Canadian Institute of Actuaries | Institut canadien des actuaires

Final Standards

Determination of Pension Commuted Values in Economic Environments Where Bond Yields are Negative

Actuarial Standards Board

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Revised Subsection 3540 (Clean)

Subsection 3540, as amended effective February 1, 2022, is reproduced below.

3540 Economic Assumptions

.01 Economic assumptions that vary depending on whether the pension is fully indexed, partially indexed, or non-indexed should be selected. For commuted values calculated in accordance with subsection 3570, the economic assumptions should be determined in accordance with subsection 3570. [Effective December 1, 2020]

.02 Economic assumptions should be selected based on the reported rates for the applicable CANSIM series for the calendar month immediately preceding the month in which the valuation date falls. [Effective December 1, 2020]

.03 Two interest rates and two rates of pension escalation, when applicable, should be calculated. The first rate is applicable to the first 10 years after the valuation date and the second is applicable to all years thereafter. [Effective December 1, 2020]

.04 The commuted value of a fully or partially indexed pension should be at least equal to the commuted value applicable to a non-indexed pension in the same amount and having similar characteristics. [Effective April 1, 2009]

.05 The following three factors should be determined from the CANSIM series:

CANSIM Series	Description	Factor
V122542	Seven-year Government of Canada benchmark bond yield, annualized (final Wednesday of month)	i_7
V122544	Long-term Government of Canada benchmark bond yield, annualized (final Wednesday of month)	i_L
V122553	Long-term real-return Government of Canada bond yield, annualized (final Wednesday of month)	r_L

Note that the factors determined above are not the reported CANSIM series, but the annualized value of the reported figure. [Effective December 1, 2020]

.06 A fourth factor should also be determined as follows:

$$r_7 = (1 + r_L) * (1 + i_7)/(1 + i_L) - 1$$

[Effective February 1, 2022]

.06.1 Four bond yield spreads should be determined, based on the index yields for the final Wednesday of the calendar month immediately preceding the month in which the valuation date falls, calculated as follows:

$PS_{1\text{-}10}$ = (Canada Mid-term provincial bond index yield, annualized) – (Canada Mid-term federal non-agency bond index yield, annualized)

$CS_{1\text{-}10}$ = (Canada Mid-term corporate bond index yield, annualized) – (Canada Mid-term federal non-agency bond index yield, annualized)

PS_{10+} = (Canada Long-term provincial bond index yield, annualized) – (Canada Long- term federal non-agency bond index yield, annualized)

CS_{10+} = (Canada Long-term corporate bond index yield, annualized) – (Canada Long-term federal non-agency bond index yield, annualized)

The bond index yields, before being annualized, referred to in this paragraph 3540.06.1 are the average semi-annual mid market yields to maturity for each index published by FTSE Canada Debt Capital Markets at the market close on the final Wednesday of the calendar month immediately preceding the month in which the valuation date falls, or such other bond index yields or calculation bases that may be promulgated from time to time by the Actuarial Standards Board for purposes of these calculations.

The bond index yields used to calculate $PS_{1\text{-}10}$, $CS_{1\text{-}10}$, PS_{10+}, or CS_{10+} are not the yields published, but the annualized value of the published figures.

If $PS_{1\text{-}10}$, $CS_{1\text{-}10}$, PS_{10+}, or CS_{10+} as calculated above is less than zero, the bond yield spread should be set equal to zero. [Effective December 1, 2020]

.06.2 Two spread adjustments should be determined as follows:

$$s_{1\text{-}10} = (0.667 * PS_{1\text{-}10}) + (0.333 * CS_{1\text{-}10})$$

$$s_{10+} = (0.667 * PS_{10+}) + (0.333 * CS_{10+})$$

If $s_{1\text{-}10}$ or s_{10+} as calculated above is more than 1.5%, the spread adjustment should be set equal to 1.5%. [Effective December 1, 2020]

.07 The following interest rates should be used to calculate commuted values:

	Interest rates
First 10 Years	$i_{1\text{-}10} = i_7 + s_{1\text{-}10}$
After 10 Years	$i_{10+} = i_L + 0.5 * (i_L - i_7) + s_{10+}$

If $i_{1\text{-}10}$ or i_{10+} as calculated above is less than zero, that interest rate should be set equal to zero. [Effective February 1, 2022]

.08 Repealed

.09 For pensions that are fully indexed to increases in the Consumer Price Index the rates of pension escalation should be determined based on the implied rates of increase in the Consumer Price Index for any escalation falling within the first 10 anniversaries of the valuation date inclusive, and thereafter determined as follows:

	Implied rates of increase in CPI
First 10 Years	$c_{1\text{-}10} = (1+i_7) / (1+r_7) - 1$
After 10 Years	$c_{10+} = (1+i_L + 0.5 * (i_L - i_7)) / (1+r_L + 0.5 * (r_L - r_7)) - 1$

