle Trudeau.

Questions or comments regarding this educational note may be directed to the Chair of PPFRC at guidance.feedback@cia-ica.ca.

SWE, GVH

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Summary

The PPFRC has concluded that effective December 31, 2021, the cost of purchasing non-indexed or fully consumer price index (CPI)-indexed annuities, prior to any adjustment for sub- or super-standard mortality, would be estimated based on the spreads and mortality assumption(s) as outlined in the following summary table.

This educational note confirms the initial guidance for 2022 assumptions that was provided in the educational note supplement issued on January 18, 2022.

Further details on the development and appropriate application of this guidance can be found in this document.

Educational note/ supplement	**Mortality table**[1]	**Non-indexed immediate and deferred pensions** *Duration*[2]*: Spread relative to unadjusted CANSIM V39062*			**Fully CPI-indexed pensions** *Spread relative to unadjusted CANSIM V39057*
		Low duration	**Medium duration**	**High duration**	**All durations**
Dec 31, 2021	CPM2014Proj	8.7: + 100 bps	11.3: + 120 bps	13.9: + 120 bps	- 40 bps

The PPFRC has been monitoring the spreads for groups of very low duration annuities (i.e., those below the low duration indicated in the table above). As at December 31, 2021, the PPFRC continues to believe that a reasonable approach to derive the spread for very low duration annuities is to extrapolate downwards from the spreads at the low and medium durations. Other approaches may also be reasonable.

The PPFRC has been monitoring the spreads for groups with durations higher than the high duration listed in the table above and has observed that these spreads are likely to be less than the spreads indicated at the high duration block. As at December 31, 2021, the PPFRC continues to believe that a reasonable approach to derive the spread for very high duration annuities is to extrapolate downwards from the spread at the high duration, assuming that the rate of decrease in spreads from the high duration will be the same as the rate of increase in spreads from the low duration to the high duration. Other approaches may also be reasonable.

The PPFRC is aware that unadjusted CANSIM V39062 increased 16 basis points on January 4, 2022, the first trading day of January. The actuary would be mindful that it would generally not be appropriate to measure the hypothetical wind-up and/or

[1] "CPM2014Proj" refers to the 2014 Canadian Pensioners' Mortality Table (CPM2014), combined with mortality improvement scale CPM Improvement Scale B (CPM-B) with no adjustments for sub- or super-standard mortality.

[2] Duration is to be determined for the portion of the liabilities assumed to be settled through the purchase of annuities, based on the medium duration discount rate.

solvency liabilities of a pension plan based on market conditions that are different than those impacting the value of assets and other factors used to determine the funded status as at the calculation date. Other considerations such as any guidance with respect to the funding of pension plans that has been published by an applicable regulatory authority would also be considered.

1. Introduction and settlement methods

According to paragraph 3330.16 of the *Standards of Practice*, the selected assumptions used for actual and hypothetical wind-up valuations would:

- in respect of benefit entitlements that are assumed to be settled by purchase of annuities, reflect single premium annuity rates;
- in respect of benefit entitlements that are assumed to be settled by lump sum transfer, reflect the standards in section 3500 respecting commuted values; and
- in respect of benefit entitlements that are assumed to be settled via alternative settlement or in some other manner, reflect the manner in which such benefits would be settled.

Benefits settled by purchase of annuities

This document has been prepared by the PPFRC and is intended to provide actuaries with guidance in selecting appropriate assumptions for hypothetical wind-up and solvency valuations of pension plans in respect of benefit entitlements that are assumed to be settled by purchase of annuities on or after December 31, 2021, and no later than December 30, 2022. For greater clarity, this document does not provide detailed guidance on selecting appropriate assumptions for hypothetical wind-up and solvency valuations of pension plans in respect of benefit entitlements that are assumed to be settled in a manner other than the purchase of annuities.

Benefits settled by lump sum transfer

The hypothetical wind-up liabilities for benefits expected to be settled through the payment of a lump sum transfer would be determined in accordance with Section 3500 of the *Standards of Practice*, as applicable, applicable legislation, and the plan terms, applying assumptions consistent with the valuation date.

Benefits settled by other or alternative settlement methods

Actuaries may refer to the revised educational note *Alternative Settlement Methods for Hypothetical Wind-Up and Solvency Valuations*, published by the PPFRC in April 2020, as well as the guidance for large plans in Section 3 of this educational note.

Selection of settlement methods assumptions

To comply with paragraph 3330.16 of the *Standards of Practice*, the actuary would make assumptions for each class of plan member as to the portion of liabilities settled by annuity purchase, commuted value transfer, or other manner of settlement. Typically, classes of plan members would include at least the following:

- active members not eligible for retirement
- active members eligible for retirement
- retired members and surviving spouses
- deferred vested members not eligible to commence a pension immediately

- deferred vested members eligible to commence a pension immediately
- former members who have residual rights under the plan

In determining the appropriate assumption for the method of settlement, the actuary would consider the following:

- Any legislative requirements to offer specific settlement options to various classes of members.
- The settlement provisions of the plan and the options to be provided to members upon plan wind-up.
- The benefit provisions of the plan, for example:
    - where a plan has generous ancillary benefits, an election to receive a commuted value transfer may be affected by the maximum transfer limits imposed under Section 8517 of the Income Tax Regulations (Canada); or
    - where a plan has inflexible retirement options and few optional forms of payment, a member may prefer to elect a commuted value transfer to increase flexibility in payment terms.
- The postulated scenario upon which the hypothetical wind-up is based.
- Past experience of the plan, when relevant.
- Any experience from actual wind-ups of comparable plans of which the actuary may be aware.

2. Guidance for valuations with effective dates on or after December 31, 2021, and no later than December 30, 2022

The guidance contained in this section applies to both immediate and deferred pensions and applies regardless of the overall size of the group annuity purchase, subject to Large Plans in Section 3 of this educational note. It applies to valuations with effective dates on or after December 31, 2021, and no later than December 30, 2022, pending any further guidance or other evidence of change in annuity pricing.

The PPFRC believes that rounding of the interest rate resulting from following the guidance outlined in this educational note to the nearest five or 10 basis points is a reasonable and appropriate approach. Each actuary would use discretion in determining whether to round the interest rate, and consistency in the application of such rounding would be followed.

Guidance for non-indexed pensions

The PPFRC has concluded that effective December 31, 2021, the cost of purchasing non-indexed annuities, prior to any adjustment for sub- or super-standard mortality, would be estimated by selecting a discount rate and mortality assumption based on the following table.

Details on the development of this guidance can be found in Appendix A.

Annuity duration	Duration	Unadjusted CANSIM V39062* as at December 31, 2021	Spread above V39062	Discount rate as at December 31, 2021
Low	8.7	1.66%	+ 100 bps	2.66%
Medium	11.3	1.66%	+ 120 bps	2.86%
High	13.9	1.66%	+ 120 bps	2.86%
Mortality table: 2014 Canadian Pensioners' Mortality Table (CPM2014), combined with mortality improvement scale CPM Improvement Scale B (CPM-B) with no adjustments for sub- or super-standard mortality.				

*Unadjusted average yield on Government of Canada marketable bonds with maturities over 10 years (CANSIM V39062).

The duration of the portion of the liabilities assumed to be settled through the purchase of annuities would be determined by calculating the impact on the estimated purchase price of a 0.01% increase in the medium duration discount rate as follows:

[(Estimated purchase price at 2.86% / Estimated purchase price at 2.87%) – 1] / 0.01%

Using this duration, the actuary would then interpolate between the durations in the table to determine the appropriate spread above unadjusted CANSIM V39062. If this duration is lower than the low duration or higher than high duration indicated in the table, the actuary would make a reasonable assumption regarding the appropriate spread and would consider the following guidance.

Very low duration annuities

The PPFRC has been monitoring hypothetical quotes for groups with durations lower than the low duration indicated in the table above. As at December 31, 2021, the PPFRC believes that a reasonable approach to derive the spread for very low duration annuities continues to be to extrapolate downwards from the spreads at the low and medium durations. Other approaches may also be reasonable.

Very high duration annuities

The PPFRC has been monitoring hypothetical quotes for groups with durations higher than the high duration listed in the table above and believes that these spreads are likely to be less than the spreads indicated at the high duration block. As at December 31, 2021, the PPFRC believes that a reasonable approach to derive the spread for very high duration annuities is to extrapolate downwards from the spread at the high duration, assuming that the rate of decrease in spreads from the high duration will be the same as the rate of increase in spreads from the low duration to the high duration. Other approaches may also be reasonable.

Example – non-indexed annuities

As at December 31, 2021, the unadjusted CANSIM V39062 was 1.66%; therefore, the guidance for the medium duration would be 2.86% (i.e., + 120 bps). Using the process

described above, if the duration of the liabilities assumed to be settled through the purchase of annuities is determined to be 10 based on an increase in discount rate of 0.01% from 2.86%, the appropriate spread above the unadjusted CANSIM V39062 would be determined as the following:

[Low spread x (Medium duration – 10) + Medium spread x (10 – Low duration)]/ [Medium duration – Low duration]

[100 bps x (11.3 – 10) + 120 bps x (10 – 8.7)] / [11.3 – 8.7] = 110 bps

Prior to rounding, an applicable underlying discount rate would then be determined as 1.66% + 1.10% = 2.76%.

Guidance for indexed pensions

The PPFRC has concluded that effective December 31, 2021, the cost of purchasing indexed annuities, prior to any adjustment for sub- or super-standard mortality, would be estimated by selecting a discount rate and mortality assumption based on the following table.

Details on the development of this guidance can be found in Appendix A.