[Effective December 1, 2020]

.10 For pensions that are partially indexed to increases in the Consumer Price Index, the rates of pension escalation should be determined by applying the partial indexing formula of the plan to those rates of increase in the Consumer Price Index, determined in accordance with paragraph 3540.09. [Effective December 1, 2020]

.11 Where rates in pension escalation are related to increases in the average wage index, it should be assumed that the average wage index will increase at rates that are one percentage point higher than the rates of increase in the Consumer Price Index. [Effective December 1, 2020]

.12 A pension that is indexed according to an excess interest approach involves increases that are linked to the excess of formula A over formula B, where A is some proportion of the rate of return on the pension fund or on a particular class of assets, and B is a base rate or some proportion of the rate of return on another asset class. In determining the interest rates under formula A and formula B, the interest rates determined in accordance with paragraph 3540.07 should be used as proxies for the rate of return on the pension fund or on any particular asset class for which the rate of return is expected to be equal to or greater than the non-indexed interest rates determined in accordance with paragraph 3540.07. [Effective December 1, 2020]

.13 Prior to calculating the commuted value, the rates of interest and/or rates of pension escalation determined in accordance with this subsection 3540 should be adjusted using either of the following approaches:

- Round each of the rates of interest and rates of pension escalation to the nearest multiple of 0.10%; or
- Round to the nearest multiple of 0.10%
  - The rates of interest, and
  - The compound difference between the rates of interest and the rates of pension escalation (the "rounded interest rates net of pension escalation").

  The final rates of pension escalation would then be determined based on the compound difference between the rounded rates of interest and the rounded interest rates net of pension escalation. This approach produces rounded interest rates, unrounded rates of pension escalation and rounded interest rates net of pension escalation.

Any rates of interest, increase, or escalation used in calculations prior to the final step of the determination should not be rounded. [Effective December 1, 2020]

Pension index frequency

.14 Reasonable approximations may be used to take into account the specific circumstances of the situation regarding payment frequency, indexing frequency, and time and amount of the first increase of pension escalations.

Pension indexed on an excess interest formula

.15 If the pension is indexed on an excess interest formula and the particular asset class is one for which the rate of return is expected to be less than the interest rates determined in accordance with paragraph 3540.07, in determining the expected rate of return on a particular asset class for this purpose, the current economic environment as well as future expectations would be considered.

Other modifications

.16 Where pension escalation rates are either modified by applying a maximum or minimum annual increase, with or without carry forward of excesses or deficiencies to later years, or modified by prohibiting a decrease in a year where the application of the formula would otherwise cause a decrease in pension, the pension escalation rates otherwise applicable would be adjusted, based on the likelihood of the modification causing a material change in the pension payable in any year. In determining such likelihood, the current economic environment as well as future expectations would be considered. Either a stochastic or deterministic analysis may be used to determine the pension escalation rates.

.16.1 Where pension escalation rates are based on the funded status of the pension plan, the pension escalation rates otherwise applicable would be adjusted, based on the likelihood of the plan's funded status causing a material change in the pension payable in any year. In determining such likelihood, the current funded status of the plan and the projected funded status in future years would be considered in determining the pension escalation rates. A stochastic or deterministic analysis may be used to determine the pension escalation rates.

.17 Where pension escalation rates are not determined by reference to increases in the Consumer Price Index, the commuted value would be consistent with the values of non-indexed pensions and fully indexed pensions.

Alternative calculation method

.18 Repealed.

Revised Subsection 3540 (Red-Lined)

The changes to subsection 3540 are marked in this red-lined version.

3540 Economic Assumptions

.01 Economic assumptions that vary depending on whether the pension is fully indexed, partially indexed, or non-indexed should be selected. For commuted values calculated in accordance with subsection 3570, the economic assumptions should be determined in accordance with subsection 3570. [Effective December 1, 2020]

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.05 The following three factors should be determined from the CANSIM series:

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Note that the factors determined above are not the reported CANSIM series, but the annualized value of the reported figure. [Effective December 1, 2020]

.06 A fourth factor should also be determined as follows:

~~$r_7 = r_L * (i_7 / i_L)$~~

$r_7 = (1 + r_L) * (1 + i_7)/(1 + i_L) - 1$

[Effective February 1, 2022 ~~December 1, 2020~~]

.06.1 Four bond yield spreads should be determined, based on the index yields for the final Wednesday of the calendar month immediately preceding the month in which the valuation date falls, calculated as follows:

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The bond index yields, before being annualized, referred to in this paragraph 3540.06.1 are the average semi-annual mid market yields to maturity for each index published by FTSE Canada Debt Capital Markets at the market close on the final Wednesday of the calendar month immediately preceding the month in which the valuation date falls, or such other bond index yields or calculation bases that may be promulgated from time to time by the Actuarial Standards Board for purposes of these calculations.