Unadjusted CANSIM V39057* as at December 31, 2021	**Spread below V39057**	**Discount rate as at December 31, 2021**
-0.14%	- 40 bps	-0.54%
Mortality table: 2014 Canadian Pensioners' Mortality Table (CPM2014), combined with mortality improvement scale CPM Improvement Scale B (CPM-B) with no adjustments for sub- or super-standard mortality.		

* Unadjusted yield on Government of Canada real-return long-term bonds (CANSIM V39057).

Partially indexed annuities

In situations where pensions are partially indexed, indexed to a measure other than the CPI, or contain a deferred component, the actuary would make appropriate provisions consistent with the guidance provided in this educational note.

The difference between the discount rate used to estimate the cost of a non-indexed annuity and the cost of a fully indexed annuity can be broken down into two components: the best estimate of the indexing produced by the formula, and a risk premium. The risk premium represents the additional cost of purchasing a fully indexed annuity over the cost that would be charged if the insurer priced indexed annuities based only on a best estimate fixed rate of indexation. The risk premium exists due to factors such as insurers' difficulty in immunizing indexed annuities, the increased risk borne by insurers when providing indexed annuities, and/or the lack of a fully competitive market for indexed annuities. In estimating the cost of a partially indexed annuity, the actuary would normally consider both the best estimate of the indexing produced by the formula and the risk premium.

Calculation of best estimate of future inflation

As an example, one reasonable approach to determine the best estimate of future inflation is through comparing the unadjusted average yield on Government of Canada marketable bonds over 10 years (i.e., CANSIM series V39062) to the unadjusted yield on Government of Canada real-return long-term bonds (i.e., CANSIM series V39057). At December 31, 2021, the best estimate of future inflation under this approach would be 1.80%, determined by comparing the unadjusted CANSIM series V39062 yield of 1.66% to the unadjusted CANSIM series V39057 yield of -0.14%. Other approaches to determine the best estimate of future inflation may also be reasonable.

Calculation of inflation risk premium

One reasonable approach to determine the inflation risk premium would be as the difference between (1) and (2), where (1) is the difference between the discount rate used to estimate the cost of non-indexed annuities and the discount rate used to estimate the cost of fully indexed annuities and (2) is the best estimate of future inflation. For example, as at December 31, 2021, the difference between discount rates for non-indexed and indexed annuities with respect to an annuity with a duration of 13.9 is 2.86% - (-0.54%) = 3.40%; therefore, the inflation risk premium would be determined as 3.40% - 1.80% = 1.60%.

Types of partial indexation provisions

Where offsets, caps, or floors apply, the actuary would adjust the implicit discount rates otherwise applicable, based on the likelihood of these features causing a material change in the pension payable in any year, guided by the current economic environment, economic expectations, and long-term historical experience. The actuary may consider the use of stochastic analysis for this purpose.

Since there are significant variations in the types of partial indexation provisions and limited data on actual purchases, it is not feasible to provide guidance that would apply in all possible circumstances. However, common indexation provisions are often based on one, or a combination, of the following four scenarios:

a) *Fixed rate increases*: If the pension increase is based on a fixed rate per year, the expected increase in the pension amounts payable is known. An appropriate discount rate would be equal to the discount rate determined as if the pension were not indexed, less the fixed increase percentage. For example, as at December 31, 2021, a 2% fixed indexation rate for an annuity with duration of 13.9 (determined as if the pensions were not indexed) would result in a discount rate of 0.86% (2.86% - 2%).

b) *Percentage of CPI*: Where the indexation is a percentage of CPI without any offsets, caps, or floors, the expected pension amounts payable can be allocated between a fully indexed pension and a non-indexed pension; an appropriate implicit discount rate may be determined as follows:

   (Indexation %) x Fully indexed proxy + (1- Indexation %) x Non-indexed proxy

For purposes of determining the non-indexed proxy in the above formula, the duration of the portion of the liabilities assumed to be settled through the purchase of annuities would be determined as if the pensions were *not* indexed.

For example, for a plan that provides indexing based on 75% of the CPI increase without any offsets, caps, or floors, and where the duration of the group expected to be settled through the purchase of annuities (determined as if the pensions were not indexed) is 13.9, an appropriate discount rate as at December 31, 2021, would be determined as
75% x (- 0.54%) + (1 - 75%) x (2.86%) = 0.31%.

c) *CPI, subject to a fixed cap:* If the cap is significantly greater than the best estimate of future inflation, the assumed discount rate would approach that of a fully indexed pension. If the cap is relatively low compared to the best estimate of future inflation, the assumed discount rate would approach that of a fixed rate increase where the fixed rate is equal to the cap. For caps that are neither relatively high nor relatively low, compared to the best estimate of indexing produced by the formula, an appropriate discount rate would be equal to that of a non-indexed pension reduced by the best estimate of the indexing produced by the formula and a portion of the inflation risk premium. The higher the cap, the higher the portion of the inflation risk premium that would be reflected, due to the increased variability in the level of indexing that would be provided.

d) *CPI, less an offset:* An appropriate discount rate would be equal to that of a fully indexed pension increased by a portion of the offset. Typically, the discount rate would not be increased by the full amount of the offset, since insurers would have difficulty immunizing the expected pension amounts given their need to protect against inflation at higher levels. For example, if the best estimate of future inflation is moderately below the offset, it would not be reasonable to assume a discount rate equivalent to a non-indexed pension, as there would be a significant likelihood that the inflation rate would exceed the offset in a number of future years, and insurers would also be expected to embed a cost associated with the risk of high-inflation environments. The use of a non-indexed discount rate in this case would incorrectly assign no value to the indexation feature. Consider, for example, a plan with indexation based on the CPI increase less 2%, with a minimum of 0%. At December 31, 2021, the offset is in excess of the best estimate of future inflation of 1.80%. In this circumstance, it would not be appropriate to estimate the cost of purchasing this annuity as if it were non-indexed.

3. Factors affecting annuity pricing

This educational note provides actuaries with guidance related to establishing assumptions for hypothetical wind-up and solvency valuations. The pricing for an actual group annuity purchase depends on many factors, and the actuary may make adjustments for these factors, with appropriate justification.

In addition to the duration of the purchase, other factors that may affect pricing of a particular purchase include, but are not limited to, the following:

- the factors related to mortality
- the overall size of the purchase
- the proportion of deferred vested members included in the group being purchased
- broad capital market conditions at the time of the purchase
- competitive pressures in the group annuity market at the time of the purchase

Nevertheless, the pricing for an actual group annuity purchase, as established by an insurer, may differ from the guidance provided herein.

Use of bona fide annuity quotes

The actuary would consider any relevant annuity bona fide quotes for the plan or related plans. Such quotes could be used as a basis for making adjustments as described above. Alternatively, the hypothetical wind-up and solvency valuation may be based on a bona fide annuity quote for all or part of a pension plan if, in the view of the actuary, the bona fide annuity quote would represent a more appropriate measure of the plan's solvency liability for the members included in the bona fide annuity quote at a particular valuation date.

Paragraph 3240.05 of the *Standards of Practice* states: "For a hypothetical wind-up valuation, the actuary may assume that the wind-up date, the calculation date and the settlement date are coincident." The actuary would therefore use caution if the quotation date of the bona fide annuity quote is not the same as the valuation date. If relying on a bona fide annuity quote for the valuation, the actuary would consider factors such as the following:

- The length of time between the valuation date and the quotation date.
- Any changes in market conditions between the valuation date and the quotation date, which may include factors specific to the insurer providing the bona fide annuity quote.
- Any changes in the demographics of the annuity group between the valuation date and the quotation date.

The actuary would describe the bona fide annuity quote and any subsequent adjustments made to the annuity quote if used for a hypothetical wind-up or solvency valuation.

Individual annuity pricing

The PPFRC observes that the pricing of individual and group annuities can differ for various reasons such as the following:

- There is a greater risk of anti-selection for individual annuities.
- The size of the average monthly pension is usually larger for individual annuities.

- Individual annuities may have less complex ancillary features.
- The ability to find appropriate fixed-income investments to back the annuity obligation may be a lesser issue for individual annuities due to the relatively small premium size, particularly during a period in which many fixed-income instruments are highly illiquid.
- The group annuity pricing is underwritten at the time of the quote, while individual annuity pricing for a particular quote may be "automated."

Where an actuary considers that a plan's benefit obligations would be settled by the purchase of one or more individual annuities, yields based on relevant individual annuity quotes may be reflected in establishing an appropriate assumption for determining the hypothetical wind-up or solvency liabilities of the plan.

Large plans

Due to capacity constraints within the Canadian group annuity market, pension plans with very large liabilities may have difficulty purchasing a single group annuity to settle their immediate and deferred pension liabilities in the event of a plan wind-up. The liability thresholds where a plan may have difficulty in effecting a single annuity purchase to settle its liabilities are:

	Non-indexed annuities	**Indexed annuities**
June 30, 2021 onward	$1,000 million	$300 million
Dec 31, 2018, to June 29, 2021	$750 million	$250 million
Sep 2013 to Dec 30, 2018	$500 million	$200 million

While size of purchase is a significant factor in making this determination, the PPFRC believes it is not the only factor, and the actuary may consider others. Furthermore, the actuary would give significant consideration to the actual annuity market as of the valuation date.

It is difficult to predict how the benefits of members who are entitled to an immediate or deferred pension would be settled in the event of an actual wind-up for plans with liabilities significantly greater than the amounts noted above. Paragraph 3240.05.1 of the *Standards of Practice* states:

"For a hypothetical wind-up valuation, the actuary may assume that benefits would be settled by the purchase of annuities regardless of any limitation of capacity in the market for group annuity contracts."