The bond index yields used to calculate $PS_{1\text{-}10}$, $CS_{1\text{-}10}$, PS_{10+}, or CS_{10+} are not the yields published, but the annualized value of the published figures.

If $PS_{1\text{-}10}$, $CS_{1\text{-}10}$, PS_{10+}, or CS_{10+} as calculated above is less than zero, the bond yield spread should be set equal to zero. [Effective December 1, 2020]

.06.2 Two spread adjustments should be determined as follows:

$$s_{1\text{-}10} = (0.667 * PS_{1\text{-}10}) + (0.333 * CS_{1\text{-}10})$$

$$s_{10+} = (0.667 * PS_{10+}) + (0.333 * CS_{10+})$$

If $s_{1\text{-}10}$ or s_{10+} as calculated above is more than 1.5%, the spread adjustment should be set equal to 1.5%. [Effective December 1, 2020]

.07 The following interest rates should be used to calculate commuted values:

	Interest rates
First 10 Years	$i_{1\text{-}10} = i_7 + s_{1\text{-}10}$
After 10 Years	$i_{10+} = i_L + 0.5 * (i_L - i_7) + s_{10+}$

If $i_{1\text{-}10}$ or i_{10+} as calculated above is less than zero, that interest rate should be set equal to zero. [Effective February 1, 2022~~December 1, 2020~~]

.08 Repealed

.09 For pensions that are fully indexed to increases in the Consumer Price Index the rates of pension escalation should be determined based on the implied rates of increase in the Consumer Price Index for any escalation falling within the first 10 anniversaries of the valuation date inclusive, and thereafter determined as follows:

	Implied rates of increase in CPI
First 10 Years	$c_{1\text{-}10} = (1+i_7) / (1+r_7) - 1$
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[Effective December 1, 2020]

.10 For pensions that are partially indexed to increases in the Consumer Price Index, the rates of pension escalation should be determined by applying the partial indexing formula of the plan to those rates of increase in the Consumer Price Index, determined in accordance with paragraph 3540.09. [Effective December 1, 2020]

.11 Where rates in pension escalation are related to increases in the average wage index, it should be assumed that the average wage index will increase at rates that are one percentage point higher than the rates of increase in the Consumer Price Index. [Effective December 1, 2020]

.12 A pension that is indexed according to an excess interest approach involves increases that are linked to the excess of formula A over formula B, where A is some proportion of the rate of return on the pension fund or on a particular class of assets, and B is a base rate or some proportion of the rate of return on another asset class. In determining the interest rates under formula A and formula B, the interest rates determined in accordance with paragraph 3540.07 should be used as proxies for the rate of return on the pension fund or on any particular asset class for which the rate of return is expected to be equal to or greater than the non-indexed interest rates determined in accordance with paragraph 3540.07. [Effective December 1, 2020]

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Any rates of interest, increase, or escalation used in calculations prior to the final step of the determination should not be rounded. [Effective December 1, 2020]

Pension index frequency

.14 Reasonable approximations may be used to take into account the specific circumstances of the situation regarding payment frequency, indexing frequency, and time and amount of the first increase of pension escalations.

Pension indexed on an excess interest formula

.15 If the pension is indexed on an excess interest formula and the particular asset class is one for which the rate of return is expected to be less than the interest rates determined in accordance with paragraph 3540.07, in determining the expected rate of return on a particular asset class for this purpose, the current economic environment as well as future expectations would be considered.

Other modifications

.16 Where pension escalation rates are either modified by applying a maximum or minimum annual increase, with or without carry forward of excesses or deficiencies to later years, or modified by prohibiting a decrease in a year where the application of the formula would otherwise cause a decrease in pension, the pension escalation rates otherwise applicable would be adjusted, based on the likelihood of the modification causing a material change in the pension payable in any year. In determining such likelihood, the current economic environment as well as future expectations would be considered. Either a stochastic or deterministic analysis may be used to determine the pension escalation rates.

.16.1 Where pension escalation rates are based on the funded status of the pension plan, the pension escalation rates otherwise applicable would be adjusted, based on the likelihood of the plan's funded status causing a material change in the pension payable in any year. In determining such likelihood, the current funded status of the plan and the projected funded status in future years would be considered in determining the pension escalation rates. A stochastic or deterministic analysis may be used to determine the pension escalation rates.

.17 Where pension escalation rates are not determined by reference to increases in the Consumer Price Index, the commuted value would be consistent with the values of non-indexed pensions and fully indexed pensions.

Alternative calculation method

.18 Repealed.