Thus, in performing a hypothetical wind-up or solvency valuation of such a plan, the actuary may assume that the benefits would be settled through a single annuity purchase, even if such a purchase would not be practical. Alternatively, the actuary may make a reasonable hypothesis for the manner in which the benefits may be settled, which would be consistent with the postulated wind-up scenario.

This guidance applies to valuations with effective dates on and after December 31, 2021, pending any further guidance on the capacity thresholds for annuity pricing.

Except as noted above, actuaries would continue to reference the April 2020 revised educational note on the *Alternative Settlement Methods for Hypothetical Wind-Up and Solvency Valuations* where such methods are considered.

Mortality adjustments

The hypothetical quotes as discussed in Appendix A were requested to be based on an assumption that the priced group's life expectancy is typical of a group annuity purchase. The hypothetical quotes were also requested to be based on typical pension sizes, irrespective of the underlying data. That is, no adjustments for sub- or super-standard mortality were to be made due to the size of the pensions, or other factors, in the illustrative block.

Insurers consider occupational and demographic factors in establishing mortality assumptions for the pricing of specific group annuities, as do pension actuaries for establishing liabilities for other purposes, including going concern valuations. The actual observed annuity quotes support this conclusion. The factors an insurer may consider are similar to those that pension actuaries consider in establishing liabilities, such as the credibility of experience, the experience of similar plans, published mortality studies, plan provisions that expose the group to anti-selection or tail risk, and possible adjustments based on characteristics such as collar type, industry, and pension size.

An adjustment to regular annuity purchase assumptions would be expected where there is demonstrated sub- or super-standard mortality versus a typical group annuity purchase, or where an insurer might be expected to assume significantly shorter or longer-than-average pension plan longevity based on the above factors. In such cases, the actuary would be expected to make an adjustment to the mortality assumption in a manner consistent with the underlying annuity purchase basis. The adjustment may include using a different underlying mortality table, developing a broad adjustment to the underlying mortality table (e.g., 90% or 110% of the standard table rates), or, in some cases, using different adjustment factors for a range of ages. Other approaches for making an adjustment may also be reasonable.

For example, if the actuary had a view that the appropriate mortality for a plan was 75% of the 2014 Private Sector Canadian Pensioners' Mortality Table (CPM2014Priv), Improvement Scale B (CPM-B) ("CPMPriv2014Proj"), a first consideration could be to express the plan's underlying mortality table using CPM2014Proj. In this example, 75% of the CPMPriv2014Proj may produce a similar liability as using 80% of CPM2014Proj (depending on plan characteristics). The actuary would then determine the amount of an adjustment, if any, to the regular annuity purchase assumptions to reflect the implied super-standard mortality.

Further guidance on the nature of adjustments for plan characteristics can be found in the second revision of the educational note *Selection of Mortality Assumptions for Pension Plan Actuarial Valuations*.

4. Wind-up expenses

Actuaries may refer to the educational note *Expenses in Funding Valuations for Pension Plans* for guidance on provisions for wind-up expenses.

5. Retroactive application

If an actuary has already prepared a funding valuation report with an effective date on or after December 31, 2021, before the publication of this guidance, the actuary would consider paragraphs 1710.36 through 1710.43 of the *Standards of Practice* to determine whether it is necessary to withdraw or amend the report.

6. Recent developments and future guidance

The PPFRC intends to continue monitoring group annuity pricing on a quarterly basis. Actuaries may use the spreads indicated above for hypothetical wind-up and solvency valuations with effective dates on or after December 31, 2021, and no later than December 30, 2022, pending any further guidance or other evidence of a change in annuity pricing.

Given the volatility in group annuity pricing that has occurred in the past few years, it is possible that revised guidance may be necessary during the year and, if that occurs, there will necessarily be some delay (such as 30 to 60 days) between the effective date of data collection and the publication of such revised guidance. When reporting results of a valuation within a period prior to 60 days of the effective date of the valuation, the actuary may wish to alert users of the report to the possibility that revisions to the report may be needed if new guidance is published.

Moreover, actuaries would consider the volatility in group annuity prices and pricing factors when communicating advice related to future hypothetical wind-up and solvency valuations.

In addition to monitoring group annuity pricing on a quarterly basis, the PPFRC intends to continue reviewing the methodology used in establishing the guidance on an ongoing basis. Issues monitored include the underlying economic and mortality basis used to express the guidance, the impact of block size, and the composition of the blocks.

Responsibility for the manner of application of pension-specific standards in specific circumstances remains that of the member in the pension practice area.

Appendix A – Methodology in developing guidance

Data

The PPFRC began collecting data from insurers on a quarterly basis in 2009. Seven insurers participated in the process as of December 31, 2021. Under the current process, the PPFRC obtained hypothetical quotes on non-indexed illustrative blocks of business of five different durations. The PPFRC added a lower and higher duration block to the original three illustrative blocks of business in 2017. The majority of the contributing insurers also provided hypothetical quotes for the illustrative blocks, determined as if the pensions were fully indexed to increases in the CPI.

Summary data in respect of the three central non-indexed illustrative blocks is as follows:

Duration	**Low**	**Medium**	**High**
Duration at December 31, 2021	8.7	11.3	13.9
Approximate premium at December 31, 2021	$19 million	$25 million	$26 million
Average monthly pension	$897	$897	$897
Approximate proportion of liability for deferred members	0%	4%	13%

For the purpose of this guidance, the durations of the non-indexed illustrative blocks shown above were determined by calculating the impact of a 0.01% increase in the discount rate, using the following formula:

[(Estimated purchase price at 2.86% / Estimated purchase price at 2.87%) – 1] / 0.01%

where 2.86% is equal to the unadjusted average yield on Government of Canada marketable bonds with maturities over 10 years (CANSIM V39062) of 1.66% plus 120 basis points (bps) at December 31, 2021, being the guidance for the non-indexed illustrative block with medium duration (as described in this educational note). Note that the durations of the three illustrative blocks will change over time as discount rates change.

The guidance contained in this educational note is partially based on hypothetical quotes provided by the seven insurance companies on illustrative group annuity business using pricing conditions as at December 31, 2021. These data were collected on the same basis as the hypothetical quotes prepared quarterly since June 30, 2013. The insurers provided quotes that they have indicated are realistic (i.e., as though the quotes truly represent blocks of business on which they are bidding) as of the agreed-upon dates. Based on the quotes, the PPFRC then calculated the implicit discount rate underlying each quote in conjunction with mortality rates equal to the 2014 Canadian Pensioners' Mortality Table (CPM2014) combined with mortality improvement scale CPM Improvement Scale B (CPM-B) with no mortality adjustments (CPM2014Proj).

The participating insurers have requested, for competitive reasons, that the PPFRC not disclose the individual discount rates underlying the insurer quotes, including the discount rate associated with the most competitive quote.

The PPFRC and the insurers agreed that, for purposes of this educational note, it would be appropriate to disclose the average of the discount rates for the three most competitive hypothetical quotes. Regardless of this average, in developing the guidance, the PPFRC considered all the information received in the confidential hypothetical quotes.

Consistent with the analysis performed at previous quarter ends, the hypothetical quote information was supplemented with data on the pricing of actual group annuity purchases and bona fide quotations in cases where the transaction did not proceed during the fourth quarter of 2021, as provided by several actuarial consulting firms. The total volume of data collected during calendar 2021 for buyout and buy-in group annuity purchases in Canada was approximately $7.4B.

Mortality basis

The PPFRC does not have access to the mortality assumptions used by insurers for purposes of pricing group annuities. The assumed mortality table and assumed future mortality improvements used to establish the discount rate guidance in this educational note are the 2014 Combined Canadian Pensioners' Mortality Table (CPM2014) in conjunction with the CPM Improvement Scale B (CPM-B) with no mortality adjustments (CPM2014Proj), irrespective of the basis used by insurers when submitting quotes. This is the current mortality table promulgated for the computation of pension commuted values in accordance with subsection 3530 of the *Standards of Practice*. The choice of the mortality assumption used for this guidance is unlikely to materially affect the estimated cost of purchasing an annuity since the guidance is derived by solving for the discount rate that along with the selected mortality table produces the price of an annuity.

Analysis – Non-indexed annuities

In establishing the guidance, the PPFRC has given weight to the hypothetical quotes and to the data collected on actual annuity purchases and bona fide quotations.

The table below provides the implicit discount rates as at December 31, 2021, underlying the average of the three most competitive hypothetical quotes, determined in conjunction with CPM2014Proj, and the spread of these implicit discount rates over the CANSIM V39062 yield. Comparable information is also shown as at September 30, 2021.

Average of the three most competitive hypothetical quotes (Using CPM2014Proj mortality tables)			
Duration	**Low**	**Medium**	**High**
	December 31, 2021		
Discount rate	2.60%	2.83%	2.86%
Spread over CANSIM V39062	+ 94 bps	+ 117 bps	+ 120 bps
	September 30, 2021		
Discount rate	2.84%	3.00%	3.08%
Spread over CANSIM V39062	+ 92 bps	+ 108 bps	+ 116 bps

The spread over CANSIM V39062 based on the average of the three most competitive hypothetical quotes increased slightly during the quarter for each of the illustrative blocks. In addition, the observed spreads for actual purchases and bona fide quotations varied during the quarter and were, on average, generally in line with the averages quoted above.

Analysis – Fully CPI-indexed annuities

The hypothetical quotes for the medium-duration illustrative block as at September 30, 2021, and December 31, 2021, are summarized as follows:

Average of the most competitive hypothetical quotes (Using CPM2014Proj mortality tables)			
	Number of hypothetical quotes in the average	**Discount rate**	**Spread over CANSIM V39057**
December 31, 2021	3	-0.74%	- 60 bps
September 30, 2021	3	- 0.29%	- 54 bps

Based on the average of the most competitive hypothetical quotes, the absolute value of the spreads relative to the unadjusted yield on Government of Canada real-return long-term bonds (CANSIM V39057) for the medium-duration illustrative block increased slightly during the quarter. The absolute value of the spread for the low and high duration blocks was larger than for the medium duration block.

While there is some indication that the pricing of CPI-indexed annuities may also vary by duration, the PPFRC has concluded that there are insufficient data at this stage to introduce this level of refinement. Consequently, the guidance contained herein is applicable to CPI-indexed annuities regardless of their duration.

The quantitative data obtained on actual fully indexed annuity purchases and bona fide quotations in cases where the transaction did not proceed during the fourth quarter of 2021, while limited, exceeded that available in prior quarters. The absolute value of the spreads relative to CANSIM V39057 for this data was smaller than for the averages quoted above.

In developing the guidance, the PPFRC considered all the information received.

Appendix B – Summary and links for historical guidance

The following is a summary of the historical guidance issued by the PPFRC. The summary is provided for reference, and actuaries are directed to refer to the respective published educational note or educational note supplement.

Educational note/ supplement/ explanatory report	**Mortality table**[3]	**Non-indexed immediate and deferred** *Duration: Spread relative to unadjusted CANSIM V39062*			**Fully CPI-indexed** *Spread relative to unadjusted CANSIM V39057*
		Low duration	**Medium duration**	**High duration**	**All durations**
Dec 31, 2021	CPM2014Proj	8.7: + 100 bps	11.3: + 120 bps	13.9: + 120 bps	- 40 bps
Sep 30, 2021	CPM2014Proj	8.6: + 100 bps	11.1: + 120 bps	13.6: + 130 bps	- 50 bps
Jun 30, 2021	CPM2014Proj	8.6: + 100 bps	11.2: + 120 bps	13.7: + 130 bps	- 50 bps
Mar 31, 2021	CPM2014Proj	8.5: + 100 bps	11.1: + 120 bps	13.6: + 130 bps	- 50 bps
Dec 31, 2020	CPM2014Proj	8.9: + 120 bps	11.6: + 140 bps	14.3: + 150 bps	- 50 bps
Sep 30, 2020	CPM2014Proj	8.9: + 130 bps	11.6: + 150 bps	14.3: + 160 bps	- 50 bps
Jun 30, 2020	CPM2014Proj	8.8: + 140 bps	11.6: + 160 bps	14.3: + 170 bps	- 50 bps
Apr 30, 2020	CPM2014Proj	8.9: + 130 bps	11.7: + 140 bps	14.5: + 150 bps	- 70 bps
Mar 31, 2020	CPM2014Proj	8.7: + 150 bps	11.4: + 160 bps	13.9: + 170 bps	- 70 bps
Dec 31, 2019	CPM2014Proj	8.6: + 110 bps	11.2: + 120 bps	13.7: + 120 bps	- 70 bps
Sep 30, 2019	CPM2014Proj	8.7: + 120 bps	11.3: + 130 bps	13.9: + 130 bps	- 70 bps
Jun 30, 2019	CPM2014Proj	8.7: + 100 bps	11.4: + 110 bps	14.0: + 110 bps	- 70 bps
Mar 31, 2019	CPM2014Proj	8.6: + 100 bps	11.2: + 110 bps	13.8: + 110 bps	- 70 bps
Dec 31, 2018	CPM2014Proj	8.5: + 100 bps	11.0: + 110 bps	13.4: + 110 bps	- 70 bps
Sep 30, 2018	CPM2014Proj	8.4: + 80 bps	10.9: + 90 bps	13.3: + 90 bps	- 80 bps
Jun 30, 2018	CPM2014Proj	8.5: + 80 bps	11.1: + 80 bps	13.5: + 90 bps	- 70 bps
Mar 31, 2018	CPM2014Proj	8.5: + 70 bps	11.1: + 80 bps	13.6: + 90 bps	- 70 bps
Dec 31, 2017	CPM2014Proj	8.6: + 70 bps	11.1: + 80 bps	13.6: + 90 bps	- 70 bps
Sep 30, 2017	CPM2014Proj	8.5: + 60 bps	11.1: + 70 bps	13.5: + 80 bps	- 70 bps
Jun 30, 2017	CPM2014Proj	8.6: + 60 bps	11.2: + 80 bps	13.8: + 90 bps	- 70 bps
Mar 31, 2017	CPM2014Proj	8.5: + 70 bps	11.0: + 100 bps	13.5: + 110 bps	- 60 bps
Dec 31, 2016	CPM2014Proj	8.5: + 70 bps	11.0: + 90 bps	13.5: + 100 bps	- 60 bps
Sep 30, 2016	CPM2014Proj	8.7: + 80 bps	11.4: + 110 bps	14.0: + 120 bps	- 70 bps
Jun 30, 2016	CPM2014Proj	8.6: + 90 bps	11.3: + 120 bps	13.8: + 130 bps	- 70 bps
Mar 31, 2016	CPM2014Proj	8.5: + 90 bps	11.1: + 120 bps	13.6: + 130 bps	- 70 bps
Dec 31, 2015	CPM2014Proj	8.5: + 60 bps	11.1: + 100 bps	13.6: + 110 bps	- 70 bps
Sep 30, 2015	CPM2014Proj	8.4: + 80 bps	11.0: + 110 bps	13.4: + 120 bps	- 70 bps
Jun 30, 2015	UP94Proj	8.3: - 20 bps	10.9: + 30 bps	13.6: + 60 bps	- 120 bps
Mar 31, 2015	UP94Proj	8.5: + 0 bps	11.3: + 30 bps	14.0: + 60 bps	- 120 bps
Dec 31, 2014	UP94Proj	8.2: + 0 bps	10.9: + 30 bps	13.5: + 60 bps	- 120 bps
Sep 30, 2014	UP94Proj	8.1: + 0 bps	10.6: + 30 bps	13.2: + 50 bps	- 120 bps
Jun 30, 2014	UP94Proj	8.0: + 0 bps	10.5: + 40 bps	12.9: + 60 bps	- 110 bps
Mar 31, 2014	UP94Proj	7.7: + 50 bps	10.1: + 80 bps	12.3: + 100 bps	- 100 bps

[3] "CPM2014Proj": 2014 Canadian Pensioners' Mortality Table (CPM2014), combined with mortality improvement scale CPM Improvement Scale B (CPM-B) with no adjustments for sub- or super-standard mortality; "UP94Proj," "UP94@2020," "UP94@2015": UP94 mortality table, combined with mortality improvement scale AA on fully generational basis or static basis to indicated year.

Educational note/ supplement/ explanatory report	**Mortality table[3]**	**Non-indexed immediate and deferred** *Duration: Spread relative to unadjusted CANSIM V39062*			**Fully CPI-indexed** *Spread relative to unadjusted CANSIM V39057*
		Low duration	**Medium duration**	**High duration**	**All durations**
Dec 31, 2013	UP94Proj	7.6: + 50 bps	9.9: + 70 bps	12.1: + 80 bps	- 110 bps
Sep 30, 2013	UP94Proj	7.6: + 60 bps	9.9: + 80 bps	12.2: + 90 bps	- 100 bps
Jun 30, 2013	UP94Proj	7.8: + 40 bps	10.2: + 60 bps	12.5: + 70 bps	- 120 bps

Educational note / supplement	**Mortality table[3]**	**Non-indexed** *Spread relative to unadjusted CANSIM V39062*		**Fully CPI-indexed** *Spread relative to unadjusted CANSIM V39057*
		Immediate	**Deferred**	**All purchase sizes**
Mar 31, 2013	UP94Proj	+ 70 bps		+ 0 bps
Dec 31, 2012	UP94Proj	+ 70 bps		+ 0 bps
Sep 30, 2012	UP94Proj	+ 70 bps		+ 0 bps
Jun 30, 2012	UP94Proj	+ 80 bps		+ 0 bps
Mar 31, 2012	UP94Proj	+ 90 bps		+ 0 bps
Dec 31, 2011	UP94Proj	+ 90 bps		+ 0 bps
Sep 30, 2011	UP94Proj	+ 90 bps		+ 0 bps
Jun 30, 2011	UP94Proj	+ 70 bps		+ 0 bps
Mar 31, 2011	UP94Proj	+ 70 bps		+ 0 bps
Dec 31, 2010	UP94@2020	+ 100 bps		+ 0 bps
Sep 30, 2010	UP94@2020	+ 110 bps		+ 0 bps
Jun 30, 2010	UP94@2020	+ 70 bps		+ 0 bps
Mar 31, 2010	UP94@2020	+ 40 bps		+ 0 bps
Dec 31, 2009	UP94@2020	+ 40 bps		+ 0 bps
Jul 31, 2009	UP94@2015	+ 10 bps to + 50 bps[4]		- 40 bps to + 0 bps[4]
Oct 31, 2008	UP94@2015	+ 100 bps to + 140 bps[4]	+ 100 bps	- 40 bps to + 0 bps[4]
Feb 29, 2008	UP94@2015	+ 70 bps to + 110 bps[4]	+ 70 bps	- 40 bps to + 0 bps[4]

[4] Higher (Lower) rate applies to purchases with a total premium over $15 (of $0) million at the valuation date. Linear grading of the 40 bps difference applies for purchases with a premium under $15 million.